2019 World Congress on Health Economics

July 13 - 17, 2019 | Basel, Switzerland

The program is current as of Friday, May 22nd, 2020. Please refer to the online program at ***https://healtheconomics.confex.com/healtheconomics/2019/meetingapp.cgi/Home*** *for updates.*

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Saturday

8:30 AM –4:30 PM SATURDAY [Pre-Congress And Sponsored Sessions]

Universität Basel | Kollegienhaus – Hörsaal 001

Global Health Expenditure Tracking

SESSION CHAIR: **Ke Xu**, World Health Organization

8:30 AM –4:30 PM SATURDAY [Pre-Congress And Sponsored Sessions]

Universität Basel | Kollegienhaus – Hörsaal 102

Immunization Economics Day 1

1:00 PM –4:30 PM SATURDAY [Pre-Congress And Sponsored Sessions]

Universität Basel | Kollegienhaus – Regenzzimmer 111

Beyond Vertical: Experiences and Approaches to Integrating Vertically-funded Health Programs into Insurance Schemes – Lessons from Africa & Asia

SESSION CHAIR: **Shreeshant Prabhakaran**, Palladium, Washington

1:00 PM –4:30 PM SATURDAY [Pre-Congress And Sponsored Sessions]

Universität Basel | Kollegienhaus – Hörsaal 114

Data to Drive Benefit Package Design: A Hands-on Orientation to WHO Tools for Informing Strategic Purchasing Priorities Through Cost-Effectiveness and Budget Impact Analysis

SESSION CHAIR: **Karin Stenberg**, World Health Organization

1:00 PM –4:30 PM SATURDAY [Pre-Congress And Sponsored Sessions]

Universität Basel | Kollegienhaus – Hörsaal 115

Immunization Economics Breakaway Discussion

1:00 PM –6:15 PM SATURDAY [Pre-Congress And Sponsored Sessions]

Universität Basel | Kollegienhaus – Hörsaal 116

Early Career Researcher (ECR) Pre-Congress Session I

SESSION CHAIRS: **Angela Esi Micah**, Institute for Health Metrics and Evaluation, University of Washington; **Tiara Wariana Marthias**, Nossal Institute for Global Health, University of Melbourne; **Giulia Greco**, London School of Hygiene & Tropical Medicine

DISCUSSANT: **Diane McIntyre**, University of Cape Town; **Philip Clarke**, Health Economics Research Centre, University of Oxford and Centre for Health Policy, University of M; **Richard Smith**, University of Exeter; **Jui-fen Rachel Lu**, Chang Gung University; **Peter Berman**, University of British Columbia; **Erin Strumpf**, McGill University

The Impact of the Affordable Care Act on Rural-Urban Disparities in Colonoscopies in Maine: An Interrupted Time Series Analysis

PRESENTER: **Ms. Annie Haakenstad**, Harvard T.H. Chan School of Public Health

Background In the United States, rural-urban disparities in health care access and costs are substantial and have major implications for health outcomes. This is particularly true for colorectal cancer (CRC), the second-leading cause of cancer-related deaths nationwide – rural residents have a 15% higher risk of CRC death. The elevated CRC mortality rates are associated with lower colonoscopy rates in rural areas. Rural residents face more substantial barriers to access to screening, including higher costs, elevated travel time, and lower density of gastroenterologists, who conduct colonoscopies. Objective This study assessed how the elimination of patient cost-sharing by the Patient Protection and Affordable Care Act (ACA) affected rural-urban disparities in colonoscopies. The policy was introduced to eliminate cost barriers to preventive services like colonoscopies and thereby increase screening rates. Given the substantial barriers to access in rural areas, it is uncertain whether rural residents benefited from the policy. Data & Methods We used the 2009-2011 All-Payer Claims Database (APCD) for Maine, which captures medical claims and member information for all enrollees in commercial insurance. Our analysis focuses on people aged 50-75 who were eligible for the cost-sharing elimination, 227,000 Maine residents. The data were merged with the American Community Survey by zip code to classify beneficiaries into rural and urban areas. ICD and CPT codes were used to identify preventive colonoscopies. We estimated colonoscopy rates based on the monthly share of insured people receiving a colonoscopy. Out-of-pocket (OOP) payments were based on the sum of all payments made by the patient on the day of the colonoscopy. We used a quasi-experimental method, a differenced interrupted time series (ITS) model, to estimate the causal effect of the ACA on the trend in the rural-urban gap in colonoscopy rates. Results Before the ACA was implemented, average patient-day OOP costs for a colonoscopy were nearly $100 higher for rural Maine residents ($293) than urban Maine residents ($196). Urban Mainers were also 7.1% more likely to have a colonoscopy in the pre-ACA period. After the elimination of cost-sharing by the ACA, we estimate a statistically significant decline in the rural-urban gap in OOP payments (p=.019) and colonoscopy rates.

What Explains the Inequalities in Healthcare use Between Immigrants and Natives in Switzerland?

PRESENTER: **Ms. Christina Tzogiou**, Zurich University of Applied Sciences and University of Lucerne

Background Even in a high income country, such as Switzerland, immigrants tend to suffer higher rates of mortality and morbidity compared to natives. Foreign nationals are an indispensable component of the Swiss demography and labor force. They comprise 25% of the permanent population, with the majority coming from EU/EFTA states. At the same time, the immigrant population in Switzerland is very heterogeneous. Unequal access to prevention, care and support can have considerable health and cost implications for the whole society. A better understanding of the inequalities in healthcare use is key for the design of cost-effective interventions towards the improvement of national health and a sustainable solidarity-based healthcare system. Objective The aim of this study is to explain the inequalities in healthcare use between different immigrant groups and natives in Switzerland. The inequality measures examined are the probability of visiting a doctor or an emergency department, as well as the number of doctor and emergency department visits in the past 12 months. Data and methods The data are drawn from the Swiss Health Survey 2012 and the Health Monitoring Survey on the immigrant population 2010 in Switzerland. The data contain information on the health status, healthcare utilization, and socioeconomic characteristics. We differentiate immigrants between first- and second generation and culturally similar and different to natives. To retrieve the relative contribution of each inequality factor we apply a non-linear decomposition method based on the Oaxaca-Blinder approach. We further extend the model by categorizing the factors into different groups, such as circumstances and effort. Results Swiss are more likely to visit the doctor compared to overall, to first generation and to culturally different immigrants. These differences could be reduced by 87%, 63% and 40%, respectively, if the corresponding immigrant groups had the same endowments as the Swiss. The contribution of effort accounts for most of the explained inequalities. Swiss also go more often to the doctor compared to the aforementioned immigrant groups. While these differences could be decreased significantly if overall and first generation immigrants had the same endowments as Swiss, the inequality between Swiss and culturally different is mainly attributed to the differences in their coefficients. Culturally similar immigrants are more likely to visit the emergency department and also exhibit a higher number of visits. Since they are fairly similar in their characteristics to the Swiss, these inequalities are mainly attributed to the differences in the coefficients. On the other hand, culturally different immigrants are less likely to visit the emergency department. The main contributing factor is the amount of the annual health insurance deductible chosen. Conclusions Healthcare utilization is lower in the immigrants most divergent from the Swiss and higher in the culturally similar. The contributions of these inequalities are heterogeneous across the four inequality measures and comparison groups. It is, therefore, important to develop customized strategies to reduce differences in endowments, but also further investigate the drivers of the differences in the coefficients.

A Moneymaking Scan: Dual Reimbursement Systems and Supplier-Induced Demand for Diagnostic Imaging

PRESENTER: **Véra Zabrodina**, University of Basel

Background: There is compelling evidence that financial incentives exert powerful influence on physician behaviour. Many countries have recently reformed the inpatient sector by introducing prospective payment and increasing patient choice to encourage hospital cost-effectiveness. Studies find mixed impacts on patient outcomes, favoring of high-margin procedures and upcoding of diagnoses in the inpatient sector. However, evidence lacks on how such reforms affect hospital healthcare provision in other care sectors, which typically differ in their reimbursement systems and incentives. Objective: In this paper, we study whether dual reimbursement systems can produce spillover effects in the form of supplier-induced demand (SID) across care sectors in hospitals. Specifically, we explore whether in-hospital imaging units increased SID on the intensive margin in the ambulatory sector following a change in the reimbursement system in the inpatient sector in Switzerland. Methods: We exploit the reform from 2012 that replaced fee-for-service and daily rates for inpatient care with prospective payment in a difference-in-differences design. In-hospital imaging units (treated), which operate in both inpatient and ambulatory sectors, suffered an exogenous shock from no longer being able to directly charge for inpatient activity. Meanwhile, ambulatory imaging practices (control) were not affected, as they do not operate in the inpatient sector. Also, all ambulatory imaging services are reimbursed by mandatory health insurance through the same fee-for-service schedule, which remained unchanged. The analysis uses exhaustive insurance claims data on ambulatory imaging services for the years 2009 to 2015. To measure SID, we use a particularity of the fee-for-service ambulatory schedule that allows any imaging provider to bill for a repeat imaging examination (RIE), on top of the examination initially (and exogenously) requested by referring physicians. This means self-referring patients to a second examination during the same visit, using the same imaging technology (CT or MRI), and implies leeway in the intensity of provision. Since RIEs provide no or little clinical benefit to the patient but a high return to the provider, we are able to capture truly induced demand with a change in RIE provision following a shock in financial incentives in another care sector. Results and conclusions: We find a significant increase in the share of ambulatory revenue from RIEs in hospitals after the reform: +4% for CT and +1% for MRI. This effect is stronger and more robust for the technology that is organizationally more flexible, but also bears long-term radiation risks for patients. Furthermore, we exploit the heterogeneity across Swiss cantons to show that this effect varies with other market incentives, e.g. competition, ambulatory reimbursement rates, and insurer bargaining power. Our findings indicate that financial incentives in one hospital sector may generate spillover effects that can be strong enough to override clinical guidance. Also, the ability for providers to self-refer patients to lucrative diagnostic examinations may induce wider externalities through greater healthcare expenditures. This has important implications for the design of reimbursement systems in health systems with multiple care sectors.

How Did Hospitals Respond to Prospective Payment System under the Japanese Universal Healthcare System?

PRESENTER: **Dr. Rong Fu**, Waseda University, Faculty of Political Science and Economics

Background The Prospective Payment System (PPS) is a significant policy to contain healthcare spending by altering reimbursement incentives in a way to implement a fixed payment regardless of the actual expenses hospitals incur in providing healthcare. Japan, with a rapid increase in healthcare spending, launched a PPS in April 2003, known as the Diagnostic Procedure Combination Per-Diem Payment System (DPC/PDPS). The fixed payment therein is set per-diem and adopted only to part of the medical procedures in inpatient care. Namely, the system has no interference with outpatient-care payments. Objective Fifteen years after the adoption, the performance of DPC/PDPS is still unclear. Accordingly, we aim to evaluate the DPC/PDPS by answering three key questions: (1) In face of the partially adopted program, will hospitals allocate more resources to medical procedures paid outside of DPC/PDPS for a larger reimbursement? (2) With the per-diem rate, are hospitals really motivated to reduce the hospital length of stay (LOS)? (3) Would the reallocation of resources (if any) affect patients' health outcome adversely? Data We use a set of nationally representative administrative records in Japan to answer the questions. Specifically, medical claims records (1997-2010) are used to verify the cost effects of DPC/PDPS. The records are randomly selected from the population medical claims, which documents thoroughly the type/volume of medical procedures provided, and summarizes the corresponding costs. A sample of 392,395 claims is extracted for estimations. In addition, discharged patient survey linked to the concurrent hospital statistics (1996-2014) are used to evaluated the efficiency and quality effects of the DPC/PDPS. The patients survey consists of the whole episode of inpatients who discharge in September of the survey year from randomly selected hospitals; the hospital statistics provides concurrent hospital information. A sample of 784,749 patients is extracted for estimations. Method We apply the difference-in-difference approach to purify the impacts of DPC/PDPS. Regarding the treated group, we focus on a group of hospitals being most credible to show the performance of DPC/PDPS—82 advanced treatment hospitals enrolled mandatorily into the program in 2003. The change in reimbursement method is thus an exogenous shock. The control group contains a group of acute-care hospitals provide similar healthcare to the treated but being outside of the DPC/PDPS. Results and Conclusions We find that the DPC/PDPS is not cost saving as expected, due to the partial adoption. The hospitals could respond in a "real" fashion—reduce volume of the PPS procedures to avoid deficit; or in a "nominal" fashion—assign the PPS procedures from inpatient care to outpatient care. We also find a 4-day decline in LOS, indicating an improvement on operational efficiency. The reduction is larger at upper quantiles of the LOS. Finally, we confirm a moderate deterioration in healthcare quality. Following the adoption of PPS, the hospitals tend to discharge patients with symptoms lightened or unchanged, rather than being fully cured.

Private Provider Incentives in Health Care: The Case of Birth Interventions

PRESENTER: **Serena Yu**, Centre for Health Economics Research and Evaluation (CHERE), University of Technology, Sydney (UTS)

Private provider incentives in health care: the case of birth interventions Background In Australia's mixed public-private provision of maternity care, women are entitled to universal care delivered in public hospitals, but may choose to pay for private care. Under private care, women receive care from their private obstetrician of choice, delivered in either public or private hospitals. Private physicians and hospitals face incentives to intervene in the process of childbirth because they are employed, paid and insured differently from their public counterparts. Private providers may intervene in childbirth in order to reduce the risk of litigation, maximise fee revenue, or optimise use of time and convenience. While private obstetric care has been associated with higher intervention rates, it is unclear to what extent this is attributable to selection effects, whereby women preferring intervention may opt for providers with a greater propensity to intervene. Objective This study examines the impact of receiving private maternity care on birth intervention rates. We explore the impact on caesarean sections, instrumental

delivery, epidural analgesia use, and induction of labour.` Data and Method: Using administrative birth data on over 280,000 births in Australia, we implement an instrumental variables framework to account for the endogeneity of choice of care. We exploit each woman's differential distance to her nearest private and public hospital to instrument for choice of care. We also exploit Australia's institutional framework – which allows a private doctor to deliver a baby in a public hospital – to examine the differences in doctor-level and hospital-level incentives. Results We find that receiving care from private obstetricians results in higher intervention rates compared to receiving public care. Giving birth in a private hospital raises the probability of intervention further. The results also indicate that the doctor-level effects are large relative to additional hospital-level effects. The results also highlight the importance of accounting for both observed and unobserved differences in the women choosing each care type, with significant differences in estimates based on whether or not the model accounts for endogeneity. Conclusions Our results show that after purging the impact of differences in patient preferences and clinical need, there remains significant variation in birth intervention rates driven solely by supply-side factors. This variation can be deemed unwarranted as it is likely attributable to incentives faced by both private doctors and private hospitals, which arise due to differences in how private providers are employed, insured, and paid. The burden of these unnecessary interventions falls on the already-overstretched health system, taxpayers whose tax dollars are directed towards a more affluent segment of the population, and the women who receive these interventions without express clinical need or desire.

The Short- and Long-Term Effects of a Large-Scale Prenatal Care Intervention

PRESENTER: **Laura Wherry**, UCLA

Background: Little evidence exists on whether policy interventions explicitly designed to improve fetal health in the U.S. can generate long-lasting benefits. Objectives: In this paper, we evaluate whether there are improvements in the short- and long-term outcomes of individuals who benefited from a publicly-funded prenatal intervention while in utero. We examine the effects of a set of landmark policies in the state of California to expand access to medical and support services to low-income pregnant women in the 1980s and early 1990s. During this period, California expanded eligibility for prenatal Medicaid coverage to undocumented immigrants and to women with family incomes below 200% FPL. The state also launched the Comprehensive Perinatal Services Program (CPSP), an "enhanced" prenatal care program providing additional services to low-income women receiving routine obstetrical care under Medicaid, including comprehensive risk assessments and targeted support services. Data and Methods: To identify the effects of these early health interventions, we apply quasi-experimental methods that take advantage of variation in exposure to the three different policy changes across different counties and population groups. We use state hospital discharge data to examine changes in insurance coverage and pregnancy outcomes. We also use a novel dataset that links birth certificate data for individuals born in California to federal survey and administrative data to examine short- and long-term outcomes under these interventions. These data contain information on health at birth and later life outcomes, including mortality, disability, educational attainment, labor force participation, income, and participation in public programs. Results: We find strong evidence that state prenatal expansions in Medicaid led to large changes in the insurance coverage of pregnant women. Preliminary analyses also indicate a significant increase in prenatal care utilization. We are now working to evaluate the effects on birth and later life outcomes. We will have a full set of results well in advance of the ECR Pre-Congress Session. Based on our prior work analyzing the long-term effects of prenatal Medicaid expansions, we anticipate that there will be associated changes in both adult economic and health outcomes for individuals who gained coverage while they were in utero. Conclusions: This research will provide timely, relevant knowledge that will help policymakers at all levels accurately assess the long-term benefits of these type of public health interventions.

1:00 PM –6:15 PM SATURDAY [Pre-Congress And Sponsored Sessions]

Universität Basel | Kollegienhaus – Hörsaal 117

Early Career Researcher (ECR) Pre-Congress Session II

SESSION CHAIRS: **James Buchanan**, Health Economics Research Centre, Nuffield Department of Population Health, University of Oxford; **Giulia Greco**, London School of Hygiene & Tropical Medicine; **Thorhildur Ólafsdóttir**, DeCode Genetics

DISCUSSANT: **Anthony Scott**, The University of Melbourne; **Eric Andrew Finkelstein**, Duke-NUS Medical School; **Virginia Wiseman**, London School of Hygiene & Tropical Medicine; **Catherine Goodman**, LSHTM (London School of Hygiene and Tropical Medicine); **Audrey Laporte**, University of Toronto; **Winnie Yip**, Harvard T. H CHAN School of Public Health, Boston, Massachusetts

Iterative Survey Design Within a Causal Framework to Predict Individual Decision-Making Based on Stated and Revealed Preferences: The Case of Blood Donation

PRESENTER: **Kaat De Corte**, LSHTM (London School of Hygiene and Tropical Medicine)

Background Stated preference surveys can provide essential parameter estimates for decision models. However, there is a lack of evidence regarding their predictive value for revealed preferences. Moreover, few studies have used within-sample designs which avoid bias due to unobserved confounding to assess hypothetical bias (sometimes known as external validity) within a causal framework. Objective This research aims to show how a two-pronged approach minimizes hypothetical bias: ex ante, iterative survey design, ex post, isolating the estimand of interest, the direct effect of stated on revealed preferences, from the total effect using mediation approaches. Data and Methods We illustrate this approach with a stated preference survey from the HEMO study (Health Economics MOdeling of blood donation) which elicited blood donors' preferences for alternative changes to the blood service. The purpose of the survey was to provide a means of predicting the mean number of donations per year under a number of potential future configurations of the blood service. Ex ante, the face validity of the survey was maximized through iterative survey design: 1) consultation with the policy-maker and pre-testing with blood donors; 2) administration of a pilot

survey (5016 invitees, 1254 responders); 3) re-assessment of the design and hypothetical bias; 4) administration of the main survey (99,998 invitees, 25,187 responders). Ex post, constraints on donors to express their preference to donate were modeled as mediators through linkage of the survey data to the PULSE database containing routinely collected data for the 1.2 million blood donors in England. In the blood context, the main constraint is deferral of donation due to low hemoglobin during the health check preliminary to every donation. Modeling the effect of deferrals to adjust the discrepancy between stated and revealed preferences allowed us to isolate the effect of hypothetical bias from the more general intention behavior gap. Results For the pilot survey, the multinomial logistic model predicts a frequency of 3.2 and 2.6 donations per year for men and women respectively with observed frequencies of 2.3 and 2.0 donations per year. This is an over-prediction by 41% for men and 30% for women. Consultation with stakeholders led to the substitution of the length of donation attribute with an appointment availability attribute as well as an adjustment of the levels of opening times. Increased sample size allowed for a full factorial rather than a d-efficient design for the main survey. For that survey, over-prediction decreased to 34% for men and 16% for women. The constraint model explains 86% of this discrepancy between stated and revealed preferences for women. For men, the constraint model explains 29% of the discrepancy. Further stratification by ethnicity or blood type does not reveal substantial heterogeneity in these results. Conclusions This research finds that the combination of ex ante and ex post methods inspired by a causal inference framework allows for minimization of hypothetical bias. Moreover, this approach can be applied to other contexts to facilitate the design of stated preference surveys to provide accurate predictions for parameters of interest required for decision-making.

The Impact of Food Price Promotion on Demand, Stockpiling Behaviour and Increased Consumption

PRESENTER: **Toby Lawrence Stephen Watt**, The Health Foundation

High bodyweight and unhealthy diets are two major risk factors contributing to an increasing global burden of non-communicable diseases. In 2014/15, obesity was estimated to cost the health service in England £6.1bn. These health issues resulted from 26.9% of adults in England being classed as obese, which has risen from 13.2% in 1993. This rate of increase has slowed since 2001, but it is still increasing, to the point where we expect to see £9.7bn in National Health Service costs for directly treating obesity by 2050. There is a considerable gap in the academic research on the health impact of food and beverage price promotions in retail stores. The extent to which such pricing strategies contribute to over-consumption of unhealthy foods and beverages or encourage consumption of healthy alternatives is largely unclear. In the UK food retail outlets food price promotions (e.g. discounted, buy 1 get 1 free, or 3FOR2 offers) are very frequent and foods and beverages with high sugar content are both more likely to be promoted and more deeply promoted. For example, over 60% of all sugar-sweetened beverages by volume were sold through price promotions by 2016. In 2018, Public Health England announced that it is considering introducing legislation that would ban certain types of price promotions on the least healthy foods and beverages. Therefore, there is great need for research into understanding how price promotions impact health in the first place and secondly how removing these could affect consumption behaviour. This paper targets this gap and, using a large representative panel of British consumer scanner data from 2012-13 (Kantar Worldpanel), measures the extent to which price promotions increase consumption of different sugar-sweetened beverages. We use a dynamic demand model, incorporating existing inventory and consumption rates which allows us to estimate the nutritional effect of price promotions through the extent to which household consumption of sugar-sweetened beverages increases as a result of increased household inventory. We find that, depending on the type of food / drink analysed, price promotions will affect food use in different ways through stockpiling, and the different extent to which consumption of a foodstuff varies with household inventory. Our preliminary findings indicate that, for instance, promotions have a large impact (>50%) on the demand for colas and less so for, say, lemonades and multipack cans of beer.

Optimal Number of Antenatal Care Visits for Positive Birth Outcomes in Resource-Constrained Settings

PRESENTER: **Martina Mchenga**, Stellenbosch University

Background Many developing countries have adopted the World Health Organisation's (WHO) focused antenatal care (FANC) recommendations, in order to reduce infant mortality and improve child and mother health. Core to this policy is a prescribed number of visits to a healthcare facility during pregnancy, as well as a specified set of medical inspections that healthcare professionals should conduct to screen mothers at risk. Initially, the proposed number of visits was set at four. In a second phase of the FANC policy, the WHO has recently recommended that this number be increased to eight. In health systems that are overburdened by high demand and under resourced, the potential for decline in quality with rapid expansion in quantity is real. We investigate this possibility using Demographic and Health Survey data in Malawi. Methods We used demographic health survey data to identify the social and economic characteristics of the sample and satellite rainfall data as an instrument to control for endogeneity in the antenatal care use. We study the effect of the number of antenatal visits on the risk of children's low birthweight. Typically, this relationship is assumed linear; once controlling for the length of gestation in such a model, the effect of visits is statistically insignificant. Our study however, implement a non-linear specification, in search of turning points and thresholds in policy effectiveness. We also use locational fixed effects (to absorb common differences at local health facilities). Results We find that the risk of low birthweight declines up until three or four antenatal visits by mothers. Thereafter, the marginal effects are zero or negative, depending on the specification. Our results also show that the optimal number of visits is not dependent on the quality of care given, however, administration of Malaria prophylaxis and giving pregnant women nutrition advice during antenatal care visits have independent impact on the reduction of low birthweight. Conclusion This study therefore concludes that visits up to a threshold of four are beneficial for delivery outcomes. Beyond that, healthcare facilities compromise on quality in the face of high demand for care. As a result, developing country health systems may perform better if fewer routine visits are conducted with more attention to quality.

Mathematical Model and Cost-Effectiveness Analysis for the Scale-up of Interventions Against Malaria in South-West Nigeria

PRESENTER: **Lausdeus Otito Chiegboka**, University of Oxford

Background 97% of Nigerians are at risk of malaria, with transmission perennial in the south and seasonal in the north. The South-West geopolitical zone falls into the region of high endemicity. However, despite this, the coverage of interventions against malaria is suboptimal and worse than other regions of the country. This necessitates evidence generation to support scale-up of the interventions in support of the National

Malaria Elimination Programme target of achieving pre-elimination by 2020. Long-lasting insecticidal nets (LLINs) and indoor residual spraying (IRS) are known to be highly effective against malaria. Hence, this study focuses on them. Objectives The objectives were to develop a mathematical model to predict the epidemiologic impact and perform a cost-effectiveness analysis of the scale-up of LLINs and IRS for malaria control in the South-West geopolitical zone of Nigeria. Data and Methods I developed a deterministic compartmental model for malaria optimised for South-West Nigeria. The model is based on non-linear differential equations and incorporates both the human and vector elements of the malaria life cycle. I then fit the model to data. Thereafter, I assessed the epidemiological impact of scale-up of LLIN and IRS. Following this, I coded costs into the model, performed a cost-effectiveness analysis and conducted sensitivity analyses on the model parameters. Results The results suggest that at the current level of LLIN coverage, there could be a rebound in malaria incidence within 5 years. However, with massive scale-up of LLIN and IRS, there could be a drastic decline in malaria incidence and parasite prevalence, leading to a lower burden of disease and cost incurred in malaria diagnosis and treatment. In general, the study finds that the scale-up of the interventions against malaria in South West Nigeria is cost-effective. The dominant intervention option is the scale-up of LLIN to 95% coverage (LLIN (95%), combined with indoor residual spraying. The incremental cost-effectiveness ratio (ICER) of this dominant intervention is US$ 9.71 per DALY averted, relative to the next best alternative, LLIN (95%) alone. This ICER, against a cost-effectiveness threshold (CET) of US$ 1968.56, Nigeria's GDP per capita, is highly cost-effective. Sensitivity analysis reveals that mosquito biting rate has the most influence on the model, influencing the model outcomes greatly and by extension, the cost-effectiveness of interventions. Conclusions Scaling up LLIN and IRS could greatly reduce the incidence of malaria in South-West Nigeria and it is highly cost-effective to do so. The major limitations to these findings are the limited data for model fitting and uncertainties around the model parameters.

Physician Deterrence from Fraud, Waste, and Abuse

PRESENTER: **Alice Chen**, University of Southern California

Background According to the Institute of Medicine, fraud, waste, and abuse in 2009 reached $750 billion (or 28% of total health care spending), and the Federal Bureau of Investigations estimated that health care fraud alone cost American tax payers nearly $80 billion per year. Of this amount, the Department of Justice recovered only $2.5 billion. Though seemingly small, this recovery reflects in part recent policy efforts—including the Affordable Care Act and Small Business Jobs Act—to weed out fraudulent providers and exclude them from participating in Medicare and Medicaid programs. We lack a comprehensive understanding of how such sanctions affect the behavior of potentially fraudulent providers who have not yet been caught. Objectives We directly examine changes in physician behavior when their peers receive direct sanctions from the US Department of Health and Human Services' Office of Inspector General (OIG). Specifically, we examine changes in billing patterns (e.g., total claims and charges, prices per service, and the use of low-value care) and physician organization sorting when a physician peer has been excluded from participating in the Medicare and Medicaid programs. Data and Methods Our analysis relies on three datasets. First, we identify information on physician exclusions from the OIG's List of Excluded Individuals/Entities (LEIE). The LEIE data includes all excluded physicians and their dates of exclusion. We supplement this data with text searches from the Department of Justice to identify dates of indictment. Finally, we use 20% administrative Medicare claims data from 2002 to 2014 to identify physicians, their organization, and their services provided. We focus on peer-responses within an organization, so our sample universe consists of physicians within organizations that have experienced an exclusion. Using a multivariate logit model, we predict which physicians are likely to be fraudulent. Then, we use event study and matched difference-in-difference approaches to analyze changes in physician billing and organization alignment among potentially fraudulent providers. Results We find that Medicare exclusions have a significant deterrence effect on potentially fraudulent providers. Responses begin at the time of peer indictment and continue through the date of peer exclusion. Claims and charges fall by approximately 12% and 7%, and they are driven by declines in both claims and charges per patient and the number per patients seen. We also find evidence that charges per service falls by 6%, suggesting that potentially fraudulent physicians are reducing billing for specifically more expensive procedures. Deterrence effects are highest in larger organizations, among hospital-based specialties, and they highlight $1 to $2 billion additional savings from the prosecution of fraud and abuse cases. Conclusions Our results demonstrate that Medicare exclusions create a significant deterrence effect among providers who consistently over-bill for care. In addition to removing fraudulent providers, efforts at reducing fraud, waste, and abuse generate large spillover effects on other potentially fraudulent providers who are yet to be sanctioned and these physicians are those for which detection is potentially more difficult and costly.

Geographical Availability and Health Care Utilization: Evidence Using Changes in Contract Periods

PRESENTER: **Visa Pitkänen**, The Social Insurance Institution

Background Equal access to health care is a central objective of many organizers of health services. In this study, I analyze the effects of geographical availability on health care utilization in a Finnish rehabilitation service, where providers are selected every four years in a competitive bidding. The procurement often changes providers and their location between the contract periods. I exploit this geographical variation and analyze the effects of changes in distance to the nearest provider. In addition, I perform a counterfactual policy analysis and estimate the effects of using geographical availability as an acceptance criterion in the competitive bidding. Data and Methods Three main data sources are used: First, provider-level data that is collected from procurement documents of the 2011 and 2015 competitive biddings. Second, register data on all service applications and patient choices in 2012-2017. Third, open postcode data on distances and population characteristics. The main empirical analysis uses difference-in-differences method with continuous treatment intensity. Additionally, discrete choice models are estimated in the counterfactual policy analysis. Results The results show that an increase in the distance to the nearest service provider decreases both the service applications and utilization. The results are robust to various sensitivity analysis. The counterfactual policy analysis shows that there is a clear trade-off between health care expenditures and service availability when providers are acquired using a competitive bidding. Conclusions Competitive biddings are often used in health care to select providers in a geographical area. This might change the location of the service providers. In this study, I show that there is a causal relationship between health service availability and the utilization of the service. Therefore, it might be justifiable to use geographical availability as an acceptance criterion in competitive biddings.

1:00 PM –4:30 PM SATURDAY [Pre-Congress And Sponsored Sessions]

Universität Basel | Kollegienhaus – Hörsaal 119

Measurement of Industry-Led Access-to-Medicines Programs

2:30 PM –4:30 PM SATURDAY [Pre-Congress And Sponsored Sessions]

Universität Basel | Kollegienhaus – Fakultätenzimmer 112

Using Household Data for Evidence-Based Health Financing Decision-Making: Are Health Expenditure and Utilization Surveys Worth the Cost?

SESSION CHAIR: **Lyubov Teplitskaya**, Palladium

Sunday

8:30 AM –12:00 PM SUNDAY [Pre-Congress And Sponsored Sessions]

Universität Basel | Kollegienhaus – Hörsaal 001

The Tenth Anniversary of China's Health Care Reform: Global Lessons for Universal Health Coverage

SESSION CHAIR: **Winnie Yip**, Harvard T. H CHAN School of Public Health, Boston, Massachusetts

8:30 AM –4:30 PM SUNDAY [Pre-Congress And Sponsored Sessions]

Universität Basel | Kollegienhaus – Hörsaal 102

Immunization Economics Day 2

8:30 AM –4:30 PM SUNDAY [Pre-Congress And Sponsored Sessions]

Universität Basel | Kollegienhaus – Hörsaal 114

4th ICECAP Measures Workshop

ICECAP: A Current Overview
PRESENTER: **Joanna Coast**, University of Bristol

Challenges with Sampling and Recruiting Children and Young People for ICECAP Measure Development
PRESENTER: **Samantha Husbands**, Health Economics at Bristol (HEB), Population Health Sciences, Bristol Medical School, University of Bristol

Test-Retest Reliability of ICECAP-A in the Adult Danish Population
PRESENTER: **Annette Willemoes Holst-Kristensen**, Aalborg University

Exploring the Content and Face Validity of the ICECAP-O and Five Other Preference-Based Measures Within the Context of Dementia
PRESENTER: **Lidia Engel**, Deakin University

Measuring Capability in People with Advanced Dementia
PRESENTER: **Joanna Coast**, University of Bristol

ICECAP-A as a Quality of Life Measure for Family Carers
PRESENTER: **Hareth Al-Janabi**, University of Birmingham

Using Deliberative Methods to Elicit a Monetary Threshold for a Year of Sufficient Capability

PRESENTER: **Philip Kinghorn**, Health Economics Unit (HEU), Institute of Applied Health Research, University of Birmingham

Applications of Capability and Sufficient Capability Approaches in Economic Evaluation: A Case-study on Heroin Addiction

PRESENTER: **Ilias Goranitis**, The University of Melbourne

8:30 AM –4:30 PM SUNDAY [Pre-Congress And Sponsored Sessions]

Universität Basel | Kollegienhaus – Hörsaal 116

Economics of Obesity

DISCUSSANT: **Bruce Hollingsworth**, Lancaster University; **John Cullinan**, NUI Galway; **Alison Hayes**, University of Sydney; **Emma Frew**, University of Birmingham

Estimating the Lifetime Benefits of Childhood Obesity Interventions: A Dynamic Microsimulation Model

PRESENTER: **Gabriella Conti**, University College London

Background: The OECD ranks obesity as the largest public health threat in the Western world. In Europe, while rates are lower than in the United States, there has been a substantial increase over the last two decades, especially in infants and children, with 1 in 3 11-year-olds overweight or obese (WHO). Over 60% of children who are overweight before puberty will be overweight in early adulthood. Childhood obesity is strongly associated with risk factors for cardiovascular disease, type 2 diabetes, mental health problems, and underachievement in school. While various policy options are considered and many interventions are trialled to prevent or reduce child obesity, there is a paucity of models able to estimate their wide life course benefits. Objective: To develop a life-cycle obesity model to estimate the economic returns to early-life obesity prevention strategies. The life-cycle modelling approach represents a substantial methodological innovation, and allows obtaining meaningful returns for a variety of health and socioeconomic outcomes relevant for policy. Our innovative approach builds upon, and substantially expands, recently developed methods to forecast the lifecycle benefits of early interventions. Data and Methods: Our methodology relies on the combination of two models. Model I is an adapted version of the German Obesity Model that uses a dynamic incidence-based modeling approach to estimate BMI trajectories depending on age, sex and socioeconomic status in the childhood to adolescence period. Individuals will enter Model I at the age of three and then move between three health states - normal weight, overweight and obese - until the age of 50. Model I incorporates rich forms of heterogeneity and can study different profiles of treated and control subjects according to their observable characteristics. We will use the treatment effects from the Childhood Obesity Prevention (CHOP) intervention in Germany as initial conditions, and longitudinal data from the German Socioeconomic Panel (GSOEP) to populate Model I. Model II is the EU-FEM model, the European version of the Future Elderly Model (FEM), a multi-risk and multi-morbidity dynamic micro-simulation model, whose main aim is to predict the evolution of the 50+ continental European health status and health expenditure to better understand the sustainability of the EU health care systems. Its main feature is that it uses real individuals from the Survey of Health, Ageing and Retirement in Europe (SHARE), allowing for larger heterogeneity in behaviour than would be allowed by a synthetic cohorts approach, and is open source and free downloadable. The model structure is based on three major components: i) the initial cohort module, ii) the transition module, and iii) the policy outcomes module. For this specific project, the modelling of the initial cohort module will be enriched with the cohort distribution obesity information obtained from Model I. Results and Conclusions: By the combined use of these two models, we will estimate the life-cycle benefits and costs of the CHOP interventions, and simulate the cost-effectiveness of starting interventions in different periods, and allowing for different impacts.

Do Consumers Respond to “Sin Taxes” Heterogeneously? New Evidence from the Tax on Sugary Drinks Using Retailer Scanner Data

PRESENTER: **Dr. Toni Mora**, Universitat Internacional de Catalunya

Background: The WHO considers the rise of obesity and non-communicable diseases as a major public health concern. Government policies such as taxes of sugar-sweetened beverages (SSBs) may help people to make better choices. The economic rationale of these policies is to internalise externalities. In May 2017, the regional parliament of Catalonia introduced a piece-wise tax on SSBs similar to the U.K. one whose rate depends on the amount of sugar contained in a defined list of beverages. Data We use longitudinal scanner data on all beverage purchases in a supermarket chain from May 2016 to April 2018. We have information on individual items prices, quantities, date of purchase as well as sugar content. The data also contains socioeconomic characteristics of the households such as age, gender, number of children and income. The supermarket chain has stores both in Catalonia and in Spain and we locate their position using geocoordinates. Using postcode data, we link in measures of local level deprivation. Our main dataset includes over 1M households and 301 stores in Catalonia and Spain. Methods We estimate Difference-in-Differences (DiD) models exploiting time (before/after) and spatial variation (Catalonia/Spain) in the introduction of the SSB. We incorporate DiD methods into: i) models of quantity of beverages and amount of sugar bought; ii) an Almost Ideal Demand System (AIDS). We control for prices, total expenditure, spell (household-store) fixed effects. We instrument prices and expenditures with average prices in other stores and non-beverage expenditure, respectively. Additional models use a battery of instruments for unit prices. We also test for common pre-trends across Catalonia and Spain, spillover and anticipation effects, and stockpiling of beverages. Preliminary results Our results suggest a reduction in high sugared beverage expenditure shares by 14-52% of the sample mean. Households have substituted these beverages with their lower sugar counterparts. We show there is substitutability between some beverages with positive cross-price elasticities of demand for isotonic and energy drinks with respect to the price of all soft drinks. As individuals mix pops and liquors, households reduce their

expenditures on liquors/Vermouth because the price of pops has increased. They then shift their expenditure on wine. This has led to a 2% overall reduction in sugar consumption. Sugar consumption of pops has reduced by 5.3%. We find that households at the top income quartile respond to the tax by reducing their expenditure shares in high sugared pops and colas by 11.5% and 13.2%, respectively. We find that sugar reduction only translates in 4-10 calories reduction per person per month. Our study implies that although sin taxes moderately change consumer behaviour, they are unlikely to be the single bullet that reduces obesity. We show that this may be due to the fact that the pass through of this tax was between 1% and 8%. Our results are comparable to those in the U.S., where the pass-through has not been higher than 10%.

Intergenerational Transmission of Body Mass in Australia

PRESENTER: **Alfredo Paloyo**, University of Wollongong

The intergenerational persistence of adiposity reflects the restricted ability for families to change their weight status across generations. Paired with socioeconomic disparities in obesity rates, this may be abetting obesity inequality. This paper estimates the inter-generational mobility of body mass in Australia. Using the Household, Income and Labour Dynamics in Australia, evidence for intergenerational immobility of body mass is found. Genetics and permanent environment account for 84% of this relationship. OBJECTIVES, DATA, and METHODS This paper estimates the intergenerational immobility of BMI and obesity in Australia for mothers and adolescents. To achieve this aim, data are drawn from nine waves of the Household Income and Labour Dynamics in Australia (HILDA) survey. The longitudinal structure of the HILDA dataset allows for fixed-effects estimation, which is used in combination with OLS to provide the basis for a discussion of the potential pathways through which the intergenerational persistence of BMI operates. RESULTS and CONCLUSIONS The OLS elasticity estimates show that the strength of the relationship between maternal and adolescent BMI in Australia is 0.239 and is mostly consistent with the international literature (Abrevaya & Tang 2011; Anderson et al. 2009; Dolton & Xiao 2015; Mo-Suwan et al. 2000; Murrin et al. 2012; Whitaker et al. 2010). However, the estimated magnitude of the intergenerational transmission of obesity in Australia sits at around the mid-point of the international estimates. Australian youths with obese mothers are 9.2% more likely to be obese themselves relative to adolescents with non-obese mothers. This estimate is over twice as large as the transmission of obesity estimated for England (Whitaker et al. 2010) and Spain (Costa-Font & Gil 2013), but only a third of the strength of the intergenerational transmission of obesity estimated for the United States (Classen 2010). Therefore, the intergenerational immobility of obesity in Australia is substantial, but not as restrictive as in the US. This paper also was able to find a clear pattern of BMI elasticity by various measures of SES. Consistently, it was found that only mothers and adolescents from the lowest SES subgroups experienced time-varying factors that simultaneously influence both maternal and offspring BMI. Evidence for variability in the intergenerational transmission of BMI for low SES households has not been established in previous research (Anderson et al. 2009; Classen 2010; Dolton & Xiao 2015). However, by examining elasticities for SES subsamples with a fixed effects approach, this clear pattern became apparent. Furthermore, the intergenerational persistence of obesity was found to be most severe among low SES households.

The Hidden Role of Piped Water in the Prevention of Obesity. Experimental and Non-Experimental Evidence from Developing Countries

PRESENTER: **Dr. Patricia Ritter**, University of Connecticut

Child obesity in developing countries is growing at an alarming pace. This study investigates whether access to piped water at home can contribute to stopping this epidemic. Lack of piped water at home increases the cost of cooking and of washing dishes, thus, it might induce people to substitute toward eating food outside the home, which typically means consuming more calories. The first part of the paper exploits an experiment run in the city of Tangiers, Morocco. The intervention encouraged take-up of an interest-free loan to finance the cost of connecting to piped water at home. I find that the intervention reduced child obesity significantly. The second part of the study exploits longitudinal data from Cebu, in the Philippines with a simple individual fixed effect model. I find that access to piped water at home reduces child and mother's overweight rates significantly, at least in urban areas with walking access to stores. I further find that the effect is generated by a substitution away from food prepared outside the home towards home-made food. This study suggests that access to piped water at home might play an important role in the fight against obesity in developing countries. It also provides evidence that programs that facilitate water at home in urban areas can have important health benefits, even in the absence of effects on diarrheal diseases. This result is especially relevant given that, while there have been great advances in improved water sources worldwide, access to piped water at home is still very limited. Finally, this paper contributes to a better understanding of the demand and willingness to pay for piped water at home: the substitution away from food outside the home toward home-made food might generate some monetary savings. Additionally, individuals likely welcome losing a few extra pounds.

The Social Return on Investment of 'the Healthy Primary School of the Future' Initiative

PRESENTER: **Marije Oosterhoff**, Maastricht University Medical Center

Background: The high prevalence of unhealthy behaviours among children is a main public health concern. School-based lifestyle interventions aim to compensate for the shortcomings in children's health behaviours, which lay the foundation for health, wellbeing, and educational achievements. The social benefits of school-based lifestyle interventions and the costs of achieving social value are crucial for decision-making on whether to adopt and implement school-based lifestyle interventions. The social return on investment (SROI) methodology aims to incorporate the non-health outcomes and intersectoral consequences of public health interventions. Outcomes that cannot be used in the calculation of return on investment are not ignored, but are used to describe the creation of social value. Objective: Examine the SROI created by the 'Healthy Primary School of the Future' (HPSF) initiative after two years of intervention. Methods: Key elements of the HPSF initiative are the provision of a healthy lunch and daily structured physical activity sessions at schools, which are new to the Dutch primary school setting. At Healthy Primary Schools of the Future (HPSF), both changes were implemented, whereas Physical Activity Schools (PAS) only offered daily structured physical activity sessions. A SROI analysis was conducted by identifying key stakeholder groups, assessing investments and outcomes, and summarizing results in a SROI calculation and SROI story. Within the quasi-experimental study, outcomes were measured quantitatively (e.g. annual child and parental questionnaires) and qualitatively (e.g. stakeholder interviews). Outcomes that could be expressed in monetary terms using standard cost prices, or the so-called financial returns, were used for the calculation of social return to

investment. Outcomes that were measured qualitatively or which could not be expressed in monetary terms, the non-financial returns, were included in the SROI story. Results: Besides the child, key stakeholder groups came from the education, healthcare, household & leisure, and labour sector. The SROI story showed that, as a result of positive changes in children's health behaviours, body mass index, and school behaviours (e.g. more positive social interaction) HPSF and PAS created social value, particularly for the healthcare and education sector. The calculation of SROI included changes in children's health-related quality of life, health resource use, school absenteeism, and parental health-related quality of life and productivity. With a two-year follow-up HPSF and PAS showed limited financial return on investment, but the time frame is too short to examine the full return on investment as it may take a longer time before all financial returns can be observed. Conclusions: HPSF and PAS generated social value on the short-term, but this could only be demonstrated using a SROI story. Follow-up assessments are of utmost importance to investigate if long-term outcomes will result in financial return on investment.

Heterogenous Peer Effects in Body Weight, Physical Activity and Dietary Choices: Does Type of Peers Matter?

PRESENTER: **Ivan Tzintzun**

This article explores peer effect heterogeneity in adolescent adjusted Body Mass Index (BMI), physical activity and dietary choices. In particular, this paper makes an original contribution by studying peers heterogenous effects based on friendship intensity. Adolescents are assumed to interact through a social network, where they have strong and weak friendships. To identify both types, I use Add-Health's wave II friendship roster questionnaire to calculate a friendship score for every friend listed by each student in the sample: friends with a high score were denied as part of the strong friendship network and the rest were placed in the weak friendship network. It is expected that strong friendships have a greater effect on individuals' observed outcomes. Identification conditions follow Liu and Lee [2010] and Dieye et al. [2017]: 2SLS and GMM strategies were used to estimate the econometric model. Preliminary results provide evidence that supports the heterogenous peer effect hypothesis: strong friendships endogenous effects dominate on adjusted body weight. From an empirical point of view, this paper provides two particular contributions: 1) it explores the potential causal mechanisms by analyzing the role of physical activity and diet choices; 2) it includes new control variables which are not previously used in the obesity peer effects literature (e.g. parent's body weight, diet quality and key personal traits, such as impulsivity.)

Bariatric Surgery is a Cost-saving Treatment for Obesity – A Comprehensive Meta-Analysis and Updated Systematic Review of the Health Economic Evaluation of Bariatric Surgery

PRESENTER: **Ms. Qing Xia**, Menzies Institute for Medical Research, University of Tasmania

Background: Obesity is a health problem with major economic consequences. The prevalence of severe obesity (BMI ≥35kg/m2) is increasing at a faster rate than obesity (BMI ≥30 kg/m2). Demand for bariatric (weight-loss, metabolic) surgery to treat severe and resistant obesity far outstrips supply and public/private insurance coverage is limited. Additionally, the public provision of bariatric surgery is not meeting the demands of people with severe obesity and super obesity (BMI ≥ 50 kg/m2) in lower socioeconomic groups. Objectives: (1) Perform a quantitative meta-analysis of health economic evidence regarding bariatric surgery from 1995, and (2) update our narrative synthesis and quality appraisal regarding the health economics reporting of bariatric surgery since September 2015. Data and Methods: Validated guidelines informed systematic screening, data extraction, content and meta-analyses. A narrative review and quality appraisal that summarized full and partial health economic evaluations regarding bariatric surgery was conducted to update our previous review from 1995. Four bio-medical databases and four economic databases were searched. Study screening was performed using the Covidence online program. Quality appraisal of included studies was performed based on the Consolidated Health Economic Evaluation Reporting Standards statement. These studies, combined with studies that were included in our previous review, were further screened for the comprehensive meta-analysis. Meta-analyses were conducted regarding annual cost changes 'before' versus 'after' surgery, and cumulative cost differences between surgical and non-surgical groups. Primary outcomes of interest included the proportion of annual cost changes before versus after surgery, and the proportion of cumulative cost differences between surgical and non-surgical groups in each reported year. Sensitivity and subgroup analyses were also conducted. Results: N=101 studies were eligible for the qualitative analyses of health economic evaluations in bariatric surgery since 1995, with n=24 studies published after September 2015. Quality of health economic reporting increased to high from our previous review and the inclusion of complications/reoperations were predominantly contained in the full health economic evaluations that rated as high quality. Health economics studies also reflected technical changes in bariatric surgery in which the number of studies of sleeve gastrectomy increased while adjustable gastric banding and vertical banded gastroplasty decreased over the last decades. Sixty-one out of N=101 studies were eligible for the quantitative meta-analyses. Bariatric surgery was cost-saving over a lifetime scenario (inclusive of the costs of complications/reoperations from 84% of studies eligible for our novel meta-analytical model). Additionally, consideration of indirect costs through sensitivity analyses increased cost savings. Medication cost savings were predominant in the before versus after meta-analysis. Although the inclusion of complications/reoperations could eliminate the cost-savings in the before versus after meta-analyses, these results were informed by the partial health economic analyses that were of relatively lower quality compared to full health economic evaluations. Conclusions: Bariatric surgery is cost-saving over a lifetime course. A broader perspective inclusive of indirect costs would drive further evidence of cost-savings. Health economists are hearing the call to present higher quality studies and include the costs of complications/reoperations; however, indirect costs and body contouring surgery are still not appropriately considered.

The Causal Effect of Body Mass Index on Inpatient Hospital Costs: Genetic Instrumental Variable (Mendelian Randomization) Analysis of the UK Biobank Cohort

PRESENTER: **Padraig Dixon**, University of Bristol

Background High adiposity as measured by body mass index (BMI) is associated with increased healthcare costs. However, almost all evidence of this association is based on multivariable analysis conducted using observational research designs prone to endogeneity bias because of measurement error, simultaneity and omitted variables. Objectives This paper exploits a novel identifying approach - germline genetic variation associated with BMI in an instrumental variable (IV) analysis. This approach has the advantage (in principle) of avoiding the limitations of both multivariable analysis and the use of other IV analyses such as those relying on the BMI a biological relative as an IV. At each point of variation

in the genome, offspring typically inherit one allele (a variant form of a gene) from their mother, and one from their father. This random inheritance of alleles is a natural experiment, in which individuals in a population can be divided into groups based on the number and type of variants inherited. These variants – pieces of the genetic code that differ between individuals – are precisely measured, independent of omitted variables and are not affected by reverse causation. Using genetic variants as IVs in this way has become known as Mendelian Randomization. Methods We estimated IV models of the marginal causal effect of BMI using 79 variants robustly associated with BMI in genome-wide association studies. The association of these variants with inpatient costs was modelled using data from UK Biobank, a large prospective cohort study linked to records of inpatient hospital care. We assessed potential violations of the instrumental variable assumptions, particularly the exclusion restriction via pleiotropy (i.e. variants affecting costs through paths other than BMI) using median-based IV methods (more precise IVs contribute more weight to the median IV estimate), and mode-based IV models (which clusters IVs into groups based on similarity of causal effects). We investigated potential non-linear effects by stratifying on the instrument-free BMI distribution. We also assessed whether any effect of BMI on costs was mediated by body fat percentage by instrumenting for both of these treatments. We controlled for dynastic effects in sensitivity analysis by using a novel within-family design. Results Data from 421,472 individuals was analysed. The marginal effect of an additional unit of BMI on costs in observational analysis was £13.65 and in inverse-variance weighted IV Mendelian Randomization analysis £19.21. There was evidence of violations of the exclusion restriction due to pleiotropy. The estimated effect size attenuated under median and mode-based IV approaches which are intended to be robust against particular types of violation of the exclusion restriction, but effect sizes remained larger than observational estimates. There was weak evidence of modest non-linear effects. There was no evidence that the effect of BMI was mediated by body fat percentage. Family fixed effects had little impact on point estimates. Conclusions This paper is the first to use genetic variants in a Mendelian Randomization framework to estimate the causal effect of BMI (or any other disease/trait) on healthcare costs.

Cost-effectiveness of the CHIRPY DRAGON Obesity Prevention Intervention in Chinese Primary School-aged Children: A Cluster-Randomised Controlled Trial

PRESENTER: **Dr. Mandana Zanganeh**, University of Birmingham

Background: Rapid socioeconomic and nutritional transitions in urban Chinese populations over a relatively short period have contributed to the rising prevalence of obesity among children. However, relatively few intervention studies have been undertaken and, in China, only one of these included economic evaluation. Economic evaluation is important as a means to aid decisions about public resource allocation. Objective: To estimate the costs and cost-effectiveness of the 'CHIRPY DRAGON' obesity prevention intervention, developed for school children in China. Data and methods: We conducted an economic evaluation alongside a cluster-randomised controlled trial of this intervention, targeting children in 40 primary schools in China. The 12-month programme, delivered by five Chinese trained project staff, included educational and skills-based workshops aimed at children aged 6-7 years and their carers (parents or grandparents) to promote physical activity and healthy eating in children within and outside school; a school food improvement component involving school caterers; and a school daily physical activity initiative. Control schools continued with usual activities. We estimated cost-effectiveness based on cost per Quality-Adjusted Life Year (QALY) and BMI z-score change. Utility-data was collected using the CHU-9D for children and EQ-5D-3L for carers; applying the UK value set for both. Resource use data was collected from both public and societal perspectives. All costs are reported in Chinese Yuan at 2016-2017 prices and converted into Pounds/US Dollars using Gross Domestic Product Purchasing Power Parities (GDP PPPs). To estimate cost-effectiveness, we calculated the incremental cost-effectiveness ratio (ICER) based on the fully adjusted costs and effects. In the absence of an agreed Chinese threshold for the value of a QALY, decision uncertainty was assessed using established UK and US thresholds, and presented using Cost Effectiveness Acceptability Curves (CEAC). Preliminary results: 40 schools with 1641 children were randomised (intervention: 20 schools, 832 children). For the public sector perspective, complete cost and outcome data were available for > 95% of children, thus no imputation was needed. Assuming an average class size of 45, the incremental cost of the intervention was 35.53 Yuan (£7.04/ US$10.01) per child. QALY and BMI z-score mean difference between groups were 0.004 (0.000 to 0.007, p= 0.034) and - 0.13 (-0.26 to 0.00, p= 0.048) in the baseline adjusted models respectively, and 0.004 (-0.000 to 0.008, p= 0.056) and -0.13 (-0.26 to -0.01, p = 0.041), in the further adjusted models respectively. The ICER was £1,760 (US$2,502) per QALY, which is far below the £20,000 per QALY and $50,000 per QALY thresholds for cost-effectiveness in the UK and US respectively. The ICER was -£54 (-US$77)/BMI z-score change. The CEAC showed a 95% probability of the intervention being cost effective at a willingness to pay threshold of £20,000 per QALY. The economic evaluation from a societal perspective is in progress. Conclusions: A number of challenges were encountered within the economic evaluation. The economic evaluation from a public sector perspective suggests that the intervention is a highly cost-effective use of public resources in reducing the problem of childhood obesity in China. Trial registration number: ISRCTN11867516

The Impact of a Change in Tax Structure on Soda Prices in Colombia

PRESENTER: **Dr. Andres I. Vecino-Ortiz**, Johns Hopkins University Bloomberg School of Public Health

Background In this presentation, a brief discussion (3 to 4 minutes) of current data, policy environment, current research environment, and research needs at the national level, will be made in order to contextualize participants of this specific session. Then, a research study describing estimates of the potential of fiscal policy to curb obesity will be presented. Half of the Colombian adults are overweight, and 17% are obese. Chronic conditions, many of them related to overweight and obesity, account for 57% of all the costs to the health system, highlighting the importance of controlling risk factors early on to prevent the development of these conditions. Diet is the most important risk factor for NCD's in Colombia, leaving policy options that curb the consumption of energy dense food as a fundamental step to address the prevention of NCD's in Colombia. One of those policy options is the implementation of a tax on sugar-sweetened beverages (SSB). The SSB tax has been already implemented in other countries, including Latin American countries. Objective This paper attempts to contribute to the growing body of knowledge on SSB taxes in middle income countries, and to provide guidance to policymakers in the tax design. Data We are using a nationally representative nutritional survey conducted in Colombia with 7140 adults in 2010 (ENSIN, 2010). Methods We applied a comparative risk assessment strategy to simulate the effect of a SSB tax on overweight and obesity prevalence by income level. Additional checks were conducted to assess different tax scenarios and pass-through assumption and household socio economic strata (SES). Results We found that

among individuals belonging to lower SES households, the SSB tax would reduce overweight and obesity between 1.5-4.9 and 1.1–2.4 percentage points ($p < 0.05$), respectively. Among individuals belonging to higher SES households, we found no statistically significant effects on obesity, and a reduction on overweight prevalence between 2.9 and 3.9 percentage points ($p < 0.05$). In the most conservative scenario (40% pass-through), a tax rate of at least 75 cents of Colombian peso (0.75 COP) per milliliter (24% of the average price) is needed to have statistically significant effects on both overweight and obesity prevalence among lower SES households. Conclusions The results of this study suggest that a SSB tax could reduce the overweight and obesity prevalence in Colombia, especially among lower SES households. This study shows that SSB taxes have a particularly beneficial distributional effect in terms of obesity and overweight in the lowest SES households. Additional social and individual benefits, or individual costs arising from the tax are not assessed in this research, implying that even larger health gains could be observed.

Utility Values for Economic Evaluation of Obesity Interventions in Children and Adolescents

PRESENTER: **Anagha Killedar**, University of Sydney

Background: Our previous work in an Australian child population has shown that the association between weight status and health-related quality of life using the PedsQL becomes stronger with age. This shows that it is important that economic evaluations use age-specific quality of life utility decrements for each weight status so that the benefits of interventions at later ages are accurately reflected in the cost-utility results obtained. A recent systematic review and meta-analysis found a significant but small difference in utility of children with obesity compared to healthy weight but there were insufficient studies to permit age-specific utilities to be determined. The use of the same utility decrements for the entirety of the child population, however, is likely to misrepresent the cost-utility of interventions addressed at specific age groups. Objective: To identify age-specific utility decrements for children and adolescents (10 to 17 years) with overweight and obesity compared to those at healthy weight. Data and Methods: We used data from the Longitudinal Study of Australian Children (LSAC); a study in which two nationally representative cohorts of children have been interviewed every two years. The first cohort has been followed since birth and the second since the age of four. In Waves 6 and 7 of this study, a self-reported measure of child health utility (CHU9D) was recorded for both cohorts. We conducted cross-sectional, linear regression analyses accounting for the complex survey data at each wave and cohort to investigate associations between weight status and CHU9D. The analyses included participants aged between 10 to 17. The analyses were adjusted for characteristics known to be associated with HRQol including sex, socioeconomic position, long-term medical condition, language spoken to child and maternal smoking status. Results: Our results show that utility decrements for each weight status change with age. For example, in the analysis of 10-11 year olds (3309 observations), there were small non-significant differences in CHU9D scores between healthy and underweight, overweight and obese weight status categories, after adjusting for known predictors of health related quality of life. However, in the 14-15 year olds (3050 observations), children with obesity had small but significantly lower CHU9D scores than those who were at healthy weight, after adjustment. Children with obesity had, on average, a 0.042 point lower utility than those at healthy weight (95% CI 0.014 to 0.071) (P=0.003). In the same age group, a small, non-significant difference of 0.015 points (95% CI -0.004 to 0.034) (P=0.12) was found for children with overweight compared with those at healthy weight. Conclusions: We propose four new age-specific utility values to be used for economic evaluation of obesity prevention and treatment interventions in children and adolescents. The values obtained are similar, but not as extreme, to utilities observed from studies focused on smaller age groups. In light of the small utility decrements identified, our results suggest that only interventions that cause considerable reductions in obesity prevalence will likely be found to have reasonable cost-utility.

8:30 AM –4:30 PM SUNDAY [Pre-Congress And Sponsored Sessions]

Universität Basel | Kollegienhaus – Hörsaal 117

The 3rd Economics of the Health Workforce Conference

DISCUSSANT: **Anthony Scott**, The University of Melbourne; **Luis Fernandes**, Centre for Health Economics at the University of York; **Michelle McIsaac**, World Health Organization; **Ulrike Muench**, ; **Bianca Frogner**, University of Washington; **Diane Skåtun**, University of Aberdeen; **Michael Simon**, University of Basel; **Audrey Laporte**, University of Toronto; **Joana Pestana**, Nova School of Business and Economics; **Toshiaki Iizuka**, The University of Tokyo; **Krishna Rao**, Johns Hopkins Bloomberg School of Public Health

Stirring the Pot: Switching from Blended Fee-For-Service to Blended Capitation in Ontario, Canada

PRESENTER: **Dr. Sisira Sarma**, Western University

Background: Like many developed countries, Canada's most populous province, Ontario, moved away from the pure payment schemes of fee-for-service (FFS) and capitation towards blended models. The vast majority of Ontario family physicians practice in blended fee-for-service (Family Health Group (FHG)) or blended capitation (Family Health Organization (FHO)) models. FHG physicians are incentivized to provide comprehensive care and after-hours services, while FHO physicians receive an age-sex adjusted capitation payment per enrolled patient, plus a reduced fee-for-service to provide in-basket services and the same incentives for after-hours services as in FHG.

Objectives: To evaluate the impact of physicians switching from blended FFS to blended capitation on production of capitated services, after-hours services, non-incentivized services, and services to non-enrolled patients. We also explore heterogeneous responses across sex, graduation cohort, practice location, timing of switch, and interdisciplinary team setting.

Methods: We develop a theoretical model of physician behaviour to generate predictions about the type of physicians likely to switch from blended FFS to blended capitation. Our model provides a structure in which to understand potential ambiguities in the services provided to enrolled and non-enrolled patients during regular- and after-hours. We use health administrative data from 2006-2014 on the quantities of

various services physicians provide during regular- and after-hours, the corresponding fees, and physician and patient characteristics to conduct our empirical analyses. We rely on a two-stage estimation approach: the first stage accounts for the differences between FHG and FHO physicians using a propensity score matching technique to render those physicians switched to FHO and those remained in FHG are comparable at the baseline. The second stage estimates the impact of switching using inverse probability weighted fixed-effects regression models.

Results: Our results, based on preferred specification, reveal that switching from FHG to FHO reduces the production of capitated services and services to non-enrolled patients by 16% and 5% per annum, and increases the production of after-hours and non-incentivized services by 8% and 14% per annum. Across all sub-groups considered, the impact of switching to FHO is negative or zero for capitated services and services to non-enrolled patients, while positive or zero for after-hours services and non-incentivized services.

Conclusions: We find that physicians alter their behaviour by producing more services whose relative prices have risen. Blended capitation reduces capitated services, while it increases after-hours services and non-incentivized services. Policy makers can reduce unnecessary care by expanding the capitated basket and limit FFS billing to restrict overprovision of services; and increase the supply of targeted services at the intensive margin during after-hours.

Does Pay-for-Performance Improve Quality of Care? Evidence from Senegal

PRESENTER: **Mylene Lagarde**, London School of Economics and Political Science

Background & objectives

Many low-income countries have chosen to introduce pay-for-performance (P4P) schemes that link financial rewards to performance targets. Although many dimensions of providers' effort are not contractible, such incentives are meant to increase quality of care, by increasing providers' motivation and accountability. Despite the enthusiasm for P4P, the evidence about its effectiveness remains mixed. While some schemes have increased the volume of care provided and structural care quality, no study has looked at the impact of P4P on the process quality and effectiveness of care provided. This study aims to fill this gap, by measuring the impact of a P4P scheme on the quality and effectiveness of care for services that were rewarded and not rewarded.

Methods

We take advantage of a randomised pilot of P4P in Senegal to identify the impact of P4P on quality of care. In the pilot, primary care facilities randomised to the treatment received financial incentives linked to the volume and appropriateness of care for maternal, reproductive and child services. We conducted an audit study in 196 public primary care facilities, using unannounced standardised patients to collect objective measures of quality and effectiveness of care. SPs are healthy individuals trained to consistently portray a particular clinical case and to subsequently report the performance of the providers consulted against a checklist reflecting the national guidelines and essential recommended care. The use of SPs provides many advantages over other methods of assessing quality such as clinical observations, patient exit interviews or use of medical records. SPs are especially useful to provide comparisons across settings, without problems of patient selection. In this study, each facility was visited by five standardised patients: two portraying a condition that was incentivised by the scheme (family planning and child with dysentery) and three presenting conditions that were not incentivised (asthma, angina and tuberculosis).

Results

Overall, we found low levels of quality of care. In control facilities, consultations lasted on average about 13 minutes, but providers completed only 30% of an essential checklist of care, asking on average 2.4 essential questions and performing 1.3 essential physical examination. Less than half of patients (41.7%) were managed according to the recommended guidelines. We found no evidence that the financial incentives provided by the P4P scheme improved any of the measures of quality of care, nor that it increased the likelihood that patients would be managed correctly. The evidence was similar for rewarded or non-rewarded services.

Conclusions

The results suggest that financial incentives are unlikely to improve dimensions of effort that are non-contractible and non-observable, especially in settings where patients have limited information about what constitutes good quality of care.

An Analysis of Donor Financing of Human Resources for Health Activities and Health Worker Migration in Sub-Saharan African Countries

PRESENTER: **Dr. Angela Esi Micah**, Institute for Health Metrics and Evaluation, University of Washington

Background

In 2016, sub-Saharan Africa had 21% of the global burden of disease, yet only 5% of the global health workforce. One of the drivers of the global health workforce imbalance is the migration of health workers. Recognizing the challenges associated with the ethical recruitment of health professionals globally, the WHO Global Code of Practice on the International Recruitment of Health Personnel was instituted in 2010. The code encourages high-income countries to provide financial and technical assistance to low-income countries to mitigate the impact of health personnel emigration. Whereas the issue of emigration of health workers and its associated impact on the health system has been well described in the literature, there is limited evidence on the issue of emigration and the transfer of development assistance for health resources.

Aims and objectives

The objective of this study is to examine the relationship between the flow of development assistance for human resources for health (DAHRH) and the emigration of health workers.

Methods

The study uses data from the Institute for Health Metrics and Evaluation's 2018 Development Assistance for Health database. This data tracks development assistance for health from 1990 through 2018. DAHRH estimates is linked to data on physician migration to the United States, United Kingdom, Canada and Australia. We use regression analysis to assess the association between the change in the number of foreign trained physicians practicing in these four high-income countries and change in the amount of DAHRH received by sub-Saharan countries.

Key findings

Preliminary results suggest there is a positive association between the flow of development assistance for human resources for health and the emigration of health workers. A 10% increase in development assistance for human resources for health is associated with a 2.4% increase in the number of physicians migrating out of the country (0.24 – 95% CI 0.14 – 0.35). Additional analysis will explore alternative models to examine the robustness of the finding.

Conclusion

Health worker emigration presents significant challenges for health systems in sub-Saharan Africa. The preliminary results suggest that other interventions besides additional investment in training and other human resource activities may be necessary to stem the flow of health workers out of sub-Saharan Africa.

The Complex Employment Decisions of Health Professionals over time: Sequence Analysis of a Longitudinal Cohort of Professional Nurses in South Africa

PRESENTER: **Duane Blaauw**, Centre for Health Policy, School of Public Health, University of the Witwatersrand

Background

More longitudinal cohort studies are required in low- and middle-income countries to investigate the factors influencing health professionals' movements and job choices. However, such studies reveal increasingly complex patterns of employment decisions over time that are difficult to analyse using traditional methods. Sequence analysis techniques were initially developed to compare DNA sequences but can also be applied to social phenomena, such as career pathways, to better analyse whole sequences of social events over time.

Methods

The data is from a prospective longitudinal study monitoring the career choices of a cohort of professional nurses in South Africa. 377 final year professional nursing students from two provinces were recruited into the study in 2008. Cohort members were interviewed telephonically each year from 2009 to 2018 to provide information about their current job. Social sequence analysis methods were used to evaluate and compare the employment patterns of the cohort over time. The participants' job locations each year were categorised by sector and area. Sequence index plots for both full and episode sequences were used to compare job choice patterns. Optimal matching was used to produce the dissimilarity matrix of distances between all of the sequences, and then hierarchical agglomerative cluster analysis was used to identify clusters of similar sequences. Finally multinomial logistic regression was used to identify the socio-demographic predictors of cluster membership. All analyses were done in Stata, using the SQ-Ados for sequence analyses.

Results

The analysis focuses on the 334 cohort member (88.6%) with complete employment histories for the first 6 years following graduation. The 334 subjects shared 86 different full sequences and 47 different episode sequences. These results revealed a number of common job sequences including; 1) staying in a public urban job; 2) staying in a public rural job; 3) moving from the public to the private sector; and 4) moving from a rural to an urban job. However, a significant proportion of nurses showed more complex job histories. Hierarchical cluster analysis confirmed these four clusters as the optimum number for this data. The multinomial logistic regression indicated that being born in a rural area or studying in the rural North-West province were significant predictors of staying in a public rural job compared to staying in a public urban job. Nurses trained at university rather than in a nursing college were also more likely to be in the cluster that moved from the public to the private sector.

Conclusions

Health workers exhibit complex and dynamic career pathways over time. Observed employment patterns are influenced by a range of factors including individual socio-demographics and professional training. More complex methods, such as sequence analysis, are useful in summarising and comparing longer career pathways.

The Effect of Nurse Practitioner and Physician Assistant Regulations on the Growth of the Opioid Treatment Workforce in the United States

PRESENTER: **Prof. Joanne Spetz**, University of California-San Francisco

Background and Objectives: Rates of opioid abuse in the U.S. are climbing, while access to addiction treatment lags woefully behind need. Medication treatment is an important component of efforts to treat those with opioid use disorder, and buprenorphine is particularly important because clinicians can obtain waivers to prescribe it outside licensed narcotics treatment programs. Until 2016, only physicians were permitted to obtain waivers until Federal law was changed, and now nurse practitioners (NPs) and physician assistants (PAs) can obtain waivers. The success of the 2016 change in increasing access to buprenorphine may, however, be affected by state-level regulations that require NPs and PAs to be supervised by or collaborate with physicians. As of January 2019, more than half of states require that NPs practice under the supervision of a physician. This study examines the interaction between scope of practice regulations and the availability of clinicians to provide buprenorphine treatment.

Methods: We measured changes in buprenorphine prescriber supply nationwide and regionally to assess the impact of the 2016 change on the number of buprenorphine clinicians, whether the change expanded access in rural areas, and the interaction between NP and PA scope of practice regulations and the outcomes of the 2016 change. Using data that list every clinician authorized to prescribe buprenorphine, we first aggregated data to the state level and estimated OLS regressions with the dependent variable of the percent of clinicians of each type (physician, NP, or PA) authorized to prescribe. We now are assembling datasets at the county level and the individual level. With the county-level data, we will estimate OLS regressions of the number of prescribers per 100,000 population, count models of the count of prescribers (with population as the offset), and logistic models of whether the county has any prescriber, with explanatory variables including the 2016 policy change, scope of practice, rural/urban setting, and other control variables. With the individual-level data, we will estimate logistic regressions to predict the odds of clinicians being located in rural communities, provider type, scope of practice, and interactions between these as the explanatory variables.

Results: The state-level analyses find that the percentage of NPs with prescribing authority is 75% higher in states that do not require physician supervision. There is no association between PA scope of practice and the percentage of PAs with prescribing authority. County-level and individual-level analyses are now underway.

Conclusions: State-level analyses find that greater practice restrictions were associated with a lower percentage of NPs, but not PAs, with waivers. Differences in characteristics between NP and PA scope of practice restrictions, such as PA regulations in all states requiring collaboration with a physician, unlike NPs, may explain the result.

An Observed over Expected Estimator to Describe Individual Patients' Exposure to Nurse Staffing During the Hospital Stay

PRESENTER: **Sarah N. Musy**

Background

Determining safe nurse staffing levels is a key challenge for hospitals. Care demands vary each shift, since the number and characteristics of patients is changing with admissions, discharges and transfers. Such fluctuations may result in a reduction or an increase of the nurses' work and therefore a potential imbalance between supply and demand of nursing services. Most research in this field is based on aggregated data over time (e.g. year) and on the hospital level. Thus, results do not reflect daily or shift variability, e.g. under- or overstaffing is not recognized due to aggregation. So far, most studies haven't considered variations of nurse staffing of individual patients over the full length of the hospital stay.

Objectives

The objective was to develop a nurse staffing model which allows to describe nurse supply and demand for individual patients over time in a large University Hospital in Switzerland.

Methods

Routine data of three years containing information about nurses and patients were used. Patient-to-nurse ratios were calculated by dividing the number of patients by the number of nurses for each unit and department every 30-minutes. A nurse staffing model was developed using a mixed-model with random effects for shift and units. Observed staffing ratios (raw data) were divided by the predicted staffing ratios (mixed-model) for the observed-over-expected (OE) rate. Based on the OE estimator shifts with extreme over (i.e. 50% less patients than the median) and under staffing (i.e. 50% more patients than the median) as well as for each patient' length of stay is described.

Preliminary results

Ten departments and 77 units with 85,706 patients and 5,721 staff totaling 58 million data points were analyzed. At night, 27.4% of the shifts had extreme over staffing, while 20.1% had extreme under staffing. In the morning, 8.3% and 15% of the shifts had extreme over and under staffing, respectively. For the evening, over staffing was present in 10.9% of the shifts, while 14.4% for under staffing. The percentage of patients experiencing no over or under staffing were 12.6% and 4.6%, respectively. The proportion of patients with one shift, between two to four, between five to ten, and more than ten shifts that had over staffing were 10.6%, 22.8%, 23.3%, and 30.6%, respectively. Concerning the

under staffing, 6.5% of the patients experienced one shift, 18.7% between two and four shifts, 23.4% between five and ten shifts, and 46.7% more than ten shifts.

Conclusion

This analysis of nurse staffing supply and demand is conducted with high level granularity. The OE results showed that almost all patients experienced extreme staffing during their hospital stay. Nevertheless, not all of the patients will experience negative and adverse event outcomes. Thus, the next step is to link the OE profile of each patient to adverse events to define the threshold and frequency of extreme staffing as well as patient characteristics.

How Productive and Allocative Efficiency in General Practice Could Be Improved by Cooperation with Nurses: Learnings from a Mixed-Method Design to Evaluate a Teamwork Pilot in France

PRESENTER: **Julien Mousques**, Institute for Research and Information in Health Economics (IRDES)

Background. France struggle to develop teamwork in primary care. In many countries, policies have encouraged integrated care and interprofessional cooperation to improve allocative and productive efficiency. The French Ministry of Health had decided to contract with a meso-tier organization – a not-for-profit organisation called Asalée – to extend a pilot over the period 2011-2018 to promote vertical integration and cooperation between General Practitioners (GPs) and Advanced Practice Nurses (APNs). This pilot includes 753 practices, 1959 GPs and 267 full time equivalent APNs for the year 2017. The pilot has benefited from various incentives including nurses' salaries and GPs' payment for coordination. GPs' participation is on a voluntary basis whereas APNs are selected, hired, trained by Asalée. APNs complement and/or substitute the GPs in the following ways: identification of type 2 diabetic (T2D) or COPD patients; (2) realisation of procedures (EKG , spirometry, foot examination…);(3) patient education. Objectives. This communication gives an overview of the public policy evaluation program of the pilot as well as its main results and policy learnings. Methods. The design is based on a mixed method design that combines three main sequential and embedded steps. First, qualitative research (interviews) aims to qualify the pilot and key dimension of cooperation. Second, exploratory framework with a taxonomy based on a survey of GPs-APNs pairs aims to clustered GPs-APNs depending on the nature and intensity of cooperation. Third, quantitative explanatory framework based on case-control frameworks, panel data (over the pre/post period 2010-2017), exact matching and difference-in-difference estimations aims to estimate the impact of the pilot. Dimensions considered are as follows : (1) GP's technical efficiency ; (2) GP's quality of T2D care ; (3) Health care utilization and expenditure. We compare, over the period 2010-2016 (2017 are still in progress) 418 treated GPs from the 1st quarter 2011 to the 4th quarter 2015 matched with 1,124 controlled GPs, as well as all their respective registered or T2D patients. Results. We show that teamwork between GPs and APNs in the Asalée pilot is innovative but also that the implementation of the pilot is heterogeneous regarding the nature and intensity of cooperation between GPs-APNs pairs. We also highlight that the pilot increase the GPs' technical efficiency at the extensive margin, improve the care and services delivered by GPs for T2D patients with no other impact on health care utilization or pathways. We also demonstrate that positive impact are mostly observed for GPs-APNs pairs for which the cooperation is effective. Conclusions. Based on a mixed-method design we show that on the whole, the Asalee pilots generates efficacy and efficiency gains compared to usual practices but, moreover, that the impact is heterogeneous and depends on the nature and intensity of cooperation between GPs and APNs.

Effects on Multimorbid Patients of Adding a Non-Medical Health Coach to the Primary Care Team: A Difference-in-Difference Analysis

PRESENTER: **Vishalie Shah**, University of Manchester

Background and Objectives

Health systems, globally, are attempting to strengthen primary care to promote a population-health management approach to care provision, incentivising prevention and self-management. This paper evaluates the 'Enhanced Primary Care' component of an integrated care model implemented in a geographical region in England. Enhanced Primary Care introduces a new non-medical role, health coaches, to the traditional primary care team. We evaluate effects of health coaching on patient outcomes and experience using a quasi-experiment.

Methods

We estimate the programme's effects on health status (EQ-5D-5L, physical functioning, psychological wellbeing and resilience), smoking, experience of care (person-centeredness and continuity of care) and primary care visits using data from 3.5 million respondents to the national GP Patient Surveys between 2013 and 2017.

We use a weighted difference-in-differences design to compare changes in outcomes over time between intervention practices and comparable control practices in the rest of England. We perform robustness checks which include 1) a more restricted control group of practice peers, 2) medium-term effects, and 3) a simplified two-group/two-time analysis. We conduct our main analysis on multimorbid patients and additional analysis on all patients to assess population-level effects.

Results

For multimorbid patients, we find reductions in psychological wellbeing of -0.0174 (95% confidence interval -0.0283 to -0.0065), relative difference -2% from the pre-intervention mean; and person-centeredness of -0.0356 (-0.0530 to -0.0183), -4%. We find no significant effects on EQ-5D-5L, physical functioning, resilience, continuity of care, smoking, and primary care visits.

For population-level effects, we find reductions in primary care utilisation of -0.0331 (-0.0448 to -0.0214), -5%; and an increase in smoking behaviour of 0.0088 (0.0009 to 0.0167), +4%. All other outcomes are not statistically significant.

Conclusions

Our results show that there is very little effect of health coaching on patient outcomes in the short-to-medium term. Introduction of Enhanced Primary Care was associated with lower psychological wellbeing and person-centeredness amongst multimorbid patients, and a slight increase in smoking among the general population. However, it was also associated with a decline in primary care visits (potentially freeing up practitioner time for more complex patients) at the population-level. The results raise important questions regarding primary care workforce changes and the time horizon of any benefits of prevention strategies.

No Pain, Some Gain: Same Quality at Lower Cost by Shifting Tasks Between Healthcare Professionals

PRESENTER: **Matteo Ruggeri**, Università Cattolica del Sacro Cuore

Background

In most EU countries, the highest share of national healthcare expenditure concerns labour costs. In traditional physician-centered models, the involvement of doctors is associated with higher opportunity costs. In order to face the rising costs of healthcare without negatively affecting the quality of care delivery to patients, EU countries are designing policies aimed at changing the size and composition of the healthcare workforce by extending and introducing new roles for healthcare professionals.

The EU-funded MUNROS project covered the care for patients with breast cancer, diabetes or heart disease in 9 European countries. Initial analysis of the data showed that changing roles, in particular delegating the provision of educational and monitoring activities to non-physicians, had no significant effect on the experience of patients, such as the satisfaction with their last visit, the care provided, or the waiting time. However, it is not yet clear what the effect is on overall patient satisfaction with care delivery.

Objective

In this paper we aim to conduct a quasi-experiment to test the possible effects of changing roles for healthcare professionals on patient satisfaction.

Methods

Data from the patient survey conducted within the MUNROS project were used (n = 2958). The three health conditions were considered where available for the nine countries involved in the survey.

Firstly, using Multiple Correspondence Analysis, a general satisfaction indicator was created with the six satisfaction dimensions included in the survey. The satisfaction indicator ranged from 0 to 1.

Secondly, a logistic regression allowed estimating the propensity matching score to select the sample being randomized either in the control or in the case groups. Control groups included patients receiving care according to traditional arrangements in the clinical pathway they were enrolled. Case groups included patients receiving care involving healthcare professionals in new or extended roles, more specifically, nurses or pharmacists conducting monitoring or educational activities rather than medical doctors.

Thirdly, 6 case-control comparisons were performed for each clinical condition.

Results

Preliminary results on diabetic patients show that patients receiving education by nurses report higher satisfaction scores. The other comparisons seem to confirm the previous findings that changing roles has no significant effects on patient satisfaction. Country-specific analyses are still ongoing.

Conclusions

Our results show that health workforce policies aimed at shifting tasks from medical doctors to other healthcare professional does not seem to affect patient satisfaction with care delivery. Consequently, the costs of care could potentially be reduced without compromising the quality of care.

Rural Internship Job Preferences of Final Year Medical Students in South Africa: A Discrete Choice Experiment

PRESENTER: **Maria Jose**, Health Economics Unit, University of Cape Town

Background: The challenging nature of rural medical practice, unpopular among doctors, results in widening inequalities in healthcare access between urban and rural areas. Medical students' internship facility choice is multi-factorial with policy makers using incentives to promote rural health recruitment. Costly interventions include the rural allowance and housing provision with mixed results.

Objectives: This study aims to determine heterogeneity in valuations for rural facility attributes by final year medical students at one South African public university to inform cost-effective recruitment policy recommendations.

Methods: Focus groups were conducted with final year medical students which identified the following facility attributes: physical safety at the facility, availability of basic resources, degree of practical experience gained at the facility, seniority of supervisor, availability of correctly fitted personal protective equipment (PPE), provision of housing, and increases in rural allowance. These were used to generate a d-efficient design with 15 choice sets, each with two rural hospital alternatives and no opt-out option. An online, unlabelled discrete choice experiment (DCE) was conducted with 224 final-year medical students. Results were effects coded, mixed logit models was used to estimate valuation of attributes, socio-economic interactions and willingness to pay.

Results: Final sample size was 193(86,16%) of the study population, majority female 130(66.33%), with urban origins 176(89.80%), unmarried 183(93.37%) and without children 193(98.47%). Most had undergraduate rural medicine exposure 110(56.12%) and intended to specialise 109(55.61%). The main effects mixed logit model found advanced practical experience, hospital safety, correctly fitted PPE and availability of basic resources the highest weighted attributes, mean utilities increasing by 0.82, 0.64, 0.62 and 0.52 respectively ($p=0.000$). In contrast, increases in rural allowance and the provision of housing provision were found to provide smaller mean utility increases of 0.001 ($p<0.01$) and 0.09 ($p<0.05$) respectively. Being female, intending to remain in general practice and having prior rural medicine exposure were associated with higher mean utility increases for hospital safety 1.59, 1.82, 1.42 respectively ($p=0.000$). Participants were willing to pay ZAR 2636.45 monthly (95%CI: 1398.55;3874.355) for advanced practical experience (equivalent to 65.91% of current rural allowance). There was no evidence of participant fatigue however left-right bias was identified at the 5% level.

Conclusion: Medical students' facility preferences have been found to be influenced by gender, career aspirations and prior experiences. Advanced practical experience is a key value proposition of rural medical practice and system-wide initiatives; securing facilities and providing PPE, should be prioritised over rural allowance and housing provision.

Employment Preferences of Obstetricians and Gynecologists to Work in the Remote District Hospitals: Evidence from a Discrete Choice Experiment in Nepal

PRESENTER: **Bishnu Gautam**, lumbini Provincial Hospital

Introduction

As of 2012, only 287 obstetricians and gynecologists (OBS-GYNs) were registered with Nepal Medical Council—a reflection of the mismatch and uneven distribution between the production of OBS-GYNs and the population demand though annually production is around 80. Recruitment and retention of OBS-GYNs is a pressing problem, especially for the rural areas of Nepal. Though having information on the priorities of OBS-GYNs while selecting a rural area for service would help in recruiting them, research on this area is lacking in Nepal.

Methods

We identified attributes that OBS-GYNs value the most based on key-informant interviews and focus-group discussions. Then, these attributes were reduced to 48 choice sets via fractional factorial design analyses. Using these unlabeled choice sets, we conducted a discrete choice experiment with 189 OBS-GYNs. To identify the utility of each attribute to the OBS-GYNs, we ran multinomial logistic regression models. We also calculated the willingness to pay/accept by the OBS-GYNs for each attribute.

Results

OBS-GYNs considered the presence of a team of OBS-GYN, pediatrician and anesthesiologist at the workplace (0.4) and willingness to pay NPR 195749 (USD 1673) per annum, provision of primary and secondary education for children (0.2, 0.3) and willingness to accept (sacrifice) NPR 85646 (USD 732) and NPR 118592 (USD 1013) per annum respectively, and opportunity of private practice (0.1) and willingness to pay NPR 52288 (USD 447) per annum. On the other hand, a higher minimum duration of service (-0.3) and willingness to accept NPR 123602 (USD 1026) per annum and the provision of a car allowance (0.07) were taken as a disincentive for service.

Results from the willingness to pay/accept quantified the amount OBS-GYNs would be willing to pay/accept if they were open to trade the attributes.

Conclusions

Rather than offering a standard incentive package to all health workers, we recommend including the attributes identified as incentives in this study to attract OBS-GYNs to serve in remote district hospitals of Nepal. This study confirmed the importance of combination interventions in attracting and retaining health workers in remote areas of Nepal.

8:30 AM –12:00 PM SUNDAY [Pre-Congress And Sponsored Sessions]

Universität Basel | Kollegienhaus – Hörsaal 118

Financing Common Goods for Health

SESSION CHAIR: **Agnes Soucat**, World Health Organization

DISCUSSANT: **William Savedoff**, Center for Global Development

When Both Markets and Governments Fail Health

PRESENTER: **Abdo Yazbeck**, Independent Consultant

The motivation behind financing common goods for health will be presented to provide the rationale behind the knowledge program.

When Markets Fail: Common Goods for Health

PRESENTER: **Peter C Smith**, Imperial College

A framework will be presented to identify common goods for health based on the economic rationale behind market failures with population-based interventions and functions that contribute to health and well-being.

Financing Common Goods for Health: A Country Agenda

PRESENTER: **Susan Sparkes**, World Health Organization

The mechanisms, as well as potential challenges and opportunities to finance common goods for health at both the national level will be unpacked and explained in detail.

Financing Global Common Goods for Health: When the World Is a Country

PRESENTER: **Gavin Yamey**, Duke Global Health Institute, Duke University

This presentation will define and analyse global common goods for health that require supranational financing and will propose policy options that address financing- and governance-related issues.

Country Perspective on Financing Common Goods for Health: Sri Lanka

PRESENTER: **Palitha Abeykoon**

We will learn how Sri Lanka's commitment to preventive health services and functions has informed and been incorporated into their ongoing primary care strengthening reforms, as well as hear about the challenges and successes to financing common goods for health.

Country Perspective on Financing Common Goods for Health: Liberia

PRESENTER: **Tolbert Nyenswah**

We will hear from the Liberian leaders who managed and coordinated the national Ebola response in 2014 as to how the country is working to prioritize investments in core public health functions post-Ebola, as well as about some ongoing challenges.

Country Perspective on Financing Common Goods for Health: India

PRESENTER: **Ajay Shah**

India's decentralized government provides a rich example of ways in which public health functions have and have not been prioritized by local governments.

8:30 AM –12:00 PM SUNDAY [Pre-Congress And Sponsored Sessions]

Universität Basel | Kollegienhaus – Hörsaal 119

Measure What Matters: Training Workshop on Household Survey Data on Out-of-Pocket Health Expenditure

SESSION CHAIR: **Gabriela Flores**, World Health Organization

8:30 AM –12:00 PM SUNDAY [Pre-Congress And Sponsored Sessions]

Universität Basel | Kollegienhaus – Hörsaal 120

Teaching Health Economics - Active Learning Methods

SESSION CHAIR: **Allen Goodman**, Wayne State University

Useful tips for Applying Health Economics Tools to Using Existing Case Studies in Health Professions

PRESENTER: **Maia Platt**, University of Detroit Mercy

The purpose of case study exercises is to foster students' critical thinking and analytical skills through active learning assignments. This presentation will argue that simply following the given parameters of the task at hand, without critically reviewing them with economic lens, might produce sub-standard outcomes in the work environment of many health professions. The ultimate goal is to highlight the still-existing gap between a typical decision-making process in nearly any health profession vs. optimal decision-making process offered by a health professional equipped with economic tools; and to offer strategies to reduce that gap.

Assessing Health Economics using Portfolios: Building Skills while Building the Assessment

PRESENTER: **Neha Batura**, University College London

A portfolio is a collection of texts and/or other materials, usually including a reflective commentary, submitted as evidence that learning has taken place. We will reflect on both our own and our students experience of using a portfolio method for the assessment of two courses in Health Economics at UCL. We will share student experience of what works and what does not. The benefits and features of a portfolio that extends learning and builds foundation skills will be described with examples from our own work. Finally, we will explore the extent to which this assessment form differentiates students, stretching the able and supporting those feeling challenged by new concepts.

Sick Around the World: Activities for Understanding Health Systems for In-Class and Online

PRESENTER: **Simon Condliffe**, West Chester University

We seek to enhance student comprehension of health economics concepts and their understanding of health systems around the world. The first step is to expose students to health care data that reinforce economic theory. The second step is to connect domestic students with international students to provide a personal perspective on the differences in health care systems around the globe. These practical, active learning exercises help students to apply theory either in the classroom setting or online. Material can be tailored to suit undergraduate classes or graduate classes and the exercises can be performed with readily available data and technology.

Noricum: 10 Years of Student Designed Health Care Systems for a Fictitious Country

PRESENTER: **Mr. Florian Buchner**, Carinthia University of Applied Sciences

About ten years ago, we created a role-play to simulate the scenario of a fictitious state (Noricum) to put students in a situation, where they have to tackle tradeoffs and conflicts of interest in a health care system by negotiations and legislation. The course is organized in three phases: (1) Conceptual phase - students take the roles of central interest groups and develop strategy papers including explicit goals and implementation strategies; (2) Action phase - phase of governmental legislative initiatives, negotiations and contracting between the interest groups; (3) Feedback phase is organized as a plenary workshop. Three key issues of the didactic concept are teaching by challenge, comprehensive feedback and constructive alignment.

Session 2: Active Learning in International Contexts

PRESENTER: **Jill Boylston Herndon**, Key Analytics and Consulting

This "hands-on" session presents "active learning" methods in international contexts. After a short introduction, Dr. Herndon facilitates and interacts with small groups to promote active learning methods for health economics teaching and learning. She will focus on active learning in an international context.

8:30 AM –12:00 PM SUNDAY [Pre-Congress And Sponsored Sessions]

Universität Basel | Kollegienhaus – Seminarraum 212

Health Care Provider Behavior and Quality of Care in Low- and Middle-Income Countries (LMICs)

SESSION CHAIR: **Margaret McConnell**, Harvard T.H. Chan School of Public Health

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10:45 AM –12:45 PM SUNDAY [Pre-Congress And Sponsored Sessions]

Universität Basel | Kollegienhaus – Seminarraum 103

Value of Health Insurance Data from a Public Health Perspective

SESSION CHAIR: **Siddharth Srivastava**, Swiss Tropical and Public Health Institute

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1:00 PM –4:30 PM SUNDAY [Pre-Congress And Sponsored Sessions]

Congress Centre – San Francisco

Financing for Universal Health Coverage: Driving System Change through Strategic Purchasing

1:00 PM –4:30 PM SUNDAY [Pre-Congress And Sponsored Sessions]

Universität Basel | Kollegienhaus – Hörsaal 115

The Benefit-Cost Analysis Reference Case: What It Is and How to Use It

SESSION CHAIR: **Lisa A Robinson**, Harvard T.H. Chan School of Public Health

6:00 PM –7:40 PM SUNDAY [Special Sessions]

Congress Centre – San Francisco

Opening Plenary: Economic Opportunity and Health Inequality: New Insights from Big Data

PANELISTS: **Raj Chetty**, Harvard University

Monday

8:30 AM –10:00 AM MONDAY [Health Care Financing & Expenditures]

Universitätsspital Basel | ZLF – Gross

Physician Payment and Pay-for-Performance/Quality

SESSION CHAIR: **Carl Rudolf Blankart**, University of Bern

Reduced Physician Payments Associated with Less Use of Physician Office Care Among Those Eligible for Both Medicare and Medicaid in the U.S.

PRESENTER: **Dr. Sandra Decker**, US Agency for Healthcare Research and Quality

AUTHORS: Tamara Hayford, Xiaotong Niu

Dual eligibles (people dually enrolled in Medicare and Medicaid) constitute a particularly vulnerable population in the United States, accounting for at least one-third of Medicare and Medicaid spending, though only 15 to 20 percent of enrollment. Most are eligible for the Qualified Medicare Beneficiary (QMB) program, under which U.S. states are responsible for Medicare patient cost sharing, set at 20 percent of the Medicare payment rate for Part B physician services. However, since 1997, federal law has allowed Medicaid programs to pay providers the "lesser of" Medicare cost sharing and the amount, if any, by which Medicaid's payment rate for the service exceeds the Medicare rate. Since Medicaid physician payment rates are generally below 80 percent of Medicare rates, many physicians are therefore only paid 80 percent of Medicare rates for services they provide to QMBs. The number of U.S. states in which physicians are paid 80 percent has increased over time as the number adopting "lesser of" policies has increased. This gradual policy shift serves as a pseudo-experiment that may have implications for how providers respond to price changes in other settings. Our analysis includes data from all but four U.S. states covering a period of 13 years, unlike previous studies which were limited to a single year of data on a smaller subset of states.

We estimate difference-in-difference-difference models with administrative (claims) data from 1999-2012 in order to analyze how policy changes over time have affected access to care for QMBs compared to Medicare-only enrollees. We compiled information about "lesser of" policies and Medicaid fees from the Kaiser Family Foundation, MACPAC, and the Urban Institute, supplemented with primary research on the timing of state policy changes.

We find that the movement toward "lesser of" payment for Part B services for dual eligibles, reducing physician payment rates by 20 percent in most cases, is associated with a 5% reduction in the number of new primary care visits for QMB enrollees and a 7 percent reduction in the probability that QMB enrollees have a new primary care visit. Both the number and likelihood of overall and established patient primary care patient visits fell by about 3 percent. Although the new primary care visit results, in particular, seem like a sizeable effect, we did not detect significant spillover effects on the use of acute care including emergency room visits or hospitalizations. Continued monitoring of quality of care measures among duals appears warranted.

Association of Specialist Physician Payment Model with Visit Frequency, Quality, and Costs of Care for People with Chronic Disease: A Propensity Score-Matched Analysis

PRESENTER: **Dr. Amity Elizabeth Quinn**, University of Calgary

AUTHORS: Brenda Hemmelgarn, Marcello Tonelli, Kerry McBrien, Alun Edwards, Peter Senior, Peter Farris, Flora Au, Zhihai Ma, Robert Weaver, Braden Manns

Non-communicable chronic diseases account for two-thirds of health care expenditures in Canada and are a major challenge for health systems worldwide. As the number of people with chronic disease increases, determining optimal models to improve the quality and value of chronic disease care is critical. Chronic disease management models have focused on the role of primary care, although specialists are also key members of the chronic care team. There is limited research in Canada and internationally on the impact of specialist physician payment models, though many countries are testing different models. One quarter of specialists in Alberta, Canada are paid through academic alternative relationship plans (AARP) (similar to a salary), with the rest receiving fee-for-service (FFS). We determined the association of specialist payment model with visit frequency, quality, and costs for patients with diabetes and chronic kidney disease (CKD).

We used laboratory and administrative health data to define a cohort of adults with diabetes or CKD newly referred to specialists between April 2011 and September 2014 in Alberta. Patients were identified using validated algorithms. These conditions and specialties represent a large proportion of chronic diseases and their providers in Canada. Primary outcome was the rate of subsequent visits with the same specialist; secondary outcomes included guideline-recommended care, rate of hospitalizations/emergency department visits for ambulatory care sensitive conditions (ACSC) specific to diabetes and CKD, and health care costs. We used propensity score matching to account for baseline differences across payment model. Using the matched cohort, incidence rate ratios (IRR) were estimated with negative binomial regression to assess rates, and risk ratios (RR) were estimated using a modified Poisson with generalized estimating equations to assess quality indicators. Standard errors accounted for patients clustering within physicians.

Patients seen by AARP physicians were sicker, though after propensity score matching, the two groups appeared well balanced. Using the matched cohort, patients seen by AARP physicians had fewer follow-up visits (IRR 0.88 (95% 0.86, 0.91;$p<0.001$)). There were no clinically relevant differences in guideline-recommended care. Patients with diabetes (though not CKD) seeing AARP physicians had higher rates of admissions to hospital/emergency departments for condition-specific ACSCs (IRR 1.23 (95% CI 1.17, 1.29; $p<0.001$)). While the cost of outpatient visits was lower for patients seeing AARP physicians ($339 vs. $349, $p<0.001$), other costs were higher. There was substantial variation in these outcomes among physicians.

Patients seeing AARP physicians had fewer visits, though it is unclear if this relates exclusively to the payment model or to variation among physicians. Patients seeing AARP physicians had a higher rate of diabetes-specific hospital admissions and emergency department visits for ACSCs. Costs appear higher for patients seeing AARP physicians across several cost categories, though the reasons for this are uncertain and may relate to how the cost of AARP physician care is estimated and to underlying unmeasured differences in patients despite matching. Aligning a health care payer's goals with specialist physician's actions to improve the quality and value of chronic disease care may require additional strategies beyond payment mechanism alone.

Multitasking in Pay for Performance. Evidence from Piecewise Linear Contracts.

PRESENTER: **Marcos Vera-Hernandez**, University College London

AUTHOR: Paul Rodriguez

Whether tasks are cost complement or substitutes is crucial for the optimal design and ultimate success of any pay-for-perfomance scheme. We propose an empirical test for determining if tasks are cost complements or substitutes. The test requires that the reward scheme is piece-wise linear, and that that there are changes over time on the rewards of some tasks. However, the reward scheme does not need to vary across agents, making it applicable to nationwide pay-for-performance programmes. The test is based on the insensitivity of effort on a particular task to variations in the price of other tasks for agents who are bunched at the kinks.

We apply our new test to The Quality and Outcomes Framework in the UK, which is the largest pay-for-performance programme for primary care physicians in the world. The programme rewards several indicators related to the management of chronic diseases. Out of 35 indicators analyzed, we find that seven tasks are complements and one is substitute.

Overall, our results indicate that pay-for-performance schemes should be successful because increasing the effort exerted in most tasks decreases the marginal cost of effort on other tasks, and consequently effort diversion does not take place.

The results also has implications on how to design an efficient primary care system: one based on family doctors rather than specialists groups together tasks, which are complements in the cost function, and hence improves efficiency.

Effectiveness and Cost-Effectiveness of Pay for Quality Initiatives in High-Income Countries: A Systematic Review of Reviews

PRESENTER: **Helene Eckhardt**, Department of Health Care Management, Berlin University of Technology

AUTHOR: Wilm Quentin

Background: Since the early 2000s, an increasing number of pay for quality (P4Q) initiatives has been introduced in high-income countries with the aim to improve quality of care. A large number of studies and systematic reviews have evaluated these schemes.

Objectives: To summarize, compare and analyse the findings of available systematic reviews concerning effectiveness, patient safety, responsiveness and cost-effectiveness of P4Q initiatives.

Methods: A broad search strategy was used to identify all potentially relevant systematic reviews in nine electronic databases (including amongst others Pubmed, Cochrane library, and Business Source Complete). After removal of duplicates, two reviewers independently screened 12 926 titles for eligibility against inclusion and exclusion criteria and assessed the quality of included reviews by applying the AMSTAR tool. Information was extracted about review characteristics and reported results concerning effectiveness, safety, responsiveness, cost-effectiveness, and unintended consequences. Reported results were analysed separately for P4Q initiatives with different contextual and structural

characteristics. A final updated search is planned for 2019. The review protocol, specifying the search strategy and inclusion criteria was published in PROSPERO in 2016 (CRD42016043043).

Results: 31 reviews published between 1999 and 2016 were included in the final analysis. These included a total of about 400 different original studies. Most reviews were of low quality as assessed by AMSTAR criteria and most reported that primary studies were also of low quality. The vast majority of reviews were performed in the US and the UK. Seven reviews were conducted in non-English speaking countries, and one review was in Portuguese. Nineteen reviews evaluated P4Q programmes in primary care, nine reviews investigated effects of both primary and hospital care and only three reviews had an exclusive focus on hospital care. Five reviews focused solely on preventive care, while another three focused only chronic care. The number of studies included in each review varied from two studies to 128 studies. Reviews of P4Q in primary care reported small positive effects on process-of-care (POC) indicators, while in hospital care P4Q appeared to be ineffective with respect to POC measures. Evidence on effectiveness with respect to improving health outcomes and patient safety indicators is inconclusive. Patient experience and patient satisfaction were rarely evaluated and usually did not improve. Reviews reported that original studies with rigorous quasi-experimental designs and a long-time horizon usually found no or minor positive effects, while studies with a short time horizon and less rigorous design found more positive results. The only review of economic evaluations of P4Q initiatives reported that most original studies found P4Q to be cost-effective. However, given that other reviews reported P4Q initiatives to be ineffective or ineffective in the long-term and most programs required additional ressources, it is unlikely that these programmes were cost-effective.

Conclusions: There is a broad body of literature about the effectiveness of P4Q. Nevertheless, reliable evidence from studies with rigorous designs remains scarce. Any new P4Q initiatives should be implemented in a way that enables rigorous quasi-experimental evaluation with data collection starting several years prior to implementation.

8:30 AM –10:00 AM MONDAY [Health Care Financing & Expenditures]

Universitätsspital Basel | ZLF – Klein

Universal Health Coverage

SESSION CHAIR: **Matthew Jowett**, World Health Organization

Who Benefits from Government Health Spending in Cambodia – Evidence for a Universal Health Coverage Policy

PRESENTER: **Augustine Asante**, UNSW Sydney

AUTHORS: Por Ir, Bart Jacobs, Virginia Wiseman

Cambodia's health care system has seen significant improvements in the last two decades. Despite this, access to quality care remains problematic, particularly for poor rural Cambodians. The government has committed to universal health coverage and is reforming the health financing system to align with this goal. The extent to which the reforms have impacted the poor is not always clear. Using a system-wide approach, this study assesses how benefits from health care spending are distributed across socioeconomic groups in Cambodia. Benefit incidence analysis was employed to assess the distribution of benefits from health spending. Primary data on the use of health services and the costs associated with it were collected through a nationally representative cross-sectional survey of 5000 households. Secondary data from the 2012-2014 Cambodian National Health Accounts and other official documents from the Ministry of Health were used to estimate the unit cost of service. The results indicate that benefits from health spending at the primary care level in the public sector are distributed in favour of the poor, with about 32% of health centre benefits going to the poorest population quintile. Public hospital outpatient department benefits are quite evenly distributed across all wealth quintiles, although the concentration index (CI) of -0.058 suggests a moderately pro-poor distribution. Benefits for public hospital inpatient care are substantially pro-poor with a CI of -0.276. The private sector was significantly skewed towards the richest quintile, who received 26% and 29% respectively of the benefits for private pharmacies and private hospital/clinic outpatient care. Relative to health need, the distribution of total benefits in the public sector is pro-poor while the private sector is relatively pro-rich. Looking across the entire health system, health financing in Cambodia appears to benefit the poor more than the rich but a significant proportion of spending remains in the private sector which is largely pro-rich. There is the need for closer monitoring of the private sector if Cambodia is to achieve its universal health coverage goals.

Spillover Effect of a Pay-for-Performance Program Under a Universal Health Care System.

PRESENTER: **Ms. Chi-Chen Chen**

AUTHOR: Shou-Hsia Cheng

Background. Financial incentive mechanisms have been adopted in health care sector to change physician behavior. Pay-for-Performance (P4P) policy aims to link insurance payment with practice performance. Several systematic review articles reported that P4P programs have led to slight improvement in health care performance. On the other hand, studies examining the spillover effect of P4P program are limited. The findings of previous studies tend to be inconclusive and with methodological problems. Therefore, this project aims to examine the short-term and long-term spillover effects of a P4P program under a universal health system.

Methods. This study utilized a large-scale natural experiment with a 3-year follow-up period under a single-payer health insurance scheme in Taiwan. Patients aged 20 years or older who were diagnosed with type 2 diabetes were included. The intervention groups consisted of patients with diabetes who were enrolled in the diabetes P4P program in 2010. The comparison groups were selected by propensity score matching

method from patients seen by the same group of physicians treating patients in the intervention group. Differences-in-differences analysis was conducted by random coefficient models to examine the short- and long-term spillover effects of the P4P program.

Results. In the preliminary results, we found that the P4P program increased the incentivized process indicators (such as HbA1c testing) and reduced the likelihood of diabetes-related hospital admission. Yet, the effects of the P4P program on the incentivized process and outcomes of care indicators diminished to some extent in the second year after its implementation. Furthermore, we found no evidence supporting spill-over effect of the P4P program on non-incentivized items.

Conclusion. The P4P program has achieved its primary goal in improving processes and outcomes of care for incentivized items in the short term, but its effects did not last for long. In addition, no spill-over effect was found for the P4P program. A longer follow-up study is recommended to explore the spill-over effect of P4P programs.

Strategic Purchasing in Health Services: Opportunities and Challenges to Improve Health Financing Towards Universal Health Coverage in Colombia.

PRESENTER: **Mr. Juan Carlos Rivillas**, Research Initiative in Health Services and Systems, University of Valle

AUTHORS: Ana Cristina Henao, Daniela Lopez-Echeverri

More and more low- and middle income countries seek to shift to strategic purchasing, creating a demand for practical tools to assess current purchasing situations and identify options for future development. As a result a Collectivity Group on Strategic Purchasing and Universal Health Coverage was launched by the World Health Organisation, the Institute of Tropical Medicine Antwerp, have designed a Rapid Assessment to assess strategic arrangements. The Guide was drafted by staff of the World Health Organisation's Department of Health Systems Governance and Financing with key inputs, revisions and additions by the Collectivity Group. The Guide further draws on previous WHO work to develop a tool to facilitate an organizational assessment for improving and strengthening health financing (OASIS) in a country.

Colombia conducted a country assessments to explore how the weaknesses in purchasing mechanisms affect UHC intermediate and final objectives as well as other effects on the health system. The assessments were complemented with i) literature review; ii) interviews and discussions with key stakeholders; and iii) quantitative data collection. They were conducted between March-July 2018. Three assessments focused on the national level and foucsed on four main main issues: Provider payment methods, Benefit package design, Information management system and Governance arrangements in strategic purchasing. The final purpose of this assessment was to outline and frame key policies issues and challenges that are considered critical to the shift towards strategic purchasing in the four health care systems:

This new evidence identified clearly the opportunities at the country and provincial level to facilitate reforms and dialogue on strategic purchasing to meet UHC by 2030, focusing on two key areas: benefit package, payment methods, and information management and governance arrangements. While governance and benefit package review processess have more developments and progress.

What did we learn? And some key messages:

- Colombia has a multiple purchaser market organised across different administrative levels, which often results in an overlapping functions and roles among ministries, mandatory health insurances schemes and private bodies.

- Increased competition (quality and efficiency) between purchasers has reduce the number of purchasers resulting in a less fragmented purchasing market.

- Payments systems might be able to talk to each other and being integrated into the National Health Information System completely. There is a need to link health needs data with payment data to support benefit package reviews.

- There is a need to develop training and skills in health financing at all levels of the health system. We need to connect the set of UHC objectives with the set of health financing function. Instead in an isolated manner.

- Moving towards more strategic purchasing is step by step approach. It seems that the implementation of new arrangements is carrying out in a gradual manner.

- An effective alignment between BP review processes and the development of provider payment mechanisms is needed. The disconnection of both processes results in avoidable barriers, which in turn generate inequalities in the health care access and undermined quality and efficiency as intermediate goals of UHC.

Catastrophic Health Expenditure and Healthcare Seeking Behavior Among the Urban Poor Population in India: Implications for Universal Health Coverage

PRESENTER: **Dr. Ajay Kumar Singh**, IPE Global Pvt. Ltd

AUTHORS: Dr. Kaveri Haldar, L M Singh, Dr. Shankar Prinja, Dr. Atul Sharma, Dr. Vineeta Sharma, Saroj Rana

Background: Focus on health patterns and determinants of urban poor is crucial in order to move towards universal health coverage. Published literature on morbidity profile, health seeking behaviour, out-of-pocket (OOP) healthcare expenditures and associated financial risk in this population from India is scarce.

Objectives: This study was undertaken to estimate OOP health expenditures and resultant catastrophic health expenditure (CHE) along with their determinants among the urban poor.

Methodology: A cross-sectional survey was conducted among 11,000 individuals from 2,400 urban households in 4 geographically diverse states of India. Along with socio-demographic and economic characteristics, information was collected on illness and hospitalization episodes, treatment seeking behaviour, out-of-pocket expenditure and coping mechanisms utilized. Prevalence of CHE was computed, and logit models were used to identify the determinants of CHE.

Results: Around 37% out-patient and 65% in-patient consultations were sought at 45 health facilities. Average annual household healthcare OOP expenditure was found to be INR 6,689. OOP expenditure on institutional delivery at public and private facilities was found to be INR 2,235 and INR 19,185 respectively. Households spent INR 26,850 per hospitalization, which was catastrophic for 10% of the households, and pushing 4.7% below poverty line. Catastrophic health expenditure rates were significantly higher among males, illiterates, older age groups, those hospitalized at private facilities and those reporting noncommunicable diseases as the reason for hospitalization.

Conclusion: The study not only indicate high OOP expenditure incurred by urban poor, but also point to large socio-economic inequalities. Expected policy response should comprise of interventions aimed at reducing the OOP expenditures and improving access to health care.

Keywords: Urban poor, Out-of-pocket healthcare expenditure, catastrophic health expenditure, Catastrophe and impoverishment and India.

Intertemporal Dynamics of Public Financing for Universal Health Coverage: Accounting for Fiscal Space across Countries

PRESENTER: **Ajay Tandon**, World Bank

AUTHORS: Dr. Jewelwayne Sacledo Cain, Christoph Kurowski, Iryna Postolovska

As countries undergo their health financing transitions, moving away from external and out-of-pocket (OOP) financing toward domestically sourced public financing, the issue of fiscal space – that is, of finding ways to increase public financing in an efficient, equitable, and sustainable manner -- is front and center in the policy dialogue around universal health coverage (UHC). Although how money is expended is just as critical as the overall resource envelope, we analyze changes in per capita public financing for health in real terms, a proxy for realized fiscal space, within and across 151 countries over time. This allows for an assessment not just of trends in public financing for health but also of contributions from three macro-fiscal drivers -- economic growth, changes in aggregate public spending, and reprioritization for health -- exploiting a macroeconomic identity that captures the relationship between these factors. Analysis of data from 2000 to 2015 shows per capita public financing for health in low- and middle-income countries increased by 5.0 percent per year on average: up from US$60 (2.2 percent of GDP) in 2000 to US$117 (2.8 percent of gross domestic product [GDP]) in 2015. Some of the largest increases were in countries in the Europe and Central Asia (ECA) and East Asia and Pacific (EAP) regions. At 3.1 percent per year, annual growth in public financing for health was lower among high-income countries, albeit from a much higher baseline in 2000. Increases in on-budget external financing comprised most of the changes among low-income countries, whereas domestic government revenues dominated changes in composition of public financing among lower- and upper-middle-income countries. Public financing increased at a faster rate than OOP sources for health in most regions except for South Asia. Although there are important country-specific differences, it is notable that more than half of the increase in public financing for health was due to economic growth alone. For the remainder of the increase, aggregate public spending contributed more than reprioritization across low and lower-middle-income countries, whereas the reverse was true in high-income countries. One key point of note from the landscaping exercise summarized in the paper is the diversity of growth trajectories across countries and, especially, the volatility in trends over time. The implications are clear: capturing public financing with a single growth rate is not the best metric to characterize country experiences, many of which are punctuated by episodes wherein trends are flat or have varying degrees of growth rates (positive or negative). Although country context matters, the importance of economic growth for public financing for health underscores the critical need to situate, integrate, leverage, and proactively manage health financing reforms within a country's overall macro-fiscal context and to assess different pillars of fiscal space holistically.

8:30 AM –10:00 AM MONDAY [Production Of Health, Health Behaviors & Policy Interventions]

Universitätsspital Basel | Pathologie – Unten (U)

Organized Session: Unintended Consequences and the U.S. Opioid Epidemic

SESSION CHAIR: **Melinda Pitts**, Federal Reserve Bank of Atlanta

The Impact of Opioid Manufacturers' Contributions to Doctors on Opioid-Related Deaths

PRESENTER: **Ashley C Bradford**, Indiana University

In the past 20 years, there has been a significant increase in opioid use and abuse within the United States. This increase, colloquially referred to as the opioid epidemic, is devastating American society. According to the Centers for Disease Control and Prevention (CDC), the number of opioid prescriptions, as well as the rate of opioid related deaths, have quadrupled since 1999. It is common knowledge that pharmaceutical manufactures give physicians gifts with the expectation that the physicians will prescribe their medications. It is possible that these gifts alter physician prescribing behavior, which could alter patient outcomes. If physicians respond to gifts from opioid manufactures by prescribing more opioid medications, then rates of misuse, abuse and even death could rise. This question has not previously been addressed in the

literature. I collect data on all non-heroin opioid-related deaths from the CDC National Center for Health Statistics' National Vital Statistics System Multiple Cause-of-Death Mortality Files for the years 2013-2015. I merge on data on the value of gifts from opioid manufacturers to each physician from the Open Payments dataset. I estimate the association between pharmaceutical gifts and opioid death using a series of Poisson regression models. Finally, I predict the number of lives that would have been saved in a counterfactual world where doctors were not permitted to receive any pharmaceutical gifts. I find that, had this practice been prohibited, 822 lives would have been saved nationally between 2013 and 2015. The implications for opioid and physician-based polices will be discussed.

Measuring the Impact of Opioid Prescribing Among Postpartum Women and Infants

PRESENTER: **Grace Bagwell Adams**, University of Georgia

Abuse of prescription opioid pain relievers has led to dramatic, rapid increases in drug overdose, drug death rates, and real declines in life expectancy in the United States. Adults of reproductive age are among those most affected by inappropriate opioid prescribing, opioid misuse, and opioid abuse. New mothers are a population who may be particularly vulnerable to adverse health effects from inappropriate prescribing. For these new moms, the link between opioid prescribing and opioid use and misuse is an area in need of empirical attention. They suffer elevated rates of chronic and acute pain and experience postpartum depression and anxiety, and preliminary research shows they are prescribed opioids at high rates following delivery.

Recent research has highlighted the extensive use of prescription opioid pain relievers among pregnant women; however, little is known about the prescribing behaviors toward postpartum mothers and the resulting impacts for maternal health. We estimate the effects of postpartum opioid prescribing for new mothers on their subsequent health outcomes. We measure the effects of postpartum opioid prescribing on emergency department visits for mothers and their infants. Additionally, we examine the and diagnoses for postpartum depression and major depressive disorder. Finally, we conduct subanalyses based on delivery type (cesarean vs. vaginal births), a woman's substance use disorder risk (based on age, use of antidepressants and anxiolytics, pain diagnoses, smoking, and alcohol abuse), and race and ethnicity.

We conduct a retrospective cohort study using 2006-2015 data from the Medical Expenditure Panel Survey (MEPS), a large representative survey of health care utilization that follows respondents over two-year panels. We estimate our treatment effects using multivariate regression, controlling for demographic variables. Our cohort includes all women with claims for inpatient, live deliveries in the 2009-2015 data (N=4,117). Initial analyses of deliveries in the MEPS demonstrate extensive prescribing for postpartum mothers, in particular those with cesarean deliveries. In these data, 31% of women received a new opioid prescription following delivery; while 56% women undergoing cesarean births received a new opioid prescription.

Many women receive opioid prescriptions following childbirth while also being at additional risk of developing substance use problems if they experience comorbidities of postpartum depression, anxiety, or persistent acute or chronic pain. Opioids have the potential to affect outcomes for new mothers; however, little is known about the long-term implications of opioid prescribing after delivery. The results of this study will help inform health care practitioners and patients about the risks of opioid use after childbirth and could support the development of alternative pain management strategies for new mothers.

Throwing Good Money after Bad Docs: The Relationship between Physician Gifts and U.S. Department of Health and Human Services Exclusion

PRESENTER: **Dr. Amanda Abraham**, The University of Georgia

Importance: The opioid epidemic resulted in 42,000 deaths in 2016 alone. Understanding the link between opioid pharmaceutical gifts and adverse physician behavior could improve efforts to prevent physicians from playing a role in opioid misuse and abuse.

Objective: To determine the association between opioid-linked monetary payments from drug manufacturers and incidence of physician sanctions (excluded from participating in federal programs by the U.S. Department of Health and Human Services (HHS)). We hypothesized that receiving any opioid-linked payments will increase the probability of receiving an HHS exclusion.

Design: We extracted all records from 2014 to 2017 CMS Open Payments data listing an opioid as the reason for payment. Payment records were merged with a longitudinal database of all active physicians in the U.S. using sequential name and address matching. All HHS sanctioned physicians were identified. We estimated difference-in-means tests and regression analyses across sanctioned and non-sanctioned physicians.

Participants: HHS excluded physicians randomly matched to an equal number of physicians who were not sanctioned. Sampling and analysis were repeated 100 times.

Results: Between 2014 and 2017, 1,526 physicians received HHS exclusions; 767,103 active physicians were not sanctioned. We found that 5.7% of excluded physicians received some opioid payment, while only 3% of the non-excluded physicians received any payments. Twice as many excluded physicians received gifts for fentanyl and "other" opioids compared to non-excluded physicians. Results from year- and geography-adjusted logistic regressions found that receipt of any opioid (OR=1.379, p=0.00002), hydrocodone (OR=1.083, p=0.0117), fentanyl (OR=1.640, p=0.0025) and "other opioid" (OR=1.760, p=0.0001) were all associated with a greater odds of receiving an HHS exclusion.

Conclusions and Relevance: Physicians who receive monetary gifts from opioid manufacturers were twice as likely to be excluded for adverse behaviors. These findings render new understanding on the consequences of financial incentives flowing from manufacturers to physicians, especially in the midst of the opioid epidemic.

The Burden of Emergency Police Calls and Opioid-Related Mortality

PRESENTER: **Dr. W. David Bradford**, University of Georgia

Almost 64,000 deaths in the United States were attributable to prescription opioid overdose in 2015, including deaths associated with heroin, illicit fentanyl, and non-synthetic prescription opioids. The American opioid epidemic has grown since the early 2000s and continues to worsen: the rate of opioid-related deaths has risen by more than 300% since the year 2000, while the rate of fentanyl-related deaths rose by 540% between 2013 and 2016 alone. While abuse of opioids continues to rise, states and local communities have responded with a variety of policies, including prescription drug monitoring programs (in their diverse forms), painkiller clinic regulation, and limits on initial prescriptions for opioids from physicians. One of the interventions upon which policy makers have placed the most hope is, however, increasing access that first responders and the general public has to naloxone. Naloxone is a rescue medication that if administered soon after overdose can reverse an overdose and even resuscitate victims who have suffered respiratory arrest. However, since a primary vector of administration is first responders such as police, the speed with which such personnel can respond to calls for assistance may have significant effects on mortality. We utilize data on all emergency calls for service to police from 29 municipalities nation-wide to assess the impact of increasing burdens of emergency calls on monthly opioid-related mortality in the community. For a subset of communities with reliable time-to-response data, we also assess the impact of additional minutes of response for drug-related (overdose) calls on the numbers of deaths monthly. Finally, we compare these associations across communities with greater and lesser ease of access to naloxone for emergency personnel and consider the mortality benefits that may accrue from increasing capacity to respond to emergency calls and increasing the availability of naloxone for police.

8:30 AM –10:00 AM MONDAY [Health Care Financing & Expenditures]

Universitätsspital Basel | Klinikum 1 – Hörsaal 1

Risk Adjustment and Cash Transfer

SESSION CHAIR: **Jui-fen Rachel Lu**, Chang Gung University

The Regional Dimension of Risk Adjustment between Social Health Insurance Funds in Germany

PRESENTER: **Dr. Juergen Wasem**, University Duisburg-Essen

Introduction:

Germany has a competitive social health insurance system with (at present) 105 sickness funds. The income related contributions of employers and insured are collected by a central "health fund". From the health fund the sickness funds receice risk adjusted subsidies (RAS) to cover their expenses for medical services and their administrative costs. On average, 95 % of the sickness funds' expenditures are covered by the risk adjusted subsidies, the sickness funds balance their budgets by charging "additional premiums" from the insured. As insured are price sensitive, the level of the addtional premiums is a major driver for competition between the sickness funds. Since 2009 RAS are related to health status, age, gender and reduced earning capacity status. They are not differentiated by region. German Ministry of Health commissioned a study to its Scientific Advisory Board on Risk Adjustment to study the regional dimension of the RAS system.

Methods:

A complete data set of individual data of 70.5 mio. insured of social health insurance with demographic, health status and regional information (on the level of the 401 German counties) and health expenditures from 2015 and 2016 was used to (i) describe the regional heterogenity of the insured in social health insurance, (ii) study regional financial balance of sickness funds and (iii) variables with impact financial losses or gains of sickness funds in different regions. (iv) Finally a set of models to include "region" into the risk adjustment system were developed and studied empirically.

Results:

(i) There is very high regional heterogenity of the insured between the 401 counties - eg. average age ranges from 39 years to 51 years, and hospital cases per 1,000 insured even after adjusting for age and gender vary from 192 to 349.

(ii) By adjusting for age, gender and health status, the risk adjustment system implicitly adjusts the subsidies to the sickness funds to a considerable degree for differences between regions. 59% of interregional differences in expenditures between counties are explained by the present RA model. Remaining interregional differences however leave room for risk selection by sickness funds and do not lead to a level playing field of the funds.

(iii) Whereas insured in large cities on average are undercompensated by 51 Euro per capita and year, insured in rural areas are overcompensated by the present RA subsidies. Main drivers for under- and over-compensation are regional differences in morbidity which are not included in the model yet. In contrast, regional supply side factors (like density of physicians or hospitals) and variables which represent socioeconomic status play only a minor role.

(iv) Models to integrate region into the RA model include: using degree of urbinisation as risk adjustor; introducing dummy variables for each county or doing a geographically weighted regression; introducing dummy variables for the driver variables for under- and overcompensation (either directly of in a cluster approach). Performance for each of the models is measured on individual, regional and sickfunds level.

Towards Capitation Payment Scheme in Finland – Current Morbidity Indicators Inadequate for Risk Adjustment

PRESENTER: **Unto Häkkinen**, National Institute for Health and Welfare (THL)
AUTHORS: Mikko Peltola, Satu Kapiainen, Merja Korajoki, Suvi Mäklin, Taru Haula, Tuuli Puroharju

Background

Finland is reforming the health and social care services. A major new element in the reformed health care system will be freedom of choice for citizens to select their provider of primary health care services. This reform requires the funding of primary health care services to be based on a risk-adjusted capitation. We analysed how the current risk-adjustment indicators, especially the morbidities therein, used to allocate state funding to the municipalities would work in the proposed regime.

Data and methods

We used administrative data of the use of health services and purchases of reimbursed prescribed medication covering the whole population of Finland from 2015 to 2016 (N = 5,487,144). In addition, we had data on the special refund entitlements for medication on certain morbid diseases from Special Refund Entitlement Register and information on socioeconomic characteristics for the whole population. We used ordinary least squares regression with four different model specifications to investigate how the present risk-adjustment indicators performs compared to models including information also on previous service use and socioeconomic status. We evaluated the models' R-squared, RMSE and MAE, and made calculations of the over- or undercompensation in two subpopulations: among the employed and those who had used primary health care services in the preceding year.

Results

Costs from the use of primary health care services differ in different age groups and between genders. The explanatory ability of the model including the present risk-adjustment factors (age, sex, morbidities) increased when socioeconomic factors and the costs incurred from the preceding year's primary health care service use. The present risk-adjustment scheme would lead to significant overcompensation of the employed individuals and to major undercompensation of individuals with service use in the preceding year.

Conclusions

Our analysis suggests that the present risk-adjustment indicators would lead to inefficient capitation if applied in primary health care production under free choice of producers. The present morbidities used in risk-adjustment do not adequately reflect the demand for primary health care services and the model as a whole leaves room for risk selection for the providers. The morbidities included in the model need to be carefully revised and the factors included in the risk-adjustment model considered.

Does Cash Transfers Reduce Financial Barriers to Health Care Utilization? Evidence from Sub-Saharan Africa.

PRESENTER: **Jacob Novignon**, Kwame Nkrumah University of Science and Technology

Access to health care remains a major challenge across several developing countries. In sub-Saharan Africa (SSA), financial barriers play an important role in sufficient and effective health care utilization. This is amplified by the largely underdeveloped financial protection schemes for health care utilization across the countries. The relatively high levels of poverty in the region also exacerbate the situation. In recent years, cash transfers have been identified as important strategies to mitigate the impact of poverty and improve social welfare. In this study we found out if cash transfers can improve financial access to health care utilization in SSA.

Against this backdrop, we investigate the impact of unconditional cash transfers on health expenditure using data from randomized controlled trials in Kenya, Malawi, Zambia and Zimbabwe. Two separate programmes were evaluated for Zambia, making a total of five programmes. Sampled households were treated using unconditional cash transfers with baseline and follow-up data collected. Programme impacts were estimated using Difference-in-Differences (DiD) estimation technique with longitudinal data. We also disaggregated our analysis across various age groups.

We found some evidence of protective impact of unconditional cash transfers on household health expenditure in two of the five programmes evaluated. The magnitude of impact ranged between 0.42 and 1.38. The findings were however not consistent across all countries included in the study. There was also evidence of some heterogeneous impact on health expenditure that worked through quality of nearest health facility. Programme impact varied across age groups with relatively higher impact among the elderly.

The findings suggest that unconditional cash transfers provide some financial protection for households in utilizing health care. However, this is not wide spread across all countries. The findings also underscore the need to simultaneous improve supply side infrastructure to encourage service utilization. Further, in deprived regions where formal risk pooling strategies do not exist, cash transfers could be designed to reduce financial barriers.

8:30 AM –10:00 AM MONDAY [Health Care Financing & Expenditures]

Universitätsspital Basel | Klinikum 1 – Hörsaal 2

Pharmaceuticals, Medical Technology and Spending

SESSION CHAIR: **Enrique Seoane-Vazquez**, Chapman University, School of Pharmacy

Global Drug Diffusion and Innovation with a Patent Pool: The Case of HIV Drug Cocktails

PRESENTER: **Ms. Lucy Xiaolu Wang**, Cornell University

Abstract: Designed to reward innovation, patent protection often leads to high drug prices that make life-saving medicines unaffordable to patients. This tension further induces increasing patent infringement and invalidation to reduce prices, particularly in developing countries. The situation is severe for treatments that require multiple drugs owned by different firms with numerous patents, notably for HIV. I study the impact of the first joint licensing platform for drug bundling (the Medicines Patent Pool) on global drug diffusion and innovation. The pool allows generic firms worldwide to sublicense drug bundles cheaply and conveniently for sales in a set of developing countries. I construct a novel dataset from licensing contracts, public procurement, clinical trials, and drug approvals. Using difference-in-differences methods, I find robust evidence that the pool leads to a substantial increase in generic supply of drugs purchased. In addition, the branded-drug makers and other entities, such as public institutions, respond to the pool with higher R&D inputs as measured by clinical trials. The R&D input increase is accompanied by increases in generic drug product approvals. Finally, I estimate a simple structural model to quantify welfare gains and simulate counterfactuals. The total benefit far exceeds the associated costs.

Keywords: Patent pool, drug bundling, innovation and diffusion, antitrust policy

JEL Code: O3, K2, I1

Curbing the Growth of Pharmaceutical Expenditure: A Panel-Data Analysis of International Reforms

PRESENTER: **Mr. Michael Berger**, Institute for Advanced Studies, Vienna

AUTHORS: Gerald Röhrling, Markus Pock, Ms. Miriam Reiss, Thomas Czypionka

Objectives

Steady increases in expenditure on pharmaceuticals over past decades, pose a critical challenge to healthcare systems around the globe, in terms of financial stability and sustainability. Policy makers have reacted by introducing a range of policy measures, aimed at controlling growth of public pharmaceutical expenditure (PPE). The goal of the present paper is to analyse which cost control measures succeeded in curbing PPE, and which did not. Further attention is paid to potential synergies, buried in combinations of cost control measures.

Methods

Using a panel dataset of ten European and two non-European OECD member countries for the period 1990-2015, we estimate the effect of dummy variables for various cost control measures along with a proxy for co-payments. As different countries introduced different policy measures at different times, the chosen estimation strategy exploits this opportunity of a quasi-experimental design. Variables were chosen based on Bayesian model selection. The resulting econometric model was estimated using Prais-Winsten regression to account for first-order autocorrelation and contemporaneous cross-sectional correlation.

Results

We find that countries with a predominantly social health insurance financed system experience roughly 2% lower PPE growth rates compared to tax-financed systems. The number of MRI units per 1,000 inhabitants as a proxy for technologisation is not found to have a significant impact. Only four policy variables are included using the Bayesian model selection approach. For three of these policy variables, an amplifying effect is observed. The strongest mitigating effect on PPE growth is accrued with a policy bundle of electronic prescription, information on prescription behaviour and pharmaceutical budgets (-5.5 to -7%). Generic substitution is found to have a highly significant effect (-2%) lagged by one year. Lastly, private pharmaceutical expenditure as a proxy for co-payments is found to have a substantial (-0.3% per 1% increase), and highly significant mitigating effect on PPE growth that is robust to inclusion of non-European countries in the sample.

Discussion

Our empirical analysis suggests that PPE growth can be successfully contained both by monetary and non-monetary means. Due to their relatively large impact, monetary measures stand out as a potent means to curb PPE growth, though come with a substantial risk of undesirable adverse effects. The effect of non-monetary measures is more limited, but all in all, such measures emerge as the socially more sensible option. To fully utilize synergies between different non-monetary measures, the introduction of a bundle of measures is preferable to singular measures.

A Moneymaking Scan: Dual Reimbursement Systems and Supplier-Induced Demand for Diagnostic Imaging

PRESENTER: **Véra Zabrodina**, University of Basel

AUTHORS: Mark Dusheiko, Karine Moschetti

Background: There is compelling evidence that financial incentives exert powerful influence on physician behaviour. Many countries have recently reformed the inpatient sector by introducing prospective payment and increasing patient choice to encourage hospital cost-effectiveness. Studies find mixed impacts on patient outcomes, favoring of high-margin procedures and upcoding of diagnoses in the inpatient sector. However, evidence lacks on how such reforms affect hospital healthcare provision in other care sectors, which typically differ in their reimbursement systems and incentives.

Objective: In this paper, we study whether dual reimbursement systems can produce spillover effects in the form of supplier-induced demand (SID) across care sectors in hospitals. Specifically, we explore whether in-hospital imaging units increased SID on the intensive margin in the ambulatory sector following a change in the reimbursement system in the inpatient sector in Switzerland.

Methods: We exploit the reform from 2012 that replaced fee-for-service and daily rates for inpatient care with prospective payment in a difference-in-differences design. In-hospital imaging units (treated), which operate in both inpatient and ambulatory sectors, suffered an exogenous shock from no longer being able to directly charge for inpatient activity. Meanwhile, ambulatory imaging practices (control) were not affected, as they do not operate in the inpatient sector. Also, all ambulatory imaging services are reimbursed by mandatory health insurance through the same fee-for-service schedule, which remained unchanged. The analysis uses exhaustive insurance claims data on ambulatory imaging services for the years 2009 to 2015.

To measure SID, we use a particularity of the fee-for-service ambulatory schedule that allows any imaging provider to bill for a repeat imaging examination (RIE), on top of the examination initially (and exogenously) requested by referring physicians. This means self-referring patients to a second examination during the same visit, using the same imaging technology (CT or MRI), and implies leeway in the intensity of provision. Since RIEs provide no or little clinical benefit to the patient but a high return to the provider, we are able to capture truly induced demand with a change in RIE provision following a shock in financial incentives in another care sector.

Results and conclusions: We find a significant increase in the share of ambulatory revenue from RIEs in hospitals after the reform: +4% for CT and +1% for MRI. This effect is stronger and more robust for the technology that is organizationally more flexible, but also bears long-term radiation risks for patients. Furthermore, we exploit the heterogeneity across Swiss cantons to show that this effect varies with other market incentives, e.g. competition, ambulatory reimbursement rates, and insurer bargaining power. Our findings indicate that financial incentives in one hospital sector may generate spillover effects that can be strong enough to override clinical guidance. Also, the ability for providers to self-refer patients to lucrative diagnostic examinations may induce wider externalities through greater healthcare expenditures. This has important implications for the design of reimbursement systems in health systems with multiple care sectors.

Estimating the Effect of County Spending on Life Expectancy at Birth in the U.S.

PRESENTER: **Carolina Cardona**, Johns Hopkins Bloomberg School of Public Health

AUTHORS: Neha Anand, Ms. Yira Natalia Alfonso, J. Mac McCullough, JP Leider, Beth Resnick, David Bishai

Background: Over the past century, spending on public health and social services has been associated with vast improvements in the health of U.S. citizens, suggesting that investments that can improve health should not be limited to the health care sector. The following study analyzes county spending across a dozen sectors to understand how county spending affects county life expectancy.

Data: County-level health and social expenditure data were drawn from the Census of Governments for the years 2002 and 2007 and was adjusted for inflation to 2010 prices using Consumer Price Index prices. To mitigate any skewing effects of more populous counties having larger expenditures in general and vice versa with less populous counties, we constructed per capita expenditures. Additionally, some counties had extremely high and low expenditure and were skewing the analysis. To control for these outliers, counties with per capita expenditure above the 99% percentile or below the 1% percentile were excluded. The final sample consisted of 3,065 counties in each year. The outcome of interest was life expectancy at birth (LEB), this was retrieved for years 2005 and 2010 in order to allow a 3-year lag for spending to have an effect on population's health.

Methods: To assess the effect of county spending on LEB, we constructed a structural equation model (SEM) using the log of per capita expenditure. The analysis was conducted separately for years 2002 and 2007. To streamline the analysis and interpretation, the model classified expenditure into three categories: i) Infrastructure; ii) Social; and iii) Law and order. To control for county economic status, we included a latent variable affecting LEB composed of poverty, unemployment, and total local government revenue. We used the maximum likelihood method to estimate the model.

Main Findings: Between 2002 and 2007, all sectors decreased their average per capita spending – except elementary and secondary education. The SEM shows evidence that in both years, 2002 and 2007, the "social" spending index had no significant effect over life expectancy, and the "law and order" spending index significantly decreased life expectancy by 0.91 and 1.48 respectively – constraining the effect of the "infrastructure" spending index to 1. In both years, economic status had a significant and high effect on decreasing life expectancy, 25.4 and 31.5 in 2002 and 2007 respectively. Overall, the effect of county spending held the significance and direction in both years, but the magnitude was higher in 2007 compared to 2002.

Conclusions: Our analysis indicates that counties that prioritize investments in infrastructure spending have significantly greater gains in life expectancy than those counties that focus on law and order spending, this finding was consistent for both 2002 and 2007. We also find that poverty and unemployment affect negatively to life expectancy. These findings may inform how county governments can redirect spending allocations to benefit the health of their constituents. To our knowledge, this is the first study using SEM to evaluate the factor structure of counties' public spending and their association with health.

8:30 AM –10:00 AM MONDAY [Health Care Financing & Expenditures]

Universitätsspital Basel | Klinikum 1 – Hörsaal 3

Fiscal Space, Financing and Costing

SESSION CHAIR: **William Savedoff**, Center for Global Development

"Thinking Outside the Norm" Is There Any Fiscal Space for Health? Lessons Learnt from Resource Mapping Exercise in Malawi

PRESENTER: **Suneeta Sharma**, Palladium
AUTHORS: Pakwanja Twea, Henry Mphwanthe@thepalladiumgroup.com, Mark Malema, Kate Langwe

Background

Malawi faces huge financing gaps, making the achievement of universal health coverage challenging. Relative to other countries in Sub-Saharan Africa, Malawi has one of the lowest total Health Expenditures (US$40). The Health sector is also heavily funded[1] by donors with substantial off-budget expenditures. The Ministry of Health and Population has explored ways to increase fiscal space for health through innovative health financing mechanisms and generating additional domestic revenue, for example pooling domestic health resources in a 'health fund' or levying an earmarked tax on fuel and motor insurance. The key outcome from the fiscal space analysis is that ironing out inefficiencies in the delivery of health care services could unlock substantial amount resources that can make a significant impact on health outcomes. To address some of the inefficiencies, the Government of Malawi adopted an annual resource mapping exercise to track health sector resources to inform planning, budgeting and potential reprogramming decisions. **Methodology**

Our study used Resource Mapping round 5 data to compare the strategic priorities of the second health strategic plan and costs to quantify funding gaps and analyze by programmatic areas to identify areas of duplicative funding, over-funding, and under-funding. The study also compared health expenditures with the burden of disease estimates (IHME) in Malawi to show case inefficiencies due to misalignment of government and donor priorities. Finally, we evaluate the absorption of donor funds for health in order to understand how this affects funding gaps. **Findings**

Malawi has few options to generate additional resources for health and suggests that efficient use of existing resources is the best avenue in the short and medium term. Removing inefficiencies in the implementation of major grants like the Global Fund, will unlock substantial resources for the sector. For example, the recently finalized Global Fund financed TB grant had a value of US$286 million, and US$231m million was spent, (overall 80.7% absorption rate). Under current Global Fund regulations, the remaining, unspent US$55m was no longer available and had to be returned. While 88% of "off-shore" costs (largely drug procurement) were spent, only 42% of the funds for in-country activities were expended within the grant period. The recent resource mapping exercise showcases further areas for efficiency gains. According to resource mapping data, alignment between health needs or the burden of disease in Malawi is not optimal, since some areas are over funded through vertical programs, such as HIV/AIDS, RMNCH, and Malaria while others are underfunded like Respiratory infections and Non-communicable diseases. Most funding gaps are in health system areas like human resources and infrastructure and few gaps in disease areas like HIV/AIDS, malaria and tuberculosis. **Conclusion**

Mobilizing domestic resources for health in Malawi is challenging. However, resource mapping and tracking can identify opportunities for efficiencies and ensure that existing, available health resources are well used to address health needs. Efficient use of funds is also critical to ensuring health gains, moving from disease specific investments (vertical programming) to overall health system strengthening. This will ensure that funding gaps are reduced

[1] External partners contribute 62% of THE

Are Health Care Premium Reductions Crowded out Under Fiscal Rules? Evidence from Swiss Cantons

PRESENTER: **Carsten Colombier**, Federal Finance Department
AUTHORS: Thomas Braendle, Jochen Hartwig

Introduction: In order to ensure universal access to health care at affordable costs, premium subsidy schemes aim at reducing the premium load for lower income groups. With steadily increasing health care costs, growing expenditures for premium reductions become a key concern for fiscal and health policy making. In this paper, we want to explore the determinants of the dynamics of health care premium reductions from a public finance perspective and better understand the budgetary allocation of public funds to health care and to premium reductions at the cantonal level. In particular, we study whether public expenditures for premium reductions are impacted by fiscal rules. We exploit the highly decentralized Swiss health care system with mandatory per capita premiums. On the one hand, Swiss cantons vary enormously in the generosity of their premium reduction schemes. On the other hand, Swiss cantons have large fiscal autonomy and accordingly differ in the fiscal rules they apply to restrict politicians' budgetary discretion. In recent years, expenditures for cantonal premium reductions are increasingly subject to sharp budgetary cuts. These cuts are often implemented due to more fiscal pressure and rising mandatory public health care expenditure.

Methods: Based on our new dataset, we exploit the variation in health care premium expenditure relative to mandatory public healthcare expenditure across cantons since the introduction of the mandatory health insurance in 1996. We use panel estimation methods and analyze a rich set of determinants. In a first step, we include socio-economic and socio-demographic factors that characterize cantonal health care markets. In a second step, we incorporate institutional differences in the design of cantonal premium reduction schemes, e.g., regarding procedural modalities. In a third step, we include political economy factors, in particular fiscal rules and party ideology, and study their impact on premium reduction expenditures.

Results: Our results suggest that expenditures for premium reductions are crowded out by other health care expenditures under fiscal rules. Moreover, the share of center-left parties in parliament appears to be positively related to premium reduction expenditures. We present a series of robustness checks regarding specification and the inclusion or exclusion of explanatory variables, cantons and specific periods.

Conclusions: Systematic changes in the composition of public expenditures due to crowding out may reflect unintended consequences of fiscal rules. Such crowding out may affect the quality of public finances and its distributional impact.

Effects of Performance Based Financing on Facility Accountability and Autonomy: Evidence from Zambia

PRESENTER: **Chitalu Chama-Chiliba**, University of Zambia

AUTHORS: Dr. Peter Hangoma, Mulenga Chonzi, Mr. Collins Chansa

In this paper we seek to examine the effect of Performance Based Financing (PBF) on facility autonomy and accountability, and the differential effects between input financing and PBF financing mechanisms. The PBF in Zambia had three study arms consisting of a pure control arm, input financing arm and PBF, set up with the goal of understanding the extent to which the gains of PBF are driven by additional financing compared to input financing. PBF was implemented during the period April 2012 to October 2014. Data for the evaluation was collected from 201 health facilities at baseline (October-November 2011) and 176 health facilities at end line (November 2014-January 2015). The facility survey used three types of instruments: 1) the facility check list was used to collect information on infrastructure, administration, availability of basic drugs and equipment, governance and autonomy; 2) the health worker questionnaire covered questions on remuneration, knowledge, job satisfaction and motivation and; 3) patient exit interviews assessed patient satisfaction and quality of care received for patients exiting ante-natal care and child health consultations. The full impact evaluation also collected data from 3,064 households at baseline and 3,500 at end line with questions covering antenatal care, post-partum care, child health, delivery outcomes and family planning.

In this study, the key indicators for autonomy are related to the perceived autonomy of the facility-in-charge on assigning tasks to staff, allocating the budget, provision of services and obtaining of resources. The indicators of interest for accountability include: Existence of a health centre committee; Number of health centre committee meetings held in the last 12 months; Existence of a work plan for the current financing year; number of supervisory visits by district hospital representative in the last three months; number of supervisory visits by the District Health Management Team in the last 3 months , Number of external staff performance assessment in the last 12 months; and number of external facility performance assessment in the last 12 months. We propose to use a difference-in difference linear regression model to estimate the effect of PBF on accountability and autonomy. We also propose to use synthetic control approach to deal with the possible contamination of the control sites. Preliminary results show that the PBF intervention was effective in improving health facility accountability and community participation in facility management. PBF facilities performed better in constituting health centre committees and holding meetings of such committees regularly. PBF facilities also conducted internal and external assessments on the performance of health workers and facility during the 12 months preceding the end line survey. The preliminary results also suggest that the PBF facilities report significantly higher autonomy on service provision, clarity on policies and procedures for doing things as well as the overall autonomy index.

How Much Does It Cost to Implement a Results Based Financing Program? Novel Evidence from Malawi.

PRESENTER: **Manuela De Allegri**, Institute of Public Health, Heidelberg University, Germany

AUTHORS: Jobiba Chinkhumba, Corinne Grainger, Elena Okada, Aleksandra Torbica

Background: Over the last decade, the implementation of Results Based Financing (RBF), as a means of promoting access to care and enhancing quality of service delivery, has seen a rapid increase across sub-Saharan Africa (SSA). The evidence is growing on the mixed impact of this approach on relevant service delivery and quality outcomes. Still, hardly any evidence is available on the cost of developing and implementing RBF programs, in spite of the fact that cost considerations are essential to reach informed policy decisions.

Aim and methods: We aimed to contribute to filling this knowledge gap by estimating the economic cost associated with the development and the implementation of the Results Based Financing for Maternal and Neonatal Health (RBF4MNH) in Malawi, an initiative combining a demand-side (conditional cash transfers) and a supply-side (performance incentives) component. We adopted a health system perspective, accounting for costs incurred by the Ministry of Health and its partners. We relied on Activity Based Costing to differentiate costs associated with start-up (2011-2012) and implementation (2013-2016). To achieve our aim and trace all activities and resources consumed accurately, we worked as a single team, bridging knowledge across implementers and academics.

Results: The overall economic value of RBF4MNH amounted to 12,478,886 euro, with start-up costs absorbing 1,433,421 euro and implementation costs absorbing 11,045,665 euro. Implementation costs rose in the initial years, but stabilized and started to decrease by 2016. Supply side and the demand side specific activities absorbed respectively 40% and 14% of the RBF4MNH value. Incentives and verification represented respectively 15% and 6% of all RBF4MNH costs. Staff costs accounted for over 25% of the intervention value.

Conclusions: Our findings indicate that the economic cost of implementing RBF exceeds by a large margin the value of the incentives alone. This observation substantiates the view of RBF as a complex intervention, requiring substantial investments and concerned human resources to be successful. Still, an informed appraisal of our findings to locate our cost estimates within the broader literature is difficult in the absence of similar studies and/or studies assessing costs associated with moving from passive towards active purchasing in health.

8:30 AM –10:00 AM MONDAY [Organization Of Health Care Markets]

Universitätsspital Basel | Klinikum 1 – Hörsaal 4

Public vs Private Models of Health Care

SESSION CHAIR: **Duane Blaauw**, Centre for Health Policy, School of Public Health, University of the Witwatersrand

Do Public Monopsonies Harm Workers? Labor Market Effects of Public to Private Nursing Home Conversions

PRESENTER: **Dr. Henning Oeien**, Oslo and Akershus University College of Applied Sciences - Fakturamottak

Background

In many European countries the long-term care (LTC) sectors are heavily regulated and dominated by public funding and provision. In expectance of increasing demand from an ageing population, many European countries are experimenting with market reforms, such as contracting out the provisions of services to private providers. The main aim of this paper is to answer the following question:

What are the effects of introducing competition among providers on labor market conditions for employees in the care sector?

The motivation for the paper is at least twofold:

First, sex segregation in the labor market explains a large part of the gender gap (Blau et al., 2017). A common argument for this fact is that women work in public sectors without competition. This paper will study the development of labor benefits in the female dominated care sector in Norway over a period that starts with a very concentrated labor market, a large public provider and a few private non-profit providers, and ends with twenty percent of providers being private for-profit.

Second, the main goal of contracting out to private providers is to achieve cost-effective production i.e. to produce the same quantity and quality of services using less resources. The contracted unit price is often much lower than the average cost of in-house production. Could part of the cost savings just be a transfer of surplus from care workers to the municipality and the private contractor?

Data and Methods

I study the effects on labor market outcomes of care staff who work in nursing homes which are converted from public to for-profit ownership status. The data covers all care staff working in nursing homes in Oslo in the period 1992 - 2015. Since 2000, the local government of Oslo has contracted out roughly 20 percent of public nursing homes to private providers. I exploit the variation in time and estimate a basic event-study model, see a standard event model framework in Lafortune et al. (2018).

Preliminary results and conclusions

1. Care staff in nursing homes experience a large wage penalty if the their work place is converted form public to for-profit ownership status.
2. The conclusion is not affected by including individual fixed effects and nursing home-specific linear time trends.
3. Policy makers considering to contract out provision of public services should take into account the wage penalty experienced by care staff.
4. Does contracting out lead to real economic efficiency gains, or is it simply a transfer of income from care staff to private contractors and municipalities.
5. In the future, I plan to include more variables describing the care staff: education, age, and sickness absence.

Differences in Patterns of Diabetes Medical Management between Traditional Medicare and Medicare Advantage

PRESENTER: **Dr. Bruce Landon**, Harvard Medical School

AUTHORS: Alan M Zaslavsky, Jeff Souza, John Z Ayanian

Background: Compared to traditional Medicare (TM), Medicare Advantage (MA) is associated with decreased utilization of services and higher quality of ambulatory care. Little is known, however, about how this translates into differences in the management of chronic medical conditions such as diabetes. We therefore sought to compare use of diabetes medications, the most important strategy for managing diabetes, between beneficiaries enrolled in Medicare Advantage (MA) and traditional Medicare (TM).

Methods: We performed a retrospective cohort analysis of Medicare claims during 2015-2016. We included beneficiaries enrolled for the full year in Medicare with available Part D pharmaceutical claims who received at least one prescription for an oral or injectable diabetes

medication. After matching MA and TM enrollees by demographic characteristics and geography, we analyzed use of medication overall, choices of first diabetes medication for those new to medication, and patterns of adding medications, as well as medication costs. Because we lacked data on clinical indicators such as hemoglobin A1C (HbA_{1C}) levels that typically drive decisions regarding use of medication, we analyzed pre-specified cohorts that were selected to identify those with diabetes at a similar stage of treatment for whom a clinician had decided that initiation or escalation of medical therapy was required, which is akin to allocating these cohorts of patients quasi-experimentally to either TM or MA. Finally, because MA plans are not uniform in their approach to managing diabetes, we also characterized variation in diabetes medication spending among MA plans.

Results: We studied a total of 1,027,884 patients from TM and 838,420 enrollees in MA over the period 2015-2016. Overall and for patients on one, two, or three diabetes medications, use of metformin (the uniformly recommended first line treatment) was higher in MA by about 3 percentage points, but use of one of the new classes of oral medication (with no generic alternative) was 5.1 percentage points higher in TM (21.3% vs. 16.2%). For those who started metformin first, use of a sulfonylurea as a second medication was 7.8 percentage points higher in MA than TM (61.5% v. 53.7%), while use of medications from newer classes was 7.7 percentage points lower (22.0% v. 29.7%). Overall, across those taking one, two, or three medications, the percent of enrollees with total costs >$1000 was higher for those in TM (difference of 4.0 percentage points, 8.2%, and 2.9%, respectively). Mean spending was $149 higher in TM for those taking one medication and $298 higher for those on two medications. The influence of MA, however, was not uniform as variation in total spending among MA plans was at least equal to the difference in mean spending between MA and TM.

Conclusions: MA enrollees are more likely to be treated with generic metformin and sulfonylureas and less likely to receive more costly, newer medications than those in TM. These findings provide evidence about how MA plans achieve savings under capitated contracts. Future research should investigate the mechanisms (e.g., financial incentives to physicians versus managed care techniques) employed by integrated MA plans to influence prescribing practices.

Strengthening Financial Management in Private Providers for Universal Health Coverage

PRESENTER: **Adesola Ogundiran**, Health Strategy and Delivery Foundation
AUTHORS: Chidera Ezeigwe, Yewande Ogundeji, Kelechi Ohiri

Introduction

Nigeria has a mixed health system, with the private sector accounting for a significant proportion of healthcare. Critical to the success of Universal Health Coverage in Nigeria is the engagement of the private health care services sector, as over 50% of residents seek care in private facilities. However, many private facilities are poorly managed, contributing to challenges of access and quality of care and poor service provision due to the inability to access capital or acquire essential equipment and infrastructure.This is compounded by a lack of enthusiasm and technical know-how of private providers to implement adequate financial management systems which will better position private facilities to provide quality, affordable, and sustainable health services critical for universal health coverage.This paper describes the design, implementation, and testing of a multifaceted financial management intervention across private facilities.

Methods

The intervention was multifaceted and implemented across 55 private facilities that were single doctor owned and managed, located in low income densely populated areas of Lagos with an average of 20 beds. First, a financial management assessment tool was developed with 5 domains of financial systems namely: financial records systems, staffing and governance, internal control, planning and budgeting, and financial reporting. Second, individual facility assessment was conducted using the assessment tool. Third, based on the findings of the assessment, customized financial management improvement plan was developed, and support provided for the implementation over six months.

Results

Marked improvement was noted in the financial management systems across all 55 facilities from a total average pre-assessment score of 10% to a post assessment total average score of 67%. Commendable improvement was achieved in each domain of financial management systems, with financial record systems improving from 18% to 74%, staffing and governance from 9% to 79%, internal control systems from 14% to 82%, planning and budgeting from 0% to 39%, while financial reporting improved from 8% to 63%. A total of 12 facilities hired account officers as a result of our intervention and 34 out of 55 facilities engaged external auditors and conducted a statutory audit. All engaged facilities now deduct and remit PAYE tax from staff salaries in compliance with the Personal Income Tax Act.

Conclusion

The study showed the dearth of financial management systems in private facilities and the need for customized interventions as a first step towards improvement, which has the potential to quickly impact compliance, control and governance.Further study will assess the impact of improved financial systems on service delivery and profitability.

Can Private Provider Network Model be a Cost-Effective Health Intervention for Scaling Access to Quality Health Care Delivery for Universal Health Coverage?

PRESENTER: **Omobosola Asuni**
AUTHORS: Kelechi Ohiri, Yewande Ogundeji

Introduction

Nigeria has a mixed health system with healthcare provision from both public and private sector. Skewed representation of privately financed facilities exists in two states, Lagos (89%) and Imo (60%) compared to national average (38%). Collectively these two states have a population of 25 million, which is more than the population of 44 other African countries. Inclusion and preparedness of privately financed facilities is critical in achieving universal healthcare coverage in Nigeria. However, the private sector is characterized by poor and variable quality of care and inefficient market structure, which limits at scale interventions and hinders the ability of the sector to realize its market potential. An intervention of a private provider network model was implemented as a cost -effective health intervention to scale up access to quality healthcare delivery by building sustainable management systems and facilitating synergistic inter-facility collaborative interventions, to leverage economies of scale and scope, to better prepare and position the private sector for health impact in proposed regional health insurance schemes.

Methodology

Recruitment of 55 physician-led facilities in low income densely populated areas in Lagos State were prioritized and aggregated into 6 geographic based networks of 5 to 13 facilities. Baseline and post-assessments were conducted across the three domains of quality: patient safety, patient experience and clinical effectiveness. Process-measures deployed were stepwise overall quality improvement, patient satisfaction survey and clinical audits. For Objectivity, external surveyors carried out the assessments and analyzed results. Interventions included development of customized quality improvement plans, supportive supervision and mentoring at facility level. Quarterly performance management, knowledge share and application from the central intelligence of peers at network level. The coordinating entity managed the provider networks by engaging experts for the implementation process through pooled negotiation at competitive prices using a training of trainer's approach. A comparative cost analysis was also conducted between the newly implemented intervention and status quo.

Results

There was improvement in the three domains of quality for all networks. Across all networks, there was a 42% improvement in patient safety. 86% of facilities in the provider networks had an improved patient satisfaction survey scores from baseline and there was 33.5% improvement in clinical effectiveness. It was also estimated that there was a potential cost savings of 141,000 USD in recruitment and negotiation of technical experts to operationalize the implementation of quality and financial interventions at scale within the private provider networks compared to status quo.

Conclusion

Access to quality healthcare delivery is a core component of universal health coverage, findings from the private sector showed improvements in all domains of quality and cost savings. Implementation of the Private sector model could potentially strengthen the health system more rapidly, increase access in under-served areas and appears to be a cost-effective intervention approach to scale and attain improved quality of healthcare delivery while containing cost. Provider network model can be tested in other private and public health economies of low middle income countries by coordinating entities such as government in preparedness for universal health coverage in LMICs.

The Association between Facility Ownership and the Provision of Suicide Prevention Services across Outpatient Mental Health Care Settings

PRESENTER: **Dr. Pei-Yin Hung**, University of South Carolina

Background: Suicide is a leading cause of death in the U.S., claiming over 40,000 lives annually. Outpatient suicide prevention services – a relatively charity care – have been proven beneficial to suicide hazard reductions. Yet, the availability of outpatient suicide prevention services in specialty mental health facilities remains unacknowledged. Public and private non-profit facilities might be more likely to provide such charity care than for-profit facilities. This study provides the evidence on the association between mental health facility ownership (public, private for-profit, private non-profit) and the provision of outpatient suicide prevention services in 2018.

Methods: Data on mental health ownership and outpatient suicide prevention services were from the 2018 Substance Abuse and Mental Health Services Administration (SAMHSA) Behavioral Health Treatment Services Locator. The 2016 5-year American Community Survey provides ZIP-Code Tabulation Area (ZCTA)-level sociodemographic and socioeconomic Information. Population-weighted multivariate logistic regression model was used to examine the association between facility ownership and suicide prevention services provision. The final model controlled for facility type (hospitals, residential facility, community mental health centers, or other outpatient mental health facilities), facility acceptance of payers (Medicare, Medicaid, cash or self-payment, private insurance, and other public payments), facility acceptance for treatment by age group (Children/Adolescents, young adults, adults, and/or seniors), rurality of location (urban, large rural, small rural, and isolated rural areas), ZCTA-level sociodemographic (age, sex, and race) and socioeconomic measures (% residents below 200 percentile of Federal Poverty Level, education attainment), and state indicators. Models controlled for state-level clustering to adjust for correlated random variances in service provisions across facilities in the same state as well as spatial autocorrelations to adjust for clustering service provisions.

Results: The proportions of public and private non-profit facilities respectively offering outpatient suicide prevention services in 2018 are more than quintuple and double the proportion of private for-profit offering the service (43.2% and 22.6% vs. 8.6%; Both P<.001). Adjusted for facility and community characteristics, compared to private for-profit facilities, the probabilities of offering outpatient suicide prevention services were 2.4 percentage points higher (23.7% vs. 21.3%; P=.037) for nonprofit and more than 6 percentage points higher (27.4% vs. 21.3%; P<.001) for public facilities. An interaction analysis between ownership and rurality locations indicates that differences in the

probability of offering suicide prevention services between non-profit and for-profit facilities are the most apparent in isolated rural markets (28.3% vs. 8.0%; P<.001).

Conclusions: Different ownership types had significantly different decisions on the provision of outpatient suicide prevention services. The size and magnitude of the differences are striking in themselves, particularly given the bluntness of the dependent variables (in the form of a simple dichotomous variable measuring whether such service is offered), the high-profile nationwide efforts to suicide prevention, and the weak nature of ownership regulations for mental health settings.

8:30 AM –10:00 AM MONDAY [Economic Evaluation Of Health And Care Interventions]

Universität Basel | Kollegienhaus – Hörsaal 001

Organized Session: How Good Is Good Enough? Assessing the Validity of Discrete Choice Experiment Validity Tests

SESSION CHAIR: **Peter Zweifel**, Universität Zürich

Patient Preferences in Type 2 Diabetes: Do Healthy Life-Years Equivalents (HYE) and Money Equivalents (ME) Measure the Same Latent Construct?

PRESENTER: **Dr. Axel Christian Mühlbacher**, Hochschule Neubrandenburg

Objective: This study compares clinically relevant time-equivalents with money-equivalents in the same discrete choice experiment (DCE). By randomizing decision models including both healthy life-years equivalents (HYE) and money equivalents (ME), it examines whether their preference patterns are similar. Thus, can HYE and ME be used to measure the same latent construct of benefit? And are attribute levels the same or subject to rescaling?

Methods: A DCE with four randomly assigned versions was performed to identify patient preferences in oral diabetes treatment. In addition to six identical attributes (adjustment of HbA1c, prevention of hypoglycemia, risk of genital infection, risk of gastrointestinal problems, risk of urinary tract infection, and weight change), a time cost or a money cost attribute was included. This permits to find out whether the attribute ‘‘additional healthy life years’’ serves as a ‘‘currency’’ in the same way as ‘‘additional expense.’’ To test for rescaling effects and possible recoding of attribute levels, the range of the time (money, respectively) attribute was varied in a scope test. Based on a fractional factorial design, generalized linear latent and mixed models (Stata, GLLAMM) were estimated using a multi-nominal logit link function and a binomial distribution for the binary responses.

Results: The analysis of the N=626 (N=318 for HYE; N=308 for ME) patients revealed similar preference patterns for the two versions of the DCE, with prevention of hypoglycemia (coef. HYE: 0.937; ME: 0.847) and adjustment of HbA1c (HYE: 0.541; ME: 0.649) being the most important attributes. The side effects, risk of genital infection (HYE: 0.301; ME: 0.416), risk of gastrointestinal problems (HYE: 0.296; ME: 0.408), and risk of urinary tract infection (HYE: 0.241; ME: 0.355) follow in the same order, with possible weight change (HYE: 0.047; ME: 0.067) lacking statistical significance. Variation of ranges in attribute levels did impact respondents’ choices.

Conclusions: The study compares HYE and ME within an otherwise identical set of attributes. Since HYE and ME lead to comparable preference patterns, the two can be seen as interchangeable measures of benefit. According to a scope test, no rescaling of the levels was present, suggesting that respondents accepted the attribute values as real in their decision-making.

Reliability of Discrete Choice Experiments –Test and Re-Test Analysis of the General Public’s Preferences for a Treatment of an Ultra-Rare Disease Affecting Children [CLN2]

PRESENTER: **Domenico Moro**

Background: The role of some Discrete Choice Experiment (DCE) validity checks (rationality, dominance, lexicographic preferences, etc.), has been questioned by some leading practitioners in the DCE field. However, a strong case remains for conducting internal validity and reliability checks involving DCE Test and Re-Test analysis, as this can indicate whether preferences expressed in response to a DCE appear to be well formed (complete), and also stable and consistent.

Methods: We conducted a large-scale DCE (n=4,009) to elicit the preferences of the UK general population for a treatment of CLN2 which is an ultra-rare disease affecting children. To validate some of the findings of the main study, we asked 250 respondents of the main sample to repeat the survey a few weeks after they first answered the questionnaire. This allows for testing the reliability of DCE results by comparing the stated preferences in the second DCE to their first set of DCE responses. If preferences are well-formed and stable, the results, e.g. willingness-to-pay values for a change in the attributes, should be consistent. Our DCE included an opt-out option, so we used appropriate Econometric models to cater for this, i.e. Conditional Logit (which does not cater for preference heterogeneity), Random Parameter Logit (which tests for preference heterogeneity across all variables), and Mixed Logit (which assumed the monetary variable was not subject to preference heterogeneity, but other variables were).

Results: The findings suggested that the results of all three models were broadly similar. The overall findings for all three models suggested that **most** point estimates for attributes, coincided, in the sense that point estimates for the 'test' sample were within 95% confidence intervals for the 're-test' sample for the same variable. The best econometric model as determined by Pseudo-Log-Likelihood, Akaike Information Criterion [AIC], and the Bayesian Information Criterion [BIC], was a Random Parameter Logit [RPL] model. For this RPL model, **all** seven point estimates for the re-test sample were within 95% CIs for the same attribute variable for the test sample.

Conclusions: These findings are very reassuring results in relation to both the completeness, stability / consistency of preferences which is an important prerequisite for deriving health policy decisions from DCE.

Stated-Preference Validity Tests: Validity Failures or Just Failures to Communicate?

PRESENTER: **Dr. Reed Johnson**

Background: A recent study provided a software tool to researchers to search discrete-choice experiment datasets for six possible internal validity tests. Twenty-one researchers from nine countries used the tool and contributed test results from a total of 55 DCE datasets. This information provides a baseline for evaluating internal validity of other studies but does not help in diagnosing possible reasons for observed internal-validity failures.

Methods: Three DCE studies were evaluated relative to the incidences of internal-validity test failures in the 55-study database. Possible reasons for failures higher or lower than expected were evaluated based on the study design, other measures of data quality, and parameter estimates.

Results: First, a study of preferences for treatments to delay onset of Alzheimers' disease symptoms found that 30% of respondents failed the dominated-pair test by choosing the alternative that had a worse level for every attribute, a rate much higher than the median 55-study rate. The study design compared a no-treatment alternative with fixed disease progression with a treatment alternative that slowed disease progression. We found a strong pro-treatment label effect, sometimes described as the "value of hope". The pro-treatment effect was strongly correlated with the apparent validity-test failure. Second, a study of preferences for multiple-sclerosis treatments used a split-sample test of whether preferences varied between 2-level attributes and 4-level attributes. Internal-validity test failures were low relative to the 55-study database and similar in both arms of the experiment. However, 4-level respondents perceived greater differences between extreme levels than 2-level respondents, suggesting the 6 tests in the validity-test tool should not be used as a standardized measure of data quality. Third, in a study of active treatment versus watchful waiting for *ductal* carcinoma in situ, respondents dominated across all 5 attributes ranging from 16% to 22%, levels similar to the median 55-study database rate of 20%. The dominance ranking is similar to that of the estimated attribute relative importance, suggesting that the dominance pattern is influenced by actual preferences rather than a simplifying response heuristic.

Conclusions: While it is tempting to treat internal validity tests as a means of scoring the quality of DCE data, researchers should be cautious about interpreting results of such tests as "failures". In many cases, test results can help researchers understand the consequences of study-design decisions, interpret parameter estimates, or obtain insights into how patients think about and answer stated-choice questions.

8:30 AM –10:00 AM MONDAY [Economic Evaluation Of Health And Care Interventions]

Universität Basel | Kollegienhaus – Hörsaal 102

The Capability Approach and Measures of Well-Being

SESSION CHAIR: **Paula Lorgelly**, King's College London

Cross-Cultural and Inter-Country Transferability and Validity of the OxCAP-MH Well-Being Questionnaire

PRESENTER: **Judit Simon**, Medical University of Vienna, Center for Public Health, Department of Health Economics
AUTHORS: Agata Łaszewska, Eva Leutner, Marold Oberrauter, Markus Schwab, Dr. Susanne Mayer, David Churchman, Georg Spiel
Background: The life impacts of mental health conditions are often not captured in commonly used health-related quality of life (HRQoL) measures. The OxCAP-MH well-being questionnaire was developed in the UK based on Sen's capability approach to overcome these limitations. It is a multi-dimensional instrument with a theoretical grounding in the ten essential human capabilities proposed by Nussbaum.

Aim/Objectives: We aimed to test the OxCAP-MH's cross-cultural and inter-country transferability and to facilitate its use internationally by developing a linguistically, culturally and psychometrically valid German language version.

Methods: Following professional translation, pilot testing and cultural and linguistic validations were conducted on a sample of 12 native German speaking patients with a mental health disorder in Austria. Open interviews and a focus group meeting were conducted, transcribed and analysed. In addition, feedback from mental health researchers from Germany was incorporated to allow cross-country applicability of the German version.

Further 159 Austrian patients receiving regular care in social-psychiatric services with a range of mental health diagnoses were included in the psychometric analysis. They completed relevant questionnaires at baseline and 6-month follow-up. Reliability was assessed using Cronbach's alpha, item-total correlations, and by investigating floor and ceiling effects. Test-retest analysis was estimated via repeated testing using intra-

class correlation coefficient (ICC). Construct validity was tested by comparing OxCAP-MH with other patient-reported measures (EQ-5D-5L/VAS, BSI-18, WHOQOL-BREF) and relevant observer rated instruments (Mini-ICF, GAF). Standardised response mean (SRM) was used to assess the responsiveness to changes over time. Factor analysis was conducted.

Results: Patients did not experience difficulties with completing the German OxCAP-MH questionnaire and all questions proved relevant. However, some changes related to issues of ambiguous wordings, differential interpretations, sentence structures, politically unacceptable expressions, differences in political systems, or cross-country language differences were necessary. Good internal consistency (Cronbach's alpha 0.85), item-total correlations (0.29-0.61) and one-month test-retest analysis (ICC 0.80) proved reliability. No floor/ceiling effects in the overall score were observed. Construct validity of the German OxCAP-MH and its ability to measure a broader concept of wellbeing in the mentally ill population was confirmed by strong correlations with generic HRQoL measures (EQ-5D-5L: 0.65, VAS: 0.58), relevant WHO-BREF dimensions (0.74 to 0.61), the BSI-18 (-0.71) and factor analysis. OxCAP-MH could distinguish between patients with different levels of QoL with the mean score (range 0-100) of 48.04 and 74.30 for 'very poor' and 'very good' QoL. In terms of responsiveness, the instrument was able to detect patients who improved in their overall scores in the anchor instruments with SRMs ranging from 0.56 to 0.90.

Conclusions: To guarantee linguistic and cultural validity and transferability of a new language version of a capability instrument, context specific piloting is essential. The study confirmed good psychometric properties of the German version and its ability to measure patients' broader wellbeing beyond health-related quality of life and functioning. Results also support the instrument's suitability for implementation in mental health practice both for clinical and health economic research. Further research is needed to investigate the transferability of the instrument to middle and low income settings.

Measuring Wellbeing Using the Women's Capabilities Index Amongst Women Involved in High-Risk Sexual Behaviour in Kampala, Uganda

PRESENTER: **Giulia Greco**, London School of Hygiene & Tropical Medicine

AUTHORS: Mr. Kenneth Roger Katumba, Rachel Kawuma, Janet Seeley

There is a growing debate on the inadequacy of standard outcome measures for evaluating the broad impacts of health promotion interventions on people's lives.

This study is part of a project that aims at adapting the Women's Capabilities Index to a different context (Uganda), in order to produce a multidimensional capabilities measure for use in low- and middle-income countries. The process of adaptation includes an explorative phase for assessing the extent to which the list of capabilities generated for the Women's Capabilities Index is valid in a different low-income setting (Uganda), with the scope to be more widely applicable. The list of capabilities in the WCI includes: physical strength, inner wellbeing, household wellbeing, community relations, and economic security. Given the similarities with other lists of dimensions, it is expected that the list of capabilities for women in Uganda will have a significant degree of overlap with the list generated for women in Malawi. What is likely to change is the identification of the indicators for measuring the capabilities. The specific objective of this study is to develop a list of capabilities for the female population suitable for use in a low-income setting, using a participatory approach.

To be consistent with Sen's theory, the selection of capabilities was conducted in a participatory manner using focus group discussions. The FGDs have two objectives: a) to explore locally relevant concepts of quality of life, dimensions of wellbeing, valuable beings and doings; and b) to explore the value and rank of the different concepts. We ran 10 FGDs, with 10 – 12 participants each. The participants are women attending the MRC Good Health for Women clinic in Mengo, Kampala. Women minor of age were excluded. Two-stage randomised cluster sampling was used to select participants. Data collection took place from October to December 2017.

Analysis is currently under way and will be completed by May 2019. Findings will be elicited based on manual framework analysis. Framework analysis uses a thematic approach, but allows themes to develop both from the research questions and from the narratives of the discussions. There is still a lot of work that needs to be done in order to use wellbeing measures in policy analysis. Some advances are taking place in the UK, but little in low-income countries, where there is a great need for using comprehensive measure of progress, since development interventions are likely to affect several aspects of people's lives. The wellbeing measure developed and tested in Uganda will be ready to be used alongside trials for the evaluation of public interventions. This measure will be able to provide a broader picture of the effects of complex interventions such as mental health programmes, which are not easily captured with standard evaluation techniques. While the measure is intended to support evaluators in low-income countries, the methodology developed in this study will also be of interest for researchers and policy makers in middle and high-income countries since it will contribute to the global debate on how to measure progress in society

Estimating the Monetary Value of Health and Capability Well-Being Applying the Well-Being Valuation Approach

PRESENTER: **Mr. Sebastian Himmler**, Erasmus School of Health Policy & Management

AUTHORS: Job van Exel, Werner Brouwer

Objective

Broader quality of life measures aiming to assess overall well-being rather than mere health effects, recently gained relevance in health technology assessment. One of those measures is the ICEpop CAPability measure for adults (ICECAP-A), developed as an operationalization of the capability well-being approach. However, to be able to use these measurements in a cost-effectiveness framework, an assessment of the monetary value for capability well-being is needed. Therefore, the aim of this analysis is to provide a first estimate of the monetary value of capability well-being gains, including a direct comparison to the monetary value of health gains.

Methods

We applied the well-being valuation approach in order to find a monetary value for the non-market goods health and capability well-being measured by the EQ5D-5L and the ICECAP-A, respectively. Subjective well-being was captured by Cantril's ladder and assumed to reflect individual utility. The latter was separately regressed on income, EQ5D-5L and ICECAP-A, allowing to calculate the willingness to pay for a QALY and a capability well-being adjusted life year through the marginal rate of substitution of these two measures and income. Data from an online survey conducted in the UK in February 2018 including 1,373 respondents aged 18 to 65 was used. To account for the possible endogeneity of income in well-being regressions, an instrumental variable approach was applied. Several robustness checks were conducted to test the impact of specific model specifications and underlying assumptions.

Results

The base-case estimate of the monetary value of 1 QALY was £ 30,786, which is similar to values found using willingness to pay experiments. One year in full capability was valued at £ 66,597. Applying sum scores instead of utility weights for EQ5D-5L and ICECAP-A produced valuations of £ 32,141 and £ 61,979. Using the Satisfaction with Life Scale instead of Cantril's ladder to assess subjective well-being generates a lower valuation of health, with a value of £ 20,988 for 1 QALY, while the value of capability well-being remained basically the same compared to the base case (£ 66,828). Not instrumenting for income lead to estimates of £ 112,336 and £ 193,305 for QALY and year in full capability, respectively. The relative value of capability well-being compared to health was consistently around two times higher throughout the conducted robustness tests.

Discussion

Our analysis provides the first estimates of the monetary value of capability well-being, also in comparison to health. Although our analysis is not without limitations, the external comparability of our estimates for health, and the relative values for health and well-being measures, generate some confidence in the validity of our approach and results. Our results furthermore highlight the importance of accounting for the endogeneity of income in well-being regressions.

Challenges in Developing Capability Measures for Children for Use in the Economic Evaluation of Health and Social Care Interventions

PRESENTER: **Paul Mitchell**, University of Bristol

AUTHORS: Samantha Husbands, Sarah Byford, Philip Kinghorn, Cara Bailey, Tim Peters, Joanna Coast

Background

Use of the capability approach is one means of broadening the evaluative space in economic evaluation (Coast et al. 2015; Lorgelly 2015). Capability measures in health economics have so far been limited in their focus on adult population groups – for example, the ICECAP measures (www.birmingham.ac.uk/icecap) have been developed for the general adult population, adults aged 65 and older and a supportive care measure for adults approaching the end of life. No existing measures of capability are currently developed for use in children (i.e. those aged under 18 years old) for health economic analysis. To provide decision-makers with capability tools for use across all ages, the development of capability measures for children is required. This paper will discuss the key challenges in developing capability measures for children, drawing on existing literature across both health economics and the capability approach.

Methods

We first present an overview of the capability approach and its application to measuring children's capabilities. An existing capability list for children is then used to critique child health measures which are currently used to produce quality-adjusted life-years. We compare the dimensions of 10 health measures for children to an existing capability list of 14 capabilities for children (Biggeri et al. 2006). We then discuss key issues related to the development of capability measurement for children, focusing particularly on: 1. how to identify capabilities; 2. how to measure capabilities; and 3. how to value capabilities, drawing upon relevant literature.

Results

Although there is good coverage across health measures for some of the content contained on the capability list (e.g. "life and physical health"), other areas (e.g. "love and care") have no coverage across existing items. Some coverage is limited by the effect health has on that capability (e.g. "education"). There are additional challenges in the development of capability measures following the ICECAP approach to measure development. Identification of relevant capabilities through a participatory approach is intrinsically more complex in children because of their development and consequent ability to engage meaningfully in qualitative interviews. Measuring capability across childhood is likely to require multiple measures to reflect the different stages of child development. Valuing capability for children also poses an additional question as to the appropriate population group from which to elicit values.

Conclusion

This paper highlights the missing capability areas of importance for children in existing health measures used in economic evaluations of health and care interventions. Although it outlines many challenges associated with developing capability measures for children, these challenges can be overcome, and it is feasible to extend capability measurement to children for health economic analysis.

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Poverty-Disability-and-Illiteracy Free Life Expectancy: A New Measure of Health and Wellbeing Based on Human Capabilities

PRESENTER: **David Canning**, Harvard University
AUTHOR: Carlos Riumallo-Herl

Background

The capabilities approach is based on the idea of measuring the choice set available to people rather than their choices or utility. Health, education and income have been identified as special goods that are particularly important for giving people the capability leading a full and meaningful life. Given the difficulties of measuring choice sets we take as a minimal criteria that a person should be alive, able bodied, literate, and have income above the poverty line, to have meaningful capability. These criteria are also related to the sustainable development goals (SDG) on poverty, good health and quality education.

Methods

We develop a population-level measure of poverty–disability-and-illiteracy free life expectancy stratified by sex. We use Sullivan's method, to incorporate the prevalence of poverty, disability and illiteracy by age and sex, from household surveys, into demographic life tables. We measure poverty using the World Bank's international poverty line. We measure disability as an impairment with any Activity of Daily Living (ADL) or Instrumental Activity of Daily Living (IADL). We measure illiteracy as an inability to read or write after age 16. Ideally, we need the joint distribution of poverty, disability, and illiteracy by sex and age in order to construct our capability adjusted life expectancy. However, this requires the joint distribution of the measures to be available for the entire age range, which is not the case in all countries. We begin by constructing measures of disability free life expectancy, poverty free life expectancy, and illiteracy free life expectancy, for each country, often from different survey sources. Then for countries where data on the joint distribution by sex and age is available we construct estimates of poverty–disability-and-illiteracy free life expectancy. This estimates for each country, stratified by sex, the average number of years a person could expect to live free of poverty, disability and illiteracy if exposed to current mortality rates and the age specific prevalence of poverty, disability and illiteracy.

Findings

We construct our separate measures of life expectancy, disability free life expectancy, poverty free life expectancy and illiteracy free life expectancy for more than 90 countries and compare them. We construct measures of poverty-disability-and-illiteracy free life expectancy in a small number of countries where data is available We find in developed countries our different measures are lower than, but close to, raw life expectancy. However, in less developed countries or capability adjusted measures are often much lower than life expectancy.

Interpretation

There are profound differences in or capability adjusted life expectancy measures across countries, which are magnified in comparison to differences in life expectancy alone. While existing summary measures of population health such as disability free life expectancy are useful form a health perspective new measures provide complementary information that can help inform policies that seek to improve human capability.

8:30 AM –10:00 AM MONDAY [Evaluation Of Policy, Programs And Health System Performance]

Universität Basel | Kollegienhaus – Seminarraum 103

International Perspectives on Efficiency and Equity

SESSION CHAIR: **Jack Needleman**, UCLA

Equity after a Social Health Insurance Program Reform in Mexico

PRESENTER: **Dr. Rocio Garcia-Diaz**, Tecnológico de Monterrey
AUTHORS: Sandra G. Sosa-Rubi, Edson Servan Mori

Abstract:

Objectives:

Many low and middle-income countries have a fragmented health system incapable of delivering universal health insurance and inadequate social nets. This cause families to finance heath spending through out-of-pocket (OOP) health payments, leaving poor families unable to ensure their consumption during periods of major illness. Several developing countries have tried to tackle this problem by introducing government run health insurance for the poor. In 2003 Mexico introduce the Seguro Popular, a voluntary health insurance paid by the government and the contribution of all household members except the poorest quintile in the income distribution. This paper analyzes changes in equity of different health financing categories in a fragmented health system during a decade after a social reform was implemented.

Methods:

The paper use Duclos, Jalbert and Araar (2003) equity measures to analyze the equity effects in terms of OOP health payments of different health financing categories that includes: Seguro Popular, Social Security, Mixture or Private health financing, and no social insurance. We compare the change in inequity that results from comparing the pre-payment and post-payment level of income after OOP health payments in health finance categories. This overall impact of OOP health payments financing is a measure of the redistributive effect that can be decomposed into horizontal, vertical and re-ranking effects in the income household distribution. To do this, we use Income and Expenditure National Survey from 2002, a year before SP's implementation, to 2008, 2012 and 2014.

Results:

Overall, we found that Mexican health system has a pro-rich redistributive effect due to the regressiveness of poor households paying more in terms of OOP health payments: OOP health payments have consistently increased inequality in the society during 2002-2014. The population without social insurance is the most vulnerable in all categories having increments all along the period. *Seguro Popular* shows a protective effect at the end of the decade. SP has lower vertical and horizontal inequity effects when compared to other health financing categories, specially, those without health insurance. Social Security has maintained the same equity effect among beneficiaries whilst private health insurance shows less vertical and horizontal equity.

Discussion:

We find that the power or redistribution effect through social health insurance as Seguro Popular can be improved up to 20% if horizontal equity is reduced among beneficiaries of the program and equal households end up paying the same amount of OOP health payments. The results also point out that in terms of equity, families without any insurance, faces more vertical and horizontal equity among all health financing categories. This result may be attributable to the multiple health systems that co-exist in which some of the population obtain more than one insurance while others do not, in particular, those households that are part of the informal economy. So the need to design a better health financing policy for those families is important giving the risk of possible catastrophic payments due to the lack of health insurance

Keywords: Seguro Popular, Equity, Horizontal Equity, Vertical Equity, Health financing

JEL Classification Numbers: I21, I22, D24, R12.

Technical Efficiency of Multidisciplinary Care for Patients with Type-2 Diabetes in Mexico

PRESENTER: **David Contreras-Loya**, University of California-Berkeley

AUTHORS: Carlos Chivardi, Roxana Rodríguez-Franco, Dr. Arantxa Colchero, Virginia Molina-Cuevas, Guadalupe Casales, Cutberto Espinosa-López, Jesús Felipe González-Roldán, Octavio Gómez-Dantés, Sandra G. Sosa-Rubi

Background:

Type-2 diabetes (T2D) is the second leading cause of death in Mexico, and its increasing burden is imposing major budget constraints on healthcare budgets of public provision systems. Evidence in high-income countries shows that multidisciplinary care (MC) for individuals with T2D has positive effects on metabolic control, which in turns prevents acute and chronic complications. However, the costs of this comprehensive model of care are currently unknown, which are an important input to assess the scalability of this model of care.

Methods:

We evaluated direct costs in a random sample of 40 health units, from which 20 were MC units (treatment) and 20 were primary health care units (control). We adopted a health system perspective and the costing year was 2017. Using standardized protocols for data extraction from medical and facility records, we measured total annual facility costs which included staff, medicines, utilities, training and equipment. The effect of scale on average unit cost was explored by regressing the log of unit cost on the log of number of clients with diabetes. The efficient scale level was analyzed by comparing marginal cost with average unit cost. Wild bootstrap (Rademacher weights) was used to correct the standard errors for the low number of clusters (State).

Results:

Average unit cost per patient-year was US$ 342 (CI 95%: 114–570) in control units, and US$ 545 (CI 95%: 120–971) in MC units. On average, MC units had 943 clients per year (CI 95%: 581–1,305), while control units had 2,192 (CI 95%: 390–3,994). Overall, 90% of the total cost is fixed, in the form of staff costs. The linear projection of average unit cost on scale and treatment revealed that a 10% increase in the number of patients correlates with an 8.6% decrease in unit cost among controls (p-value < 0.001), while the scale effect in MC units is around 10% (p-value = 0.167). The linear projection of total cost on scale revealed a marginal cost of US$ 7.6, while the minimum observed average unit cost was US$ 13.9. If all facilities shifted their scale to the observed 75th percentile (1,587 clients/year), average unit cost would decrease to US$ 65 for MC and US$ 61 for controls.

Conclusions and discussion:

We found considerable opportunities to increase cost-efficiency for T2D care in Mexico. Our data showed that facilities have not yet achieved the minimum efficient scale; this means that demand-side interventions to increase service utilization can yield considerable economic benefits for specialized and scarce services, such as T2D treatment.

The Equity Impact of a Universal Health Promotion Programme in Northern Sweden

PRESENTER: **Anni-Maria Pulkki-Brännström**, Umea University

AUTHORS: Marie Lindkvist, Eva Eurenius, Jenny Häggström, Anneli Ivarsson, Dr. Filipa Sampaio, Inna Feldman

Background

Few public health interventions are evaluated from an equity perspective. In this paper, we analyse income inequalities in birth outcomes and in healthcare utilisation for children and their mothers in the first two years after delivery in Northern Sweden. The main objective is to evaluate whether the Salut Programme, a universal health promotion intervention that aimed to strengthen healthy lifestyle and positive health behaviours, had any effect on health equity. Our previous findings support the intervention's effectiveness and cost-effectiveness.

Methods

We used a register-based retrospective observational design in which the child's date of birth, and the mother's place of residence at that time, determined whether the child and the mother were classified as belonging to the control group (geographical areas that received care-as-usual) or the intervention group (areas where the intervention was implemented from 2005), and either the pre-measure (children born 2002-2004) or the post-measure (children born 2006-2008) period. The sum of the parents' taxable income was used as the socioeconomic ranking variable. We computed the standard and absolute concentration indeces for seven binary indicators of positive birth outcomes, and for inpatient care and outpatient visits for children and their mothers during the two years after the child's birth. Using a difference-in-difference approach, we assessed whether the extent of inequality changed differentially over time in the intervention and control areas.

Results

There were surprisingly few income inequalities in positive birth outcomes, with the exception of full-term pregnancies, which were concentrated among the poor at pre-measure, and normal birth weight, which was concentrated among the rich at post-measure in the intervention area. We found no evidence of income inequalities in child healthcare utilisation. However, for mothers, utilisation was significantly pro-poor at post-measure in the non-intervention area. Inequalities in utilisation did not change significantly in either area between pre- and post-measure. However, the extent of inequality changed differentially between pre- and post-measure for two of the seven positive birth outcomes as follows. A pro-poor concentration of full-term pregnancies at pre-measure disappeared at post-measure in the intervention area, and an increase in pro-poor concentration of babies with normal birth weight for gestational age in the control area was not matched by a similar increase in the intervention area.

Discussion

There are concerns that participation in universal health promotion programmes, such as the Salut Programme, differs by socioeconomic status. It is therefore imperative that such programmes are evaluated both from a cost-effectiveness and an equity perspective, and that any equity-efficiency trade-offs are revealed. Our previous results demonstrated the effectiveness and cost-effectiveness of the Salut Programme, whereas the current results raise some concerns about the intervention potentially reducing the pro-poor concentration of positive birth outcomes. Despite the more complex, recently developed methods for incorporating equity concerns into cost effectiveness analyses, such as distributional CEA and extended CEA, there is value in presenting evidence on equity effects and cost-effectiveness separately, using methods that decision-makers are already familiar with.

Health System Productivity in China: A Comparison of Pre-and-Post 2009 Healthcare Reform

PRESENTER: **Ms. Peipei Chai**, China National Health Development Research Center

AUTHORS: Yuhui Zhang, Maigeng Zhou, Shiwei Liu, Yohannes Kinfu

Objective Improving efficiency and productivity is one important way for improving health system performance. This study assesses health system productivity in China pre-and-post its 2009 healthcare reform from a system-wide perspective with a focus on child health, maternal health and non-communicable disease (NCDs) related health issues. It also aims to identify the contextual factors impacting productivity and propose policy suggestions within the context of the 2030 Healthy China agenda.

Methods This study used a bootstrapping Malmquist Productivity Index (MPI) technique to assess the production of child health, maternal health and NCDs related health issues of health systems in 31 provinces in mainland China for the period 2004-15. In the analysis, health outcomes were measured jointly by infant survival rates, maternal survival rates and healthy life years calculated only considering NCDs for the time, three key population's health issues prioritized by 2030 Healthy China agenda, and health inputs were measured by health expenditure, density of medical personnel and hospital beds. It also used a bootstrapping Tobit regression to identify the contextual factors that impact the productivity.

Findings The average bootstrapped MPI measure for 2004-15 was 0.9403, and overall productivity tended to be much more sluggish after the introduction of the new healthcare reform in 2009. Moreover, health system productivity was quite heterogeneous across provinces. The decomposition of MPI indicates that the productivity degradation was mainly caused by decreasing returns to scale (RTS), or specifically by the massive decrease in scale of technology (i.e. an annual decrease rate of 7.82%), which offset the improvement in scale efficiency (i.e. an annual growth rate of 2.73%) observed over the study period. However, pure technology and pure technical efficiency remained at a relatively stable level and had a neutral impact on productivity change at the same period. Tobit regression results suggest that economic level and medical staff to bed ratio had positive effects on productivity, while the percentage of out of pocket (OOP) payments in total health expenditure (THE), population aging and educational attainment had negative effects on productivity.

Conclusion Chinese health system has not performed very well in terms of productivity, and even worse after the new healthcare reform. Chinese government must guarantee optimizing resource allocation and improving health financial security, etc., so as to improve health system scale efficiency and scale of technology, and hence to improve health system productivity.

8:30 AM –10:00 AM MONDAY [Production Of Health, Health Behaviors & Policy Interventions]

Universität Basel | Kollegienhaus – Seminarraum 104

Ageing #1

SESSION CHAIR: **Elham Mahmoudi**,

Do Pension Programs Reduce Chronic Stress Levels Among Seniors in England?

PRESENTER: **Dr. Andres I. Vecino-Ortiz**, Johns Hopkins University Bloomberg School of Public Health
AUTHOR: Antonio J Trujillo

Objectives

This paper studies the effect of the UK state pension on chronic stress levels among seniors in England as measured through biomarkers for chronic stress. These results have potential implications on the mental and physical health of these seniors as well as on their demand for preventive services.

Methods

We are using data from the English Longitudinal Study of Aging (ELSA). ELSA is a 6-wave nationally representative longitudinal survey of the non-institutionalized population above 50 in England. We measure stress levels using a set of biomarkers available in the data comprised in an index called allostatic load (AL) which signals the physiological response to stress. AL is a tool used in neurobiological sciences to measure chronic stress.

Because we have observational data and the state pension has almost universal coverage, our identification strategy focuses on assessing allostatic load levels in the neighborhood of the state pension eligibility age, using a regression discontinuity design (RDD). The age threshold offers an exogenous, quasi-random assignment of the individuals in the neighborhood of the threshold allowing us to measure discontinuities in the trajectory of the AL. We follow several alternative specifications including higher-order polynomials and the inclusion of retirement as a confounding variable.

Results

We found that becoming eligible for the UK state pension reduces the levels of allostatic load by between 11-17% among males living in less wealthy households with no significant impact on respondents living in the wealthier ones. The magnitude of the stress reduction is half of that found in other studies attributable to belonging to minority groups or living in a high-poverty area. We also found that the state pension reduces the allostatic load levels among women who both live in less wealthy households and who live by themselves.

Discussion

Pension programs worldwide face financial challenges, as life expectancy increases and seniors become a larger proportion of the population. This forces governments to balance the measurable costs and benefits of these programs.

In this study, we provide evidence suggesting that eligibility for the UK state pension reduces the levels of chronic stress, potentially implying that these programs offer previously unmeasured welfare gains that should be taken into account when proposing pension reforms. We provide

hypothesis on the heterogeneity of the results and policy recommendations based on our results.

Can Hearing Aids Delay the Onset of Alzheimer's and Other Aging Morbidities Among Adults with Hearing Loss?

PRESENTER: **Dr. Elham Mahmoudi**

AUTHOR: Mr. Neil Kamdar

Motivation. More than 27 million Americans 50 years or older suffer from hearing loss (HL). It reduces social interaction, precipitously lowers quality of life, and has been linked to severe cognitive and health decline. Hearing aids (HA) may prevent or mitigate the onset of conditions associated with mental and physical decline.

Objective. This novel study longitudinally followed patients 50 years of age and older who had not been diagnosed with Alzheimer's disease or dementia (AD), anxiety or depression, drug or alcohol disorder, and injuries associated with falling 12 months prior to their index HL diagnosis to estimate the association between HA use and risk of development of these conditions within three years of HL diagnosis.

Data. We performed a retrospective cohort study of adults with HL using a national, private insurance claims database Clinformatics® Data Mart Database. This claims database captures all healthcare encounters for 79 million adults and children. The study period covered 2008 to 2016. To infer patients with new HL diagnosis, we excluded patients with a HL diagnosis or a HAs procedure codes within one year prior to the index HL diagnosis. Patients with pre-existing diagnosis of any of our outcome conditions were also excluded.

Study Design. We conducted bivariate analyses of baseline demographic characteristics and comorbid conditions at the time of HL diagnosis. We propensity matched HA users and non-users (at a caliper of 0.001 without replacement). To examine disease-free survival of HA users versus non-users, we constructed Kaplan-Meier product-limit survival curves for each of our outcomes. We applied Log-Rank tests to examine the proportional hazards assumption and to test for differences in survival curves. We developed Cox proportional hazards regression models to calculate unadjusted and risk adjusted hazard ratios to measure the effect of HA use on each of our four outcomes within 3 years of HL. All models were adjusted for demographic variables and clinically relevant morbidities.

Principal Findings. Among 176,716 adults aged 50 and older diagnosed with HL, 22,799 (13%) used HAs. Large gender and racial/ethnic gaps exist in HA use. Approximately, 11.3% of female vs. 14.5% of male patients used HAs ($P < 0.0001$); furthermore, 14.1% of White vs. 9.5% of Black ($P < 0.0001$) and 7.8% of Hispanic patients ($P < 0.0001$) used HAs. At the state-level, Pearson correlation coefficient indicates negative associations between incidence rate of HA use and AD ($r=-0.294$; $p=0.034$). The risk-adjusted hazard ratios of being diagnosed with AD, depression or anxiety, drug or alcohol disorder, and injuries associated with falling within 3 years after HL diagnosis, for those who used HA vs. those who did not, were respectively lower by 0.82 (95% CI: 0.76-0.88), 0.92 (95% CI: 0.89-0.95), 0.91 (95% CI:0.80-1.04), and 0.86 (95% CI: 0.81-0.92).

Policy Implications and Conclusions. Our study demonstrates the modifiable role of HA in delaying the onset or prevention of devastating and high resource intense conditions of cognitive and health decline. This is important because HL is increasingly common among older adults and early use of HAs may prevent or delay physical and mental decline.

The Effects of Urban-Rural Residents' Medical Insurance Integration on Healthcare Utilization Among Chinese Mid-Aged and Older Adults

PRESENTER: **Dr. Haipeng Wang**, Shandong University

AUTHORS: Chaofan LI, Chengxiang Tang

Objective China successfully achieved universal health insurance by launching Urban Employee Basic Medical Insurance (UEBMI), New Rural Cooperative Medical Schemes (NCMS) and Urban Residents Basic Medical Insurance (URBMI). However, there exist disparities in finance level, benefit package and reimbursement rate among different medical insurance schemes, which leads to inequality in health care utilization. Several provinces piloted in integrating NCMS and URBMI to establish a unified health insurance scheme in 2014. This study aims to evaluate the effects of urban-rural basic medical insurance integration on health care utilization.

Methods The data were obtained from China Health and Retirement Longitudinal Study (CHARLS). 8281 respondents who enrolled in URBMI or NCMS in both 2013 and 2015 were included to analyze. Quasi-experiment design was conducted to examine the effect of medical insurance integration on health care utilization. Respondents living in integration piloted provinces were considered as treatment group, and those residing in other provinces were control group. Data from 2013 wave were used as pre-integration and data from 2015 were considered to be post-integration.

The key outcome variables for health care utilization were probability and positive number of outpatient visits last month, probability and positive number of inpatient visits last year. Propensity score matching was used to balance the covariates between treatment group and control groups and difference-in-difference analysis (DID) was performed to examine the effects of integration.

Results The probability of outpatient visit decreased between 2013 and 2015, from 19.6% to 17.6% in control group and from 16.4% to 15.2% in treatment group. The mean number of outpatient visits in control group reduced 0.1, while it increased 0.4 among the treatment group. The probability of inpatient visit in treatment groups (1.9%) increased more than that in control groups (1.1%). Moreover, the mean number of inpatient visits remained the same in control groups, while it increased about 0.4 in treatment group.

The integration had no significant effects on probability of outpatient visit (β=0.04, P>0.05), whereas it had significantly positive effects on number of outpatient visits (β=0.04, P<0.05). Similarly, the integration also had no significant effects on probability of inpatient visit (β=0.16, P>0.05), whereas it had significantly positive effects on number of inpatient visits (β=0.84, P<0.05).

According to subgroup analysis, the medical insurance schemes integration had positive effects on number of outpatient visits for rural residents (β=0.41, P<0.05) but no effects for urban residents (β=0.23, P>0.05). Similarly, it had positive effects on number of inpatient visits for rural residents (β=1.19, P<0.05) but no effects for urban residents (β=0.37, P>0.05). Moreover, the integration had positive effects on number of outpatient visits (β=0.53, P<0.05) and inpatient visits (β=1.77, P<0.05) for the poorest but no effects for other groups.

Conclusion The urban-rural basic medical insurance integration in China improves health care utilization among the mid-aged and older adults. Moreover, the residents living in rural area and poorest economic status could benefit more from the integration, which promotes equity in health care utilization.

Key words: Integration, Urban-rural Residents Medical Insurance, Health care utilization, Quasi-experiment, Difference in difference

Does Widowhood Have an Impact on Wellbeing, Health Status, Healthcare and Non-Healthcare Use? A Longitudinal Analysis across European Countries.

PRESENTER: **Luz Maria Peña-Longobardo**, Universidad de Castilla-La Mancha

AUTHORS: Beatriz Rodriguez-Sanchez, Juan Oliva

Background

Widowhood can be one of the most traumatic events in a person's life. The existing literature The literature has deepened in the analysis of the negative effects of widowhood on the dimensions of well-being, health and demand for healthcare resources. However, , few studies have considered these dimensions together, differentiating between the most immediate effects of the negative shock and tested if there is an element of adaptation in the medium term, after a few years since the event.. Therefore, the main objective of this analysis is to estimate whether widowhood affects wellbeing and health status across different European countries in the short as well as the medium-long term. In addition, it is analysed if individuals who became widowed have a greater use of resources in both health care (hospital admission, number of medical doctor visits) as well as non-healthcare resources (professional care services, residences and family care).

Data and Methods

It was used the Survey of Health, Ageing and Retirement in Europe-SHARE (waves 1, 2, 4, 5 and 6). Genetic matching regressions were performed to analyse the differences in the considered dimensions between those individuals who have become widowed compared with those who remain with a partner. More precisely, we focused in the difference between wellbeing, being depressed, self-reported health status, death, hospital admission, visits to primary and specialist care, emergency, formal and informal care use. Moreover, the analysis was also performed by gender and country.

Results

Results showed that people who have become widowed in the short term (after 2 years from the time they became widowed) have a worse health status in terms of wellbeing (1.9 points less on the CASP scale) and a higher probability of being depressed (25 percentage points more) compared to those who remain married or in a couple. In addition, they are more likely to receive professional care (10 percentage points more) and informal care provided by a relative or a friend not residing at home (18 percentage points more). However, no differences were found in the use of healthcare services. In the medium-long term (after 4-6 years since they became widowed), there are no differences in health status between both groups in the state of health, but in the use of professional services (11 percentage points) and informal care from outside the household (17 percentage points more). Additionally, the impact of widowhood was much higher in males than in females, and in Mediterranean countries.

Conclusions

Individuals who became widowed had a worse health status and are more likely to receive care (professional and informal) compared to people who remained married or with a couple. Additionally, the data reflects an adaptation effect in terms of wellbeing and health status since the differences in health status between widowed people and people who remain in a couple in the long term disappeared. However, the effect in the medium-long term from becoming widowed on non-healthcare used was still observed.

8:30 AM –10:00 AM MONDAY [Production Of Health, Health Behaviors & Policy Interventions]

Universität Basel | Kollegienhaus – Seminarraum 105

Tobacco, Alcohol, and Guns

SESSION CHAIR: **Ana Balsa**, Universidad de Montevideo

Impact of Choice Set on Tobacco Consumption: Evidence from a Natural Experiment

PRESENTER: **Ryota Nakamura**, Hitotsubashi University

AUTHOR: Dr. Ying Yao

Impact of choice set on consumption decision is a classic theme in economics and marketing research. Would smokers reduce smoking intensity if cigarette brands that they usually purchase became no longer available, or would they keep the same level of consumption from alternative brands? Establishing a causal relationship between choice set and tobacco consumption is challenging. First, consumers' choice set is endogenous. Second, the choice of cigarette brands is habitual and does not vary much. In order to address these methodological challenges, we design an observational study that enables the estimation of causal effects by leveraging the impact of a natural disaster – the 2011 Great East Japan Earthquake. The earthquake hit some of the major factories of Japan Tobacco Inc. (JT), the largest tobacco manufacturer in Japan. Being unable to continue production in the disaster-stricken areas, JT decided to temporarily or permanently terminate some of its brands. To investigate the change of smoking patterns due to the change in available choices of tobacco brands, we exploit large-scale, nationally representative consumer scanner panel data in Japan from 2010-2014. Using a difference-in-differences approach, we find that smokers who were affected by the product discontinuations significantly reduced their total cigarette consumption. The effect is particularly pronounced when cigarette consumption is measured by the total amount of tar and nicotine consumed. Moreover, their cigarette consumption decreased gradually over time, implying a persistent effect of choice set on consumption. The effect on less educated smokers was greater than that on highly educated smokers.

Role of Social Capital and Social Influence on Tobacco Consumption in Rural Uttar Pradesh, India

PRESENTER: **Md Zabir Hasan**, Johns Hopkins Bloomberg School of Public Health

AUTHORS: Joanna E. Cohen, David Bishai, Akshay Ahuja, Shivam Gupta

Background:

India has the World's second largest tobacco consuming population. Despite governments effort, only a 6% decline in prevalence was observed in the six years since 2010. While tobacco use is an individual behavior, social environment and relationship between individuals, groups, and communities (defined as social capital) often determine tobacco use. Based on a conceptual framework integrating social cognitive theory and social capital theory, this study aims to explore the role of social capital and social influence on tobacco consumption among household heads in rural Uttar Pradesh, India.

Method:

Data from a community-based cross-sectional survey was used to estimate self-reported tobacco use among 6,218 household heads (≥18 years) from two rural districts of Uttar Pradesh. Multilevel confirmatory factor analysis was used to generate factor scores of four social capital constructs (*Organizational Participation*, *Social Support*, *Trust* and *Social Cohesion*) both at individual and community levels. The *social influence* of tobacco consumption was measured by "non-self" cluster proportion of tobacco use in the community. The explanatory power of the covariates was assessed using generalized linear (logistic) models with Huber/White/sandwich robust variance estimator.

Result:

We found 63% (95%CI: 61.57-66.82) of the household heads consumed any tobacco products. Among the social capital constructs, only *individual organizational participation* was significantly correlated with tobacco use (adjusted odds ratio = 1.07, 95%CI: 1.01-1.13, $p < 0.05$) after adjusting all covariates. Controlling for confounders, a 10% increase in "non-self" cluster proportion of tobacco use in the community (*social influence*), was associated with a 10.3% increase in the odds of tobacco use (95% CI of adjusted odds ratio: 1.05-1.16, $p < 0.01$).

Conclusion:

Around two-thirds of household heads consuming tobacco in a community may provide enabling social cues to others believing tobacco use is a normative behavior. However, above and beyond the effect of *social influence*, participating in community groups and organized social activities had an independent and significant association with one's likelihood to consume tobacco. The result of this study has important policy implications as the majority of the tobacco control policies in India focus on individual tobacco control behavior. We suggest further exploration of the causal effect of social influence and participation on tobacco use. And acknowledging the limitation of cross-sectional data, we recommend synergizing the current tobacco control efforts with community-level participatory interventions to denormalize tobacco-related health behaviors in rural Uttar Pradesh, India.

Alcohol Availability and Alcohol-Attributable Mortality: Evidence from Administrative Data

PRESENTER: **Ms. Relika Stoppel**, University of Potsdam

Background and aim: This paper analyzes the impact of restricting alcohol sales hours on 100% alcohol-attributable mortality (AAM) in Estonia. Previous studies find strong evidence that restricting alcohol availability is effective in reducing alcohol use and alcohol misuse. In order to reduce the prevailing high alcohol consumption, Estonia implemented alcohol sales restriction in the capital city of Tallinn in 2007 and a year later in the whole country.

Methods: By using mortality data for the period 1997-2015, this paper measures the effect of the policy on the country level and on the county level. On the country level the effectiveness of the policy is measured by using an ARIMA model. For the county level analysis, a difference-in-differences (DiD) method is applied. Since the alcohol sales policy was first introduced in Tallinn and almost a year later in all of Estonia, this

setting provides us with a treatment group (Tallinn) and a control group (rest of Estonia). Therefore, by using a DiD approach, we can measure the effectiveness of alcohol sales regulation on the county level by comparing the outcomes of AAM in Tallinn to those in the rest of Estonia before and after the policy was implemented.

Results: The policy was effective in reducing AAM on the country level from the initial 4 deaths per month by 1.581 deaths. The country-wide policy was most effective for the age group 35-49; and men experienced higher reduction in AAM than women. The effect measured with the DiD analysis¾a reduction in AAM by 1.371 deaths per month¾is comparable in magnitude with the result of the ARIMA analysis. This suggests that the population responded to the policy on the country level and on the county level to a similar extent. Both outcomes are statistically significant at the 1% level.

Conclusion: A reduction in alcohol sales hours has a significant and long lasting negative effect on 100% alcohol-attributable mortality. The results suggest that in the context of Estonia, restricting alcohol sales hours has a negative effect on AAM.

Keywords — Alcohol, health policy, mortality, public health

JEL: I12 — Health Production: Nutrition, Mortality, Morbidity, Substance abuse and Addiction, Disability, and Economic Behavior

JEL: I18 — Government Policy; Regulation; Public health

Changes in Age of Handgun Purchase Policies and Adolescent Suicide Fatalities in the United States

PRESENTER: **Dr. Julia Raifman**

AUTHORS: Elysia Larson, Michael Siegel, Michael Ulrich, Colleen Barry, Anita Knopov, Sandro Galea

Background:

Suicide is the second leading cause of death among adolescents aged 15 to 24. At a time of increased recognition of the role of firearms in adolescent fatalities, three states increased the age of handgun purchase to 21 years in 2018. We aimed to evaluate whether changes in state policies limiting handgun sales to those over 21 years, relative to 18 years, were linked to a reduction in adolescent suicide fatalities.

Methods:

We used suicide mortality data from the Center for Disease Control and Prevention's Web-based Injury Statistics Query and Reporting System. We compared suicide fatality rates among adolescents aged 18-20 in the five years before and after policy changes in three states that changed the age of handgun sales policies relative to six states with consistent age 18 sales policies. Missouri and South Carolina changed the age of handgun purchase from 21 to 18 years in 2007 and 2008, respectively. West Virginia changed the age of handgun purchase from 18 to 21 years in 2010. We selected Texas and Alabama, Florida and Kentucky, and North Carolina and Indiana as geographically proximate comparison states matched on baseline trends in suicide fatalities for Missouri, South Carolina, and West Virginia, respectively. We used a linear difference-in-differences approach to examine the relationship between policy changes and all-cause and cause-specific suicide fatality rates, adjusting for state, year, proportion of adult suicides due to firearms, and state poverty and unemployment levels and clustering standard errors by state. As a falsification test, we repeated the main analysis among those aged 13 to 17 years, whom we would not have expected to be affected by the policy change. Due to the small number of states in the sample, we conducted permutation analyses to precisely estimate p-values.

Results:

Matched state pairs had parallel trends in suicide fatalities prior to policy changes. Age 21 handgun sales policies were associated with 3.45 fewer suicide fatalities per 100,000 person-years (95% confidence interval [CI]: -3.89 to -3.01, permutation adjusted p-value <0.001) among adolescents aged 18 to 20 years old. They were associated with reduced firearm suicide fatalities (-2.13, 95% CI: -2.84 to -1.41) and with non-firearm suicide fatalities (-1.32, 95% CI: -1.84 to - 0.80). Age 21 handgun policies were not associated with suicide fatalities among those aged 13 to 17 years (0.22, 95% CI: -1.17 to 1.61), satisfying this falsification test. The 28% (95% CI: 24% to 31%) reduction relative to the overall suicide fatality rate of 12.40 suicides per 100,000 person-years would be equivalent to 322 (95% CI: 282 to 363) fewer suicide fatalities among adolescents aged 18-20 years old each year in the 35 US states without age 21 handgun sales policies.

Discussion:

Age 21 handgun sales state policies were associated with reduced adolescent suicide fatalities. Given this evidence and that there is widespread public support for increasing the age of handgun purchase policies, state and national policymakers may wish to consider age 21 handgun purchase policies.

8:30 AM –10:00 AM MONDAY [Supply Of Health Services]

Universität Basel | Kollegienhaus – Seminarraum 106

Health Workforce and Practice Patterns

SESSION CHAIR: **Marc Höglinger**, Zurich University of Applied Sciences - WIG

Nurse Practitioners' Prescription Authority Restriction and the Rural Urban Disparities in Mortality Rates

PRESENTER: **Nasim B. Ferdows**, University of Southern California

AUTHOR: Amit Kumar

People living in rural areas are one of the largest underserved populations in the US. While age-adjusted mortality rates in rural and urban counties paralleled during 1970s and 1980s, mortality rates in urban counties declined more rapidly in the last two decades, resulting in rural-urban mortality gap that has been continuously increasing. Rural residents are typically marginalized economically, less educated, have limited access to healthcare and have worse health outcomes compared to their urban counterparts. Furthermore, rural areas are disproportionately inhabited by elderly populations with high prevalence of chronic diseases. With the increasing aging population in rural areas along with the shortage of healthcare professionals in primary care services addressing their healthcare needs becomes more challenging. Evidence suggests that access to primary care services is one of the major problems in rural counties. There has been a longstanding shortage of physicians in rural areas and in some communities and states, nurse practitioners (NPs) might be the main providers of primary care services. However, different states pursue different regulations for NPs prescription authority in primary care settings. This study compares the trends in age-adjusted mortality rates and supply of physicians in states with different NP prescription authority, using Area Health Resources Files (AHRF) and Compressed Mortality Files (CMF). We defined rural and urban markets based on the 2013 Rural/Urban Continuum Codes. The outcome was age-adjusted mortality rate per 100k population for adults older than 65. Physician supply was defined as the number of physicians per 1k population. We defined rural and urban markets based on the 2013 Rural/Urban Continuum Codes. Linear regression with county fixed effects was used to evaluate the association between physician supply and mortality among rural and urban counties in states with different NP prescription authority. Age-adjusted death rate in rural counties in states with current restrictions on NPs declined from 5,500 to 4,800 deaths per 100k from 1992 to 2014. However, the death rate in rural counties in other states declined from 5,000 to 4,300 deaths per 100k population from 1992 to 2014. The supply of physicians in rural counties in states with current restriction on NPs increased from 0.9 to 1.1 physicians per 1k population from 1992 to 2014. While in states with no restrictions on NPs, the supply of physicians increased from 1.2 to 1.8 in the most remote rural counties and increased from 1.1 to 1.5 physicians per 1k population in states with prior restrictions on NPs. Our results indicate that rural-urban mortality gap is most considerable in states where NPs are not authorized to prescribe medication, compared to other states. Counterintuitively, the states with the restriction on NPs prescription authority have the lowest supply of physicians in rural areas, compared to other states' rural counties. Therefore, people living in rural areas in states where NPs are not authorized to prescribe medication suffer from not receiving care and especially medications due to both the lower supply of physicians and the restrictions on NPs prescription authority.

For the Public Good? Management and the Performance of Private Healthcare Providers in Tanzania

PRESENTER: **Matthew Quaife**, London School of Hygiene & Tropical Medicine

AUTHORS: Timothy Powell-Jackson, Catherine Goodman, Jessica King, Christina Makungu

In many low- and middle-income countries (LMIC), the private healthcare sector comprises a major and growing source of treatment. Their rapid growth reflects a confluence of factors including inadequate public provision, especially in the face of rapid urbanisation, together with rising disposable incomes. However, the appropriate role of the private sector is much contested. There are widespread concerns about provider incentives and over-provision of care, and while the private sector is widely used, the quality of care received by patients is often dire. One potential driver of better quality is management. A growing literature has documented the important role of management practices in determining firm performance across multiple industries and there is emerging evidence that management matters in the hospital sector of high-income countries. The management-performance relationship remains unexplored in the healthcare sector of LMICs.

We implement a survey of structured management practices in a national sample of 227 private healthcare facilities in Tanzania, combining these data with "process of care" measures obtained from 909 standardised (undercover) patient visits and 5425 observations of patient-client interactions. We first examine the relationship between our management score and several measures of quality of care, namely correct treatment of the SP cases and compliance with infection prevention and control (IPC) standards. Regressions control for a rich set of facility characteristics that could potentially confound the relationship. We then explore the drivers of good management. We leverage a firm experiment in which facilities in our sample were randomly assigned to an intervention that, over an 18 month period, sought to improve organisation-level processes, systems and clinical standards. Finally, we return to the observational data to examine whether poor management practices are more prevalent when health facilities face weak competition, are not-for-profit and are managed by non-clinicians.

We report a number of key findings. First, variation in management practices across facilities is considerable, with a large proportion of facilities poorly managed. Second, we find that better managed health facilities have higher quality of care. The effects are substantial: going from the 10^{th} to the 90^{th} percentile of management practices is associated with a 43 percent increase in correct treatment and an 18 percent increase in IPC compliance. The relationship between management and quality of care is, however, driven almost entirely by the for-profit (as opposed to the not-for-profit mission) facilities in our sample. Third, results from the field experiment show no significant effect of the intervention on the management practices score. These findings show that, while management practices are strongly linked to better clinical quality, improving such practices is far from straight forward.

Peer Pressure in Surgery: How Colleagues Determine a Physician's Treatment Style

PRESENTER: **Luis Fernandes**, Centre for Health Economics at the University of York

AUTHORS: Nils Gutacker, Martin Chalkley

Background. Variation in treatment choices for similar patients is substantial and well documented in the literature, but its determinants remain unclear. Adjusting for patient characteristics explains variation only to a limited extent. Less is known about how supply-side factors, such as practice environment or heterogeneity in physicians' behaviours, drive the observed hospital or regional variation in healthcare delivery. One such area of treatment variation is hip replacement, where both cemented and uncemented prostheses are common, despite official recommendations in England in favour of the former. The aim of this study is to explore the extent to which orthopaedic surgeons' practice style or the environment in which they work determine differences in the treatment choice between cemented and uncemented hip replacements.

Data. We employ patient-level administrative data from all publicly-funded hip replacement surgeries performed in England between 2008 and 2016. These data include information on patient characteristics, clinical information and details of the admission pathway, as well as identifiers of the physician in charge of delivering care.

Empirical Strategy. We use exogenous shocks in physicians' practice environments due to job moves to estimate the impact of environment on physicians' treatment decisions within a difference-in-differences analysis framework. For each orthopaedic surgeon in England, we construct employment histories and identify those who move from one hospital to another during the study period. The practice environment is defined as the rate of cemented hip replacements for all physicians in the hospital, omitting the moving doctor's own cases. We test both i) heterogeneity in adaptation patterns to a new environment using dynamic DiD models as well as ii) non-symmetric treatment effects for physicians who move to high-cemented vs. low-cemented environments. Finally, we explore if the decision to move to a specific hospital depends on whether the practice environment is more aligned with physicians' own practice style, i.e. positive matching.

Results. Our sample includes 481,704 cases of hip replacement performed by 3,903 physicians. We have identified 124 physicians who move hospitals at some point during our study period. After the move, physicians' are 5.5 percentage points more likely to perform a cemented hip replacement for every 10 percentage point change in the practice environment. We find that physicians' practice styles change quickly after the move, with little to no further adaptation to the new environment after the first year. This suggests that the change in physicians' propensity to perform a cemented procedure after the move is mainly driven by local hospital constraints and peer effects. Furthermore, physicians respond symmetrically to increases and decreases in the hospital cemented rate. We find no evidence of endogenous move of physicians to hospitals.

8:30 AM –10:00 AM MONDAY [Specific Populations]

Universität Basel | Kollegienhaus – Regenzzimmer 111

Organized Session: Economic Considerations in Reaching the Hard to Reach for Vaccination

SESSION CHAIR: **Aaron Wallace**, Centers for Disease Control and Prevention

DISCUSSANT: **Ulla Kou Griffiths**, UNICEF; **Taiwo Abimbola**, Centers for Disease Control and Prevention

Economic Value of Vaccinating Geographically Hard-to-Reach Populations with Measles Vaccine: A Modeling Application in Kenya

PRESENTER: **Bruce Lee**

Since special efforts are necessary to vaccinate people living far from fixed vaccination posts, decision makers are interested in knowing the economic value of such efforts. Using our immunization geospatial information system platform and a measles compartment model, we quantified the health and economic value of a 2-dose measles immunization outreach strategy for children <24 months of age in Kenya who are geographically hard-to-reach (i.e., those living outside a specified catchment radius from fixed vaccination posts, which served as a proxy for access to services). When geographically hard-to-reach children were not vaccinated, there were 1,427 total measles cases from 2016-2020, resulting in $7·6 million ($2·8-$22·4 million) in direct costs and productivity losses and 7,504 (3,338-16,962) disability-adjusted life years (DALYs). The outreach strategy cost $65 ($18-$123)/DALY averted (compared to no outreach) when 25% of geographically hard-to-reach children received MCV1, $104 ($32- $196)/DALY averted when 50% received MCV1, and $236 ($103-$416)/DALY averted when 100% received MCV1. Outreach vaccination among geographically hard-to-reach populations was highly cost-effective in a wide variety of scenarios, offering support for investment in an effective outreach vaccination strategy.

Hard to Reach Populations: A Systems Mapping Approach to Bridging the Gaps for Vaccination

PRESENTER: **Sachiko Ozawa**, University of North Carolina-Chapel Hill

Expanding vaccination coverage into populations that are hard-to-reach for vaccination has increased in priority for immunization initiatives; however, economic evidence to inform decision making on how to best expand vaccination coverage among these populations remains unclear. The complex and interrelated nature of the supply and demand mechanisms associated with reaching hard-to-reach populations necessitates a systems approach, which allows for the simultaneous consideration of all mechanisms, including how they directly or indirectly interact to influence the whole service delivery system. Systems maps are diagrams of the relevant components of a system and the connections among and between them. We developed a systems map in the context of vaccination to examine the relationships between the mechanisms that make

individuals hard-to-reach and the economic evidence, such as costs or cost-effectiveness, associated with efforts to reach them. To validate the components of our map and solicit expert opinion on the economic evidence gaps, we convened a committee of experts on immunization economics who collectively represent thirty-five academic institutions as well as twelve government and non-governmental organizations. Based on consultations with our expert committee and supplemental literature searches based on the feedback from the experts, we further developed and revised the systems map to be reflective of all system components. By illustrating which relationships between barriers that make individuals hard-to-reach require further economic evidence research, our systems map can help decision makers and stakeholders better understand and prioritize existing data gaps, which in turn can help inform evidence-based decisions about the choice of interventions to reach hard-to-reach populations.

Defining Hard-to-Reach Populations for Vaccination

PRESENTER: **Tatenda Tariro Yemeke**

Extending the benefits of vaccination to everyone who is eligible requires an understanding of which populations current vaccination efforts have struggled to reach. A clear and consistent definition of “hard-to-reach populations” is essential for estimating the size of target groups, sharing lessons learned, and allocating resources appropriately. A literature review was conducted to determine what formal definitions of hard-to-reach populations exist and how they are being used, and to propose definitions to consider for future use. The definitions for hard-to-reach populations identified from the literature were classified by barriers to vaccination (i.e., the process by which individuals become difficult to reach for vaccination). Overall, we found that 1) there was a need to distinguish populations that are hard-to-reach versus hard-to-vaccinate, 2) the existing literature poorly defined hard-to-reach and hard-to-vaccinate populations, and clear criteria or thresholds for classifying these populations were missing. Based on this review, we propose that hard-to-reach populations be defined based on supply-side barriers to vaccination (e.g., geography by distance or terrain, transient or nomadic movement, home births or other home-bound mobility limitations, healthcare provider discrimination, lack of healthcare provider recommendations, legal or policy restrictions, insecurity due to war and conflict, low quality vaccination services); and hard-to-vaccinate populations be defined based on demand-side barriers (e.g., distrust, religious beliefs, gender-based discrimination within the household, lack of awareness of vaccination benefits and recommendations, low socioeconomic status, lack of time to access available vaccination services) among persons with access to vaccination services. but difficult to vaccinate due to. The same population can have multiple barriers to vaccination, and barriers that make populations hard-to-reach should be distinguished from those that make them hard-to-vaccinate. Further work is needed to better define hard-to-reach and hard-to-vaccinate population groups, improve measurement of the size and importance of their impact, and examine interventions related to overcoming supply and demand-side barriers. This work will enable policy makers, governments, donors, and immunization programs to better plan interventions and allocate necessary resources to remove existing barriers to vaccination.

8:30 AM –10:00 AM MONDAY [Demand & Utilization Of Health Services]

Universität Basel | Kollegienhaus – Fakultätenzimmer 112

Health in Developing and Less Developed Countries

SESSION CHAIR: **Adrianna Murphy**,

Health Service Use and Catastrophic Expenditure Among the Elderly with Chronic Diseases in China Using Intersectionality Theory and CART Analysis

PRESENTER: **Ms. Qun Wang**, Dalian University of Technology

AUTHOR: Xinrui Ding

Background

Chronic conditions represent more than 70% of all deaths globally. Equity in health service use and catastrophic expenditure (CHE) due to chronic diseases have attracted much attention among researchers. These studies usually adopted traditional approaches to equity analysis (considering one source of inequity at once). However, in the framework of intersectionality, social disadvantage arises from interrelated and intersecting social determinants. Nevertheless, very few studies are available on the application of intersectionalty theory in health system researches based in China. This study is going to filling this gap.

Methods

We used the third wave (2015) of China Health and Retirement Longitudinal Study (CHARLS) data. CHARLS is a longitudinal household survey conducted among the adults aged 45 and older in 28 provinces of China. The total number of sampled respondents in 2015 was 20,907.

Any health service use was defined as either using outpatient or inpatient service due to chronic diseases. CHE was defined as the share of household out-of-pocket health expenditure caused by chronic diseases in relation to household non-subsistence expenditure once exceeding 40%. We used logistic regression to initially analyze social determinants of health service use and CHE due to chronic diseases. We then used classification trees (CART) (a popular machine learning and data mining method) to explore interactions between different social determinants and their impacts on health service use and CHE among respondents with chronic diseases.

Results

14,300 respondents (equivalent to 68.4% of all respondents) reported at least one chronic disease. Among them, 3,770 sought outpatient care, 2,449 sought inpatient care, and 9,322 did not seek any inpatient nor outpatient care. Logistic regression showed that age, gender, household size, social-economic status (SES), region (eastern, middle, and western China), and health status were significantly associated with health service use related with chronic diseases. While age, education, marriage, SES, health status, whether using outpatient care, whether using inpatient care, and region were significantly associated with CHE due to chronic diseases. CART analysis showed that groups not likely to use services were those aged less than 65 years with one chronic condition, those aged more than 65 years with lowest SES, and those aged more than 65 years with lower SES living in western and middle China. While groups more likely to suffered CHE were those seeking outpatient and inpatient care with more than one chronic condition and lowest SES, those seeking inpatient care with lowest SES aged more than 75 years, and those seeking outpatient care with lowest SES not married aged more than 75 years. The overall agreement rates for the trees of health service use and CHE were 82% and 90%, respectively.

Conclusion

This is one of the very few studies applying intersectionality theory in China. Relying on CART analysis, we identified a set of complex interations not apparent using traditional equity analysis methods. We suggest the government that special considerations should be given to those households with the interacted features not likely to seek care and/or more likely to suffer CHE due to chronic diseases.

A Private Social Enterprise Saving Womens' Lives in Northern Mozambique

PRESENTER: **Michael André Hobbins**, SolidarMed
AUTHORS: Sonil Joanguete, Marielle Jousse

Background & Introduction

In rural areas of Northern Mozambique, access to health care remains precarious. Maternal Mortality is over 489 deaths/100000 life-births. According to the DHS 2011, 80% of the population reported distance and cost for transport as the main hurdles to reach health care. In the district of Chiure, Province of Cabo Delgado, we estimate that every 5th woman wants to give birth at the health centre but cannot get there in time. 40% of maternal death occur during birth and during the first 24h after delivery. Caesarean Section rates in the district are below 5%, suggesting that most maternal deaths occur in the communities.

SolidarMed tested an innovative strategy based on social entrepreneurship with the goal to organise transport options that bring pregnant women to the next health centre for free and on time in case of emergency.

Method & Approach

The idea starts with the set-up of a company that rents motorbikes to designated taxi drivers (entrepreneurs), who have the obligation to respond – for free – when called for an emergency by a designated community. SolidarMed tested the concept by renting out 3 motorbikes in 2018, evaluating the financial feasibility for the taxi driver, the response rate to the emergencies, and gather first data to model profitability of the future local company. Main outcomes were: balance sheet for driver (USD/100KM), number of emergencies transported and missed (emergency was defined as any pregnant woman that needed to go to the health centre for birth), community feedback.

Results

Three Motorbikes have been giving services in 2018, of which data were evaluated from 2 from January to September and 1 from July to September. In total, 1759 services were provided and 5307 people were transported over a distance of 18863 KM. Total income was 3110 USD (148 USD/Month & Driver). The overall cost of maintenance and fuel was 382 USD and 876 USD over the entire period, respectively. The net revenue for the driver was almost 10 USD/100KM. In the same time period the drivers responded to all requested 93 emergencies, for free. All the women had a positive birth outcome and spot-feedbacks from the communities were positive throughout.

Conclusion and Next Steps

This innovative concept provides free emergency transport to pregnant women indirectly through the set-up of taxi services. Besides its positive outcomes on the health of the pregnant women and their babies, the model further impacts family economy and increases access to markets. Two major challenges are the maintenance/repair of motorbikes and driving licences for people in the community. Financial models indicate that an initial investment of about 400'000 USD over three years may lead to a profitable company.

In 2019, The company will be set up and a first investment in 10 additional motorbikes and drivers will be done. GPS tracking devices linked to emergency call numbers are also considered to prepare management modalities at scale.

Are Roles of HMOs Satisfactory Amongst Social Health Insurance Beneficiaries in Enugu, Southeast Nigeria?: Demand-Side Analysis

PRESENTER: **Eric Obikeze**, University of Nigeria, Enugu Campus

Are Roles of HMOs Satisfactory Amongst Social Health Insurance Beneficiaries in Enugu, Southeast Nigeria?: Demand-side Analysis

Eric Obikeze[1,2]; Obinna Onwujekwe[1,2]

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Abstract

Background: Health insurance has been identified as a major option for achieving Universal Health Coverage (UHC). Nigeria in a bid to achieve health coverage, introduced national health insurance scheme (NHIS) in 1999. Health Maintenance Organizations (HMOs) were made part of the scheme. Although roles of HMOs are stated in the NHIS guidelines, the extent of satisfaction with their roles amongst the beneficiaries of the scheme requires some in-depth analysis and understanding. This study therefore is a demand side analysis of level of satisfaction the beneficiaries have with roles of HMOs in the implementation of Nigeria's social health insurance scheme.

METHODOLOGY: The study used quantitative method and adopted a cross sectional descriptive design. Respondents were sampled using Finite Population Sampling Technique. 615 Federal enrollees were sampled and they represented the social health insurance beneficiaries. The quantitative data were collected using interviewer administered questionnaire. To ensure validity of the findings, triangulation of the study variables were conducted by three experts, which provided detailed understanding of the patterns of responses. Data were subjected to descriptive statistics of percentages, means and standard deviation and further analysed using multinomial logistic regression model. Respondents were divided into economic quartiles using principal component analysis. Concentration index was used to determine equity in the variables of interest. Probability values less than 0.05 was considered statistically significant.

RESULTS: Major roles played by HMOs were registration of enrollees, monitoring and evaluation of providers, sensitization of people, making referrals in the scheme, paying monthly capitation and fee for service to providers. 31.3% of the beneficiaries rated HMOs lowest in a scale of 1-5. Concentration index showed that the poor were more satisfied with roles of HMOs than the rich. The level of satisfaction with the roles of HMOs among enrollees using cross tabulation of variables were statistically significant ($p < 0.05$). Multinomial logistic regression also showed that level of satisfaction with roles of HMOs across variables were statistically significant among the respondents (prob > Chi^2 = 0.000).

Conclusion: The study showed clear indication of the roles of HMOs and the level of satisfaction that beneficiaries have about them. Even though the respondents showed good knowledge of HMOs' involvement in the scheme, they however did not show a corresponding awareness of major roles of HMOs. The study revealed that roles and knowledge of HMOs and probably what they stand for are not properly understood. This was buttressed by the result of the rating of the roles of the HMO, which showed a low representation of what is indeed required from them.

Economic Burden of Multimorbidity in India: Implication for Healthcare Policy and Planning

PRESENTER: **Habib Farooqui**, Public Health Foundation of India

AUTHOR: Dr. Anup Karan

Background and Objective: An estimated 55 million households experienced catastrophic healthcare expenditure in India in the year 2014. The situation is expected to worsen given the demographic and epidemiological transition India is witnessing and increasing trend of multimorbidity. The purpose of this research is to generate evidence on economic consequences of multimorbidity on Indian households. We hypothesized that multimorbidity not only results in high level of out of pocket (OOP) expenditures but also leads to compensatory reduction in expenditures on co-morbid conditions leading to sub-optimal care.

Methods: We analyzed the health and morbidity survey (HMS) data from National Sample Survey Organization (NSSO) 71st round (January 2014 to June 2014) survey. Approximately 72,000 households were included in the survey through a multistage sampling process. We estimated the prevalence of multimorbidity and OOP expenditure with reference to selected individual NCD conditions and in presence of multimorbidity. Propensity score matching (PSM) technique was applied to generate comparable counterfactual group for generating robust estimates of expenditure for selected disease conditions with and without multimorbidity. As a part of sensitivity analysis, first, we compared the means between households with multimorbidity and matched control household using a t-test for each covariate used in the regression model that generated the propensity scores; second, we re-estimated our results after excluding households that experienced a death in the previous year, and after excluding the 1% of households with the highest out-of-pocket spending on illness; and third, we re-estimated our results using the stratification matching method, which essentially matches subgroups of cases and controls instead of on a one-to-one basis.

Results: We observed that among men aged ≥ 40 years, 13.6% reported atleast one NCD morbidity and 1.7% reported multimorbidity; whereas among women 17.3% reported at leadt one NCD morbidity and 2.4% reported multimorbidity, We also observed that most common dyads of diseases were diabetes and hypertension (16.2%), diabetes and goiter (13.7%), injury and epilepsy (13.4%), diabetes and cardiovascular diseases (12.6%), hypertension and hearing (12.6%), hypertension and cardiovascular diseases (12.0%), hypertension and neurological disorder (11.1%). In terms of economic consequences of multimorbidity, our estimates suggest that highest level of household OOP expenditure was incurred on cancers, both as standalone morbidity and multimorbidity (USD1,524 and USD2,372, respectively) followed by epilepsy (USD1,016 and USD140, respectively), cardiovascular diseases (USD767 and USD991, respectively), and injuries (USD797 and USD674, respectively) per episode inpatient care. In addition, the propensity score matched analysis suggest that household OOP expenditure for cancer, neurological disorders, cardiovascular disease, and musculoskeletal disorder was higher in stand-alone scenario as compared to multimorbidity scenario in inpatient setting highlighting compensatory expenditure reduction on account of catastrophic expenses in multimorbidity. The same is true in outpatient setting for cancer, neurological, musculoskeletal, gastrological, skin and genitourinary disorders.

Conclusion: Our present analysis reiterates the long standing need for financial risk protection of households against catastrophic health expenditures due to multimorbidity.

8:30 AM –10:00 AM MONDAY [Economic Evaluation Of Health And Care Interventions]

Universität Basel | Kollegienhaus – Hörsaal 114

Organized Session: From Art to Science- the Future of Model Validation. Four Trends in Health Economic Decision Modeling and Their Implications for Model Validation.

SESSION CHAIR: **Stefan Lhachimi**, Institute for Public Health, University Bremen

Review of Current State of the Art in Health Economic Model Validation

PRESENTER: **Dr. Isaac Corro Ramos**, Institute for Medical Technology Assessment (iMTA)

The notion of the importance of validating simulation models is almost as old as when the use of models started to become more widespread. For example, Naylor and Finger in 1967 discussed the relevance of validating computer simulation models used in industrial systems and issues surrounding this validation. Without proper validation, it cannot be assessed whether the outcomes produced by a model make any sense in view of what these outcomes are intended to be used for. In health economics (HE), ever since their use, HE decision models have been challenged regarding credibility (validity), salience (the relevance of the model) and legitimacy (the representation of stakes and viewpoints). A complicating factor regarding credibility is that many models are built for the account of parties (sponsors) with clear stakes in the model outcomes, that is, legitimacy may clearly be an issue. Regulatory bodies (model users) who use model based economic evaluations for reimbursement decisions or price negotiation, have addressed the challenge of model validity in various ways.

Many errors occur in model development and its application – for instance, a study towards the quality of models used in Australian health care policy making reported flaws in 203 of the 247 reviewed models – and validation helps minimizing these errors and their effects on model outcomes. In addition, referring to the famous quote by George Box, models are simplified representations of real-life systems and hence principally ‘wrong’, which implies that one needs to establish the boundaries of the applicability of the model. In other words, one needs to assess if the model is ‘right enough’ to be used for some application. Validation also serves this purpose, provided it is performed with clear applications in mind.

This presentation will provide an overview of the various guidelines and tools that are available to help reaching the purposes of error avoidance, suitability assessment and better decisions. The presentation will start with a short introduction of terminology. Then it continues by discussing a range of recent guidelines and checklists reflecting the growing attention for model validation. Guidelines, tools and checklists will be discussed regarding their purpose, target group of users and applicability. We conclude that recently a range of more operational tools has been published that helps both model builders and model users to pay more attention to model validation in a systematic way. Nevertheless room for improvement exists regarding practical guidance and interpretation.

Trends in Health Economic Modeling and Implications for Validation.

PRESENTER: **Talitha Feenstra**, Rijksuniversiteit Groningen

This presentation will discuss four trends in health economic (HE) decision modeling (and economic evaluation in a broader sense) with an impact on the future of model validation.

First, new, more complex treatment strategies, like precision medicine often require more complex health economic decision models than cohort based state transition models to enable proper evaluation. These models have to accommodate patient heterogeneity and various sequential treatment decisions. More complex models are harder to assess without proper validation reports, even with full access to their modeling code. This hence stresses the need for a systematic approach towards HE decision model validation.

Second, further international cooperation will benefit model validation by concentrating the different efforts for it and increasing the number of involved users and stakeholders. Many HE models are commissioned for the purpose of reimbursement dossiers by international headquarters of pharmaceutical companies. Therefore, models are being developed internationally and then partially adapted to local settings and requirements. This implies that reimbursement authorities can benefit from international coordination of efforts to enhance model validity.

Third, performing model validation requires sufficient insight into the model and access to the model’s code. Most guidelines and tools aim at model developers or the model assessment groups that have full access. HE modeling has been lagging behind compared to other simulation modeling fields regarding open source software and code sharing. Code sharing initiatives and other efforts for enhancing model transparency may also increase model validity, since they widen the group of potential assessors, as already mentioned in the first US panel book. Another interesting idea is to develop standard modules for health conditions that can be extensively verified individually and used as building bricks in HE models.

As fourth and final point, in economic evaluation in general, increased involvement of stakeholders is seen. Model development and validation will benefit from the involvement of stakeholders through an iterative process, in which the modeler’s understanding of what is to be modeled or validated will improve from stakeholder participation, while also stakeholders will learn from model outputs and provide new input for

model improvement and validation. In HE model development and validation, a major group of stakeholders, that has the potential of making real contributions to it, is commonly ignored, namely patients. It will be discussed how this could be altered.

To conclude, model validation should become more structured and standardized, as well as more transparent. Open source code, stakeholder involvement, more attention for validation techniques and the reporting of model validation tests, as well as re-use of model elements (model "building bricks") hopefully all serve to increase the quality of health economic modeling and help us set the step from considering model validation as an art to it being a science with clear and established quality requirements.

Health Economic Model Validation: The Perspective of Public Health Organizations

PRESENTER: **Salah Ghabri**, French National Authority for health (HAS)

Health economic decision models are increasingly recognized in the process of reimbursement decision and price negotiation of new medicines among several countries. In France, cost-effectiveness analysis (CEA) submissions are mandatory for the process of price negotiation of innovative health technologies. They are assessed by The French National Authority for health (Haute Autorité de santé, HAS).

Most current guidelines of economic evaluations published by health technology assessment (HTA) agencies emphasize the importance of validation of economic decision models (ex. description of the validation process and comparing the models against models of similar technology) but without proposing a practical framework for addressing the problems of economic validation. However, the Australian and the Dutch guidelines (Pharmaceutical Benefits Advisory Committee, PBAC; The National Health Care Institute, Zorginstituut Nederland) recommend the use of a practical tool "validation Assessment Tool of Health-Economic Models (AdViSHE) for reporting of economic validation.

This presentation proposes an overview and examples of HTA agencies' experiences in HE decision model validation and underlines the extent to which public health organizations (i.e. HTA agencies) are (and can be) can be involved in the process of addressing the concerns of model validation. The presentation discusses the benefits of a joint collaboration of econometricians, health economic analysts, health economists and public health organization experts for the improvement of the practices framework of model validation and the challenges related to the complexity of future health economic models. The following issues will be discussed:

- Is the notion of a health economic decision model really clear since there is no unique economic model? Compared to econometric models, should we define a *number of minimum requirements* of economic analytic decision models?
- The need to specify a prioritized list of decision analytic economic validation.
- The methodological framework permitting to improve the process of transparency and consistency of decision analytic economic models.
- The practical recommendations for conducting external validation that is generally the most difficult task of economic model validation.
- Can (should) we involve patients in the process of economic model validation (e.g. the involvement of patients in the "*early dialogue*" stage of health technologies projects between pharmaceutical industries and European HTA agencies?

8:30 AM –10:00 AM MONDAY [Demand & Utilization Of Health Services]

Universität Basel | Kollegienhaus – Hörsaal 115

Antibiotics/Pharma

SESSION CHAIR: **Jennifer Whitty**, University of East Anglia

Is There an Appetite in the United Kingdom for Online Antibiotic Prescribing? Evidence from a Discrete Choice Experiment

PRESENTER: **James Buchanan**, Health Economics Research Centre, Nuffield Department of Population Health, University of Oxford

AUTHORS: Laurence Roope, Liz Morrell, Koen Pouwels, Julie Robotham, Lucy Abel, Derrick W Crook, Timothy Peto, Christopher C Butler, Sarah Walker, Sarah Wordsworth

Background

Antimicrobial resistance is increasing, driven by widespread, often inappropriate, use of antibiotics. In the United Kingdom (UK), patients have traditionally accessed antibiotic treatment by attending a free face-to-face consultation with a primary care physician. If antibiotics are prescribed, these can be obtained by paying a prescription charge at a pharmacy (currently £8.80/item). This approach helps to ensure appropriate use of antibiotics, but can lead to frustration if the process does not meet patient expectations. However, the past decade has seen an increase in the number of 'online pharmacies'. These private providers offer to dispense antibiotics following a paid-for consultation and operate outside the national health service, so might have less incentive to ensure appropriate use of antibiotics. This development could have a negative impact on the fight against antimicrobial resistance. The aim of this study was to understand public preferences for these alternative forms of consultation, and the factors that impact these preferences.

Methods

To achieve our aim we conducted a discrete choice experiment (DCE). DCE respondents completed 16 questions in which they chose between two labelled alternatives: a consultation with a primary care physician at their local medical centre or a consultation with a primary care physician via the internet. Each alternative consultation type was specified in terms of 5 attributes, identified via literature reviews and stakeholder interviews: how similar the consultation is to a traditional 'face-to-face' appointment, waiting time for a consultation, physician reputation, the process by which an antibiotic prescription would be collected, and consultation cost. Respondents were recruited via a general population online panel. Mixed logit and latent class regressions were conducted to analyse the choice data.

Results

734 members of the public completed the survey (response rate 74%). The factors that were valued by respondents when seeking antibiotic treatment were having a consultation at their local medical centre rather than via the internet, waiting time for a consultation, physician reputation and consultation cost. Respondents were willing to pay £11 for a consultation at their local medical centre rather than a consultation via the internet, regardless of the other factors. Respondents were also willing to pay £5 for a traditional face-to-face consultation, but were unwilling to pay for consultations by phone, video or instant messaging service. Furthermore, respondents required a 77 hour (3 day) reduction in waiting time to accept a consultation via the internet instead of a consultation at their local medical centre. However, respondent preferences exhibited considerable heterogeneity; five population subgroups were identified with different preferences. In particular, one group showed a lower strength of preference for traditional consultations, with a higher concern for convenience.

Conclusions

Overall there does not appear to be much appetite for seeking antibiotic treatment from online pharmacies in the UK. However, this population-level finding masks considerable preference heterogeneity, and we identify specific subgroups who might be more open to online services. If these providers adopt a more permissive approach to antimicrobial stewardship than the NHS, there is a risk that the online services could negatively impact public health.

Anti Microbial Resistance, Comorbidities and Costs in the Last Year of Life in Queensland Australia

PRESENTER: **Kim-Huong Nguyen**, The University of Queensland

AUTHORS: Megan McStea, Tracy Comans

The economic burden of Antimicrobial resistance (AMR) in the acute care setting is of concern. As we age, the onset of infections increases and subsequently antimicrobial use [1]. Australia, despite AMR strategies, still has a limited understanding of the impact that AMR has on the cost to our healthcare system [2]. The incidence of AMR among the aged needs particular focus to understand its correlation with patients with geriatric syndrome and/or dementia and assessment of Australian refined diagnosis related groups (AR-DRG).

Methods

We used AR-DRG and costs from the National Hospital Cost Data Collection (NHCDC), as well as revenue, to paint an economic picture of the AMR identified patients in their last year of life. Using probabilistically linked hospital administrative databases and state level registries, AMR related ICD-AM-10 codes were extracted from a matched cohort of dementia patients. We then calculated patient-level use of health services for the period of study from first admission until death and precisely for the last 12 months of life.

Results

At least one resistance code was found for 1800 patients; 10% dementia patients versus 8% non-dementia patients. Resistance to penicillin, methicillin, vancomycin, or an antibiotic comprised 85% of resistance codes.

1240 (69%) patients also had a UTI ICD code; 58% were patients with dementia. Using the Charlson Comorbidity Index (CCI)[3] we found that as the number of comorbidities increases so does the proportion with an AMR code.

Using NHCDC costs, the mean cost in the last 12 months of life for a patient in public hospitals without identified AMR is $27,917(95%CI:$27,112–$28,723) as compared to an identified AMR patient, $48,567(95%CI:$45,214–$51,919). There was no significant difference between the dementia and non-dementia groups. This pattern was repeated for the revenue margin where public hospitals had a significantly greater shortfall in revenue for AMR identified patients as compared to non-AMR patients (-$15,671(95%CI:-$17,995--$13,346) vs (-$8,686(95%CI:-$9,269--$8,103)p-value<0.001). When comparing DRG to NHCDC costs for AMR identified patients in their last year of life we see that DRGs significantly understate the cost of hospitalisation for AMR patients ($43,912(95%CI:-$41,973–$45,850)p-value <0.001) and most particularly for those with dementia ($47,361(95%CI:$42,806–$51,915) vs ($41,544(95%CI:$42,806-$51,915)p-value<0.001). After controlling for CCI, dementia, age, and sex, AMR is associated with additional costs in the acute care environment ($16,277(95%CI:$13,627–$18,927).

Conclusion

Any record of AMR with or without current presence of invasive infection is associated with increased hospital cost. The AR-DRG payment system does not cover these costs and the level of disparity is significantly more than for non-AMR episodes. While AMR presentations are different and more prevalent for dementia patients, there is no significant difference in cost.

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Mind the Gap! Explaining Changes in on- and Off-Patent Drug Utilization over Time- a Decomposition Approach

PRESENTER: **Katharina Blankart**, University Duisburg-Essen

AUTHOR: Sotiris Vandoros

Background: Since the mid-1990s, pharmaceutical consumption in Germany has increased by 50% whereas costs have increased by 20%. Specifically, generic utilization has increased at a faster rate than that of drugs under patent protection. In this study, we analyze changes in utilization in both brand name and generic drug markets over time. At physician level, we explore whether differences in utilization by market status can be explained by variation in promotional activity, competition, regulation for efficient prescribing and, disease prevalence.

Methods: We compile data from European Medicines Agency market authorizations and information on generic entry, a panel of 3,025 prescribing physicians, promotional data and information on policies for efficient drug use in Germany between 2011 and 2014. Outcome variables reflect first differences by the number of prescriptions, sales, and prescriptions per patient between the first quarters of 2011 and 2014. In a Heckman adjusted two-stage model, we account for selectivity of prescribers with regards to the propensity to adopt a product in the first stage. The second stage captures the associations with changes in utilization by a set of explanatory variables that reflect competition, regulations and composition of patients. We use threefold Oaxaca-Blinder decomposition to identify the share of unexplained variation by the explanatory variables for two market specifications: 1) on-patent (70 substances) compared to off-patent markets (51 substances) and; 2) generic and brand name markets in the off-patent market (49 substances each).

Results: The drugs analyzed reflect 21% of the German ambulatory prescription market. On average, in utilization increased by 1.3 prescriptions per physician and substance for on-patent drugs (off-patent: 2.5, generic: 5.7). Only brand name drug utilization in the off patent market decreased (-2.4). The partial regression results of the utilization models suggest that associations with changes in utilization are largest for changes in the number of manufacturers, changes in the share of patients above age 65, share in aut-idem prescribing (physicians exclude substitution) and if drugs are subject to reference pricing. Effect sizes were similar across market specifications (brand name vs. generic, on vs. off patent drugs) and predominantly differ by magnitude of the effect. Across outcomes, the decomposition suggests that the part that can be explained by differences in the determinants of drug utilization is substantial, but varies by outcome variable, e.g. 26% in the off-patent vs. on patent market by number of prescriptions.

Conclusions: Changes in drug utilization differ by market status. Increases in drug utilization seem partly beyond regulators' control of economically efficient prescribing.

Factors Associated with Drug Shortages in Canada

PRESENTER: **Wei Zhang**, University of British Columbia

AUTHORS: Daphne Guh, Huiying Sun, Larry D Lynd, Aidan Hollis, Paul Grootendorst, Dr. Aslam Anis

Background: Drug shortages are an increasing concern in Canada and globally. In Canada, since March 14, 2017 manufacturers have been required to report drug shortages if they experience important delays in supplying the Canadian market with an approved drug. Despite the fact that Health Canada and researchers have recognized the negative impact of drug shortages on patients, health care professionals and the health care system, there is little empirical evidence on the types of drugs that are susceptible to shortages and the major factors associated with shortages in Canada.

Objective: To identify the major factors that are associated with drug shortages in Canada.

Data: Canadian Drug Shortage database contains information on drug identification number (DIN) in shortage (a unique number to indicate a drug's active ingredients, strength, dosage form, route of administration and manufacturer), shortage start date, shortage reasons, and actual or expected shortage end date. The drug shortage database was further linked to the Health Canada Drug Product Database, which contains information on all DINs that are available in Canada.

Methods: Our study sample was all DINs marketed in Canada excluding over-the-counter and ethical drugs. The follow up time period of each DIN was their time being on market from March 14, 2017 (mandatory reporting) to September 12, 2018 (about 18 months). The DINs with the same active ingredients, dosage form and route of administration were then organized into a group, called a "market". The outcome, drug shortage at the market level, was defined as yes if all DINs under a "market" were reported in shortage. The factors considered included market structure at baseline, changes in the number of manufacturers over the previous two years, and route/dosage form. The association between the factors and drug shortages was assessed using a logistic regression model adjusting for Anatomical Therapeutic Chemical classification.

Results: A total of 2,026 markets (9,948 DINs) were included in our analysis. Of them, 10.7% markets (n=216) were reported in shortage and their average number of days in shortage was 107 (SD=118). Compared with markets with branded manufacturers only, markets with a single generic manufacturer and markets with branded manufacturers and a single generic manufacturer were more likely to be in shortage (odds ratio=1.70, 95% CI (1.17-2.49) and 3.68 (1.46-9.29), respectively). Markets with decreasing number of manufacturers and markets with constant single manufacturer over the previous two years were more likely to be in shortage than markets with increasing number of manufacturers or markets with multiple manufacturers but no change of the number of manufacturers (odds ratio=2.80 (1.23-6.36) and 5.37 (2.48-11.63), respectively). Markets with complicated routes/dosage forms (injection, oral non-solid, and others, respectively) were more likely to be in shortage than those of the oral solid regular release.

Conclusion: Our results suggest that relatively lower profit margins, indicated by generic entry with single generic manufacturer, may trigger shortages. Fewer manufacturers and more complicated production (route/form) are also associated with drug shortages.

Drug Stock-Outs, Health-Seeking Behavior and Facility Bypassing in South Africa

PRESENTER: **Ronelle Burger**, Economics Department, Stellenbosch University
AUTHORS: Rulof Burger, Lewis McLean

We investigate how patients navigate the health system in response to a drug stock out at their closest public clinics. For this purpose, we use a nationally representative panel data set of South African patients (National Income Dynamics Study) matched with facility-level data on stock-outs, managerial quality and location (District Health Information System).

We estimate a conditional logit model in which patients select from an expanded choice set including the three nearest public clinics, public hospitals, private health care facilities and not presenting at any facility. We thus jointly model the choice set of respondents (including vertical and within-public-clinic horizontal bypassing) instead of estimating separate models on subsets thereof.

The choice probabilities are modelled as functions of patient and facility level attributes, allowing us to interpret the coefficient estimates in these models as utility function parameters for visiting a public clinic that experienced a stock-out at time t. We utilize the time-dimension of the data set to examine how the persistence in stockouts affects health-seeking behavior.

We find evidence that vertical and horizontal bypassing occurs in response to drug stock-outs. When their nearest public clinic experiences a drug stock-out, patients are more likely to travel to their second or third nearest public facility or to seek private health care. Bypassing is more likely if the alternative facilities are not much further than the nearest facility or if the patient owns a car. Vertical bypassing to a private facility is particularly likely if the three nearest public clinics experience simultaneous stock-outs or if the patient is relatively wealthy.

Drug stock-outs also increase the probability of not consulting any health provider and thus presumably going without drugs – although the likelihood less so for patients in very poor health. As expected we see that the bypassing response is reversed with replenishment of drug stocks at the nearest facility.

We also find that the poorest members of society are most likely to forego care (not consult) in response to a stock-out. This may explain previous findings by Koomen et al. (forthcoming) showing that poorest communities are not only more likely to experience drug stock-outs, but also more vulnerable to such shocks. In poor communities, drug stock-outs are more likely to lead to adverse TB treatment outcomes and death.

8:30 AM –10:00 AM MONDAY [Production Of Health, Health Behaviors & Policy Interventions]

Universität Basel | Kollegienhaus – Hörsaal 116

Inequality of Opportunity in Health

SESSION CHAIR: **Apostolos Davillas**,

Ex Ante Inequality of Opportunity in Health, Decomposition and Distributional Analysis of Biomarkers

PRESENTER: **Apostolos Davillas**
AUTHOR: Andrew M Jones

Health inequality has many sources, not all of which are equally objectionable. The existing literature focuses on socio-economic inequalities in health, explaining health variations as being due to differences in living conditions, access to health care, and health-related lifestyle. The underlying concept of this literature implicitly suggests a distinction between legitimate and illegitimate inequalities. Building on the concept of inequality of opportunity (IOp), the "egalitarian" framework does not necessarily indicate equality of the distribution of health outcomes *per se* but emphasises the role of individual responsibility in defining a "fair" health distribution.

In this study, we use data from *Understanding Society*: the UK Household Longitudinal Study to provide a comprehensive analysis of ex ante IOp in health and its underlining sources using objective health indicators. We use nurse-collected and blood-based biomarkers to measure health: spanning obesity, blood pressure, inflammatory biomarkers, blood glucose and cholesterol. We use each biomarker separately and we also construct a composite score as a proxy measure of wear and tear on the body, this is commonly known as the allostatic load.

Applying a direct *ex ante* IOp approach, we find that inequalities in health attributed to circumstances (IOp) account for a non-trivial part of the total health variation. For example, observed circumstances account for 20% of the total inequalities in our composite measure of multi-system health risk, allostatic load. Shapley-type decompositions show that apart from age and gender, education and childhood socioeconomic status are important sources of IOp. We also propose an extension to the measurement of *ex ante* IOp based on the recentered influence function (RIF) regression technique to explore how IOp may vary across the distribution of biomarkers. This shows that the percentage contribution of socioeconomic circumstances (education and childhood socioeconomic status) to IOp, relative to differences attributable to age and gender, increases towards the right tail of the biomarker distribution, where clinical concerns are typically focused. Oaxaca-type decompositions, which are used to analyse gender and age differentials in IOp, reveal that these differentials vary across the distribution of our composite health measure (allostatic load).

The Effect of Education on Equality of Opportunity in Health

PRESENTER: **Dr. Iryna Kyzyma**, Luxembourg Institute of SocioEconomic Research

There is extensive evidence that higher educational attainment is associated with better health and higher life expectancy (‘the education-health gradient'). The relationship persists over time and across countries, and is valid for all demographic groups. The literature, however, is less conclusive with respect to the causal impact of education on health. Whereas some authors find a positive effect, others find no effect or a positive effect only for some demographic sub-groups.

Apart from inconclusive results on the impact of education on health, the literature does not provide any answer on the question whether additional educational attainment might help to reduce inequality in health, even if it does not necessarily improve health outcomes at the aggregate level. This might be the case if, for example, extension of education benefits to a larger extent disadvantaged population sub-groups than those with more appealing socio-economic background. We address this question by evaluating the causal impact of education received in childhood on inequality of opportunity in health later in life. As a next step, we explore potential mechanisms underlying the relationship between education and inequality of opportunity in health.

Our identification strategy builds on the exploitation of the exogenous variation in the minimum number of compulsory school years within and between several European countries, which we use to instrument the number of years in education spent by each respondent. This variation steams from a set of school reforms introduced at different points of the 20^{th} century in different European countries. The strategy has been widely explored in previous literature to study the impact of education on health (Brunello et al., 2013; Crespo et al., 2014) and the impact of education on earnings (Brunello et al., 2017).

The estimations are based on data from the Survey of Health, Aging, and Retirement in Europe (SHARE). The SHARE is a longitudinal survey of individuals aged 50 years and older. It started in 2004 in 10 European countries and was extended later on to 27 European countries and Israel. The dataset provides extensive information on demographic and labor market characteristics of respondents, their family arrangements, household income and asserts, and, most importantly, on a wide range of health indicators, health behaviors and health care utilization. In wave 3 (2008-2009), the SHARELIFE questionnaire was utilized to collect information on life histories of the respondents (their childhood circumstances, employment history, health and health care utilization history, etc.) which provides necessary information for evaluating inequality of opportunity in health.

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Health at Birth and Effects on Educational Outcomes in Brazil

PRESENTER: **Isabela Brandao Furtado**, Insper

AUTHOR: Enlinson Mattos

This paper estimates the effects of birth weight on educational outcomes for Brazil using a twin fixed effect approach. The recent literature, mainly based on data from developed countries, has provided evidence that health at birth is a critical factor for outcomes related to health and to cognition. Using a matching of administrative birth records of and school enrollment we aim to provide this type of evidence for Brazil. We use two rich administrative records, the birth record (System of Information on Live-Born Infants-SINASC) and school attendance record (School Census) so as to produce evidence of the effects of birth weight through life in Brazil. Most of the estimation of the impacts of health at birth consists of seeking to separate the effect of birth weight itself from parental characteristics and investments made during life. After all, maternal background characteristics and even genetic factors associated with the birth weight may also play a critical role in determining a child’s health and educational outcomes. In order to address this omitted variable bias issue, a twin fixed effect (TFE) identification strategy has been widely used instead of the Ordinary Least Square (OLS) estimations.

Using the richness of the administrative data for Brazil, the main contribution of this paper is threefold: (i) to estimate the effects of birth weight on Apgar score and educational outcomes using a twin fixed effect identification strategy; (ii) to compare the OLS and TFE estimations, providing evidence on parental compensating behavior; (iii) to show that birth weight impacts are different across socioeconomic groups. The main finding is that birth weight matters. For instance, the findings suggest that a 10% increase in birth weight is associated with a 6/% increase in the chances of completing high school by the age of 17 and with a 3.6% decrease in the probability of repeating a grade. Furthermore, estimates provide evidence that parents tend to compensate, rather than reimforce, the negative effects of adverse initial health conditions. Larger effects are found for the infants with low birth weight, limited access to basic health care services, lower maternal education and enrolled at schools of lower socioeconomic status.

Achieving Universal Health Coverage in South Africa: The Multiplier Effect of Cash Transfer Policy

PRESENTER: **Cyprian Mcwayizeni Mostert**, The Wits Reproductive Health and HIV Institute (Wits RHI)
AUTHOR: Judit Vall Castello

Background

The achievement of universal health coverage in developing countries will rely on how quick countries address household poverty and inequalities. Currently, cash transfer (CT) policy targeting the poor segments of society is promoted as an important financial vehicle to address household poverty in order to bring positive societal development. In this study we investigate the impact of CT policy on children education and health outcomes focusing in both the primary and secondary phase of education. We also examine the spill-over effect of CT policy to parent's employment.

Methods

To identify the effects of this policy we focus on South Africa and exploit the changes in age eligibility requirements of the CT policy to build a control and treatment group based on birth cohort. We use data from the Statistics South Africa General Household Survey (GHS), and Labour Force Survey (LFS) covering 1998 to 2014 . A two stage least square model was then applied to quantify the impact of CT policy to education, health and employment outcomes across the two groups.

Our results show that CT policy improves reading and writing abilities at both the primary and secondary education levels but it only fosters school attendance at secondary level. We also discovered that CT policy improves health outcomes by reducing illness especially in the secondary phase of schooling. We also provide evidence that the effects of this policy are larger for boys. Importantly, the positive effects of CT programs also foster spill-over effects to other members of the family as we document increases in both mothers and fathers employment outcomes.

Conclusions

In light of these positive outcomes, there is evidence that continuity of CT policy enforces resilient development of South African population in several dimensions that go beyond health and educational achievement of the targeted children. Health systems of other developing countries and indeed the universal health coverage goal can benefit from the implementation of this policy considering its multiplier effect, intersecting health, education and employment outcomes.

8:30 AM –10:00 AM MONDAY [Economic Evaluation Of Health And Care Interventions]

Universität Basel | Kollegienhaus – Hörsaal 117

Extending the Methods of 'Traditional' Economic Evaluation

SESSION CHAIR: **Anne Spencer**, University of Exeter

Including Future Unrelated Medical Costs in Economic Evaluations for England & Wales

PRESENTER: **Meg Perry-Duxbury**, Erasmus School of Health Policy & Management, Erasmus University Rotterdam
AUTHORS: Martine Hoogendoorn, Miqdad Asaria, James Lomas, Pieter van Baal

NICE guidelines specify that future unrelated medical costs in life-years gained should be excluded from economic evaluation, while unrelated health benefits of unrelated medical care should be included. This asymmetric treatment of costs and benefits implicitly favors life extending interventions, particularly those targeted to populations with a higher prevalence of multi-morbidity. The aims of this paper are to illustrate how this would change the relative weight given to different types of interventions, and to demonstrate that there is a practical solution to the inclusion of future unrelated medical costs.

We combined various data sources to construct estimates of per capita NHS spending by age, gender and proximity to death and developed a framework for adjusting these estimates for costs of disease. Using cause-deleted life tables we illustrate how the resulting estimates of unrelated NHS spending can be combined with previously calculated disease related cost estimates and update several case studies with these unrelated medical costs. One such case study is the chemotherapy drug Osimertinib, a drug for patients with non-small cell lung cancer, which was recommended by NICE in 2016.

Our results show that by including future unrelated medical costs the ICER increases by £4,230 (10%), from £41,705 to £46,110. Because we do not adjust for related diseases this is somewhat of an overestimate. It is clearly feasible that an ICER for a life-extending intervention on the cusp of the threshold, may lie above the threshold once future unrelated medical costs are included. Therefore, if future unrelated medical costs are not included in economic evaluation, many interventions will be displacing more health than accounted for in the ICER, and some may be incorrectly using the fact that an ICER lies just below the threshold as an argument for reimbursement.

Distributional Consequences of Including Survivor Costs in Economic Evaluations

PRESENTER: **Klas Kellerborg**, Erasmus School of Health Policy & Management, Erasmus University Rotterdam

AUTHORS: Dr. Bram Wouterse, Matthijs M. Versteegh, Pieter van Baal

Medical interventions that increase life expectancy of patients result in additional consumption of non-medical goods and services in 'added life-years'. There has been some debate whether these survivor costs should be included in cost-effectiveness analysis conducted from a societal perspective. This paper adds to the existing literature on future non-medical consumption costs by focusing on the estimation of these costs and the socio-economic distributional consequences of including them in economic evaluations. Data from Dutch household spending surveys spanning the years 1978-2004 were used to estimate non-medical consumption per capita by age, educational attainment and household size. We decomposed spending into age, period and cohort effects and modeled the non-linear age and cohort patterns of consumption using P-splines. Estimates of non-medical consumption by age and education were combined with life tables to estimate what the impact of including non-medical survivor costs would be on the incremental cost-effectiveness ratio (ICER) if a death is prevented at a certain age. Results reveal survivor costs differ strongly by age and education. We found that when cohort effects are ignored the impact on the ICER is underestimated, while if the household size is not taken into account the impact is overestimated. Excluding survivor costs implicitly favors interventions targeted at the higher educated and potentially amplifies socio-economic inequalities in health.

Measurement and Valuation of Forgone Childhood Education and Leisure Time in Economic Evaluation: Methods, Challenges and the Way Forward.

PRESENTER: **Lazaros Andronis**, University of Warwick

AUTHORS: Mandy Maredza, Stavros Petrou

Economic evaluations carried out to inform the allocation of finite public funds ought to take into account all relevant costs and benefits. When such evaluations adopt a societal perspective, it is important that they include 'time-related' costs arising from productivity and leisure time losses due to receipt of care. For programmes that relate to children, similar costs arise from forgone time, though there is a distinct lack of insights into how such costs should be identified, measured and valued. With this in mind, our paper explores how forgone time—including absence from formal education and childhood leisure time—can be estimated and incorporated into economic evaluations. We look at theories and approaches to time valuation proposed in different disciplines and we discuss their suitability for use in health economics research. While there is a sizeable literature on time valuation methods in education, labour and transportation economics, much of this is not directly applicable to economic evaluation of health care interventions for children. To assist researchers and decision makers, we present an iterative framework comprising relevant considerations, including (i) the importance of including 'time-related' costs (e.g. relevance to adopted perspective, likelihood that costs may be duplicated or captured in other parts of the evaluation); (ii) the design of the data collection exercise (e.g. frequency, means of data collection) and (iii) possible approaches to valuation of forgone leisure and education time (e.g. direct elicitation, proxy valuation). We conclude by highlighting current gaps, discussing existing challenges and suggesting areas for future research.

Should We Consider Baseline Health Utility Scores When Developing Decision Models for Economic Evaluations? a Case Study of Joint Replacement.

PRESENTER: **Philip Clarke**, Health Economics Research Centre, University of Oxford and Centre for Health Policy, University of M

AUTHORS: Jose Leal, Michelle Tew

Background: Decision models of joint replacement interventions are used to inform resource allocation across jurisdictions and identify areas of further research. Generally such models focus on transitions informed by patient characteristics, clinical and surgical variables, prior co-morbidity and BMI. However, health utility from preference-based instruments, such as the EQ-5D, has also been shown to be an important predictor of outcomes and costs of joint replacement and of long-term mortality in the general population.

We examined whether measures of utility derived from EQ-5D-3L were predictors of mortality, costs and revisions in individuals with osteoarthritis undergoing planned knee replacement. The rationale was to inform a decision model evaluating the cost-effectiveness of enhanced recovery pathway in this population. Furthermore, we re-estimated the decision model excluding utility data to examine the potential impact on decision making resulting from that choice.

Data: We used patient-level data from three large linked datasets: National Joint Registry (NJR), Hospital Episode Statistics (HES) and Patient Reported Outcomes Measures (PROMS). NJR collects information on all knee replacements performed each year in both public and private hospitals in England. HES holds information on all patients admitted to public hospitals in England. PROMS collects pre-operative and 6 month quality of life questionnaires, EQ5D-3L and Oxford Knee Score, for knee replacements performed in public hospitals in England. We used data from 2008 to 2016 and identified over 500,000 knee replacements in NJR linked with HES data, of which about half had linked PROMS data.

Methods: We developed a Markov cohort model simulating progression and costs from planned surgery to death in 6-month cycles. We included the following health states: complications within the first 6 months, first and second revision following replacement, contralateral joint replacement and subsequent revision, and death. We used logistic models and parametric proportional hazards models to estimate health state transitions conditional on pre-operative EQ5D-3L utility scores after controlling for other baseline covariates: age, sex, BMI, pre-operative Oxford knee score, ASA grade, partial or total hip replacement, and Charlson co-morbidity score. Generalised linear models and two-part models were used to estimate health state costs in the year of the replacement and subsequent years. These models were also re-estimated using the same samples but excluding pre-operative EQ5D-3L utility covariates.

Results: Pre-operative EQ5D scores were significant predictors of mortality, complications within 6 months, time to contralateral knee replacement, as well as hospitalisations and respective costs. For example, the hazard ratio indicated a 3% reduction in the hazard of death after

6 months (p<0.001) for a 0.1 increase in utility. The odds ratio indicated a 5% reduction in the odds of being hospitalised after 6 months (p<0.001) for a 0.1 increase in utility.

Conclusions: Utility scores as measured by the EQ5D-3L were significant predictors of progression, mortality and costs in individuals with osteoarthritis undergoing joint replacement. Decision models informing economic evaluations could be improved by including self-reported quality of life at baseline when predicting progression, costs and Quality Adjusted Life Years (QALYs).

8:30 AM –10:00 AM MONDAY [Evaluation Of Policy, Programs And Health System Performance]

Universität Basel | Kollegienhaus – Hörsaal 118

Evaluation of Aging, Morbidity, Care Coordination and Alternative Payment Models

SESSION CHAIR: **Young Kyung Do**, Seoul National University College of Medicine

Multimorbidity and Intention of Early Retirement: The Contextual Circumstances of a Relationship - Results from the Survey of Health, Ageing and Retirement in Europe (SHARE)

PRESENTER: **Manuel Serrano Alarcon**, Escola Nacional de Saúde Pública, NOVA University of Lisbon

AUTHORS: Mr. Julian Perelman, Pedro Laires Sr., Helena Canhão

BACKGROUND: Multimorbidity (MM) is growing worldwide, and has become a healthcare and research priority. It may trigger disability, willingness to retire prematurely and, ultimately, actual early retirement, thereby generating substantial productivity losses. This study aims to describe and measure the association between MM and intention of retirement (IoR) in EU, and to estimate whether this relationship is shaped by working conditions and national labor policies.

METHODS: We used data from the Survey of Health, Ageing and Retirement in Europe (SHARE) from 2015. SHARE is a cross-national project exploring topics related to working conditions, health and well-being, and socioeconomic status among people aged 50 and older in Europe. The sample comprised all employees aged between 50 and 65 years old, i.e., before retirement age in most countries (N= 11,790). We modelled IoR (elicited from those still at work, by using the direct question: “Thinking about your present job, would you like to retire as early as you can from this job?”) as function of MM (measured by the presence of at least two main self-reported chronic conditions), adjusting for age, sex, education level, and income, by means of logit models with country fixed effects. We then included as covariates the working conditions (using the effort–reward imbalance as an indicator of stressful psychosocial work environment), and the integration policy indicator published by OECD (2010), consisting in ten sub-dimensions, which captures the intensity of each country’s measures for activation and employment integration (maximum of 50 points). These variables were interacted with MM, to test if MM had a greater effect among people with worse working conditions, and among those living in countries with less inclusive labour policies.

RESULTS: IoR was reported by more than half (62.5%) of European workers with MM, compared to 52.5% among those without MM (19% variation, $p<0.001$). The likelihood of IoR was significantly greater, by 11.3 percentage points, among people with MM (marginal effects: 11.3, 95%CI: 7.2-15.4; p<0.001). Although we found a positive association between worse working conditions and IoR (marginal effects: 18.3, 95%CI: 13.5-23.1; p<0.001), working conditions did not significantly alter the relationship between MM and IoR. Furthermore, poor integration policies (i.e. low OECD scores) did neither modify the association between MM and IoR. The MM-IoR relationship prevailed even when considering only those EU countries with stronger (OECD scores above EU average) and the strongest (upper tercile of OECD scores) disability policies (marginal effects: 12.9, 95%CI: 7.2-18.6 and 12.4, 95%CI: 7.2-17.5, respectively).

CONCLUSIONS: MM is associated with IoR in Europe. This association was not affected by working conditions, neither national labor policies. Thus, regardless of the need for better quality of work and national policies aiming for better integration of disability, MM should be targeted *per se* given its substantial role on IoR.

Predicting PROMs for Hip Replacement Surgery: Benchmarking Results Incorporating Supervised Machine Learning

PRESENTER: **Mr. Manuel Huber**, HelmholtzZentrum München

Background: Patient reported outcome measures (PROMs) can be used to control quality of care but also to support shared decision-making between patients and doctors. Current PROMs prediction models often rely on traditional methods like linear regression but may be outperformed by more advanced techniques like supervised machine learning. The aim of this study is to benchmark one machine learning-based prediction model (MLP) for hip replacement surgery against a linear model currently used by the NHS.

Methods: NHS PROMs registry data for hip replacement surgery from April 1st 2015 to March 31st 2016 were acquired for the conduct of this study. Generic (EQ-5D-3L Visual Analogue Scale: VAS) and disease-specific (Oxford Hip Score: OHS) measurements were to be predicted. VAS/OHS ranges from 0/0 (worst health) to 100/48 (best health). The advanced models are based on an extreme gradient boosting implementation in R and were trained to predict VAS as well as OHS, via 10-fold cross validation (3 repetitions). Root-mean-square error (RMSE) and mean absolute error (MAE) served as performance comparison metrics. Independent variables range from sociodemographic parameters (e.g. age groups) to comorbidities to preoperative health-related quality of life.

Results: The filtered data release for the evaluation contains 30.524 observations. 59.7% of participants are female; most participants are 70 to 79 years of age. Mean preoperative and postoperative VAS are 64.85 and 76.91, while mean preoperative and postoperative OHS are 18.47 and 39.66 respectively. 44 % of patients report improvement for VAS, 91 % for OHS. Further analysis regarding this discrepancy will be considered. The MLP model included 40 independent variables. The linear model included comparable variable types but had access to more detailed patient data. MLP outperformed the linear model (RMSE: 16.10 vs. 16.26 for VAS and 7.61 vs. 7.79 for OHS) slightly. A comparable margin is also present for the MAE (VAS: 11.89 vs. 12.25; OHS: 5.75 vs. 6.15).

Conclusion: Extreme gradient boosting delivered better predictive performance than the current PROMs prediction model used by NHS for hip replacement surgery. The performance lead was present for both outcomes and both metrics, despite incorporating a more restrictive set of variables. More detailed explanatory variables are needed to improve prediction accuracy. Regular and improved benchmarking of currently utilized PROMs prediction models may foster the implementation of shared decision-making in clinical practice.

Improving Care Coordination for Frail Elderly People: Evaluation of Personalized Health Plans in France

PRESENTER: **Anne Penneau**, Institute for Research and Information in Health Economics (IRDES)

AUTHORS: Zeynep Or, Damien Bricard

Context: The communication and collaboration of health and social care providers is a major factor for improving care delivery and outcomes for elder people with complex needs. As part of experimentations aimed at improving care coordination for frail elderly people (75 years and older) a new integrated consultation tool, named «personalized health plans (PHP) » has been introduced in France in 2014. The PHP targets frail elderly people in difficult social situation (isolation, poverty, etc.) and aims to improve coordination of different health and social care actors to reduce dependency, avoidable hospitalizations and polypharmacy.

Objective: We aim to evaluate the impact of PHP on healthcare utilization and outcomes.

Methods. The impact evaluation has several methodological challenges since we need to identify a control group whose characteristics are similar to those targeted by PHP (and who have not benefited from it) with limited information to characterize health and social status available in the administrative data. We developed two empirical strategies. First, we used past trends in care utilization and expenditure to define health profiles and control populations. This allowed us to estimate in difference-in-difference (DID) the impact of PHP on health utilization and quality outcomes. But this strategy does not overcome entirely the selection bias due to unobserved individual social situations. Therefore, secondly, we used the heterogeneity in the diffusion of this tool across professionals in different regions over time to estimate the impact of PHP on intention to treat. Results: The results suggest that PHP allowed to identify older individuals with complex care needs. It had a significant impact on increasing nursing care expenditures at home and a small impact in reducing pharmaceutical consumption. But PHP did not have any impact on any of the quality indicators measured by ambulatory sensitive hospitalisation, polymedication or emergency visits.

Conclusion: These preliminary results do not support the PHP as an effective tool for reducing hospital use or total health expenditure. Supporting multidisciplinary teams in developing and monitoring PHP can improve its effectiveness.

Health Care Spending and Quality 8 Years into Global Payment

PRESENTER: **Michael Chernew**, Harvard Medical School / Dept of Health Care Policy

Background

Global payment models give providers a prospectively determined spending target or budget for the care of a defined population. Providers, often as accountable care organizations (ACOs), can earn shared savings and, in some models, assume shared risk. Bonuses are awarded for quality to mitigate potential incentives to underuse care. To date, long-run evidence on spending and quality under global payment is lacking. We evaluated 8 years of the Blue Cross Blue Shield of Massachusetts Alternative Quality Contract (AQC), a global payment model with two-sided risk.

Methods

Using 2006-2016 data, spending among enrollees whose physician organizations entered the AQC starting in 2009 was compared to that among privately-insured individuals in similar plans across control states (the 8 other New England states) through an intention-to-treat framework. We compared spending and utilization in the AQC to control using a difference-in-differences approach within an ordinary least squares regression model at the individual-year level. We decomposed changes in spending by site and type of care and by price versus utilization. We compared process and outcome quality to 2007-2016 New England and national averages. We evaluated whether savings on claims were larger or smaller than incentive payouts to providers. We examined changes in risk scores to look for potential changes in coding intensity, and we tested for differences in pre-intervention spending trends. Sensitivity analyses were performed.

Results

After 8 years, average annual medical spending on claims in the 2009 AQC cohort increased by $500 per enrollee less than control ($p<0.001$), a 12.7% savings on claims. While medical claims savings were driven by lower prices in the first 3 years, after 8 years 56.5% of these savings were explained by lower utilization. We found no evidence of increased coding intensity. Process and outcome quality improved on most measures (such as diabetes care, cholesterol screening, and blood pressure and hemoglobin A1c control) relative to New England and national averages. Enrollees of organizations that entered the AQC in 2010, 2011, and 2012 had medical claims savings of 13.9% ($p<0.001$), 8.7%

(p<0.001), and 3.8% (p=0.01) relative to control, respectively, by 2016. Pre-intervention trends in spending were not significantly different from control for all cohorts. Incentive payouts to providers, including shared savings and quality bonuses, exceeded medical claims savings in the first 3 years, but were exceeded by such savings in the last 5 years, producing net savings.

Conclusions

Medical spending on claims in the AQC grew slower relative to control over 8 years. In the early years, these relative savings on claims were largely achieved through referring patients to lower-priced providers or settings. In later years, it was increasingly achieved through lower utilization, including in imaging, laboratory tests, physician visits, and emergency department visits. While initial years produced reductions in claims spending without net savings, net savings emerged in later years, despite significant shared savings and quality bonuses paid to provider organizations. As ACO models mature, these findings suggest that a two-sided contract with meaningful quality incentives may offer a framework for sustained savings with improved quality for patients.

8:30 AM –10:00 AM MONDAY [Supply Of Health Services]

Universität Basel | Kollegienhaus – Hörsaal 119

Organized Session: Financial Incentives in Health: Recent Results from Impact Evaluation Studies of Performance-Based Financing Schemes in the Kyrgyz Republic, Nigeria and Tajikistan

SESSION CHAIR: **Adam Wagstaff**, Development Research Group, The World Bank

Improving Maternal and Neonatal Health in Nigeria: Performance-Based Financing Versus Decentralized Facility Financing

PRESENTER: **Eeshani Kandpal**, The World Bank

AUTHORS: Madhulika Khanna, Benjamin Loevinsohn, Elina Pradhan, Christel Vermeersch, Gyorgy Fristche, Opeyemi Fadeyibi, Kevin McGee, Emmanuel Meribole, Prof. Wu Zeng

Background: The Government of Nigeria and the World Bank tested performance-based financing (PBF) and decentralized facility financing (DFF) to improve maternal and neonatal health. PBF provides funding directly to health facilities based on the quantity and quality of services they deliver. Facilities have autonomy in how they use the funds. Up to half the funds can be used to pay performance bonuses to staff. Supervision was substantially strengthened. DFF was identical to PBF except that facility earnings were not based on the quantity or quality of services, there were no performance bonuses, and the amount received was, by design, half the amount earned by PBF facilities. This paper reports an impact evaluation (IE) of the PBF-DFF pilot.

Methods: A three-armed trial with experimental and quasi-experimental components was used to assess the effectiveness of PBF, DFF, and a control arm ("business as usual") to improve the quantity of key maternal and child health (MCH) services delivered and the quality of care (QOC) provided in public facilities. All the local government areas (LGAs) in three states were randomly allocated to either PBF or DFF, yielding a truly randomized comparison of PBF-DFF. Control states and LGAs were chosen by matching population demographic characteristics to those in the treatment states, generating a "difference-in-difference" comparison of the NSHIP arms to the control. Baseline health facility and household surveys were conducted in 2014 and at endline in 2017.

Findings: Both PBF and DFF had a practically and statistically significant impact on the quantity of key MCH services. Of the 8 quantity indicators identified in the IE concept note, 7 showed positive adjusted differences in difference and 3 were statistically significant. For example, NSHIP increased fully immunized child (FIC) coverage by 14 percentage points (pp) and modern contraceptive prevalence by 4.5 pp. PBF and DFF also had a sizeable and consistent effect on QOC. Of the 26 indicators of quality identified in the IE concept note before data was collected, 20 (77%) showed statistically significant estimates of program impact. However, there was little difference between the PBF and DFF arms in terms of QOC and only modest differences in the coverage of key services. Specifically, PBF led to an 11 pp increase in skilled birth attendance; but DFF outperformed PBF on Penta3 coverage and insecticide-treated net usage by children younger-than-5. Other key outcomes (curative care for children younger-than-5, modern contraceptive prevalence, and antenatal care utilization) were not significantly different between PBF and DFF. The largest gains under NSHIP occurred in the upper income quintiles.

Interpretation: Both PBF and DFF had important effects on the coverage and quality of MCH services while the control arm, like the rest of Nigeria, made only modest progress. The improvements were accomplished at a cost that is affordable. Both interventions are cost-effective and were likely successful due to decentralization of funds, autonomy given to the facilities, improved supervision, and investments in health systems management.

Impact Evaluation of the Tajikistan Performance-Based Financing Pilot

PRESENTER: **Gil Shapira**

AUTHORS: Tashrik Ahmed, Damien de Walque

Since 2015, a performance-based financing pilot project has been implemented in rural areas of two provinces in Tajikistan to improve quality and coverage of maternal and child health and noncommunicable disease services. Primary health facilities receive financial incentives

conditional on the number of provided targeted services and a quality checklist score. This paper presents the results of an analysis employing a difference-in-differences approach to identify impacts of the pilot. Rich facility- and household-level data were collected in 216 catchment areas in 16 districts before the launch of the program and after three years of implementation. The program had a positive impact on a range of quality indicators such as availability of essential drugs and equipment, adherence to patient safety procedures and proper calculation of cardiovascular risk among patients above 40. Health providers, whose income increased by about 40 percent as a result of the program, report higher job satisfaction. At the household level, we do not find significant impact on health seeking behaviors although the program improved perceptions towards the health facilities.

Improving Health Care Quality of Care through Financial Incentives or Supportive Feedback? Results from a Randomized Evaluation Among Maternity Hospitals in Kyrgyzstan

PRESENTER: **Jed Friedman**, World Bank

AUTHORS: Eeshani Kandpal, Ha Nguyen, Arsen Askerov, Gyorgy Fristche, Memeryan Shimarova, Klara Oskombaeva

Background

Designed in response to slow progress in health outcomes despite near-universal coverage, the Government of the Kyrgyz Republic tested both performance-based financing (PBF) and enhanced supervision (ES) approaches to improve the quality of key maternal and child health (MCH) services. Supervision of quality of care practices with supportive feedback, and facility autonomy over funds, were substantially strengthened in both the PBF and ES arm. However, only the PBF arm received additional funding based on quality of care improvements.

Methods

A randomized three-armed trial was used to assess the relative effectiveness of PBF, ES, and a control arm ("business as usual") in terms of the quality of maternal health services delivered in specialized maternity hospitals. All 63 maternity hospitals in the country were randomly assigned to either PBF, supportive supervision, or business as usual in a public ceremony. Health facility surveys were conducted at baseline in 2014 and at endline in 2017, covering direct observation of labor and delivery services, tests of health worker skill via patient simulations, and other quality measures. In addition, comprehensive data on all births from the national Newborn Birth Registry is used to explore impacts on birth outcomes and delivery-related complications.

Findings

The PBF arm significantly improved the structural quality of facilities as measured by hygiene, drug availability and quality, and blood availability. In terms of process quality, assessed clinical skill for the management of post-partum hemorrhage and newborn resuscitation using patient simulations increased in both the PBF and ES arms. Both arms also showed significant improvements in partograph use during active labor and delivery, and in the orderliness of the delivery room. Regarding health outcomes, both PBF and ES reveal improvement in the first minute APGAR score of the infant while the PBF arm also witnesses a significant reduction in the volume of blood loss by the mother during delivery and, correspondingly, a significant reduction in the incidence of maternal hemorrhage.

Interpretation

Applying the PBF framework to an exclusive focus on the quality of care at maternity hospitals results in improved quality of care in various dimensions – structural quality, clinical quality, and patient health outcomes. ES also results in significant gains in various aspects of care. Depending on how the observed quality gains are aggregated, PBF likely produces greater overall improvements in the quality of maternal health care than ES, albeit at a higher cost.

8:30 AM –10:00 AM MONDAY [Supply Of Health Services]

Universität Basel | Kollegienhaus – Hörsaal 120

Organized Session: Analysing the Dynamics of the Labour Market for Health Workers: Linking Policy to Evidence

SESSION CHAIR: **Pascal Zurn**, World Health Organization

PANELISTS: **Kara Hanson**, London School of Hygiene and Tropical Medicine; **Krishna Rao**, Johns Hopkins Bloomberg School of Public Health; **Salif Samake**, Independent consultant

8:30 AM –10:00 AM MONDAY [Specific Populations]

Universität Basel | Kollegienhaus – Seminarraum 208

Health Service Use and Global Health

SESSION CHAIR: **Logan Brenzel**, Bill & Melinda Gates Foundation

Association between Health Insurance and Return to Work: An International Comparative Analysis across Three Countries

PRESENTER: **Abdulgafoor M. Bachani**, Johns Hopkins Bloomberg School of Public Health

AUTHORS: Rantimi Adetunji, Niloufer Taber, Cuong Pham, Muhammad Fadhli Mohd Yusoff

BackgroundHealth insurance is an important social protection mechanism to insure vulnerable populations against health shocks. This study aims to examine the association between health insurance and return to work after an injury that required hospitalization. The hazard ratio for return to work was examined and compared across Kenya, Malaysia and Vietnam.

MethodsWe conducted a prospective cohort study of 759, 730, and 904 moderate to severely injured patients at public hospitals in Kenya, Malaysia and Vietnam respectively. We administered a baseline and four follow-up surveys (1, 2, 4, and 12 months after discharge). Kaplan-Meier estimates of the proportion who returned to work were computed. A Cox proportional hazards model was used to examine the contribution of health insurance; social welfare programs; self-assessed disability factors; and patient socioeconomic, demographic, and injury characteristics on time to return to work, with all but health insurance considered a time-varying covariate.

ResultsOf those fully or partially employed prior to their injury, 56% were again employed by the end of follow-up. 53%, 1.5% and 67% of this population lacked any form of insurance, while 42.5%, 86%, and 31.5% only had government subsidized insurance in Kenya, Malaysia, and Vietnam respectively. Cumulative proportions of return to work at 1, 2, 4, and 12 months/end of follow-up post-injury were 1.6%, 8%, 19%, and 41% in Kenya, 4%, 9.9%, 30%, and 44% in Malaysia, and 27.5%, 47.6%, 65.9%, and 73.8% in Vietnam. Insurance and obtaining government or charitable assistance was not associated with return to work post-injury, after accounting for injury mechanism and severity; medical interventions and ongoing rehabilitation; demographic factors; and economic factors. Factors that were associated with higher rates of return to work included lower time-varying self-rated disability (HR=0.910, $p<0.001$), lower baseline injury severity (HR=0.973, $p=0.001$), higher child dependency ratio (HR=1.136, $p=0.007$), baseline income as a higher percent of total baseline household income (HR=1.531, $p=0.002$), female gender (HR=1.166, $p=0.050$), and being self-employed, (compared to farmers: HR=1.239, $p=0.031$; compared to private employees: HR=1.460, $p<0.001$). Controlling for all other variables in the model, citizens of Vietnam had 2.957 times the hazard of returning to work as compared to citizens of Malaysia and 10 times compared to citizens of Kenya ($p<0.001$ for both).

Conclusions Return towork was significantly associated with factors indicating patient responsibility for the household, including child dependency ratio, importance of the patient's work in the household resources, and being a working female member of the household. Being self-employed as compared to being a farmer or a private employee was also associated with earlier return to work, possibly due to inability to engage in labor substitution. Finally, injury severity and disability were associated with later return to work, indicating that these patients were medically constrained from work. These various factors indicate that the most important factors in determining time to return to work are economic need and medical constraints, rather than support from insurance, rehabilitation, or social welfare programs.

Horizontal Inequity in Child Health Care Services in India: A Cross Sectional Study Using the Demographic Health Survey

PRESENTER: **Ms. Tulasi Malini Maharatha**, Indian Institute of Technology, Chennai

AUTHOR: Umakant Dash

Background-

Children are vital to the nation's present and its future. There has been a great deal of progress in reducing childhood death and diseases. But the countries should not be blinded by these facts, because several indicators of children's health point to the need for further improvement. Child health target for SDGs shout to reduce the preventable death of neonatal mortality to at least as low as 12 per 1000 live births and children under-5 mortality to at least as low as 25 per 1000 live births by 2030. One of the major impediment towards the attainment of Sustainable Development Goals is the prevalence of inequitable utilization of child health care services, this issue is more prominent in the low and middle income countries. This could be mainly due to inadequate policy initiatives. Therefore, analysis of child health indicators aids identification of hotspots where policy lags behind to improve the equitable access for utilization of child health services.

Objective-

The present study will approach the issue of equity in child health care by estimating and explaining deviations from horizontal equity in India. Further, the study attempts to determine the contribution of need-based and socioeconomic determinants of the utilization of child health care services.

Data and Methodology-

The study employed the recent Demographic Health Survey (DHS) 2015-16 of India (n = 206,292). Probit model is being used because our response variable (treatment seeking for child) is qualitative in nature. The model was applied to estimate need-predicted child health care utilization. Furthermore, need-standardized health care utilization is assessed through indirect standardization method. Concentration index is measured to reflect income-related inequity of health care utilization. The horizontal inequity was calculated using the gamut of variables, they can be categorized as (i) the individual socioeconomic status, (ii) the health care needs, (iii) non-need factors as well as (iv) health care utilization of child. Finally, decomposition analysis of the concentration index for need-standardized health care utilization was applied to assess the relative contribution of socioeconomic factors of child health inequities.

Results-

Indirect standardization of the utilization of child health care services reveals a pro-rich distribution with a concentration index of 0.082, while the unstandardized concentration index was noted as 0.08. This shows that the contribution of need based factors towards child health inequity is less (-0.002) compared to non-need based factors (-0.48). Additionally, decomposition analysis reveals that the prevalence of health inequity is significantly determined by wealth status, mother's education, Integrated Child Development Services (ICDS) and place of residence. Through the findings of this study, it is recommended that, there is a greater need of prioritization of policy and subsequent increase in public investments towards child health.

Do Maternity Providers Do What They Know?: Know-Do Gaps in the Quality of Maternal and Newborn Care in Rural Uganda

PRESENTER: **Dr. Slawa Rokicki**

AUTHOR: Jessica Cohen

Every year 2.5 million women and newborns die during or shortly after childbirth and 3-6 times this suffer a severe morbidity event. While rates of facility-based delivery have increased substantially in the past decade, quality of care in facilities remains low, resulting in millions of women receiving services that are delayed, inadequate, or harmful.

Little concrete evidence exists on the primary drivers of low-quality maternity care in low-income countries. Two key dimensions include provider competency and effort. In this study, we assess the gap between what providers "know" (based on clinical vignette tests) and what they "do" (based on direct observations of care provided). We also explore the extent of variation in quality of care within and across facilities, and within and across providers.

Data were collected for 415 deliveries, conducted by 107 providers in 38 maternity facilities in rural Uganda. Measures of knowledge and quality were based on a 20-item index of essential care that has been developed for and evaluated in low- and middle-income settings, capturing key dimensions of the process quality of intrapartum and immediate postpartum care, including initial patient examination, patient monitoring, and delivery, newborn, and postpartum care. We used three sources of data: (1) direct observation of care by providers, (2) interviews with providers, and (3) facility assessments. We used multilevel random effects models with varying intercepts for providers and facilities to assess the influence of observation-, provider-, and facility-level characteristics on the know-do gap. We also computed variance partition coefficients (VPCs) to assess the proportion of variance that lies at each level of the model hierarchy.

The mean quality level across providers was 43%, meaning that the average provider performed fewer than half of the essential process quality items. The average gap between what a provider knows to do and what she actually did was 25%, with largest know-do gaps for actions related to infection control and patient monitoring (e.g. checking vital signs). Observed quality of care did not increase with knowledge and, therefore, know-do gaps were 31% larger for providers in the top knowledge quartile vs. the bottom ($p<0.001$). In the multilevel model, know-do gaps were 7% greater for providers' with high levels of training relative to those with low levels ($p=0.07$). Facility infrastructure reduced know-do gaps, as providers working at facilities with the best availability of clinical supplies had 8% lower know-do gaps than those working at facilities with the worst availability ($p=0.06$). VPCs showed that the majority of the variance in know-do gaps was due to factors across providers within a facility. However, almost a third of variance was attributed to factors across patients within a provider.

Overall, we find substantial gaps between what maternity providers in rural Uganda know and what they do in providing obstetric and newborn care. Our results reinforce the growing awareness that improvements in maternal care quality in low-income countries such as Uganda are unlikely to be successful if they are built on traditional approaches of training and infrastructure upgrading alone.

Health Service Utilisation and Direct Healthcare Costs Associated with Obesity in Older Adult Population in Ghana

PRESENTER: **Ms. Stella T Lartey**, Menzies Institute for Medical Research, University of Tasmania

AUTHORS: Barbara de Graaff, Costan G Magnussen, Godfred O Boateng, Moses K. S Aikins, Nadia Minicuci, Paul Kowal, Lei Si, Andrew J Palmer

Background: In many developing countries, most older adults (50+ years) die from noncommunicable diseases (NCDs) rather than infectious or parasitic diseases. Obesity, a major risk factor for NCDs in older adult populations, siphons considerable amount of resources from the health system due to associated increased medical and treatment costs. We examined the association between annualized health services utilization as well as direct healthcare costs, and excess body weight (overweight: body mass index, BMI $\geq$25.00 and < 30.00 kg/m^2, and obesity as BMI $\geq$30.00 kg/m^2) among older adults in Ghana.

Methods: We used data from a nationally representative, multistage sample of 3350 people aged 50+ years from WHO Study on Global AGEing and adult health (2014/15). Health service utilisation was measured by the number of health facility visits over a 12-month period. Direct costs (2017 US dollars) included out-of-pocket payments and the National Health Insurance Scheme (NHIS) claims. Associations between utilisation and BMI were examined using survey multivariable zero-inflated negative binomial model; and between costs and BMI using survey multivariable two-part regression models.

Results: Twenty-three percent of the sample were overweight and 13% were obese. In comparison to normal weight participants, multivariable analysis revealed that overweight and obesity were associated with 75% and 159% more inpatient admissions, respectively. Obesity was also associated with 53% additional outpatient visits. These utilization rates translated into costs of which the NHIS bore approximately 60% of the average total costs per person expended in 2014/15.Overweight and obese groups had significantly higher total direct healthcare costs burden of $121 million compared with $64 million for normal weight in the entire older adult Ghanaian population. Multivariable analysis showed that compared with normal weight, the total costs per person associated with overweight increased by 73% and more than doubled for obesity. The costs associated with overweight and obesity groups were all statistically significantly different from normal weight.

Conclusion: Excess body weight was associated with higher annual health service utilization and direct healthcare costs in the older adult population of Ghana. Even though the total prevalence of overweight and obesity was about half of that of normal weight, the sum of their cost burden was almost doubled. Properly implemented weight reduction measures could lead to reductions in health service utilization and direct healthcare costs in the older adult population.

Keywords: Obesity, older adults, health service utilization, direct healthcare cost, WHO-SAGE Wave 2, Ghana

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8:30 AM –10:00 AM MONDAY [Specific Populations]

Universität Basel | Kollegienhaus – Seminarraum 209

Economic Analysis in Mental Health

SESSION CHAIR: **Jill Furzer**, University of Toronto

Mental Health over the Life Course: Evidence for a U-Shape?

PRESENTER: **Ms. Hermine Hiltje Dijk**, University of Groningen

AUTHOR: Jochen Mierau

In recent years a large number of studies have investigated how well-being and mental health are affected by age, and a large number of studies have found evidence for a U-shaped relation between the two (e.g., Blanchflower & Oswald, 2008; Lang et al., 2011; Cheng et al., 2017). According to these studies individuals experience a midlife low, or `midlife nadir', in mental health and well-being. However, these results have often been called into question (e.g., Yang, 2008; Glenn, 2009; Frijters & Beatton, 2012; Bell, 2014), mainly because of the methodological impossibility of truly separating age effects from period and cohort effects. As a result, knowledge of life-course trajectories of mental health and well-being have remained at an impasse. Consequently, this study aims to identify the age-profile of mental health while introducing only minimal bias to reach identification.

A number of approaches has been suggested to tackle the age-period-cohort problem, all with different assumptions. Unfortunately, these different approaches often lead to conflicting results. For example, studies assuming cohort effects are negligible consistently report U-shapes in mental health, life satisfaction or well-being (e.g., Lang et al., 2011; Le Bon & Le Bon, 2014; Blanchflower & Oswald, 2016; Laaksonen, 2018), whereas studies assuming that period effects are negligible consistently report no U-shapes (e.g., Frijters & Beatton, 2012; Kassenboehmer & Haisken-DeNew, 2012; Fitzroy et al., 2014).

An alternative approach proposed by De Ree and Alessie (2011) and Van Landeghem (2012) stands out because of its lack of need for arbitrary assumptions. By focusing on the first differences of life-satisfaction, or well-being, these studies can identify age effects up to a linear trend.

Using mental health data from the US Panel Study of Income Dynamics (PSID) we apply this first difference estimation to derive an unbiased estimate of the second derivative of the age effect as well as an estimate up to a linear period trend of the first derivative. Next, we use a battery of estimators using only minimal assumptions by varying cohort restrictions to approximate the first derivative.

We find conclusive evidence that the age profile of mental health in the US is not U-shaped and tentative evidence that the age-profile follows an inverse U-shape where individuals experience a mental health high between ages 45-75. Further analyses confirm that the U-shape is not only absent in the US, but also in Germany and the Netherlands.

This finding is not in line with the literature, which frequently reports a U-shape in mental health (Blanchflower & Oswald, 2008, 2016; Lang et al., 2011). This difference in results might arise because the current study differs from previous studies in its use of control variables, using direct data on mental health instead of relying on mental healthcare use data, and using statistical methods that rely less on arbitrary assumptions.

The findings in this study are highly societally relevant as they indicate which age groups might be at risk for mental health problems. Future research should investigate what the determinants of the age pattern of mental health are.

Effects of Household Member Mortality on Mental Health: Evidence from South Africa

PRESENTER: **Dr. Ellen Moscoe**, University of Pennsylvania

AUTHOR: Harsha Thirumurthy

Background: The burden of disease associated with mental disorders in low- and middle-income countries has received heightened attention in the past decade, but there is limited evidence on factors shaping mental health outcomes in these countries. Moreover, despite the high mortality rates in sub-Saharan Africa, little is known about the effect of household member mortality on mental health outcomes of those who survive. We use longitudinal data from South Africa to study trends in mental health and assess the effects of household member mortality on depression scores of surviving household members.

Data and Methods: We use five waves of longitudinal data collected between 2008-2016 as part of the National Income Dynamics Study to assess the effect of household-level mortality events on the presence of depressive symptoms, as measured by the 10-item Center for Epidemiologic Studies Depression (CES-D) scale. We examine how CES-D scores, and proportion with scores >10, the cutoff for depression, of individuals aged ≥15 years are affected in the period after the death of a household, controlling for time trends and a range of socio-demographic characteristics. We also examine whether depression scores are affected prior to mortality events, particularly since AIDS-associated mortality was common during the study period, and assess whether the receipt of social protection programs are protective for mental health. We use individual-level fixed effects models that compare within-person changes over the five survey waves.

Results: From 2008 to 2016, the proportion of adults in South Africa meeting the threshold for depression fell substantially from 27% to 17%. Individuals in households that experienced a death in the past 6 months and 7-12 months had CES-D scores that were 0.60 ($p<0.01$) and 0.49 ($p<0.01$) higher (worse) than individuals in households with no deaths in the past 24 months, whose mean CES-D score was 5.78. The effect of recent deaths (in past 0-6m) is robust to the inclusion of individual fixed effects. The increase in CES-D score is equivalent to a 4 percentage point increase in scores above the cutoff for depression, a relative increase of 14%. Among those who experience a household death, receiving financial support through a social protection program (such as the child grant or old age pension) reduces the negative effects on depressive symptoms. The results also provide suggestive evidence that mental health outcomes of individuals deteriorate during the 24 month period prior to the death of a household member.

Conclusions: This study is among the first to examine the relationship between the death of household members and mental health of surviving household members in a setting with high rates of adult mortality due to HIV/AIDS and other factors including interpersonal violence and road traffic accidents. Our findings show a strong association between mortality events in a household and worse mental health outcomes among surviving household members but also indicate a large secular decline in the prevalence of depressive symptoms since 2008 that warrants further investigation.

Kill Two Issues with One Stone -Simple Methodology for Dealing with Sample Selection and Endogenous Regressor (The Case of Mental Health and Labor Productivity)-

PRESENTER: **Mr. Shuhei Kaneko**

AUTHOR: Dr. Haruko Noguchi

- Background and Objective

Numerous studies have been investigating the relation between subjective health and labor productivity. However, few studies have tackled squarely the endogeneity issue caused by omitted variable and selection bias. We propose a methodology to adjust abovementioned two sources of endogeneity for examining the role of health in labor market and its gender difference among the working age population in Japan.

- Data

We use the data of the Comprehensive Survey of Living Conditions (CSLC), which is a nation-wide repeated cross-sectional survey conducted by Ministry of Health, Labour and Welfare. The CSLC has been conducted once every three years since 1986, and consists of four questionnaires for basic questions about household members, health status, income/saving, and long-term care (LTC) utilization. All sampled individuals are required to answer questions about household and health status. However, regarding questionnaires for income/saving and LTC, approximately 10% respondents are randomly chosen from the entire sample. We utilize the latest three waves of CSLC from 2010 to 2016, because some variables necessary to this study such as educational attainments are missing before 2007. Since this study focus on working population, we extract people aged from 20 to 65 years old from the data.

- Method

We apply two-stage estimation strategy such that the probability of job participation are estimated at the first stage and Mincer-type wage are assessed at the second stage. And, mental health status is included in each equation as endogenous regressor. In the first stage, we apply Heckman's selection model with instrumental variables (IVs) probit. Next, we compute the inverse mills ratio for each individual and put it into second stage estimated by 2 stages least squares. We employ common symptoms of cold (general malaise, headache, and cough) as IVs. These

symptoms can strongly correlate with the self-rated health status, but, these symptoms can randomly occur to individuals after controlling for an opulent number of characteristics. The results of Sargan and F tests imply the validity of these IVs.

- Result and Discussion

We find that an increase in Kessler 6 (K6) score would negatively affect the probability of labor force participation and wage for both male and female. The size of effect tend to be slightly larger in the first stage for females, while it seems to be larger in the second stage for males. For example, six-point deterioration in K6 score might decrease the probability of labor participation by 4.8% and 4.6% for female and male, respectively, and also it tend to decrease wage by 3.6% and 4.2% each for female and male workers. The result is robust when we shrink the sample to 25-60 years old population or when we drop the outlier sample (below 1 percentiles and above 99 percentiles in wage distribution). Most previous literature in Japan could not find statistically significant effects of health on labor outcome for female workers. However, significant effects of health for both genders observed in our results would reveal the importance of adjusting multiple sources of endogeneity to avoid either underestimation or overestimation.

ICD10 Vs. CES-D: The Development of Diagnoses and Indicators of Depression in Germany 2006-2014

PRESENTER: **Andre Clement**, Witten/Herdecke University

Background: Back pain (M54), "colds" (J06) and, depression (F32/F33) are the three most common individual (ICD-) diagnoses in Germany. According to recent estimates, these three diagnoses alone account for about one-fifth of all sick days. Depression is particularly important as part of Mental, Behavioral and Neurodevelopmental disorders (F00-F99). Statistics show, that, the number of cases of incapacity to work (IW) and the duration of IW caused by these diagnoses has more than doubled between 2006 and 2014. An unresolved issue in health care research is whether depressive illnesses have actually increased or if other reasons might have caused the increased number of diagnoses.

Methods: To answer this question, we examine data from the European Social Survey 2006 (ESS3) and 2014 (ESS7) together with German health insurance data on IW. In the two ESS rounds data on general life satisfaction (LS) with one's own life (on a scale of 1 to 10) and on the respondents' mental health were collected. Using the CES-D scale, depression symptoms and their frequency were classified with a total number of points between 0 and 24. We compare the respective values for both sexes over time and determine the strength of the differences applying Cohen's d. For the health insurance data, we use the IW cases and IW days per 100 member years of the corresponding years.

Results: The increasing number of IW cases and IW days is neither reflected in the development of the LS nor the CESD scores. In fact, we observe a contrary development for both values: The general LS had a small positive effect (d=0.31), increasing by 0.6 points overall. For women, this difference is relatively smaller (0.4 points, d=0.27), for men relatively stronger (0.6 points, d=0.36). Also, the CESD scale shows a positive development: men show a small effect (d=0.24). The average value decreased by 0.7 points. Although the median of the female panelists dropped from 6 to 5, the effect is still negligibly small for them (d=0.12). As a result, the average CES-D score declines by 0.6, which is only a negligible effect (d=0.18). The median also remains constant at a value of 5.

Conclusion: Despite increasing life satisfaction and decreasing depression symptoms, significantly more Mental, Behavioral and Neurodevelopmental disorders are diagnosed in Germany. Therefore, this substantial increase cannot be explained by the available prevalence data. However, there might be a higher sensitivity to mental disorders in the conversations between doctors and persons affected. Whether the patients are more open-minded towards mental disorders or doctors diagnose more specifically in this direction must be shown by further research.

8:30 AM –10:00 AM MONDAY [New Developments In Methodology]

Universität Basel | Kollegienhaus – Seminarraum 212

Organized Session: Developing Cost Data Repositories: Lessons Learned from HIV/TB, Immunization, Malaria, and Social and Behavior Change.

SESSION CHAIR: **Anna Vassall**, London School of Hygiene & Tropical Medicine

Developing a Web-Based Repository for HIV and TB Costs: Methodology and Lessons Learned.

PRESENTER: **Dr. Lori Bollinger**

AUTHORS: Dr. Willyanne DeCormier Plosky, Lauren Carroll, Drew Cameron, Gabriela B Gomez, Dr. James G Kahn, Dr. Carol Levin, Elliot Marseille, Mohamed Mustafa Diab, Mariana Siapka, Lily Alexander

Easily accessible and reliable cost data are critical to improving resource allocation and planning for HIV and TB in low- and middle-income countries. There is a widespread uncertainty regarding costs for HIV/TB prevention and treatment services, due to variation in intervention content and implementation, as well as costing methods; geographic and programmatic gaps; and data inaccessibility. The Global Health Cost Consortium (GHCC) was established to improve the quality, quantity, usability and accessibility of data on the cost of delivering services for HIV and TB. Two products are now available: the Reference Case for Estimating the Costs of Global Health Services and Interventions, and the Unit Cost Study Repository (UCSR).

The UCSR was designed to be an easily-accessible resource for users to obtain consistently-defined cost data displayed by key characteristics: region, country, type of intervention, etc. There were several steps in its development: defining consistent typologies of interventions for both HIV and TB; ensuring consistency with the principles of the newly-minted Reference Case; performing a systematic review of published and grey literature, along with other supplemental searches; extracting the data, which included designing an extraction form, performing quality assurance, and wrestling with complex issues such as whether to first inflate or convert the currency; developing a quality rating; and then designing the actual web-based repository. We focus here on this final step, designing the repository, although lessons can be drawn from all stages of this process.

Designing the web-based repository involved answering several key questions: Who are the primary target audiences? What types of data will be displayed (i.e., definition of unique trait)? Is the repository easy to use? Does the repository work well on a mobile device? How can the data be displayed without overwhelming the user? And finally, Does the repository address the needs of different users? In the end, after consultations with key stakeholders and several experts, the repository design included: requiring the user to focus on either one intervention or one country; displaying the data in layers, to facilitate ease-of-use; incorporating alerts and unique trait fields to further clarify differences in the data; and utilizing a step-wise approach to data visualizations.

There are many lessons that can be drawn from this experience: understanding the overarching analytics plan, as well as the final display requirements, before designing the data extraction form is critical; consulting experts, including data analysts as well as web designers, greatly improves the final product(s); given the great diversity of how cost data are reported, defining the unit of measurement and specifying the unique trait that differentiates each entry in the repository, is both challenging and imperative; dropdown menus are useful in the data extraction form when there are multiple extractors; and ensuring that the process of extracting data and uploading to the repository is as straightforward a procedure as possible saves time in the future when new individuals attempt to follow the same process.

Developing the Immunization Delivery Cost Catalogue (IDCC): Methodology and Lessons Learned from a Systematic Review on Immunization Delivery Costs in Low- and Middle-Income Countries.

PRESENTER: **Kelsey Vaughan**, ThinkWell

AUTHORS: Ms. Annette Ozaltin, Michaela Mallow, Dr. Logan Brenzel

Immunization delivery cost information isn't often readily available at the right time and in the right format: cost data is fragmented and of variable quality, making it difficult for policymakers, program planners, and other global and country-level stakeholders to understand and use. Since 2016, ThinkWell and John Snow, Inc. (JSI) have facilitated the Immunization Costing Action Network (ICAN) – a learning community with the aim of increasing the visibility, availability, understanding and use of evidence on the cost of delivering vaccines. As part of the ICAN, ThinkWell conducted a systematic review which aimed to answer a question frequently asked by global and country immunization stakeholders: what are the unit costs of vaccine delivery across different low- and middle-income countries and through a variety of delivery strategies? The extracted data are housed in the Immunization Delivery Cost Catalogue (IDCC), available as an interactive Microsoft Excel workbook and web tool, making easily accessible information on the unit cost results, along with methodological and contextual information to help with comparison and their interpretation.

The systematic review searched for peer-reviewed articles and grey literature that included immunization delivery costs in low- and middle-income countries published between 2005 and 2018. The cost catalogue presents 465 immunization delivery unit costs (e.g., delivery cost per dose, per capita, per full immunization of a vaccine or fully immunized child, and per person in the target population) from 63 articles and reports (resources). The IDCC includes details about the resource's costing methodology, and the reported cost results. All cost findings were also converted to a common year (2016) and currency (U.S. dollars [USD]) to ensure comparability across studies and different settings and to facilitate benchmarking.

Lessons on data extraction, standardization, and presentation may be useful to others developing unit cost repositories or other cost databases. Data extraction was found to be an iterative process; additional attributes for extraction were identified after data from a number of resources had already been extracted, and once again when analysis started, meaning some resources had to be revisited to extract the additional information. Reporting limitations meant it was often impossible to understand methods or findings sufficiently from the resource; contacting authors helped clarify some of these uncertainties. Extracting data attributes exactly as they were reported in each resource, without recoding into a common language, helped minimize interpretation errors that may have occurred during this extraction and recoding, but may have limited usability of the data. A quality assessment highlighted the variability in reporting and methods quality for immunization costing, identifying an opportunity to develop standard guidance. A review of different currency conversion methods helped identify a methodology that best captured local currency fluctuations. In terms of presentation of the data, user testing helped identify important features of the online and offline databases. How-to videos and in-person and webinar demonstrations of the databases increased understanding of their use.

Methods and Challenges for Systematically Reviewing the Costs and Cost-Effectiveness of Malaria Control and Elimination Strategies.

PRESENTER: **Edith Patouillard**, WHO

AUTHORS: Kathryn Shuford, Lesong Conteh, Efudem Agboraw, Mara Kont

Data on the cost and cost-effectiveness (CE) of disease control interventions are needed to support national strategic planning, including the production of resource needs estimates, health impact analyses, prioritization and financing of strategies. For malaria, the most recent systematic review was published in 2011 with a focus on evidence generated between 1990 and 2010. As the coverage of malaria control

interventions increases, elimination strategies develop, and new tools are approaching, a new evidence base in a publicly available repository is required.

Published and grey literature in English-, French- or Spanish-language on the cost or CE of malaria control or elimination strategies were searched for the period 2005-2018. Studies of any design were considered, except modelling studies reliant exclusively on secondary data. Main outcomes were the unit costs and CE of malaria-related health outcomes associated with World Health Organization (WHO) currently recommended interventions. To reduce potential bias and error in study selection, three reviewers independently evaluated studies, with a fourth reviewer available to resolve any conflicts. The inclusion of each study was evaluated by screening title and abstract and then by reading full text articles. Only studies meeting all inclusion criteria were retained for data extraction and quality assessment (QA). To ensure consistency, each reviewer worked independently from the same data extraction template specifically developed for the review purpose whilst ensuring alignment with other initiatives involved in systematic reviews and development of the unit cost and CE data repository. An online software was used to divide and manage workload between reviewers.

A total of 16,973 studies were screened. After applying all exclusion criteria, 128 studies were finally retained for data extraction and QA. Preparatory challenges included the clear definition of the review boundaries to ensure quality and rigor were not compromised in a context of relatively limited time and resources. Search-related challenges included a lack of flexibility and missing features of the review management software, and the process of dealing with duplicates. Screening challenges concerned the application of inclusion and exclusion criteria on studies drawing on a mix of primary and secondary data or partial modelling; misspecification of study types in the abstract; the treatment of implicit rather than explicit study characteristics; and, the variety in costing methods used. Review-related challenges involved developing a data repository that balanced user friendliness and harmonization with other initiatives. QA also proved challenging, specifically on how best to combine existing QA frameworks to suit the review needs and the lack of existing guidance on how to evaluate the quality of studies coming from the grey literature. Several positive aspects of the review should be noted, including the much more explicit way recent studies have reported on essential costing and economic evaluation information; the value of using the software Covidence to organize and facilitate the review process, particularly regarding a screening process that involved individuals working in different locations; and, finally the value of making the review results a product that will contribute to other efforts collecting standardized unit cost and CE data across health interventions.

The Development of a Repository of Cost Data for Social and Behavior Change Interventions: Methods and Lessons Learned.

PRESENTER: **Dr. Willyanne DeCormier Plosky**, Avenir Health

AUTHORS: Nicole Bellows, Dr. Lori Bollinger, Mr. James Rosen, Michelle Weinberger

The USAID-funded Breakthrough RESEARCH project (B-R) is working to gather and analyze evidence on the costs of social and behavior change (SBC) interventions to support the argument, through a published business case and enhanced modelling incorporating SBC, that investing in SBC is crucial for improving health and advancing development. Methods for the database development have included: (1) conducting a published and grey literature review; (2) applying inclusion criteria based on characteristics of a social and behavior change intervention and presence of a sufficiently rigorous cost estimate; (3) adapting the extraction form used by the Global Health Cost Consortium (GHCC) for the Unit Cost Study Repository (UCSR); and (4) extracting data from over130 studies. Once the extracted data have been cleaned, unit costs will be converted to a common currency and currency year and standardized to annual estimates where relevant.

Several lessons were learned during the database development process. Identifying the appropriate set of search terms that would generate an inclusive but manageable number of hits (5,000-7,500 abstracts) was challenging and required testing the percentage of returned abstracts that were relevant. Another lesson learned is that, while combining the terms “economic” and “financial” with the term “cost” in the search were too broad, it was helpful to add currency symbols such as $ to the “cost” search term to identify relevant articles. Adapting the extraction form initially resulted in using approximately 10% of the fields from the GHCC template and focused on clearly defining the type of cost (e.g., financial or economic), the unit of observation, the intervention components and implementation process, the target population, and a standardized disaggregation of the cost into various input categories. However, as extraction proceeded, new fields and options for drop-down lists were added to clarify details of the cost estimate, improve the inter-rater reliability between extractors, and better tailor the extraction form to SBC interventions. These additional fields included further cost types (e.g., total intervention cost, [intervention] unit cost, [component] unit cost, etc.); adding “above-site” to possible costing perspectives; adding a column and options for intervention phase (e.g., research and design, start-up training, implementation, etc.); and breaking the original intervention detail column into four columns (who [staff], what [components], which [specificity of component], and when [duration of contact/how often]). Recurrent training with extractors, regular calls, detailed extraction instructions that were updated to advise on emergent questions, and quality review of the extraction by the senior analyst were critical to maintain standardization between extractors and high quality of the final product. Utilization of pre-determined drop-down options from the GHCC template for relevant columns saved time and allowed for potential alignment with the GHCC UCSR and other databases employing similar templates.

Through discussion of these experiences, in tandem with those developing (or interested in developing) similar databases at the global and national levels, it is hoped that mutual learning can occur to prevent “reinvention of the wheel” and improve both the design and utility of these databases.

8:30 AM –10:00 AM MONDAY [Demand & Utilization Of Health Services]

Universität Basel | Vesalianum – Grosser Hörsaal EO.16

Organized Session: Socio-Economic Status and Healthcare Utilization

SESSION CHAIR: **Jongsay Yong**, University of Melbourne

Equal Long-Term Care for Equal Needs with Universal and Comprehensive Coverage? an Assessment Using Dutch Administrative Data

PRESENTER: **Marianne Tenand**, Erasmus University of Rotterdam

Background and objectives:

This study tests whether the Dutch elderly with similar care needs receive similar long-term care (LTC), independently from their income. Evidence on the ability of existing policies to ensure that all individuals have access to adequate long-term care, regardless of their socio-economic resources, is still scarce. It could yet improve public debates, as many countries are currently reforming their LTC systems, either to broaden coverage or to reign in increasing spending. As one of the few countries that offer generous universal coverage of long-term care expenses, the Netherlands stands out as a reference. Whether its social LTC insurance ensures horizontal equity in LTC use had not been assessed.

Methods and Data:

We exploit exhaustive administrative register data on the publicly-subsidized LTC services the Dutch are entitled to receive and how much they effectively use. The linkage of additional administrative sources provide high-quality measures of income and wealth as well as socio-demographic characteristics (age, gender, migrant background, marital status) and region of residence. The study focuses on individuals aged 60 and older eligible for LTC in 2012 (N=616,934).

We measure the concentration of the monetary value of LTC use across the income distribution by the means of concentration indices. We use an indirect-standardization method to control for differences in needs. In contrast with previous studies of inequity in care use that relied on a statistically derived variable of needs, we use an explicit measure of needs. In the Netherlands, eligibility for LTC is based on a needs assessment conducted by an independent agency, referring to Ministerial guidelines. Consistently, we take the monetary value of the LTC services an individual was made eligible for to be a relevant measure of her care needs.

Results:

Five key results emerge. First, most elderly use less LTC than what they are entitled to, while there was no shortage of LTC supply in 2012. Second, under-use compared to assessed needs is more pronounced among the rich than among the poor. Third, we find a pro-poor Horizontal Inequity index both in the subgroup eligible for home care and in the subgroup eligible for institutional care. Fourth, among the elderly eligible for institutional care, richer individuals are more likely to forgo LTC or to use home care instead. Fifth, regional disparities in need-standardized LTC use cannot be explained by regional differences in the socio-demographic composition of the eligible population, nor by 'under-consuming' regions being systematically richer or poorer than the other regions.

Conclusions:

At face value, our findings suggest that the Dutch LTC insurance 'overshoots' its target to ensure that LTC is accessible to poorer elderly. Yet, the implications depend on the origins of the difference and one's normative stance. This pattern may be explained by differences in preferences, but also by higher copayments on nursing homes and greater feasibility of home-based LTC arrangements for richer elderly. Other countries that look at the Dutch model when expanding public LTC insurance should not simply assume that disparities in access will no longer be an issue.

Estimating Local Need for Mental Health Care to Inform Fair Resource Allocation within the NHS in England: Cross-Sectional Analysis of National Administrative Data Linked at Person-Level

PRESENTER: **Laura Anselmi**, The University of Manchester

Background:

Equitable access to mental health care is a priority for many countries. The National Health Service in England uses a weighted capitation formula to ensure that the geographical distribution of resources reflects need.

Aim:

To estimate local need for adult secondary mental health, learning disabilities and psychological therapies services in England.

Methods:

We used demographic records for 43,750,558 adults registered with a primary care practitioner in England linked with information on service use, ethnicity, physical health diagnoses and type of household, from multiple datasets. Using linear regression we estimated the individual cost of care in 2015 as a function of need and supply variables measured at individual and area level in 2013 and 2014. We obtained individual need estimates by sterilising the effect of the supply variables. We aggregated the need estimates by GP practice, age and gender to derive weights for capitation estimates. We included the areas percentage of recipients of out of work benefits as a proxy for socio-economic status.

Results:

Higher costs were associated with being aged between 30 and 50 years; of white, black African, black Caribbean or mixed ethnicity; having been admitted for specific physical health conditions, including drug poisoning; and living alone, in a care home or in a communal environment. Individuals living in areas with higher percentages of out-of-work benefit recipients and higher prevalence of severe mental illness had higher cost. Individuals living further away from a mental health trust and registered with a student GP practice had lower costs. The inclusion of additional socio-economic status did not improve the predictive power of the model nor affected the estimated relative need across areas.

Conclusion:

Need weights informed the distribution of £9.5bn, 12% of the health budget allocated to local organisations in 2019.

The Intergenerational Effects of Language Proficiency on Child Health Outcomes

PRESENTER: **Dr. Johannes Sebastian Kunz**, Monash University Centre for Health Economics
AUTHOR: Nicole Black

Background and objectives:

Equity in access to health care services among culturally and linguistically diverse populations is an important goal within the health care system. An English language deficiency (ELD) can potentially influence health care utilization through both demand- and supply-side channels, yet there is little knowledge on this relationship. There is also limited understanding of the intergenerational effects of language skills on children's health outcomes or health care seeking behaviour. This study investigates the effect of an ELD among immigrant parents on their child's primary health care utilisation. We focus on Australia, which has a universal public health care system, allowing us to mute potential selection into health insurance coverage.

Methods:

We use survey data on children (under 14 years) from the Longitudinal Study of Australian Children that is linked to administrative records on health care utilization through Medicare Australia over a 10 year period (2004 to 2013). We examine children born in Australia to immigrant parents. A key challenge in identifying the effect of an ELD on health care utilization is that there are unobserved characteristics of the parent (such as ability and preferences for assimilation into the host society) that may be correlated with both their language skills and health investments or health behaviours. We use a number of approaches to address the concern, including an instrumental variable estimator that exploits the age at arrival into Australia as an instrument, based on the recognised 'critical period hypothesis' of language acquisition.

Results:

A strong and robust positive correlation exists between parental ELD and health care costs; children incur around 25% more health care costs if their parent has an ELD. We demonstrate that this effect is robust to selection on unobservables. Our IV estimates confirm a causal interpretation. Disentangling the effect, suggests that it is largely due to more GP visits, rather than more specialist doctor visits, diagnostic tests, pharmaceuticals or other services. Yet, we find that an ELD does not lead to children having poorer health, and we investigate a number of alternative demand- and supply- side mechanisms.

Conclusions:

Within the Australian universal public health care system, children of immigrants are faring well irrespective of their parent's language proficiency. Yet, a parent's ELD increases children's health care costs substantially. An overlooked benefit of programs that increase English language skills of immigrants is likely to be a reduction in health care costs.

Does Socio-Economic Status Affect Hospital Utilization and Adverse Outcomes of Chronic Disease Patients?

PRESENTER: **Jongsay Yong**, University of Melbourne

Background and objectives:

This study examines how socio-economic status (SES) affects hospital utilization and adverse hospital events of chronic disease patients in the state of Victoria, Australia. The investigation focuses on patients diagnosed with one of 12 selected chronic diseases. By examining different utilization measures and adverse hospital events, this study not only uncovers the difference in utilization but also traces the sources of the difference. The study addresses an important policy question, namely, in implementing capitation funding for chronic diseases, how much, if any, allowance should be made for SES disadvantage when setting the capitation funding amount?

Methods and Data:

Using the notion of horizontal equity, this study attempts to identify the initial first year spell of the disease and compare outcome measures for this initial spell. The outcome measures examined include: hospital costs, length of stay, number of admission episodes, number of 28-day readmission, number of complication, and number of potentially preventable hospitalisation (PPH) episodes. To identify the initial spell, we make use of three years of hospital administrative data (2013/14 to 2015/16) to extract a sample of 237,743 patients with chronic disease spells. The SES measure is constructed using the utilization records of specific health and human services. Linear and generalized linear regressions are estimated with a rich set of explanatory variables to account for casemix differences across patients.

Results:

During the initial one-year spell, chronic disease patients with moderate and high SES disadvantage tend to incur higher hospital costs by about 20% (about A$2,400 to A$3,100) more than patients with no SES disadvantage, longer LOS by about 16% to 21% (about 1.7 to 3.0 more days), and more admission episodes by about 15% to 16% (about 0.3 to 0.4 additional episodes). These disadvantaged patients also tend to have more incidents of 28-day readmissions and complications, each by about 6% to 7%, and PPH episodes by about 9% to 10%.

Conclusions:

SES disadvantage is found to have a significant and material impact on hospital utilization and the incidence of adverse events in hospitals. The results are robust to different estimation methods and alternative measures of SES.

10:30 AM –12:00 PM MONDAY [Special Sessions]

Universitätsspital Basel | ZLF – Gross

Special Organized Session: Pay for Performance: Drawing Lessons from Across High, Low and Middle Income Settings

SESSION CHAIR: **Søren Rud Kristensen**, Imperial College London

PANELISTS: **Fatimah Mustapha**, World Bank; **Meredith Rosenthal**, Harvard University; **Peter C Smith**, Imperial College

10:30 AM –12:00 PM MONDAY [Economic Evaluation Of Health And Care Interventions]

Universitätsspital Basel | ZLF – Klein

Organized Session: Striving for a Societal Perspective for Economic Evaluation

SESSION CHAIR: **Mark Sculpher**, Centre for Health Economics at the University of York

DISCUSSANT: **Werner Brouwer**, Erasmus School of Health Policy & Management

A Framework for Economic Evaluation When Costs and Effects Cross Sectors

PRESENTER: **Simon Walker**, Centre for Health Economics University of York

In the first presentation, Simon Walker will present a framework for economic evaluation which expands on the ‘impact inventory’ of the 2nd US Panel on Cost-Effectiveness in Health and Medicine to set out the series of assessments to be made, to distinguish points at which value judgements feed into the evaluation, to show the sensitivity of the results to alternative judgements and to bring out consideration of opportunity cost. The inventory captures the impact of an intervention on individuals from a set of outcomes or *dimensions of interest* determined by value judgements and institutional arrangements of the decision makers to be informed. The inventory catalogues both the direct impacts and opportunity costs (i.e. the impacts associated with what is forgone). Alternative approaches for aggregating the impacts and the underlying normative judgements are then considered.

Simon Walker is a Senior Research Fellow in the Team for Economic Evaluation and Health Technology Assessment at the Centre for Health Economics, University of York. His research focuses on the methods and application of economic evaluation and cost-effectiveness analysis to the evaluation of interventions in health care. His applied research has assessed interventions ranging from patient level interventions across a broad range of diseases to system level policies such as pay for performance schemes. He has a broad range of methods interests including the appropriate approaches to evaluating interventions with costs and effects falling beyond health care and the consideration of non-financial resource constraints in economic evaluation.

A Case Study in Social Cash Transfers and Subsidies for Agriculture in Malawi

PRESENTER: **Susan Griffin**, University of York

Susan Griffin will apply the framework to a case study looking at social cash transfers and subsidies for agriculture in Malawi. The unconditional social cash transfer programme (SCTP) in Malawi was found to have positive outcomes in six different areas: consumption, food security and material needs; productivity and asset accumulation; health and nutrition; schooling and child labour; safe transition to adulthood; well-being of care-givers. To inform the revision of the SCTP and the integration across social protection and transfer programmes, an economic evaluation must account for the varied outcomes, their interaction and overlap. The evaluation must also reflect the needs of the varied set of stakeholders that fund social protection, including the Ministry of Agriculture, Ministry of Health and others. The case study explores how economic evaluation can inform negotiation and co-ordination across stakeholders.

Susan Griffin is a Senior Research Fellow at the Centre for Health Economics, University of York. In 2008 Susan became a Research Council UK Academic Fellow in Health Economics and Public Health. Dr Griffin has contributed to numerous appraisals for NICE in her roles as a Committee member, a member of one of the independent academic groups contracted to conduct assessments and evidence reviews for NICE, and as part of the decision support and economic and methodological research units. Her research interests include the use of decision-analytic models in cost-effectiveness analysis and the use of evidence synthesis techniques and value of information analysis. Dr Griffin currently researches the application of methods for economic evaluation in the field of public health and with a focus on incorporating concerns around health inequality.

2nd US Panel on Cost-Effectiveness in Health and Medicine: Deliberations Regarding Perspective

PRESENTER: **Peter J Neumann**, Tufts Medical Center

Peter Neumann will outline the deliberations of the 2nd US Panel on Cost-Effectiveness in Health and Medicine on appropriate perspectives. The original panel on cost-effectiveness in 1996 recommended that the reference-case analyses should assume a societal perspective, reflecting the viewpoint of a decision maker considering the broad allocation of resources across the population. Under such a perspective, the analyst considers all parties affected by the intervention and counts all significant outcomes and costs that flow from it, regardless of who experiences them. The Second Panel recommended that cost-effectiveness analyses include not one but two reference cases — one based on a societal perspective and one on a health care sector perspective. The former is recommended because of the importance of capturing the broad consequences of health interventions, including those outside the health care sector; the latter is a nod to pragmatism, since it is more closely tied to the resource implications considered by health sector decision makers. It is also a call for clarity, since differentiating the two perspectives should help consumers of these analyses better understand the consequences of interventions that fall outside the health sector. Our panel further recommends inclusion of an “impact inventory,” a structured table listing the health and non-health-related effects of an intervention that should be considered in a societal reference-case analysis.

Peter J. Neumann, Sc.D., is Director of the Center for the Evaluation of Value and Risk in Health (CEVR) at the Institute for Clinical Research and Health Policy Studies at Tufts Medical Center, and Professor of Medicine at Tufts University School of Medicine. His research focuses on the use of comparative effectiveness research and cost-effectiveness analysis in health care decision making. He is the founder and director of the Cost-Effectiveness Registry, a comprehensive database of cost-effectiveness analyses in health care. Dr. Neumann has written widely on the role of clinical and economic evidence in pharmaceutical decision making and on regulatory and reimbursement issues in health care. He served as co-chair of the *2nd Panel on Cost-Effectiveness in Health and Medicine*. He is the author or co-author of over 250 papers in the medical literature, the author of *Using Cost-Effectiveness Analysis to Improve Health Care* (Oxford University Press, 2005) and co-editor of *Cost-Effectiveness in Health and Medicine, 2nd Edition* (Oxford University Press, 2016). Dr. Neumann has served as President of the International Society for Pharmacoeconomics and Outcomes Research (ISPOR), and as a trustee of the Society for Medical Decision Making. He is a member of the editorial advisory boards of *Health Affairs* and *Value in Health* and has served on many advisory boards, including those for the Congressional Budget Office and the Robert Wood Johnson Foundation. He has also held several policy positions in Washington, including Special Assistant to the Administrator at the Health Care Financing Administration. He received his doctorate in health policy and management from Harvard University.

The Role of Perspective in Benefit-Cost Analysis Versus Cost-Effectiveness Analysis

PRESENTER: **Ms. Lisa A Robinson**, Harvard T.H. Chan School of Public Health

Lisa Robinson will contribute a fourth presentation which will contrast the approaches used in CEA to that conventionally-used in benefit-cost analysis (BCA). In BCA, analysts typically begin by defining who has standing; i.e., whose benefits and costs will be counted. Often analysts report the aggregate impacts on the full population affected and also report the results disaggregated across key subgroups, similar to reporting impacts from both a societal and a health care perspective in CEA. BCA guidance generally recommends assessing all impacts, using screening analysis to focus resources on those impacts that are most important to address in detail. As conventionally conducted, in BCA individuals are assumed to be the best, or most legitimate, judges of their own welfare. Values are derived from individual preferences for spending on the outcomes of concern rather than on other goods and services; these values are summed to estimate the net benefits to society. While other approaches to BCA have been proposed, none are yet fully-developed or widely-used.

Lisa A. Robinson is a senior research scientist at the Harvard T.H. Chan School of Public Health, Center for Health Decision Science and Center for Risk Analysis. She focuses on improving the use and usefulness of benefit-cost analysis, particularly for policies with outcomes that cannot be fully valued using market measures. Recently, Ms. Robinson has been working on applying these methods to global health and developing reference case guidance. She was a previously a Senior Fellow at the Harvard Kennedy School of Government’s Mossavar-Rahmani Center for Business and Government and is an Affiliate Fellow of its Regulatory Policy Program. She is also past President of the Society for Benefit-Cost Analysis, receiving its Richard O. Zerbe Distinguished Service Award, and a Fellow and former Councilor of the Society for Risk Analysis, receiving its Richard J. Burk Outstanding Service Award.

10:30 AM –12:00 PM MONDAY [Economic Evaluation Of Health And Care Interventions]

Universitätsspital Basel | Pathologie – Unten (U)

Organized Session: Challenges in the Economic Evaluation of Health Systems Interventions: Is Constrained Optimisation a Useful Source of Ideas?

SESSION CHAIR: **Alec Morton**, University of Strathclyde

PANELISTS: **Anna Vassall**, London School of Hygiene & Tropical Medicine; **Katharina Hauck**, Reader, Imperial College London; **Justice Nonvignon**, University of Ghana; **Fiammetta Maria Bozzani**, London School of Hygiene & Tropical Medicine

10:30 AM –12:00 PM MONDAY [Economic Evaluation Of Health And Care Interventions]

Universität Basel | Kollegienhaus – Hörsaal 001

The Use of Discrete Choice Experiments in Policy: Future Directions and Challenges

SESSION CHAIR: **Richard Norman**, Curtin University

Women's Preferences for Design of Conditional Cash Transfer Programs Focused on Maternal and Child Health in India: A Discrete Choice Experiment

PRESENTER: **Dr. Krishna Rao**, Johns Hopkins Bloomberg School of Public Health

AUTHORS: Avril Kaplan, David Bishai, Shivani Kachwaha

Conditional Cash Transfers (CCTs) are rapidly becoming important to national strategies to improve maternal and child health and nutrition in low and middle-income countries. India recently began implementing the national Maternity Benefit Program (MBP) to encourage health care use during pregnancy and early childhood; under discussion is to also include child nutrition services within a CCT program. This paper aims to understand the preferences of mothers with young children for design features (i.e. cash transfer amount and conditionalities) of CCT programs aimed at improving uptake of maternal and child health and nutrition services. This will provide guidance on incorporating user preferences in the CCT program design and potentially increase the probability of participation.

We conducted a Discrete Choice Experiment in two districts of the state of Uttar Pradesh in north India in 2018 where we interviewed 405 mothers with children below three years of age. Respondents were presented with 18 hypothetical CCT program profiles defined in terms of five attributes – cash transfer amount, number of ante-natal care visits, number of visits for child immunization/growth monitoring, time taken to complete a visit, and health benefit received (proxy for service quality). Conditional logit regression was used to analyze respondent choices.

Our findings indicate that mothers valued the amount of cash transfer, the quality of services, and quicker health center visits. They did not have a strong preference for the number of health center visits required to fulfill service use conditionalities. Higher cash amounts are associated with greater probability of participating in the CCT program. Further, for any given amount of cash amount, better service quality (i.e. produced better health) elicited greater probability of participation. Mothers put a high valuation on service quality; they were willing-to-pay (i.e. give up) INR 2858 ($41) for a program that produced good health; this suggests that with good quality services, a lower cash amount can elicit the same level of participation. Without any cash transfer, only improving service quality from average to good would increase participation by 27%. A cash transfer amount of INR 6000 ($86, currently offered by the MBP) combined with fair (good) quality services would increase the probability of participation by 78%(85%), compared to baseline. Preference for these attributes differed across sub-groups defined by prior users of government health services, and socioeconomic status. Poor households valued a given cash transfer amount more than better-off households, while better-off households valued good health outcomes more than poorer households Aligning maternal and child health CCT programs with user preferences can increase program participation.

A New Tool for Creating Personal and Social EQ-5D-5L Value Sets, Including Valuing Dead

PRESENTER: **Trudy Sullivan**, University of Otago

AUTHORS: Paul Hansen, Franz Ombler, Sarah Derrett, Nancy Devlin

Background: The EQ-5D is a standardised instrument used to measure health-related quality of life (HRQoL), an essential component in most health economic evaluations and much health outcome research. It is the most commonly-used HRQoL instrument in New Zealand (NZ) and internationally. The original version of the instrument, the EQ-5D-3L, is gradually being superseded by the newer EQ-5D-5L version. Using discrete choice experiments (DCEs) to create EQ-5D-5L value sets is becoming increasingly common. The main advantage of DCEs relative to other choice-based valuation techniques, such as time trade-off and standard gamble methods, is that they are cognitively less demanding and can be implemented relatively easily and cheaply using the internet for data collection. A new online tool for creating personal and social EQ-5D-5L value sets was recently developed and trialled in NZ.

Method: The PAPRIKA method – an acronym for Potentially All Pairwise RanKings of all possible Alternatives – is based on applying a novel type of adaptive, full factorial DCE. The method, which learns from and adapts to each participant's preferences, involves – in the present context – participants pairwise ranking health states defined on two EQ-5D dimensions at a time and involving a trade-off, and a binary search algorithm that identifies health states worse than dead. To constrain the number and complexity of the questions, only the first, third and fifth severity response levels of each of the EQ-5D dimensions were presented in the DCE; weights for the second and fourth levels were calculated using interpolation. After extensive testing and refinement, the tool was distributed via an online survey to a representative sample of NZ adults. As a check of data quality, two questions were repeated at the end of the DCE for the purpose of testing the consistency (reliability) of each participant's answers. In addition, participants were asked to report their own health on the EQ-5D-5L questionnaire and EQ VAS, and their demographic characteristics (allowing the heterogeneity of personal preferences and differences between population sub-groups to be easily tested), and to provide feedback on the survey.

Results: The survey was completed by 5112 people. Using the inbuilt data quality checks and time to complete, 2468 'high quality' personal value sets were used to create a NZ EQ-5D-5L social value set including the value of dead within the EQ-5D-5L system. Participants answered 20 pairwise-ranking questions on average, taking less 10 minutes to complete. The majority of participants found the survey instructions and design easy to follow, and agreed that their ranking of the dimensions, based on their personal preference weights, were as they expected.

Conclusion: The new valuation tool for creating *personal* and *social* EQ-5D-5L value sets is feasible and acceptable to participants, including for creating their own personal value sets. A NZ social value set suitable for use in CUA and PROMs was created. The tool could be used in other countries too, and also tested against other methods for creating value sets.

Designing and Undertaking an Online Discrete Choice Experiment to Inform Policy-Focussed Analyses Assessing Efficiency of Mental Healthcare Trusts in England

PRESENTER: **Donna Rowen**

AUTHORS: Philip Powell, Maria-Jose Aragon, Rowena Jacobs

Aim: The study aim was to elicit preferences to determine relative preferences for different aspects of mental healthcare delivery. These preferences were elicited to inform analyses assessing efficiency of different mental healthcare trusts in England. Important aspects of quality of mental healthcare were to be identified by triangulating policy documents, service user and healthcare professional views and existing datasets measuring quality of healthcare. Aspects of quality of mental healthcare deemed important were then able to be used as attributes in a discrete choice experiment (DCE) to generate relative preferences across aspects of quality for use in analyses assessing efficiency of mental healthcare trusts.

Methods: First, a review of policy was undertaken, examining aspects of quality of mental healthcare from UK policy documents, to inform a topic guide for qualitative investigation. Second, six focus groups were conducted, three focus groups involved mental healthcare service users and three involved mental healthcare professionals, recruited via a National Health Service (NHS) trust in England. The focus groups were led using a semi-structured topic guide involving open ended questions around what participants thought were important aspects of quality in mental healthcare. Prompts were used from the aspects of quality identified in the review of policy documents. The focus groups were transcribed and analysed using Framework to classify the concepts raised into themes and sub-themes. Third, existing available datasets for NHS trusts in England were searched and examined to determine whether and how these themes and sub-themes could be meaningfully measured for different trusts using existing available data. Potential aspects of quality were selected to form the attributes and severity levels for use in a DCE, taking into account the findings of the focus groups and the ability to measure these using available data. Fourth, feedback on the wording of selected attributes was sought from people with experience of mental health problems and their carers, to ensure the wording was appropriate. Fifth, these attributes were used in a DCE conducted online with members of the general population, mental healthcare service users and mental healthcare professionals.

Results: Ten stakeholder and policy-relevant attributes were selected for use in the DCE: waiting times; ease of access; person-centred care; co-ordinated approach; continuity; communication, capacity and resources; treated as a person; recovery focus; inappropriate discharge; and effectiveness.

Discussion: The attributes in this DCE have been selected using triangulation between policy documents and service user and healthcare professional involvement, whilst ensuring that the attributes are able to be measured across different healthcare trusts using existing available data. The approach was undertaken to try to ensure that the attributes and severity levels were appropriate, measurable and relevant to multiple stakeholders within mental healthcare delivery. This approach has ensured that the results of the DCE are able to be inform assessments of the efficiency of different mental healthcare trusts, and able to be used to inform policy. However, one disadvantage of the approach is the considerable challenge of matching what was important to service users and mental healthcare professionals to available data.

Capturing the Role of Addiction in Smokers' Choices: An Addiction-Conditioned, Hybrid Choice Model Approach Applied to Smokers in the US

PRESENTER: **John Buckell**, Yale University

AUTHORS: David Hensher, Stephane Hess

Use of discrete choice models is growing rapidly in tobacco markets and these models are being used to answer key policy questions. Despite this growth, many aspects of smokers' choice behavior are still not well understood, and these features may be important for policymaking. One such feature is addiction. It is well-known that addiction plays a central role in smokers' behavior. Yet, modelling of addiction in choice models

has been limited, if not entirely absent. In this paper, we address this issue directly. Focus is given to two main issues in attempting to capture the role of addiction in choice models for smokers. The first is modelling addiction which is unobserved. Only indicators of addiction, such as the number of cigarettes smoked per day, are available. We use a hybrid choice model within which a latent variable of addiction is specified. This latent variable explains indicators of addiction in the data. We then regress the latent variable on a set of individual characteristics to understand addiction and the resulting variation in choice behavior. Second is the question of how to incorporate addiction into the utility function. In this approach, we allow addiction, via the latent variable, to enter in two ways. We specify interactions between our measures of addiction and the attributes/products in the utility function. This allows us to gauge the extent to which addiction mediates smokers' relative sensitivities for attributes and products. Next, we adapt the experience-conditioned choice model so that addiction is allowed to impact the scale of utility. This allows us to gauge the extent to which addiction affects smokers' choice responses to attribute variation. Initial results suggest the presence of an underlying addiction to cigarettes captured by the latent variable. We then see that this cigarette addiction plays a critical role in smokers' choice behavior. Those that are more addicted have stronger preferences for cigarettes and are unwilling to switch to e-cigarettes. These smokers are most at risk from tobacco, since cigarettes are the more harmful tobacco product. Further, addicted smokers value nicotine in tobacco products to a much greater extent than those that are less addicted; this finding is obscured by analyses that assume addiction away. Thus, one mechanism for encouraging smokers to switch or to quit would be to reduce the amount of nicotine in cigarettes. This policy is currently on the regulatory agenda in the US. These results suggest that this policy could be effective at encouraging addicted smokers, arguably the highest-risk group of smokers, to less harmful products and, therefore, lead to substantial health gains.

10:30 AM –12:00 PM MONDAY [Economic Evaluation Of Health And Care Interventions]

Universität Basel | Kollegienhaus – Hörsaal 102

Organized Session: Capability Measures for Economic Evaluation in Older People

SESSION CHAIR: **Joanna Coast**, University of Bristol

Measuring Capability in Adult Patients at Different Stages of Life: A Qualitative Investigation in Patients Requiring Kidney Care

PRESENTER: **Paul Mitchell**, University of Bristol

Background: The development of the ICECAP capability measures began with research targeted specifically at people age 65 and older, leading to the first measure known as the ICECAP-O. A capability measure was subsequently developed for all adults aged 18 and older, known as the ICECAP-A. Although both ICECAP measures contain five domains each and have similar domains with attachment, enjoyment and independence appearing on both, there are differences in wording on the other domains (i.e. achievement versus role and stability versus security), albeit with overlapping themes captured between these domains. Those wishing to use one of these capability measures are faced with a choice when their population contains individuals whose age spans the traditional range of employment and retirement (i.e. under and over 65 years old). Further, individual's specific life contexts (for example, early retirement, chronic conditions) may affect their own perceptions of their stage of life and the most appropriate measure.

Aim: To understand the views of those who could potentially complete either ICECAP-A and ICECAP-O and how their responses to the two measures differ.

Methods: Qualitative data from 'think-aloud' interviews followed by a semi-structured interview with 30 patients requiring kidney care (outpatients for chronic kidney disease, kidney transplants and haemodialysis) were analysed alongside the responses provided to the two ICECAP versions. Constant comparative analysis combined a focus on verbalised perceptions across the two age groups and responses to domains that are similar across both measures.

Results: Preliminary analysis shows that 12 people aged 65 and over and 18 aged under 65 completed the task between April and July 2017. When asked what measure they preferred, ICECAP-A was preferred by 7 of 12 older adults, citing its ease of completion as well as the importance of the stability and attachment domains. Four out of 12 preferred the ICECAP-O, with the security domain having perceived greater depth, being age appropriate and less vaguely worded compared to the ICECAP-A cited as reasons for preferences. For the 18 younger adults there were six clear preferences for the ICECAP-A and six clear preferences for the ICECAP-O. Reasons for preferring ICECAP-A over ICECAP-O were its ease of completion, liking the achievement question on ICECAP-A and not liking the role question on ICECAP-O. Reasons for choosing ICECAP-O over ICECAP-A were a perceived greater depth in ICECAP-O over ICECAP-A, the future focus in the security domain on ICECAP-O and not liking the achievement question on ICECAP-A. Answers to similar domains across measures were mainly as expected overall, with higher variation in responses from domains worded differently across measures. Constant comparative analysis of the responses to similar domains across the ICECAP-A and ICECAP-O is currently ongoing.

Conclusion: Further detailed qualitative analysis will be undertaken before iHEA and presented to offer conclusions on which ICECAP measure to use when conditions span across the two measures. It is important to resolve this because the differences in wording of similar domains do appear as reasons for preferences between the measures, as well as considerations related to age and health condition.

Feasibility and Acceptability of ICECAP-O Capability Measures in People over 75 Years of Age Treated for End-Stage Kidney Disease with Dialysis or Comprehensive Conservative Care

PRESENTER: **Karan Shah**, NHMRC CTC

Background: A broader notion of wellbeing related to an individual's capability to do the things that are important to them (based on Sen's capability theory), rather than solely health related quality of life (HRQoL), is proposed as a more meaningful measure to value healthcare. The ICECAP-O capability index, measured five domains: attachment, role, enjoyment, security, and control. The aim of this study was to assess the feasibility and acceptability of ICECAP-O in people with end-stage kidney disease aged 75 years or older, and explore differences in HRQoL and capabilities for those treated with dialysis and those treated with comprehensive conservative (non-dialysis) care.

Methods: A prospective cross-sectional study of wellbeing and HRQoL in older people with ESKD (estimated kidney function or glomerular filtration (eGFR)≤10ml/min/1.73m^2), treated at three renal units in the UK and Australia during 2014-2017, was undertaken. Patients were managed with dialysis (facility haemodialysis, peritoneal dialysis, home haemodialysis) or with comprehensive conservative care. Wellbeing and HRQoL were assessed using ICECAP-O (0-1 scale, 0=no capability, 1=full capability), and Short-Form six dimensions utility (SF-6D, 0-1 scale, 0=death, 1=full health) derived from the SF-12 questionnaire. Linear regression assessed associations between treatment, wellbeing and HRQoL. Pearson's correlation coefficient assessed convergent validity between the instruments. The feasibility and acceptability of the ICECAP-O and SF-12 questionnaires were assessed by response rate and specific items asking patients whether the questionnaire was easy to complete, and whether it covered questions important to their wellbeing and quality of life (1-5 scale, 1=strongly agree, 5=completely disagree).

Results: Of 129 patients, median age 81 years [IQR 78-85], 65% males; 83(64%) were managed with dialysis and 46(36%) with conservative care. The mean ICECAP-O capability for the cohort was 0.72 (SD 0.19), and mean SF-6D utility was 0.62 (0.14). When adjusted for treatment type and sociodemographic variables, those managed on dialysis reported lower overall ICECAP-O wellbeing (-0.07, 95%CI -0.16 to 0.02), and lower mean SF-6D utility (-0.05, 95%CI -0.12 to 0.01) than those managed conservatively. The SF-6D utilities score and pain domain were strongly correlated with the overall ICECAP-O wellbeing with a Pearson's coefficient of 0.65 ($p<0.001$) and 0.56 ($p<0.001$) respectively. At the domain level, the role and control domains of the ICECAP-O questionnaire were strongly correlated with the pain domain of the SF-6D, with a Pearson's coefficient of 0.51 ($p<0.001$) and 0.53 ($p<0.001$) respectively. All other domains of the ICECAP-O were weakly or moderately correlated with SF-6D domains, values ranging from 0.05 to 0.49. Overall, patients strongly agreed both questionnaires were easy to use (mean score 1.78) and relevant to assessing wellbeing (1.77) and HRQoL (1.79).

Conclusions: Measuring wellbeing using ICECAP-O provides additional insights into the impact of dialysis on older people than HRQoL SF-6D measurement alone, and has potential to improve economic evaluation of treatment for ESKD. Among older people, the ICECAP-O may be more relevant, covering important domains of quality of life and wellbeing than the SF-6D.

Associations between Social Isolation, Health-Related Quality of Life and Capability Wellbeing Using the ICECAP-O Instrument, in Older Australians

PRESENTER: **Rachael Morton**, University of Sydney

Background: Social isolation produces many long-term deleterious physical and psychological effects particularly among older people where it is especially common. While much of the theory around social isolation has been documented, few studies have been conducted among older people to determine the association between social isolation, health-related quality of life and newer measures of capability wellbeing. This study aims to determine these associations.

Methods: The participants were 508 community-dwelling residents who were living independently in retirement villages in New South Wales, Australia; and enrolled in the Dancing, AgeiNg, Cognitive, and Economics (DAnCE) cluster randomised trial of social dancing to prevent falls. Participants completed a baseline and 12-month survey which included three instruments: Lubben Social Network Scale (LSNS-6) – measuring social isolation; Short Form-12 (SF-12) – measuring health-related quality of life (HRQOL); and *the* ICECAP-O capability index –measuring capability wellbeing. Discriminant validity assessed the ability of the LSNS-6 and ICECAP-O to detect differences in baseline characteristics of the study population. Associations between social isolation, HRQOL, and capability wellbeing were assessed through linear regression, and correlation between instruments assessed using Spearman's rank correlation coefficient. Changes in HRQOL and capability wellbeing over time in participants with two measures were assessed using ANCOVA models with adjustment for baseline values and treatment allocation.

Results: Of 508 participants at baseline, 230 (45%) were aged 80 years or older, 301 (59%) were living alone, and 359 (71%) had 2 chronic conditions. The mean LSNS-6 score was 19.16 (SD 2.89) (range 0 to 30, higher score indicates better social connectivity and lower social isolation); mean SF-12 physical component summary (PCS) was 47.70 (SD 8.84) and mental component summary (MCS) 52.72 (SD 9.64) (standardised mean 50); and mean ICECAP-O score 0.88 (SD 0.11) (range 0 to 1). At baseline, discriminant validity indicated the LSNS-6 was able to detect high levels of social isolation for those aged ≥ 80 ($p=0.0174$), exhibiting a score of ≥ 5 on the Geriatric depression scale ($p<0.0001$), and ≤ 27 on the Cognitive status (MMSE) ($p=0.0027$). For the ICECAP-O, discriminant validity indicated the instrument was able to detect lower wellbeing in people living alone ($p=0.0272$), and those exhibiting a score of ≥ 5 on the Geriatric depression scale ($P<0.0001$). Convergent validity identified moderate associations between ICECAP-O and SF-12 scores in the Vitality (0.31) and Mental health (0.39) domains. Adjusted scores at 12-months for 385 participants showed a small but significant increase in social isolation measured by LSNS-6; a decrease in physical health but no significant change in mental health as measured by SF-12; and no significant change in capability wellbeing as measured by ICECAP-O.

Conclusions: The ICECAP-O instrument was able to detect lower wellbeing in those who were socially isolated. The ICECAP-O provides additional information about wellbeing that is not captured by standard HRQOL instruments, and may be useful for economic evaluation of health and social care interventions in older people.

An Investigation of the Construct Validity and Responsiveness of the Danish ICECAP-A

PRESENTER: **Annette Willemoes Holst-Kristensen**, Aalborg University

Background: The ICECAP-A is a measure of capability wellbeing for use in economic evaluation in adults. ICECAP-A has five attributes: stability, attachment, autonomy, achievement, and enjoyment. There is increasing evidence on construct validity but very little known about the responsiveness of the measure. Construct validity relates to the degree that relationships between a measure and other variables confirm *a priori* expected patterns of association; responsiveness aims to detect the ability of a measure to determine important or meaningful changes over time. This study aims to provide the first assessment of construct validity in patients with cardiovascular disease (CVD), chronic obstructive pulmonary disease (COPD) and diabetes, and to assess the responsiveness of the ICECAP-A in this group.

Methods: Data is being collected from patients attending out-patient rehabilitation in the municipality of Aalborg, Denmark, from March 2018 to March 2019. Patients were referred by their general practitioner to rehabilitation after an acute event related to CVD, COPD or diabetes. Patients were asked to answer a questionnaire (the AAK) developed by the health care centre and ICECAP-A at baseline and 12 weeks follow-up (the end of the rehabilitation programme). Clinical data obtained through the rehabilitation programme collected at baseline and follow-up were also available for analysis. To assess construct validity, *a priori* hypotheses were developed based on existing evidence about the ICECAP measures in other contexts. Based on these hypotheses, associations between selected variables and the ICECAP-A attributes will be analysed through chi-squared tests for categorical variables or one-way analysis of variance for continuous variables. To investigate responsiveness, the anchor-based method will be used. Patients will be divided into groups showing positive, negative and no change, by changes between baseline and follow-up in variables obtained through the AAK and clinical data. Analyses will be conducted using both the weighted and unweighted ICECAP-A scores, with effect sizes, standardised response means, and t-tests used to quantify responsiveness. Findings will be explored across different age groups and the different disease groups.

Results: Recruitment will be completed in March 2019. To date (30 November 2018), 245 patients have been recruited to the study (84 CVD, 62 COPD, and 99 diabetes patients) and provided baseline data, and 184 patients provided 12-week follow-up data by this date. Mean ICECAP-A score at baseline was 0.872 (SD 0.13); (0.870 (SD 0.15) for CVD, 0.859 (SD 0.12) for COPD, and 0.882 (SD 0.12) for diabetes). Correlation coefficients and the results of statistical testing for the associations between the ICECAP-A and AAK and clinical variables at baseline will be presented; results of the anchor-based responsiveness analyses will be generated.

Conclusion: This study will provide the first investigation into construct validity and responsiveness to change for the Danish translation of the ICECAP-A and the first investigation into responsiveness to change for any ICECAP measure in the context of CVD, COPD and diabetes. These findings will be discussed in relation to sub-groups by age.

10:30 AM –12:00 PM MONDAY [Evaluation Of Policy, Programs And Health System Performance]

Universität Basel | Kollegienhaus – Seminarraum 103

Moms and Kids: Selected Topics in Programme Evaluation

SESSION CHAIR: **Yubraj Acharya**, The Pennsylvania State University

Public Provision of Menstrual Hygiene Products and School Absenteeism: Evidence from South Africa

PRESENTER: **Mr. Nicholas Stacey**, PRICELESS SA, University of the Witwatersrand

Limited access to menstrual hygiene products is suggested to deter school attendance for poor adolescent females during menstruation. In low income settings, females without access to menstrual hygiene products report reduced school attendance during periods of menstruation due to discomfort and fears of embarrassment or social stigmatization. Recognizing menstruation as a healthy feature of womanhood, there have been calls for the exemption of menstrual hygiene products from sales or value-added taxation and for subsidization of menstrual hygiene products. While the rationale for these calls have often been rights- or dignity-based, others argue that there are secondary benefits for human capital accumulation in terms of improved school attendance that warrant the subsidization of sanitary products. The literature on the effect of improved access to menstrual hygiene products and school attendance is limited however with only isolated small-scale intervention studies. Drawing on household survey data and applying difference-in-difference methods, we estimate the intention-to-treat effect of a recent large-scale provincial government effort in KwaZulu-Natal, South Africa, providing sanitary pads to female students on school absenteeism among adolescent females. We find a 4.97 percentage point reduction in the probability of school absenteeism among teenage females attending public schools in the treated province as compared to those in control provinces. The effect is limited to females from asset-poor households.

Analysis of Horizontal Inequity in Maternal Health Care Utilization in India: A Cross- Sectional Study

PRESENTER: **Sumirtha Gandhi**, Indian Institute of Technology Madras

AUTHORS: Umakant Dash, Suresh Babu

Background

With the world transcending from the era of Millennium Development Goals to the Sustainable Development Goals, health equity analysis has gained huge attention. The presence of health inequity in maternal and child health also holds importance because it hinders the overall improvement in health status.

Objectives

This paper attempts to examine income related inequality and also measures horizontal inequity underscoring the distributional nuances.

Data & Methodology

National Family Health Survey of 2005-06 and 2015-16 were used for the analysis. Three outcome variables namely antenatal care, skilled based attended and postnatal care services were chosen. Independent variables are categorized into need-based variables and non-need-based variables. Need based variables are BMI status, Age, Birth order and non-need-based variables household size, education, religion, caste, place of residence, prevalence of under-five, wealth index, age at marriage. Probit model was used to elucidate the utilization of complete maternal health care services. Indirect standardization was further conducted to exhibit need-based standardization results. Following the descriptive analysis, concentration curves and concentration indices were computed to discern horizontal inequity in the utilisation of maternal health care services. Finally, the decomposition of horizontal inequity index was done to unravel the impact of correlates impacting utilization of maternal health care services, thereby delving deeper into individual contributions of the socio-economic factors driving the dependent variables of utilization.

Results and Recommendations

Unstandardized concentration indices for Antenatal Care, Skilled Based Attendance and Postnatal Care between 2005-06 and 2015-16 plummeted from 33.39% to 18.59%, 30.85% to 9.79% and 26.80% to 8.64% respectively. After standardising the need-based variables, the value of Antenatal Care, Skilled Based Attendance and Postnatal Care services fell from 30.83% to 17%, 33.43% to 8.98% and 24.82% to 8.04% between 2005-06 and 2015-16. Need based factors like age of the respondent and body mass index, has significant bearing on the utilisation of complete maternal health care services. Concentration index found to be symptomatic with pro poor distribution, indicating that the proportionate concentration of the complete utilisation of maternal health care services is higher among poor. Those utilizing maternal health care was significantly affected by factors like, education status, quintile groups and age at marriage etc. Although the level of health inequity improved across all maternal health care interventions, massive improvement has been witnessed in skilled based attendance when compared to the antenatal care and postnatal care services. At this juncture, it is essential for the policy makers to tailor policies and concert greater efforts on the interventions that are capable of enhancing equitable utilisation of antenatal care services and postnatal care services.

Impacts of National Health Mission on Access to Maternal Health Services: Evidences from a Mixed Method Study in India

PRESENTER: **Sukumar Vellakkal**, BITS Pilani

Background and Objective

There is growing debates on two alternative pathways for achieving universal health coverage- the supply-side strengthening versus demand-side financing. India’s National Health Mission [NHM] - launched in 2005 with the goals to strengthen the primary public healthcare system - has been based on both the strategies. The supply-side strategies of the NHM includes strengthening primary healthcare infrastructure, and deploying ASHAs (community health workers) at the village levels, while the demand-side strategies include the conditional cash-transfer program (named Janani Suraksha Yojana –JSY) targeted on pregnant women to use healthcare facilities for child-birth. This study aims to identify the factors that enable and impede access to maternal health services in the context of NHM, and to inform the policy making on the relative relevance of both the strategies.

Data and Methods

This study applied a mixed method approach including both qualitative and quantitative methods in two phases. In the first phase, to identify the enabling and impeding factors of access to maternal health services we conducted a qualitative study among a purposive sample of 151 participants consisting of JSY users/non-users, ASHAs, members of Village Health and Sanitation Committees, and officials at different tiers of healthcare facilities in the Indian states of Jharkhand, Madhya Pradesh and Uttar Pradesh. In the second phase of quantitative analysis, informed by the key findings and insights from the qualitative study, we conducted an impact evaluation of the NHM on access to select maternal health services (ante-natal care, and institutional delivery) across the Indian states. Based on a quasi-experimental framework of impact evaluation of pre- and post NHM periods with statistical matching using the data from DLHS-2 (2004-05) and DLHS-4 (2014-16) with a sample of more than 0.3 million women, we applied difference-in-differences (DiD) models with ante-natal care, and institutional delivery as dependent variables, and select supply-side strengthening and demand-side financing variables as covariates.

Results and Conclusions

The qualitative study found that the ASHAs' support services and awareness generation of the benefits of institutional healthcare emerged as major enabling factors. The JSY cash incentive played a lesser role as an enabling factor because of higher opportunity costs in the use of healthcare facilities versus home for childbirth. The socio-cultural practices interacted with trust in the skills of traditional birth-attendants were the most prevalent impeding factors. The quantitative estimates of impact evaluation found that the average treatment effect (ATE) of the

interaction variables of health facilities, ASHAs and conditional cash-transfer has shown greatest impact on access to maternal health services than the estimates of these variables without interaction, after adjusting for other covariates. The estimates of the local average treatment effects (LATE) of the poor population groups also confirm same pattern of results. Our study findings highlight the importance of implementing a contextually appropriate mix of both supply and demand side strategies in the public health programs. Our study also highlights the importance of applying mixed methods study using both qualitative and quantitative approaches informing each other to guide more evidence-based public health policy making.

10:30 AM –12:00 PM MONDAY [Production Of Health, Health Behaviors & Policy Interventions]

Universität Basel | Kollegienhaus – Seminarraum 104

Ageing #2

SESSION CHAIR: **Ulrike Muench**,

Analysis of Mortality after Hip Fracture on Patient, Hospital and Regional Level in Germany

PRESENTER: **Claudia Schulz**, University Medical Center Hamburg-Eppendorf

AUTHOR: Dr. Hans-Helmut Koenig

Hip fractures are common consequences of falls in older adults. They are associated with considerable costs and lead to numerous negative health outcomes, of which the worst is mortality. There is evidence for regional variation of hip fracture incidence. Variation of subsequent mortality between hospitals and regions might suggest inequalities in health care and reveal health gaps across regions. In this study, we sought to examine patient-, hospital-, and region-level factors associated with mortality after hip fracture, and quantify how much of the variation in mortality is explained by each level.

We used patient-level statutory health insurance claims data from 01/2009 through 12/2012. Additional information was obtained from the list of German hospitals ("Krankenhausverzeichnis") and the German Federal Statistical Office. Regions were classified based on two-digit postal code. We investigated the association of independent factors on patient, hospital and regional level with mortality within six months after hip fracture. We incorporated the hierarchical structure of the data by applying a multilevel Cox proportional hazard ("frailty") model with random intercepts on hospital and regional level and partly time-depending covariates.

The dataset contained information on 123,119 hip fracture patients in 1,014 hospitals in 95 German regions. Among all patients, 20.8% died within six months after hip fracture. The multivariate analysis revealed that the patient-level factors male sex, increasing age, increased pre-fracture care level, increasing comorbidity, rehospitalization and lack of rehabilitation were significantly associated with an increased hazard of mortality, as well as a large hospital size. Variation was largest on patient level, modest on hospital level and lowest on regional level. Up until now, regional level variation could not sufficiently be explained by regional factors.

Mortality after hip fracture was related to various factors on patient and hospital level. Analysis suggested a higher extent of variation on patient than on hospital and regional level. The identification of patient-related risk factors may help to forecast mortality after hip fracture. The minor regional variation of mortality after hip fracture might suggest a virtually standardized and in all regions similar treatment and care of hip fractures in Germany. Efforts should be directed to identify further potential sources of variation on patient, hospital and regional level.

Heterogeneous Impact of Retirement on Health and Health Behavior across Groups with Different Educational Background: Evidence from a Nationwide Panel Survey in Japan

PRESENTER: **Dr. Mari Kan**, University of Hyogo

AUTHORS: Shigeki Kano, Takashi Oshio

Retirement is one of the biggest life events when people experience drastic change in life-style, economic situation, time allocation and relationship with others, which are named a few. Those changes are associated with health and health behaviors. This study examined the impact of "retirement" on health and health behavior focusing on the difference across the groups with different educational background. To avoid bias arising from workers' endogenous retirement decisions, previous research has mainly used instrumental variable (IV) methods with pension eligible age as an IV, for example. However we are interested in isolating the pure effect of "retirement" from the general effect of being out of the labour force. Therefore we employ a regression discontinuity design using the unique practice of mandatory retirement in Japan. We used panel data from the Longitudinal Survey of Middle-aged and Elderly Persons conducted by Japan's Ministry of Health, Labour and Welfare in 2005–2012. We exploit the discontinuity in working status around the mandatory retirement age of 60 in Japan to identify the effect of retirement. We focused on three health behaviors (current smoking, heavy alcohol drinking, and leisure-time physical activity) and two health indicators (self-rated health and psychological distress).

We find that retirement has a statistically significant effect on psychological distress among men. Retirement improves men's mental health, but the magnitude of the improvement is larger among retirees with higher education than ones with high school or less education. Men with higher education quit smoking when retire but are more likely to be a heavy drinker. Retirement promoted leisure-time physical activity among men with high school or less education but not among men with higher education. Among women, retirement does not affect the psychological

distress unlike men. Only women with high school or less education are more likely to start leisure-time physical activity after retirement while both groups of women drink more alcohol after retirement.

Additionally we examined the general effect of being out of the labour force using a mandate retirement age as an IV, and found similar effects of retirement for each group but the magnitudes of the effects are much larger than the effects of "retirement". It suggests the possibility in which the effects of retirement in the existing literature are over-estimated.

Can Medicare Save Money By Covering Hearing Aids?

PRESENTER: **Dr. Elham Mahmoudi**

AUTHOR: Mr. Neil Kamdar

Motivation. While hearing loss (HL) is the third most common chronic condition among older adults and has been linked with adverse health conditions, hearing aids (HAs) are not covered by Medicare andmost other private insurers, adding to the financial barriers of acquiring HAs. While evidence shows that HAs improve health and quality of life for people with HL, no study has yet investigated and quantified the extent of their cost-savings benefit.

Objective. This novel study longitudinally followed patients 65 years of age and older who were covered by Medicare Managed Care in order to compare total healthcare costs, as well as utilization and cost of inpatient, emergency department, outpatient, and office visits within 3 years of index diagnosis of HL between those who used HAs and those who did not.

Data. We performed a retrospective cohort study of 110,611 older adults with HL diagnoses using a national, private insurance claims database Clinformatics® Data Mart Database. This claims database captures all healthcare encounters of over 79 million adults and children. To infer patients with new HL diagnoses, we excluded patients with a HL diagnosis or any HA procedure codes within one year prior to the index HL diagnosis.

Study Design. We analyzed medical claims data (2008-2016), identifying adults 65 and older who were diagnosed with HL. We applied propensity score matching to adjust for selection bias using baseline demographic, clinical, and cost characteristics (at a caliper of 0.001 without replacement). All costs were inflation adjusted to 2016 dollars.We applied a pre-post quasi-experimental design, using multiple group interrupted time series analysis (ITSA) regression models to estimate quarterly changes in total cost and use and cost of various healthcare services, comparing HA users with non- users. Our pre-period was 1 year prior to index HL diagnosis and our post-period was 3 years after.

Principal Findings. We were able to propensity match 2,974 of HA users with non-HA users. There were no significant differences between average healthcare utilization and spending between the two groups prior to index HL diagnosis (pre-period). Average total healthcare cost in 1 year prior to HL diagnosis among those with and without HAs were $12,221 and $12,653, respectively. In the first year after diagnosis, due to cost of HAs, total average healthcare cost was higher for patients with HAs vs. those without ($15,271 vs. $14,301). However, in years 2 and 3 following HL, patients with HAs exhibited lower average total cost compared to non-users with $1,102 and $1,697, respectively ($p < 0.001$). The difference-in-differences coefficient indicated effectiveness of HAs in reducing healthcare costs (b=-171, p=0.031; 95% CI:-325 to -17).

Policy Implications and Conclusions.HAs would substantially reduce cumulative healthcare costs across the life course of the patient. In 2016, out of 16.4 million adults 65 years and older with HL, only 14% used HAs. Our study shows that within 3 years of HL diagnosis, use of HAs could have approximately saved Medicare more than $22 billion if the remaining 86% of people with HL diagnosis would have used HAs.

Comparing the Health Impact of Providing Informal Care between the UK and the Netherlands

PRESENTER: **Judith Bom**

AUTHOR: Jannis Stöckel

Background: Western countries generally offer some form of publicly funded long-term care (LTC) to their citizens. Set-up and comprehensiveness of these services differ widely, especially with regard to the reliance on informal care, the provision of non-health related LTC by family and friends. In the UK, informal care is an integral part of the system and considered the first source of care, while formal services are income dependent. In the Netherlands, reliance on social networks only very recently became an explicit policy objective. Therefore, the incentives to provide informal care potentially are different from the UK, as caregivers are still more likely driven by intrinsic motivation. This different position of informal care in the respective LTC systems might lead to differences in the impact of providing care, as caregiver burden might differ considerably depending on whether provision is driven by voluntary decision or social norm. Also, the availability of formal care services in the Netherlands might mitigate detrimental health effects as opting out of caregiving, when needed, is easier.
Objectives: We aim to estimate the causal health effects of providing care on caregivers in the UK and the Netherlands. This is the first in-depth study into caregiving effects covering different countries, with different LTC systems.
Methods: We estimate the direct impact of providing informal care by matching caregivers to similar non-caregiving individuals using propensity score matching. By matching individuals on their propensity of providing informal care, captured by the presence of persons in need, socio-economic characteristics, and pre-treatment health status we overcome endogeneity concerns related to the caregiving decision, allowing for causal estimates of the health effects of caregiving.
Data: We use the first four waves of the Dutch Study on Transitions in Employment, Ability and Motivation and compare this with data from the UK Household Longitudinal Study. As the Dutch dataset covers persons aged 45-64 years, we limit the UK adult population dataset to this age-range. After exclusion of respondents with missing information on the covariates of interest the samples consist of 10,253 Dutch and

11,741 UK respondents. Among these, respectively 2,697 and 2,815 individuals are caregivers.
Results: Matching of the samples shows that we find sufficient common support between the treated and the matched sample, with balanced covariates between the groups within each country.
Comparing the caregiving effects between both countries we expect to see a stronger negative health impact (for similar care intensities) in the UK sample. The universal and comprehensive Dutch LTC system might namely make it easier to opt for formal care when caregiving tasks become too burdensome.
Conclusion: In the light of growing attention for the health and wellbeing of informal caregivers it is important to understand how caregiving effects differ dependent on the LTC system and its incentives and support for informal caregivers. This study aims to fill this gap, enabling policy makers to better understand the importance of LTC system design for the health outcomes of informal caregivers.

10:30 AM –12:00 PM MONDAY [Specific Populations]

Universität Basel | Kollegienhaus – Seminarraum 106

Market Organization and Child Health

SESSION CHAIR: **Nancy Breen**, National Institutes of Health

State Marketplace Insurance Plan Features and Family- and Plan-Paid Expenditures for Children with Mental Health Conditions in the USA

PRESENTER: **Ms. Kathleen Thomas**, The University of North Carolina at Chapel Hill
AUTHORS: Izabela Annis, Jessica Dykstra Steinbrenner, Nicole Kahn
Background: This presentation explores the association of state marketplace plan features in the USA with family- and plan-paid expenditures for children with mental health conditions. Poor understanding of health insurance plan features makes it difficult for families to pick plans that meet their needs. An unanswered question is which insurance plan features are most important for these families.

Methods: Pooled cross-sectional data 2003–2012 from the Medical Expenditure Panel Survey, a nationally representative survey in the USA, combined with popular plans purchased in state health insurance marketplaces were used to examine expenditures for children with mental health conditions (n=5,761) and autism (n=406). Plan features were mapped to the corresponding expenditures of the families in both samples, resulting in 102 hypothetical scenarios per child suggesting what families and plans would pay if they held each plan. Plan features examined were deductibles, copayments, coinsurance, and maximum visits for all services in and out of network because coverage levels varied if services were received within a specified geographic network or outside it. Simulations examined impacts of 1) having plan features at the low/high mode, and 2) using services in- versus out-of-network. Descriptive statistics (mean, 95% confidence intervals) summarize expected expenditures and proportion paid by families and plans.

Findings: Twenty network-specific and six network-invariant plan features were coded. Popular marketplace plans had a modal in-network person deductible of $3,000, with a low mode of $2,500 and a high of $5,000. Corresponding out-of-network values were $6,000, $5,000 and $10,000. Specialty physician coinsurance rates had a modal in-network rate of 0%, with a low mode of 0% and a high of 20%. The out-of-network values were 40%, 0% and 60% respectively.

Simulated out-of-pocket expenditures for families with children with mental health conditions were $1,042 (46% of total) for in-network services and $1,397 (50% of total) if services were obtained out-of-network. Corresponding values for children with autism were $1,614 (46%) and $2,559 (54%). The drug deductible was the most important plan feature, followed by person deductible and person out-of-pocket limit. For example, for children with mental health conditions, if the drug deductible was $1,000 rather than the modal value of $0, families would pay an additional $353 out-of-pocket. Findings for children with autism generally result in larger changes.

Conclusions: Families raising children with mental health conditions who are covered through marketplace plans in the USA pay a significant amount, about half, of the costs of their child's care out-of-pocket. Deductibles and out-of-pocket loss limits are the most important plan features driving out-of-pocket costs.

Implications for Policy or Practice: People are unfamiliar with health insurance plan features and disappointed with their value. Families raising children with mental health conditions would benefit from greater transparency about what plans might pay for their child's particular needs in order to compare and choose the best plan. Future work should explore development of algorithms to inform this choice.

Hospital Market Competition and Infant Mortality

PRESENTER: **Ciaran Phibbs**, Department of Veterans Affairs
AUTHORS: Jeannette Rogowski, Douglas O. Staiger, Jeffrey Horbar, Erika Edwards, Jochen Profit, Scott Lorch

Objective: For decades, organization of neonatal intensive care along regionalized care delivery systems has been a health policy priority, underpinned by research at the hospital level demonstrating significantly lower morbidity and mortality when high-risk deliveries occur in hospitals with a high-level, high-volume NICU. The clear association of higher volume and better outcomes has the policy implication that at least to some level, more concentrated NICU markets would be associated with better outcomes. However, the existing NICU volume

investigations have failed to take into account market-level hospital competition. In other areas of health care, reduced competition has been associated with lower quality of care delivery. Our objective was to study the influence of these potentially opposing forces on neonatal and infant mortality.

Methods: County-level infant and neonatal (<28 day) mortality were extracted from CDC Wonder for 2000-2014. Data were restricted to the 550 largest counties for which CDC releases county-specific birth and death data (the excluded counties all have small populations). Counties were linked to Dartmouth Hospital Referral Regions (HRRs) and the mortality rates were calculated for each HRR/year. The competitiveness of each delivery market was defined as the Hirschman-Herfindahl Index (HHI) for the share of births in each HRR, using the reported number of births for each hospital within a given HRR from the AHA Annual Survey of Hospitals.

Results: Delivery markets are moderately concentrated. Average market concentration increased monotonically and significantly over the 15-year period from a mean of 0.201 in 2000 to a mean of 0.253 in 2014, with considerable variability across regions. The inter-quartile ranges were 0.095 to 0.273 and 0.122 to 0.311 in 2000 and 2014, respectively. Regression results showed that increased delivery market concentration was associated with reduced neonatal and infant mortality, but these results became non-significant when the time trend was controlled for.

Conclusions: For this initial examination, increased concentration of deliveries does not appear to be associated with worse neonatal or infant mortality. Further investigation is needed to better account for market and provider characteristics that are known to be associated with these outcomes. Given the significant effect of NICU volume, one needs to account for the fact that reaching minimum volume standards has different effects on the competitiveness of the market as market size varies. Thus, the optimal level of market concentration could well vary by market.

10:30 AM –12:00 PM MONDAY [Specific Populations]

Universität Basel | Kollegienhaus – Regenzzimmer 111

Organized Session: Economic Evidence to Support Vaccine Introduction Decision Making

SESSION CHAIR: **Raymond Hutubessy**, Initiative for Vaccine Research, World Health Organization

DISCUSSANT: **Frederic Debellut**, PATH's Center for Vaccine Innovation and Access

Surveillance for Enteric Fever in Asia Project (SEAP) II: Patient Cost of Illness

PRESENTER: **Nelly Mejia Gonzalez**, U.S. Centers for Disease Control and Prevention

AUTHORS: Sarah Wood Pallas, Denise Garrett, Samir K Saha, Farah Naz Qamar, Jason Andrews, Kashmira Date, Taiwo Abimbola

Background: In low- and middle-income countries, enteric fever (typhoid and paratyphoid fever) remains a major public health problem and leads to hospitalization, missed work days, missed schooling, out-of-pocket expenditures for families, and in severe cases, death. The Surveillance for Enteric Fever in Asia Project (SEAP) is a large, multi-center, prospective surveillance study designed to estimate the disease and economic burden of enteric fever at selected sites in Bangladesh, Nepal, and Pakistan. This analysis aims to estimate the cost of illness of enteric fever for patients in SEAP study sites to inform country- and region-level funding decisions on typhoid control interventions, particularly use of new typhoid conjugate vaccines.

Methods: Data were collected from patients of all ages with blood culture-confirmed cases of *Salmonella* (S.) Typhi enrolled in eight SEAP study sites (two in Nepal, two in Bangladesh, and four in Pakistan), including a mix of private sector, public sector, and charity-based hospitals, all in urban or peri-urban areas. From September 2016 to October 2018, patients or their caregivers were surveyed by phone 2-3 days after lab testing or hospital discharge and six weeks after study enrollment. Data collected included direct medical and non-medical costs (e.g., transport, food, lodging or childcare while seeking healthcare) and productivity losses from illness onset until the survey dates.

Results: Of 3,298 eligible case-patients with blood cultures positive for *S.* Typhi, 2,892 (88%) responded to the first cost of illness survey (1,687 in Bangladesh, 402 in Nepal, and 803 in Pakistan) and were included in the analysis. The proportion of case-patients <18 years old was 90% in Bangladesh (both sites are pediatric hospitals), 30% in Nepal (both sites serve all age patients) and 41% in Pakistan (one of four sites is a pediatric hospital). In 2016 US dollars, the reported median patient out-of-pocket direct medical expenses were $57 in Bangladesh, $37 in Nepal, and $143 in Pakistan; median patient out-of-pocket direct non-medical expenses were $5 in Bangladesh, $5 in Nepal, and $7 in Pakistan. The median number of work days lost by patients was 8 days in Bangladesh, 10 days in Nepal, and 28 days in Pakistan; the median number of school days lost was 15 days in Bangladesh, 8 days in Nepal, and 15 days in Pakistan. Across the three countries, the median expenses incurred by patients who received some inpatient care were at least seven times larger than among those receiving only outpatient care (Bangladesh: $40 outpatient vs $294 inpatient, Nepal: $24 outpatient vs $2,617 inpatient, and Pakistan: $102 outpatient vs $1,391 inpatient). The ratio of median direct medical expenses to total health expenditure per capita was 17:10 in Bangladesh, 9:10 in Nepal, and 39:10 in Pakistan. Differences in costs across countries reflect differences in health care prices and payment structures (e.g., availability of charitable care) and case mix.

Conclusion: SEAP results illustrate the economic burden of enteric fever to patients and their families, providing important evidence to inform cost-effectiveness analyses of typhoid vaccination strategies and other enteric fever control intervention decisions.

Program Cost Analysis of Influenza Vaccination of Health Care Workers in Albania

PRESENTER: **Sarah Wood Pallas**, Centers for Disease Control and Prevention (CDC)

AUTHORS: Albana Ahmeti, Winthrop Morgan, Iria Preza, Erida Nelaj, Malembe S Ebama, Dr. Ann Levin, Kathryn E Lafond, Silvia Bino

Background: Since 2012, the World Health Organization (WHO) has recommended influenza vaccination for risk groups including health care workers (HCWs), pregnant women, children aged 6-59 months, the elderly, and patients with chronic diseases. Influenza vaccination of HCWs contributes to health facility infection control and pandemic preparedness. Vaccinating HCWs has different cost implications for national health systems compared to routine infant immunization; however, there is limited economic evidence to inform influenza vaccination decision making in low- and middle-income countries. Albania, a middle-income country, has self-procured influenza vaccine to cover 50% of HCWs in public sector health facilities throughout the country since 2014, supplemented by vaccine donations since 2016 through the Partnership for Influenza Vaccine Introduction (PIVI) that also covered other risk groups who otherwise must pay for influenza vaccination in the private sector. During a pilot of the WHO's Seasonal Influenza Immunization Costing Tool (SIICT), we conducted a program cost analysis of HCW influenza vaccination scenarios in Albania to inform scale-up and sustainability decisions.

Methods: We used the SIICT's ingredients-based micro-costing approach to estimate incremental financial and economic costs from the government perspective of vaccinating HCWs in Albania with trivalent inactivated influenza vaccine for the 2018-19 influenza season based on 2016-17 season data. Economic costs included financial costs (i.e., Government of Albania monetary outlays) plus the value of existing government resources and external partner donations (e.g., vaccine). Data were collected from administrative records, key informant consultations, and site visits at national and a convenience sample of subnational sites. Scenario analyses estimated the change in costs due to variations in vaccination coverage (80%-85%), vaccine presentation (pre-filled syringes or single-dose vials), and vaccine prices (US$4.54-US$5.30 per dose, including customs). Costs were compared to Albania's annual health and immunization expenditures.

Results: In the baseline scenario, 13,377 HCWs (70% of 19,110 HCWs eligible for influenza vaccination) would be vaccinated at an estimated total incremental financial cost of US$60,094 and economic cost of US$158,470. Procurement of vaccine and supplies represented the largest share of both financial costs (89%; US$53,672) and economic costs (44%; US$69,779). Per vaccinated HCW, the financial cost was US$4.49 and the economic cost was US$11.85 (US$0.48 and US$6.63 respectively without vaccine). Service delivery incurred no financial costs and represented 10% (US$16,589) of economic costs, mainly in-kind personnel time. Alternative scenarios with higher coverage targets, pre-filled syringes, and higher vaccine prices increased total economic and financial costs, although the economic cost per HCW vaccinated was lower under scenarios with higher coverage targets as some costs were spread over larger numbers of HCWs. Across all scenarios, costs were <0.07% of Albania's 2016 government health expenditure of US$251 million, and <5.25% of Albania's estimated 2016 national immunization program economic costs of US$3.3 million.

Conclusions: This cost analysis provides insight into resource requirements, cost drivers, and options for Albania and other middle-income countries considering scaling up influenza vaccination for HCWs, as well as unit cost estimates that can inform cost-effectiveness and budget impact analyses to characterize the economic value of influenza vaccination.

Costs and Cost-Effectiveness of a Two-Dose Oral Cholera Vaccination Campaign in Maela Refugee Camp, Thailand

PRESENTER: **Aaron Wallace**

AUTHORS: Kashmira Date, Sarah Wood Pallas, Nuttapong Wongjindaonon, Christine Phares, Taiwo Abimbola

Introduction: Cholera vaccination campaigns are increasingly used to control and prevent cholera outbreaks; however, little is known about the cost-effectiveness of their use in refugee camps. We conducted a cost-effectiveness analysis of the 2013 pre-emptive oral cholera vaccination (OCV) campaign for all refugees in Maela refugee camp, northern Thailand, where four cholera outbreaks occurred during 2005-2012 with incidence rates up to 10.7 cases per 1000 population.

Methods: Using a societal perspective, we calculated the economic cost (in 2017 US$) of the OCV campaign via reviews of financial records and interviews with involved organizations, households with cholera illness, and health workers. In the base case scenario for estimating cost-effectiveness, we first estimated the campaign effect on cholera incidence rate (IR) and case fatality ratio (CFR), from a static cohort-based transmission model, using historical data from disease surveillance. We calculated incremental cost-effectiveness ratios for the outcomes of death, disability-adjusted-life-years (DALY) and cases averted using the model outputs, calculated cost of illness and campaign cost. In sensitivity analyses, we varied the CFR and IR.

Results: The household economic cost of illness was US$ 21 and health sector economic cost of illness was US$ 51 per case. In the OCV campaign, 63,085 OCV doses were administered; the campaign economic cost was US$ 289,561, with 42% attributable to vaccine cost and 58% to service delivery cost. In our baseline scenario comparing the OCV campaign to no campaign, the incremental cost was US$ 1.9 million per death averted, US$ 1,745 per case averted, and US$ 71,255 per DALY averted over duration of protection provided by cholera vaccination; cost per DALY averted was 3.5 times the 2017 Thailand GDP per capita (US$ 19,779). Using sensitivity analysis, increasing the CFR from 0.09% to 0.35% or the IR from 3 to 10 cases per 1000 individuals resulted in a cost per DALY of US$ 19,779.

Conclusions: The low CFR and low incidence in the cholera outbreaks occurring in this refugee camp were the main factors associated with the high cost per DALY averted, and contributed to the finding that the OCV campaign would not be cost-effective by conventional willingness to pay standards (1-3 times GDP per capita thresholds). However, sensitivity analyses indicated that the use of a pre-emptive campaign would be a cost-effective choice in certain scenarios with a higher CFR or higher cholera incidence. Thus, cholera campaigns might be considered among interventions to reduce the risk of cholera epidemics.

The Economic Value Chain for Seasonal Influenza Vaccines in South Africa

PRESENTER: **Ijeoma Edoka**, PRICELESS SA, School of Public Health, Faculty of Health Sciences, University of Witwatersrand
AUTHORS: Heather Fraser, Ciaran Kohli-Lynch, Winfrida Mdewa, Cheryl Cohen, Karen Hofman, Raymond Hutubessy

In South Africa, influenza and pneumonia account for a significant number of deaths annually. The burden of seasonal influenza is further exacerbated by the high prevalence of HIV and tuberculosis in the country. To address this burden of disease, the South African National Department of Health introduced an influenza vaccination programme in 2010. However, due to budget constraints and competing priorities in other disease areas, coverage remains low among high-risk population groups (which include pregnant women, HIV positive individuals, those with other underlying medical conditions, and adults over 65 years of age) targeted by the programme. Furthermore, a dearth of economic evidence limits the argument for increased investment in the seasonal influenza vaccination programme in South Africa. This study aimed to assess the costs and cost-effectiveness of the seasonal influenza vaccination programme concurrently using, for the first time, two standardised tools recently developed by the WHO – the Seasonal Influenza Immunization Costing Tool (SIICT), an ingredients-based costing tool, to estimate the total costs of the seasonal influenza vaccination programme; and the Cost-Effectiveness Tool for Seasonal Influenza (CETSI), a static decision analytic modelling tool, to assess the cost-effectiveness of the seasonal influenza vaccination programme compared to a 'no vaccination programme' scenario from a health systems- and societal- perspective over a 1-year time horizon. Therefore, in addition to assessing the costs and cost-effectiveness of the seasonal influenza vaccination programme in South Africa, this study pilot-tested the two new WHO tools in combination, assessing their flexibility and ease of application in different settings. Data required to populate these tools were obtained from various sources: data on the costs of the programme through interviews with key informants at all administration levels of the public healthcare system; costs associated with treatment of influenza through secondary data analysis of the National Institute for Communicable Diseases (NICD) Healthcare Utilisation and Costing Survey (HUCS); health-related quality of life and vaccine efficacy through literature reviews; and epidemiological parameters – including burden of disease data – through secondary data analysis of NICD surveillance data and the HUCS. In addition to estimating the overall cost-effectiveness of the seasonal vaccination programme, we estimated an Incremental Cost-Effectiveness Ratio expressed as incremental cost per quality-adjusted life year for each high-risk target group. The findings of this study provide economic evidence needed to aid decision-making around the scale-up of the seasonal influenza vaccination programme in South Africa and improve efficiency in the allocation of resources across high-risk target populations, as well as demonstrate how countries can apply the WHO economic analysis value chain toolkit in their decision-making around seasonal influenza vaccination.

10:30 AM –12:00 PM MONDAY [Demand & Utilization Of Health Services]

Universität Basel | Kollegienhaus – Fakultätenzimmer 112

Environment/Elections and Health

SESSION CHAIR: **Jongsay Yong**, University of Melbourne

Potential Health Care Savings Following Passage of Smoke-Free Law in Mesquite, Nevada, USA

PRESENTER: **Prof. Jay J. Shen**, University of Nevada, Las Vegas
AUTHOR: Sfurti Maheshwari

Background. Exposure to secondhand smoke (SHS) contributes to significant preventable morbidity and mortality due to cardiovascular disease, neoplastic events, and respiratory problems. Exposure to SHS at home or at work increase their risk of developing heart disease by 25–30%, stroke by 20−30% and lung cancer by 20–30%. The United States annually spends $170 billion on medical care to treat smoking-related disease in adults. Disease and lost production due to workplace exposure to SHS costs are estimated as $5.6 billion each year. About 67.4% of Nevada adults were exposed to SHS between 2009 and 2011, 55.7% of them in public places and the remaining in their workplaces. This study estimated effects of hypothetical smoke-free legislation on hospital admissions and emergency department visits due to three major groups of diseases and the resulting health care cost savings in Mesquite, a city in Nevada with 18,000 residents.

Methods. Five years of Nevada emergency department (ED) visit data and Nevada inpatient discharge data, from 2011 to 2015 were used for analysis. There were 5,619,568 ED visits and 1,828,459 hospital discharges that were included in the datasets. The zip codes were used to identify patients from Mesquite. The total charge of a hospitalization or an ED visit was used to estimate potential economic impact of the smoking reduction. Smoking related clinical conditions were grouped into three categories: coronary events, cerebrovascular conditions, and respiratory conditions and were sub-categorized using the ICD-9 codes. Potential reductions in ED visits and hospitalizations due to smoke-free legislation were obtained from a meta-analysis based on 45 domestic and international studies. Those studies indicate that, on average, smoke-free laws may reduce the relative risk (RR) of coronary events by 16%, cerebrovascular accidents by 16%, and respiratory disease by 24%. The mean (i.e., average), median, standardized deviation, and range of the total charges the specific clinical conditions were calculated.

Results. Overall, the estimated numbers of hospital admissions showed decline in numbers from 2011 through 2015 in Mesquite for all the major groups of diseases. Reduction in coronary and cerebrovascular events contributed to about $5.5 million and $1.5 million towards inpatient care cost savings, respectively. The total inpatient cost savings following treatment of all respiratory events over 5-year period can be projected to about $2.9 million. Reduction in ED Visits due to respiratory events contributed highest amount of savings of about $1.6million followed by $1.1million of ED cost savings due to coronary events. Medicare and Medicaid insurance also have a significant amount of health care cost savings following the implementation of a potential smoke-free law in Mesquite.

Conclusion. Our research supports the assertion that smoke-free laws lead to fewer hospitalizations and a reduction in health care expenditures for a wide range of major diseases. Citizens in Mesquite, Nevada, would save an average of $2.6 million in medical spending each year if the city adopted a comprehensive, smoke-free policy, requiring all workplaces and public places to be smoke-free indoors. Smoke-free laws have potential to be simple and effective interventions to improve population health.

Acute bronchitis and COPD, to which does air pollution entails higher hospitalization burden from economic perspective ---- an evidence from southwestern China

PRESENTER: **Ms. Zhang Pei**

AUTHOR: Dr. Xiaoyuan Zhou

AIM To explore the impact of daily PM2.5 concentration on admission of COPD and Acute bronchitis (AB) by Distribution Lag Model (DLM) and economic burden of the patients. **Method** The number of hospitalized patients with COPD 69,615 and AB(AB) 350,506 of Western China in health insurance record from 2013-2015 were collected, coupled with local daily meteorological and air pollution data during the three years. Quasi -Poisson regression and DLM were used to analyze the impact of daily PM2.5 concentration on admission of COPD and AB, and economic burden of the diseases were observed. **Result** The influence of daily PM2.5 concentration on COPD admission peaked on the first day followed decreasing gradually in forthcoming 2-3 days. Also, for AB, the hospitalization reached the maximum on first day, however, it showed protective effect after a time lag of 1-2 days. The cumulative effect of PM2.5 concentration on the admission of COPD was statistically significant during 0~30 days, while the cumulative effect on the admission of AB was statistically significant only in 0~4 days. According to the analysis by age group, the average daily PM2.5 concentration of COPD mainly affects people over 65 years old; For AB, the average daily PM2.5 concentration has an impact on all age groups, and the cumulative effect declined with pollution time moving forward. With the falling of PM2.5 concentration yearly, the annual per capita economic burden of COPD decreased by 1.4 percentage points, while that of AB increased by 5.5 percentage points. **Conclusion** The daily PM2.5 concentration showed a different lag effect on admission l for COPD and AB respectively. The lag effect on the former lasts longer and has been always harmful, but less significant impact on the economic burden of patients. The lag effect on the latter lasts for a short time, and there will be some protective effect after 1-2 days, but the economic burden has increased. Moreover, the senior population were more vulnerable with PM2.5 compared to other groups, while it was not case for AB.

Does Social Care Mitigate the Effects of Environmental Shocks on Health?

PRESENTER: **Mr. Giuliano Masiero**, Università della Svizzera italiana

AUTHORS: Dr. Michael Santarossa, Fabrizio Mazzonna

Objectives. The effectiveness of local government's social expenditure in mitigating the future use of health care resources is a relevant policy question for the National Health Service. Whether social expenditure may substitute, complement, prevent or postpone the use of NHS resources is seldom investigated in the health economics literature, and previous studies lack evidence on the impact of local government's social expenditure on health care use. This paper exploits exogenous environmental shocks (daily temperatures and earthquake events) to explore the relationship between local social expenditure and hospital admissions for different causes of disease and different social groups.

Data and methods. To analyze the impact of social expenditure on hospital admissions we exploit detailed municipality-level data from Italy, where decisions on social expenditure are delegated to local governments and, therefore, provide a large source of heterogeneity across the country. This dataset is then combined with data from the universe of hospital admissions for mental health and cardiovascular diseases for the period 2001-2015 aggregated by municipality. We use daily data on extreme temperature shocks and earthquake occurrences to identify exogenous hospital admission surges, and analyze if heterogeneity in past social expenditure causes differences in hospital admissions when climate and seismic shocks occur. This strategy allows us to overcome endogeneity due to reverse causality between hospitalizations and social expenditure. Finally, the detail of hospital admission data allows us to explore the effects of social expenditure by socio-demographic groups.

Results. Preliminary findings suggest that social expenditure mitigates hospitalizations with age-group specific effects. People in the age group 35-65 seem to benefit more from social expenditure than the oldest age cohorts. This is likely due to the nature of local social expenditure, whichenhances families' financial well-being but is rather ineffective for severe health problems.

Do Elections Affect Healthcare Utilization?

PRESENTER: **Hung-Hao Chang**, National Taiwan University

AUTHOR: Dr. Chad Meyerhoefer

An emerging body of medical literature indicates that elections cause both psychological and physiological reactions in voters. For example, Stanton et al. (2010) found that the societal shifts and political dominance resulting from the 2008 U.S. presidential election increased stress responses in those who voted for the losing political party. Similarly, Hoyt et al (2018) found that young adults with negative perceptions of U.S. president Donald Trump reported increased stress before his election and on election night. Current studies in this area have several limitation. First, they use small random samples, and second, they do not account for selection into party affiliations or preferences.

We provide the first causal analysis of elections on healthcare utilization and expenditures. We determine whether different types of medical services are affected by elections (e.g. outpatient services, inpatient services, prescription drugs) as well as how healthcare use by individuals with different medical conditions responds to political campaigns and elections. Our data also allow us to determine how the level of political intensity during an election results in greater healthcare use, and if the effects of campaigns and elections are more pronounced in rural or urban areas. Finally, we study the post-election period to investigate whether elections have a long-term or short-term effect on health and medical care use.

The data we use are unique and come from several sources. We extract data on elections and medical care from administrative profile of the Central Election Bureau and the health claim profiles of the National Health Insurance Program (NHI) in Taiwan, respectively. Because the NHI covers all citizens of Taiwan, we use a 5% random sample in our analysis of each election, which results in 131,238 - 148,144 insurants per election for two mayoral and two presidential elections over 2005 – 2012. We also collected data on factors that influence healthcare utilization, such as the number of health care providers and air quality in each township.

We identify the effect of elections on healthcare use using a regression discontinuity (RD) difference-in-differences (DiD) empirical design. In order to account for the skewness of healthcare use and expenditures we apply the RD-DiD framework to a two-part model. We estimate this model on the set of medical claims submitted four weeks before and four weeks after each election. In this RD-DiD model we use the age at which citizens are permitted to vote (age 20) to create the discontinuity such that age is the running variable with a bandwidth of 60 months. Because we simultaneously compare changes in healthcare utilization over time for those who are eligible to vote to changes in utilization those not eligible to vote the framework also makes use of difference-in-differences identification.

Preliminary results suggest that elections increase the use of outpatient services and prescription drugs, but do not affect inpatient service use. Moreover, the effect of elections is transitory with elevated health care use dissipating during the second week after the election. We also find that these effects are more pronounced in rural areas.

10:30 AM –12:00 PM MONDAY [Economic Evaluation Of Health And Care Interventions]

Universität Basel | Kollegienhaus – Hörsaal 114

Economic Evaluation Applications for Chronic Disease

SESSION CHAIR: **Marcia Weaver**, University of Washington

Evaluating the Cost-Effectiveness of Early Biologic Agent Treatment in Crohn's Disease Using Real World Observational Data in Switzerland

PRESENTER: **Ms. Nadia Pillai**, Institute of Social and Preventive Medicine

AUTHORS: Dr. Valérie Pittet, Mark Dusheiko

Background and objectives

Crohn's disease (CD), a chronic inflammatory bowel disease (IBD) of the gastro-intestinal tract, poses a global public health challenge due to severe morbidity and high healthcare utilisation associated with long-term pharmaceutical therapy, risk of hospitalisation and surgery and specialist monitoring. Biologic agents to treat CD show promise to increase remission, change the natural course of the disease, and improve patients' quality of life. However, uncertainty remains about the optimal timing of treatment initiation and their cost-effectiveness. This study evaluated the cost-effectiveness of biologic treatment initiated within two years of diagnosis (early initiation) compared to non-biologic treatment or use of biologic agents more than two years after diagnosis (late initiation) for CD patients in Switzerland.

Methods and data

A Markov model was constructed for newly diagnosed CD patients to model the risk of disease complications, flares and surgeries in the treatment groups over the patient's lifetime. Transition probabilities, resource utilisation and quality of life are derived from the Swiss IBD Cohort Study (SIBDCS), a prospective, national cohort collecting data annually since 2006 across Switzerland. Unit costs borne by third-party payers for IBD-related clinical activity were derived from Swiss insurance claims data and linked to physician- and patient-reported healthcare utilisation in the SIBDCS. Indirect costs were included to reflect the societal perspective. In order to adjust for selection bias, propensity score matching was used to identify similar patients in the treatment groups based on observed clinical and socio-demographic characteristics at enrolment into the cohort.

Results

Preliminary results for 350 matched CD patients (49.7% early initiation, 50% late initiation) are reported. In the first eight years of diagnosis, average annual total direct and indirect costs were 11'000CHF (95%CI: 2'260CHF, 19'800CHF) higher for patients in the early initiation group compared to those in the late initiation group. Within the late initiation group, 56% did not receive biologic treatment during the study follow-up; their crude mean expenditures were 3'000CHF compared to 14'200CHF for those who did go on to receive a biologic agent. Interestingly, costs for the early initiation group declined by 0.5% (95%CI -7.6%, 6.7%) with disease duration, while costs in the late initiation group grew by 9% (95%CI 1.0%, 16.8%) per year on average as more individuals started biologic therapy. On average, quality of life scores, based on the SF-6D questionnaire, were 0.07 (95%CI: -0.02, 0.15) points higher for the early initiation group, however, this was not statistically different to the late initiation group. Over time, quality of life remained stable for both groups.

Conclusion

Preliminary results during the first eight years of diagnosis show a high cost burden associated with early initiation of biologic agents and no significant differences in quality of life when compared to late initiation. Future work will model these effects over the patients' lifetime to

assess the long-term impact of late initiation and re-treatment with biologic agents on health outcomes and costs. This study provides crucial evidence to aid ongoing evaluation of the efficiency of healthcare delivery in the Swiss health system and cost-containment efforts.

Cost-Effectiveness of Direct-Acting Antivirals for Chronic Hepatitis C Treatment-Naive Patients in China

PRESENTER: **Xia Wei**

AUTHORS: Li Yang, Mr. Yuxuan Feng, Mr. Haowen Yuan, Xiaoyan Wu

Background

Hepatitis C has become a global public health problem, and the long-term complications such as liver cirrhosis or hepatocellular carcinoma caused by it have caused great economic burden on patients. In China, the standard of care(SOC) for chronic hepatitis C is pegylated interferon plus ribavirin(PR) for 48 weeks, which is not very effective and associated with relative high risk of adverse events. The arise of direct-acting antivirals (DAAs) has dramatically improved the effectiveness and reduced the incidence of adverse events, but they are expensive than SOC at the same time. DAAs have been available since 2017 in China, so which drug should be included in reimbursement system and how should it be priced causes great concern nowadays.

Objectives

Our aim was to evaluate the cost-effectiveness of the major DAA regimens compared with SOC for chronic hepatitis C treatment-naive Chinese patients and to afford some references for decision-making in reimbursement system of China.

Methods

A decision analytic Markov model was established to estimate the lifetime costs, life years (LYs), quality adjusted life years (QALYs) and incremental cost-effectiveness ratio (ICER) from the perspective of the third-party payer. The data were obtained from clinical trials, literatures and drug price databases specific to China. The regimens compared in this research include: a) pegylated interferon and ribavirin (PR) for 48 weeks; b) daclatasvir (DCV) and asunaprevir (ASV) for 24 weeks; c) sofosbuvir(SOF) and PR for 12 weeks; d) ombitasvir, paritaprevir and ritonavir(OBV/PTV/r) and dasabuvir(DSV) for 12 weeks; e) elbasvir/ grazoprevir((EBR/ GZR) for 12 weeks. The annual discount rate was 3%. Sensitivity analyses were performed to evaluate model robustness.

Results

Base-case analyses results show that in chronic hepatitis C treatment-naive Chinese patients, all those DAA regimens proved to be dominant over PR (more effective and less costly). DCV+ASV, SOF+PR, OBV/PTV/r+DSV and EBR/ GZR gained 1.07,1.21,1.36 and 1.41 LYs and 1.44,1.63,1.83 and 1.90 QALYs more than PR, respectively. The cost savings were RMB25366,16933,33897 and 38376, respectively. At the same time, DAA regimens prevented more long-term complications than PR. Probabilistic sensitivity analyses show that DCV+ASV, SOF+PR, OBV/PTV/r+DSV and EBR/ GZR had a probability of 80.70%, 77.50%, 84.80%, 86.60% probability of being cost-effective at WTP of one time GDP per capita when compared with PR, respectively.

Conclusion and policy implications

DAA regimens are more cost-effective than PR, so traditional interferon therapy no longer has any advantage of price and efficacy. AS for the four DAA regimens considered in our research, EBR/ GZR was the most cost-effective. DAA regimens could be included in drug insurance list and case payment or value based payment for chronic hepatitis C treatment could be explored in the future.

Cost-Effectiveness Analysis of Multidisciplinary Care for Patients with Type-2 Diabetes (T2D) in Mexico: A Quasi-Experimental Retrospective Evaluation

PRESENTER: **Sandra G. Sosa-Rubi**, National Institute of Public Health

AUTHORS: David Contreras-Loya, Carlos Chivardi, Fernando Alarid-Escudero, Roxana Rodríguez-Franco, Ruy López-Ridaura, Virginia Molina-Cuevas, Guadalupe Casales, Cutberto Espinosa-López, Jesús Felipe González-Roldán, Octavio Gómez-Dantés

Background: The increasing prevalence and mortality of type 2 diabetes (T2D) is imposing major financial burdens on households and health systems around the world. Multidisciplinary care (MC) for T2D patients in high-income countries improves metabolic control, prevents acute and chronic complications, and optimizes quality of life; however, the costs of this comprehensive model are not known.

In Mexico, the prevalence of T2D in adults reached 14%. In 2011, the mortality rate attributed to T2D turned into the second cause of death nationwide. The traditional model, which offers medical treatment through physician and nurse as main providers has shown limited results in controlling hyperglycemia. In 2007, the Ministry of Health (MoH) implemented a comprehensive model of diabetes care to improve the effectiveness of the control T2D patients. This model provides sequential care visits to a team of professionals: physicians, psychologists, nutritionists, and social workers. Patients are expected to reach glycemic control within 12 months of admittance to these units.

Methods: We conducted a cost-effectiveness analysis of a MC model of T2D patients compared to the traditional model by estimating the costs and health outcomes using a quasi-experimental retrospective design. Epidemiological and cost data were gathered from a sample of 40 primary facilities randomly selected from 2006-2007: 20 treatment facilities (MC) and 20 control facilities (traditional model of care). We selected individuals with at least 12 months of follow-up and collected data from medical records: gender, age, HbA1c, years with diabetes, body mass

index, blood pressure, and lipid profile. Total costs included medications, health staff, equipment, general services and training, which were derived from patient- and facility-level data. We measured the change in HbA1c after one year of treatment. We assumed no unmeasured confounding to estimate average treatment effect (ATE) using Inverse Probability of Treatment Weighting (IPTW) and propensity score matching to control for systematic differences between individuals treated (n=446 patients) and controls (n=202). We applied latent class models to identify the effect among those patients with inadequate control of T2D at baseline.

Results: Direct costs per patient-year in traditional care were 359 USD and 557 USD in MC units. At baseline, mean levels of HbA1c were 8.1% (CI 95%: 7.9 - 8.3) for patients in multidisciplinary care facilities and 8.4% (CI 95%: 8.1 – 8.7) for patients in primary facilities. The ATE-PSM estimate of the difference of HbA1c at follow-up was -0.50 (CI 95%: -0.78 to -0.21) percentage points of HbA1c. The ATE for those with inadequate control at baseline was -0.85 (CI 95%: -1.32 to -0.40). The incremental cost-effectiveness ratio (ICER) for the MC model of care was 248 USD per percentage point of HbA1c compared to the traditional model.

Conclusions: Our study showed evidence that MC care in MoH-sponsored facilities in Mexico can be a cost-effective strategy. Future research objectives include the estimation of long-term benefits in terms of quality of life, and an exploration of the role of quality of care.

10:30 AM –12:00 PM MONDAY [Supply Of Health Services]

Universität Basel | Kollegienhaus – Hörsaal 115

Organized Session: Understanding the Drivers of Provider Behaviour in the Prescribing of Antibiotics: Evidence on Supply-Side Moral Hazard from Audit Studies in Three African Countries

SESSION CHAIR: **Roman Xu**, Sun Yat-Sen University

Prescribing Behaviour and Physician Agency: Evidence from South Africa

PRESENTER: **Mylene Lagarde**, London School of Economics and Political Science

Information asymmetries are ubiquitous in health, and they create many challenges related to provider behaviour. One particular problem, influencing the financing and sustainability of health systems, comes from the fact that providers rarely bear the financial consequences of their treatment recommendations (provider moral hazard). As such, they may not exert much effort to recommend the less costly treatment. Conversely, doctors may care about the financial consequences of their decisions for their patients if they pay out-of-pocket (altruistic provider hypothesis).

In this study, we explore these two determinants of provider behaviour in the context of the primary care market in South Africa. We exploit the fact that about 40% of GPs in South Africa are licensed to dispense drugs: they charge a fee for the consultation and an additional fixed charge if they dispense drugs to patients. In other words, when these GPs decide to dispense drugs, because they bear the cost of the drugs given, they face a rationing incentive. Conversely, provider moral hazard is likely to occur when they write a prescription since they do not internalize the costs of drugs prescribed.

We conduct a field experiment to explore the relative and combined effect of this rationing incentive and the patient insurance status on provider performance and prescribing behaviour. On the one hand, we use standardised patients portraying a simple case of respiratory viral infection to manipulate the patients' request for a separate prescription to create an exogenous change in the rationing incentive faced by dispensing GPs. On the other hand, we send these patients randomly with or without insurance to test the altruistic provider hypothesis.

We find strong evidence of provider moral hazard: in the absence of rationing incentives, providers increase the value of drugs prescribed by R80, or 1.2x the cost of drugs dispensed. However, there is no change in the proportion of unnecessary antibiotic prescribed. In other words, providers facing a rationing incentive reduce the value but not the quantity of unnecessary treatment. Moreover, there is no change in the effort exerted by providers during the consultation. However, we cannot detect a difference in the type or cost of drugs prescribed to insured vs. non-insured patients. Our results suggest that financial incentives forcing physicians to internalise part of the cost of their treatment decisions encourage them to reduce the cost of treatment, but do not lead to more rational prescribing and reduction of unnecessary antibiotics.

Does the Patient's Voice Matter? A Randomised Experiment to Explore the Role of Provider-Driven Demand in Antibiotic Prescribing Practices Among Private Health Facilities in Tanzania

PRESENTER: **Jessica King**

Introduction: Tanzania has a high rate of antibiotic usage among outpatients, which may contribute to antimicrobial resistance. In order to design interventions to address the high antibiotic prescription rate, it is important to understand what drives this behaviour. An experiment in China showed that patient knowledge of appropriate antibiotic use (signalled by making a statement that they had read antibiotics were not needed for a simple cold/flu) reduced the overall proportion of patients who received a prescription, the proportion who received an antibiotic prescription and drug expenditure. This suggested the provider-initiated antibiotic use explained high prescription rates, and we replicated the experiment in Tanzania to test the hypothesis that antibiotic prescription is a supply-side driven phenomenon.

Methods: Standardised patients (SPs) visited 227 private health facilities in Tanzania to seek care, as part of a wider evaluation of the implementation of the SafeCare quality improvement programme. The SPs were trained to present a case of uncomplicated upper respiratory tract infection (URTI), with symptoms of a cough, sore throat and headache lasting three days. SPs were randomised to “informed” (n=114) or “uninformed” (n=113) roles; informed SPs made a statement at the time of presenting their symptoms that they had heard antibiotics were not necessary for a simple cough, and uninformed patients made no such statement. SPs reported all drugs prescribed and expenditure on drugs and other fees.

Results: 98.2% (223) of SPs were prescribed at least one drug. Among patients who received a prescription, the mean number of drugs prescribed was 2.74, and 91.0% (203) of those prescriptions included at least one antibiotic. 93.8% (95% CI: 89.13-98.3) of uniformed SPs were prescribed an antibiotic compared to 85.1% (95% CI: 78.4-91.7) of informed SPs (p=0.033). There was no difference in the overall prescription rate (98.2% in both groups, p=0.99), mean number of drugs prescribed (2.68 in uninformed vs 2.70 in informed, p=0.87) or the mean drug expenditure (USD3.57 in uninformed vs USD3.75 in informed, p=0.59).

Discussion: There was an extremely high rate of antibiotic over-prescription, with over 90% receiving an unnecessary prescription. Patients who signalled knowledge of correct antibiotic prescription practices were less likely to be prescribed an antibiotic than those who did not. However, signalling this knowledge did not reduce overall prescription rates of any drug, mean number of drugs prescribed or mean drug expenditure, in contrast to findings in China. This suggests there is a substitution effect, with providers who change their behaviour in response to patient knowledge choosing to replace the antibiotic with another drug. Further work is required to understand to drivers of this concerning overuse of antibiotics in Tanzanian outpatient care.

10:30 AM –12:00 PM MONDAY [Production Of Health, Health Behaviors & Policy Interventions]

Universität Basel | Kollegienhaus – Hörsaal 116

Methods

SESSION CHAIR: **Teresa Bago d'Uva**, Erasmus School of Economics

Evaluating User Fee Exemption for Children in South Korea’s National Health Insurance: Using Bayesian Structural Time-Series Model

PRESENTER: **Mr. Jinhwan KIM**

AUTHOR: Young Kyung Do

This study aims to evaluate the effect of the user fee exemption policy for inpatient care of children under the age of six in South Korea’s National Health Insurance (NHI), which was implemented on January 1, 2006 and then partially abolished on January 1, 2008. Given that children are often the highest priority population group for expanding and strengthening insurance coverage in many societies, this study could add an important knowledge regarding universal health coverage. Moreover, the policy had a clear starting time point for a specific age group, thereby offering an opportunity to estimate its impact in a pre-post, policy-comparison framework. Children aged 7-10 were used as a comparison group. Another strength is that the study data come from South Korea’s NHI database, thereby using an entire universe of inpatient care episodes within NHI. Average user fee per admission episode, incidence of household catastrophic health expenditures, the number of admission episodes, the average length of stay, and the average expenditure per admission episode were examined, using the Bayesian structural time series model. Separate analyses were also conducted for type of medical institutions, parents’ income group, and 5 most frequent diseases.

With the user fee exemption policy in place, user fee for each admission episode decreased by 98% (as expected), while the number of admissions increased by 22%, the average length of stay by 10%, and the average expenditure per admission episode by 7.8%. When using 2.5% of annual household income as the cut-off for defining catastrophic health expenditure, admission episodes with catastrophic health expenditure decreased from 0.82% to 0.01%, and this impact was predominant in the 1st and 2nd income quintiles (poorest income groups). Some interesting differences by type of medical institutions and frequent diseases were noted.

The results showed that the user fee exemption policy for children protected low-income households from catastrophic health expenditures and led to an increase in the use of inpatient care. However, the financial impact of the policy was tantamount to what was claimed by some opponents of the policy as “explosion in medical expenditure.” Our estimates suggest that the policy effects are translated into around a 35.8% increase in user fees spent by the same age group and a 68.6% increase in total medical cost for the same age group incurred to the insurer (National Health Insurance Corporation, NHIC). The apparent larger increase in medical costs over the observed period seems attributable to the user fee exemption policy itself.

Valuation of a New Dementia Specific Utility Instrument, the AD-5D

PRESENTER: **Tracy Comans**, The University of Queensland

AUTHORS: Kim-Huong Nguyen, Alyssa Welch, Brendan Mulhern, Julie Ratcliffe

BACKGROUND:

The Alzheimer's Disease-Five Dimension (AD-5D) is a is a dementia specific preference based measure of quality of life derived from the QOL-AD, the most commonly used quality of life instrument for people with dementia. Discrete choice experiments with duration (DCE_{TTO}) have been used previously to value health states for preference based measures.

OBJECTIVE:

This paper reports on the valuation of AD-5D health states with a representative sample of the general population in Australia using the DCE_{TTO} elicitation technique.

METHODS:

A DCE with 200 choice sets of two health state-duration combinations, blocked into 20 blocks of 10 choice sets each, was designed and administered to an online sample representative of the Australian population by age, gender and income. Two additional choice sets comprising internal consistency and dominance checks were also included in each survey version. A range of model specifications investigating preferences with respect to duration and interactions between AD-5D dimension levels were estimated. A valuation algorithm was developed using multinominal logistic (MNL) regression, with estimated coefficients transformed to the 0 (being dead) to 1 (full health) scale suitable for the calculation of quality-adjusted life-year (QALY) weights for use in economic evaluation. We tested multiple model specifications, including standard MNL (conditional logit) and random-coefficient MNL (mixed logit) and the generalised MNL with a special case of scale heterogeneity MNL specification. The final algorithm was chosen based on the logical ordering and statistical significance of attribute-level coefficients and model fit statistics.

RESULTS:

A total of 1999 respondents completed the choice experiment. Overall, respondents were slightly better educated and with higher annual income than the Australian general population. The estimation results from different specifications and models were broadly consistent with the monotonic nature of the AD-5D. Overall, physical health was the most important attribute, followed by "living situation". Memory, supposedly most important aspect of dementia, was the least important attribute of all. Utility is increasing with increased life expectancy and decreasing in milder levels within each dimension of the instrument. Model fit statistics indicated that there are substantial heterogeneity amongst individual respondents. A scale heterogeneity MNL performed best by all criteria and was chosen to generate the utility algorithm for the AD-5D health states.

CONCLUSIONS:

The newly developed DCE-based valuation algorithm for the AD-5D will have wide applicability in facilitating QALY calculations for the economic evaluation of treatments and interventions targeting people with dementia and/or their family carers.

Contingent Valuation Method for Eliciting Willingness-to-Pay for Spectacles Among Slum-Populations in South Asia

PRESENTER: **Guillaume Trotignon**, Sightsavers

AUTHORS: Thomas Engels, Elena Schmidt, Malabika Sarker, Dr. Atonu Rabbani, Goutam Sadhu, Sarah Gillani

Aim

The objective of this research is to elicit willingness-to-pay (WTP) for spectacles among slum-dwellers in three cities in South Asia: Dhaka (Bangladesh), Jaipur (India) and Lahore (Pakistan) and identify potential inequalities of opportunity in access to spectacles.
Methodology/Methods

This research uses an innovative method to elicit WTP for spectacles from slum residents with no visual impairment. We conducted three separate population-based surveys to collect data on respondents' characteristics and WTP using a contingent valuation approach (n=3,044). Scenario description included simulating refractive error by asking respondents to wear ready-made spectacles with different powers before the WTP elicitation. We adopted a triple-bounded dichotomous choice elicitation format, using a sequence of yes/no choice questions to narrow down respondents' WTP. Three different bid starting values were used to control for starting point bias and proposed bids were increased or decreased depending on the previous answer. The reliability and internal validity of the WTP estimates was assessed following the method described by Foreit & Foreit (2002). Findings

Contingent valuation method can be successfully used to elicit willingness-to-pay for spectacles in a slum population with low literacy and education levels and little or no familiarity with spectacles. The dichotomous choice format with follow-up questions was well understood by respondents who are used to negotiating over the price of items they purchase on a regular market. The mean price that respondents were willing-to-pay was equivalent to 7.8 USD in Dhaka, 9.5 USD in Jaipur and 6.3 USD in Lahore. Despite living in slums, study participants were willing and able to purchase or contribute towards the price of a pair of spectacles. Our findings suggest that there is a potential for introducing cost recovery mechanisms and/or using a market-based approach to provide spectacles to slum-dwellers. We found that individual and household characteristics of slum population determined WTP and subsequently demand for services. These characteristics need to be taken into account when determining marketing strategies, price structure and subsidisation mechanisms for specific sub-groups in the target population. Conclusion

We conclude that it is feasible to use contingent valuation method to assess WTP from population groups with low literacy and educational levels in low- and middle-income countries. Significant differences in WTP based on respondent socio-demographic characteristics show that access to eye health, and more specifically to spectacles, could be subject to inequalities of opportunity. Findings from the WTP analysis can be used by future policy and eye care programmes aiming to reduce the burden of visual impairment among the most disadvantaged groups of the population.

10:30 AM –12:00 PM MONDAY [Evaluation Of Policy, Programs And Health System Performance]

Universität Basel | Kollegienhaus – Hörsaal 117

Organized Session: Sin Taxes, Their Health and Fiscal Consequences. Applications in OECD and Asian Countries.

SESSION CHAIR: **Talitha Feenstra**, Rijksuniversiteit Groningen

DISCUSSANT: **Erik Buskens**, University of Groningen; **Maarten Postma**, University of Groningen

The Pass-through of Alcohol Taxes to Prices in OECD Countries

PRESENTER: **Ce Shang**, University of Oklahoma Health Sciences Center

Background: Excessive drinking is a major cause for adverse health, economic, and behavior-related consequences. Among all policies aimed at reducing excessive drinking and related harms, increasing taxes is arguably the most effective intervention, and it is important to fully leverage its benefits. In particular, how excise alcohol taxes are passed through to prices will ultimately impact drinking behaviors. Economic theories suggest that the degree to which taxes are passed to prices depends on the supply and demand curves and how competitive the market is. In a competitive market, the taxes are at most fully shifted to prices (i.e., one dollar increase in taxes would lead to one dollar increase in prices). However, how excise taxes are actually shifted to prices is an empirical question.

Methods: Using panel data of alcoholic beverage prices and taxes from 31 OECD countries (including Japan and South Korea) from 2003 to 2016, we estimated the excise tax pass-through rates to prices of a variety of alcohol products, including beer, wine, Coganc, Gin, Scotch whisky, and liqueur Cointreau. Using a difference-in-difference framework in a cross-county context, we found that taxes for beer, wine, Cognac, and Liqueur Cointreau were firmly over-shifted, taxes for Scotch whisky were mostly over-shifted, and taxes for Gin were mostly fully passed -through to prices.

Results: Specifically, a $1 increase in beer excise taxes leads to a $1.2 increase in minimum beer prices, a $1.5 increase in average prices, and a $1.7 increase in maximum prices. For wine, the pass-through rate was 1.5 for minimum prices, but increased to 2.9 for average prices and to 4.4 for maximum prices. For Cognac, Scotch, and liqueur Cointreau, excise taxes were over-shifted, with a rate of 1.8-2.2 for Cognac, a rate of 1.1-1.4 for Scotch whisky, and a rate of 2.2-2.3 for liqueur Cointreau. In fact, depending on how to choose cutoff rates for over-shifting, excise taxes can be considered as fully-shifted if the cutoff rate for over-shifting is set to be greater than 1.2. In addition, liquor taxes were nearly fully shifted to gin prices at a rate of 0.89-0.94.The results are robust to various different model specifications, including first-difference models, dynamic models with both past and future taxes as controls, and seemingly unrelated regressions.

Discussion/Conclusion: Alcohol excise taxes are mostly over-shifted to prices and lead to a higher price increase than the tax increase. Further, the tax pass-through rates along the price distribution are not statistically different within each alcoholic beverage type. Therefore, tax increases can be an effective policy to raise prices and thereby reduce excessive drinking and related harmful consequences.

Reducing Burden of Diseases through Tobacco Taxes Intervention in Mongolia

PRESENTER: **Ariuntuya Tuvdendorj**, University of Groningen

Reducing burden of diseases through tobacco taxes intervention in Mongolia

Background/Objectives: Smoking is the most important preventable cause of many chronic diseases. A quantitative analysis of the potential health gains from reduced smoking is important for priority-setting in health in Mongolia. Aim of this study was to quantify the effect of tobacco tax increases on future smoking prevalence and on the smoking-related diseases burden in Mongolia.

Methods: The Dynamic Model for Health Impact Assessment (DYNAMO-HIA) tool was used. Applying the most recent available national Mongolian data as input, tobacco taxation scenarios were evaluated. Demographic data was taken from the Mongolian Statistical Information Services, smoking data came from a representative population based survey (STEP, N=6013) and smoking-related disease data were obtained from the health-info database of the National Health Center in Mongolia. The World Health Organization, chronic diseases model (DISMOD-II) application was used to impute missing epidemiological data and to smooth data into one year age categories. Price elasticity was assumed to be -0.4 for adults (over 21 years old) and -0.8 for adolescents (under 20 years old) based on the global estimates for low/middle income countries. The DYNAMO-HIA model then simulated the changes in smoking prevalence and smoking-related disease burden for two levels of one-time price increases of tobacco (25% and 75%) in Mongolia.

Results: After three years, current smoking prevalence was reduced by 2% points at the population level for a 75% price increase scenario as compared to the reference scenario of constant prices. The effect on smoking transition rates disappeared over time, since the population by assumption adjusted to the higher tobacco price. In the first year after a 75% price increase intervention, more than 10 thousand disability-adjusted life years (DALYs) would be avoided from six smoking-related diseases. These were 1,632 oral cavity and pharynx cancer (C00-C14); 1,583 oesophagus cancer (C15); 1,654 lung cancer (C33-C34); 2,176 ischeamic heart diseases (I20-I25); 1,645 stroke (I60-I69; G45). More than 75% of the health gains occurred among the male population.

Discussion/Conclusion: A simulation model is by definition uncertain and only a projection of what might happen if all except smoking policy remains as it is now, but accounting for known demographic trends. This should be taken into account when interpreting the findings. Also the estimates of price elasticity for Mongolia were quite uncertain. However it is relevant that price elasticities are larger for adolescents. In Mongolia, almost one third of the population are children under 14 years old. To prevent large increases in youth smoking, pricing policy maybe especially relevant.

Estimating the Long-Term Fiscal Effects of Sin Taxes: Government Perspective Modeling in Korea.

PRESENTER: **Mark Connolly**

Background: Estimating outcome improvements attributed to sin taxes is a useful metric for evaluating policies in this domain. However, sin taxes collect taxes from those that continue smoking and often fail to consider the future direct and indirect taxes of those that quit smoking compared to those that continue smoking. Applying a public economic perspective, it is possible to project improvements in outcomes over a longer timeframe to demonstrate how health gains from those that quit smoking can translate into future tax revenue for government from reduced morbidity and mortality. This would suggest that a more thorough evaluation of fiscal policy related to sin taxes can be achieved by projecting outcome improvements from the public economic perspective.

Methods: We describe a public economic framework that estimates how changes in smoking attributable morbidity and mortality can translate into future tax revenue for government based on improved productivity of workers when they quit smoking, as well as reduced morbidity and pre-mature mortality. The analysis here follows a generational accounting framework for assessing the fiscal impact of government policy decisions. Applying current prevalence of smoking in Korea, a cohort model was developed for smoker and former-smokers. We model age-specific income adjusted for mortality (smoking attributale and non-smoking) work-activity, and retirement, applied to the average income-tax burden and collection of indirect taxes from disposable income. Tobacco tax revenues are estimated based on age-specific cigarette consumption. The model simulated the lifetime discounted fiscal transfers for each of the aforementioned segments in Korean Won (KRW).

Results: Compared to current smokers, former smokers generate higher lifetime earnings and pay more direct and indirect taxes over their lifetime. The incremental present value of lifetime tax revenue varied depending on the age of quitting smoking from KRW4.56 million per person (age 20-30) and KRW0.41 million per person (age 61-65). The incremental net gain in public economic benefit from quitting smoking compared to current smokers varied by age at which they quit from KRW3.45 million per person (ages 26 – 30) to KRW2.97 million per person (ages 61 -65).

Conclusion: We demonstrate that it is possible to apply a public economic perspective to evaluate the fiscal consequences of changes in smoking attributable morbidity and mortality. Because sin tax models represent different government sectors e.g., health service for delivery of health and Treasury for collecting taxes, a unified government perspective framework that translates health gains into future taxes may be more impactful to implement future policy changes that influence behaviour as Treasury departments are often reliant on tobacco taxes and need to appreciate the benefits of improved health outcomes.

10:30 AM –12:00 PM MONDAY [Evaluation Of Policy, Programs And Health System Performance]

Universität Basel | Kollegienhaus – Hörsaal 118

Organized Session: Accountability Interventions and Health Outcomes: Evidence from Audits, Community Engagement, and Social Accountability

SESSION CHAIR: **Damien de Walque**, The World Bank

The Impact of Social Mobilization on Health Service Delivery and Health Outcomes

PRESENTER: **Ghazala Mansuri Ms.**, World Bank Group

AUTHORS: Xavier Gine, Salma Khalid

We use a randomized community development program in rural Pakistan to assess the impact of citizen engagement on public service delivery and maternal and child health outcomes. The program emphasized the participation of women, who had identified access to primary care as a critical need for them and their children at baseline. We find that social mobilization through organizing women in groups had a significant impact on the performance of village-based health providers. We find economically large improvements in pregnancy and well-baby visits by Lady Health Workers, as well as increased utilization of pre and post-natal care by pregnant women. In contrast, the quality of supra-village health services did not improve, underscoring the importance of community enforcement and monitoring capacity for improving service delivery.

Externalities in Politicians' Malfeasance: Norms of Corruption and Yardstick Competition

PRESENTER: **Dr. Gustavo J. Bobonis**, University of Toronto

AUTHORS: Anke Kessler, Xin Zhao

A small number of *successful societies*—in a fairly small group of wealthy countries—have been able to develop a functional and reliable state (Acemoglu and Robinson 2012; Besley and Persson 2011; Fukuyama 2014). Most other states—such as most (non-fragile) states in the developing world—have evolved into *clientelist societies*. An overarching question posed by citizens, experts, and policymakers alike is the great challenge of identifying whether and how societies can transition from clientelist to successful ones in a *sustainable* manner.

One point of discussion in debates about whether and how societies can transition from clientelist to successful ones *sustainably* is the perceived limited effectiveness of government's ability to mitigate politicians' malfeasance. A growing literature emphasizes effectiveness of anti-corruption strategies -- such as audit programs -- aimed at uncovering misuse of public resources to enhance politicians' accountability and improve delivery of public services (e.g., Gans Morse et al. 2017). However, existing evidence regarding sustainability of these efforts is mixed. A concern common across both civil society groups and scholars for this perceived ineffectiveness is the difficulty of modifying the moral values and norms regarding the appropriateness of public officials' engagement in corrupt practices. We have limited systematic evidence regarding the extent to which these forces play a role in maintaining clientelism and corruption.

In this paper, we study externalities in politicians' malfeasance and whether these can help explain the perceived concerns regarding the pervasive prevalence of corruption across clientelist societies. We do so in the context of Puerto Rico's program of municipal anti-corruption audits, the findings of which are made publicly available and disseminated to citizens and to prosecutorial authorities. We construct a longitudinal and spatially-linked dataset of the extent of anti-corruption audits in all municipal governments during the period 1987-2014. To measure the effects of these audits, our empirical strategy relies on features of the setting. First, audit reports released in the period leading up to an election – which we term "timely audits" – are more likely to inform on the incumbent government's activities than reports published shortly after an election due to a high independent turnover rate of politicians. Second, municipalities are audited in a pre-established and fixed order, making the timing of audits and their assignment into timely and untimely groups plausibly exogenous.

Consistent with previous work, we find that timely and foreseeable audits induce a significant short-term reduction in municipal corruption, an improvement in public services to disadvantaged groups in the municipality – prenatal care to mothers of lower socio-economic status – and improvements in neonatal health outcomes (i.e., gestation period, low birthweight). In contrast, we document substantial *negative* external effects of these anti-corruption audits in adjacent municipalities. An increase from the first to the third quartile in the level of exposure to audits of adjacent municipalities leads to a 30 percent increase in observed corruption in the own municipality.

Finally, we build a simple model of norms of corruption among local politicians and yardstick competition across municipalities to rationalize these and other patterns of perverse electoral accountability.

Social Accountability and Health: Experimental Evidence from Governance Interventions in Uttar Pradesh, India

PRESENTER: **Manoj Mohanan**

AUTHORS: Kendal Marie Swanson, Harsha Thirumurthy, Vikram Rajan

There has been a growing recognition among governments and donors that citizens can be instrumental in enhancing the accountability of public officials, reducing leakage of funds, and ultimately improving health service delivery [[1],[2]]. Social accountability (SA) interventions, which typically include providing information to constituents (including information about entitlements, rights, and responsibilities) as well as facilitation of community meetings to enable grievance redressal, have received considerable attention as a promising method to engage community members in monitoring the delivery of public services. There remains debate about whether the impact of social accountability is driven by information interventions alone or by facilitation efforts that solve collective action problems.

The State Government of Uttar Pradesh (UP) - as part of a World Bank supported health systems strengthening project - implemented SA interventions in 10 districts, and randomized 120 villages in two additional districts for rigorous evaluation. In this study, 40 villages were randomized to an *Information Only* arm, 40 to an I*nformation plus Facilitation* arm and the remaining to a control arm. Both intervention arms received key information about local health indicators as well as facts about the village health,sanitation, and nutrition committee (VHSNC), a village level statutory body that is responsible for identifying local health priorities and allocating resources. In the *Information plus Facilitation* arm, trained government facilitators helped organize monthly community meetings to discuss health, nutrition, and sanitation.

Using data collected two years after introduction of the SA interventions, we find that both intervention arms had significant, positive effects on health outcomes and that the *Information plus Facilitation* intervention arm demonstrates consistently larger effects than the I*nformation Only* intervention arm.

We report impact of *Information plus Facilitation* in the following text and impact of *Information only* (IO) in parentheses. Among children <2 years of age, the *Information plus Facilitation* arm reduced stunting rates by 5.6 percentage points (0.9 for IO) and increased likelihood of receiving treatment for diarrhea within the first day by almost 14 percentage points (4.3 for IO). Full immunization rates increased by 11.8 percentage points (7.2 for IO). Institutional delivery rates increased by over 5.6 percentage points in both arms. The SA interventions also had a significant effect on fertility rates; we find 5.4 percentage point reductions in births in the past 1 year (4.4 for info). Our findings suggest that information provision and facilitation jointly have larger effects than provision of information alone.

[1]. Ringold, D., A. Holla, M. Koziol, and S. Srinivasan, *Citizens and Service Delivery: Assessing the Use of Social Accountability Approaches in Human Development Sectors.* 2011, Washington, DC: The World Bank.

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10:30 AM –12:00 PM MONDAY [Supply Of Health Services]

Universität Basel | Kollegienhaus – Hörsaal 119

Cost, Productivity and Health Outcomes

SESSION CHAIR: **Shelley Farrar**, University of Aberdeen

The Causal Effect of Volume on Health Gains from Hip Replacement Surgery: Evidence from England

PRESENTER: **Ms. Laurie Rachet Jacquet**

Objective

Larger hospitals are assumed to provide better quality of care, due to greater surgical experience and/or more standardised processes of care. This volume-outcome association has been reported in the literature, but the evidence of a causal effect of surgical volume on quality remains scarce. Furthermore, few studies have looked beyond 'failure measures' such as mortality or readmission rates. Understanding whether the observed association is causal and how it benefits patient health is highly relevant in the context of policies that aim to concentrate care or to increase hospital competition.

The objective of this paper is to investigate the causal effect of hospital and surgeon volume on health improvements for elective (i.e. planned) hip replacement patients in the English NHS.

Data

We link together routine administrative data (Hospital Episodes Statistics) and patient-reported outcome measures (PROMs) at the patient level for all public hospitals in England for the financial year 2015/16. Patients report their pain and functioning shortly before and six months after the surgery as part of the national PROM survey. We use the Oxford Hip Score (OHS), which is a hip-specific patient-reported measure of health status.

Methods

We regress the post-operative OHS on volume, and control for hospital and patient characteristics. We are able to adjust for patient case-mix with a large number of patient medical and socioeconomic variables reported in the administrative hospital data (e.g. age, sex, medical risk factors, comorbidities, socio-economic status). Importantly, our model also includes controls for the pre-operative health status and how long the patient has lived with symptoms prior to surgery. By using hip-specific risk-adjustment variables, we aim to reduce the bias due to unobserved patient severity in the estimation of the volume-outcome effect.

Volume-outcome effect may be subject to an endogeneity bias if hospitals with higher quality enjoy a reputation effect and attract more patients. We address the reverse causality issue which arises from hospital demand's responsiveness to quality, by constructing a measure of hospital volume that is exogenous to quality. Specifically, we estimate a patient-level model of hospital choice (multinomial logit model) as a function of exogenous factors of hospital choice such as, chiefly, patient's distance from the hospital. We then replace the observed volumes by the predicted (exogenous) volumes in our OLS regression. This allows us to obtain a causal effect of hospital volumes on health outcomes in the context of elective hip replacements in the English NHS.

Findings

Preliminary results suggest that the observed volume-outcome effect at the hospital level is clinically small in the context of elective hip replacement, and is no longer statistically significant once we account for the endogeneity of volume. Further analyses will be conducted to analyse the volume effect at the surgeon level.

Effects of Healthcare District Secessions on Costs, Productivity and Quality of Services

PRESENTER: **Mika Kortelainen**, VATT Institute for Economic Research

AUTHORS: Simon Lapointe, Antti Moisio, Kalevi Luoma

While the research evidence on the economies of scale in the provision of public services has been somewhat mixed, policymakers around the world seem to be convinced that "bigger is better". Thus, the policy trend in recent decades has been towards larger jurisdictions, through amalgamations of municipalities and districts, mergers of service units and closures of facilities. In healthcare services, this policy has typically meant mergers of small hospitals and other healthcare units.

Much of the empirical evidence on economies of scale in healthcare services is based on the cost effects of hospital mergers especially in the United States. Yet, previous evidence is quite mixed, as some studies have found significant cost savings and some others no improvement in efficiency or productivity (see e.g. Dranove 1998, Ferrier and Valdamanis 2004, Choi et al. 2012). As far as economies of scale in local public services are concerned, another relevant literature concerns the effects of municipal mergers and secessions. Municipal mergers are typically expected to reduce spending and improve productive efficiency of local public services, while the effects are often expected to be opposite for municipal secessions. The results from previous studies are generally quite mixed, as some papers have presented supportive evidence for mergers to bring economies of scale (see e.g. Reingewertz 2012, Blesse and Baskaran 2016) or secessions to result in a reduction in economies of scale (e.g. Carvalho de A. Lima and da Mota Silveira Neto 2018), while many recent papers have not found mergers to affect spending or service provision (e.g. Allers and Geertsema 2016, Harjunen et al. 2017). Yet, the papers looking at the effects of municipal mergers or secessions have not studied healthcare services. This is mainly due to the fact that in many countries municipalities are not responsible for healthcare services.

In this paper we approach the question of economies of scale in healthcare by analysing the secessions of healthcare districts in Finland. By healthcare districts we refer to public entities or authorities that are responsible for providing community-based primary healthcare services to the residents of their member municipalities. These districts or co-operative units are owned and funded by their municipalities. We use the difference-in-difference approach to evaluate the impacts of healthcare district secessions on costs, productivity and quality of primary healthcare services in Finland between 1990 and 2003. To address potential non-random or endogenous treatment assignment of secessions, we also utilize propensity score difference-in-difference approach. Our results show that primary healthcare costs have grown considerably faster for the seceded healthcare districts than for the non-seceded ones, while outputs have increased somewhat more for the former than for the latter group. Interestingly, we find the impact of secessions to be insignificant on the productive efficiency of healthcare districts. Our results regarding the impact on quality of primary healthcare services indicate the effects of secessions to be also quite small.

Total Factor Productivity and Baumol's Cost Disease in the Swiss Nursing Home Industry

PRESENTER: **Dr. Michael Santarossa**, University of Pavia

AUTHORS: Mr. Giuliano Masiero, Massimo Filippini

Objectives and data. Enhancing nursing homes efficiency is a challenging task for health policy makers due to population ageing trends and increasing health care costs. Nursing home productivity has been widely analyzed in the literature but questions remain on the determinants of efficient outcomes. In this study, we estimate total factor productivity (TFP) using firm level data for the universe of Swiss nursing homes for the period 2007-2015. Then, we focus on determinants of TFP and trends in labor productivity and wage growth, and provide evidence of Baumol’s cost disease, which contributes to explain increasing long-term care costs. In particular, we exploit the 2011 reform of the Swiss long term care sector to investigate the impact of incentive regulation on nursing home productivity and explore the role of management and institutional forms in explaining the heterogeneity in productivity.

Methods. We estimate a single-output translog cost function which accounts for detailed output characteristics using fixed and random effects panel data regressions. Then, we derive TFP change over time and analyze its determinants. We exploit the cantonal and temporal discontinuity provided by the 2011 long term care reform to estimate the impact of incentive regulation on TFP and analyze if the effect of incentive regulation is mediated by the type of ownership. We control for a set of nursing home characteristics, including managerial aspects. We apply the same approach to analyze the determinants of labor productivity.

Results. We find that TFP change follows a decreasing trend between 2007 and 2015, indicating a decrease in productivity growth over time. The major factor contributing to this trend is the decreasing productivity of labor. This result is coupled with an increasing wage-trend, and provides evidence of Baumol's cost disease. This evidence is confirmed by data at federal level showing similar wage trends in the whole Swiss economy, but lower labor productivity gains in the long-term care sector. The 2011 reform of the long term care sector does not seem to affect the decreasing trends in total factor and labor productivity, regardless of the type of institutional form. Preliminary findings suggest that differences in the managerial organization and the institutional form contribute to explain differences in productivity.

Predicting Cardiovascular Disease Risk at an Individual-Level Using Machine Learning and Linked Health and Social Administrative Datasets for a Whole Country

PRESENTER: **Nhung Nghiem**

AUTHORS: Andrea Teng, June Atkinson, Nick Wilson, Binh P Nguyen, Tony Blakely

Background

Cardiovascular disease (CVD) is the leading cause of death and health inequalities in many countries. Identifying those at increased risk of CVD events is useful to target lifestyle (diet, physical activity) and preventive pharmaceutical interventions. Whilst there are existing CVD risk assessment models such as QRISK2, Framingham, and Reynolds, data science and – in particular – machine learnings offers the potential improved and more accurate risk prediction. We tested the accuracy and generalisability of machine learning algorithms with extensive national-level health and social administrative data sets, including heterogeneity of performance across ethnic groups.

Methods

We used New Zealand (NZ) national linked datasets, including health (e.g. hospitalisation, pharmaceutical dispensings, lab tests requested, diabetes) and social data (e.g. birth country, educational level, income, deprivation etc). The health outcome was CVD events (either

hospitalisation or two prescriptions over a 12-month period) over a one-year period in 2014 after predictor variable measurement. An ensembled machine learning method (the Super Leaner) was used, with 10-fold cross validation to predict a CVD event. The best base machine learning models included Lasso, Random Forest, Classification Trees, Bayesian Generalized Linear Model, and Neural Network.

We then compared our Super Leaner prediction results with a more traditional risk prediction model (Cox regression models using the so-called PREDICT equations). We analysed top predictors for a CVD event using a Random Forest model and an alternative metric (that is the change in the weight of each variable in the prediction results).

We determined if false positive rates and false negative rates varied across ethnic and income groups. We also assessed the relative performance of the machine learning algorithm when applied to the next year (i.e. 2015), compared to the traditional Cox model.

Results

The Super Leaner model had greater accuracy in terms of AUC (area under the ROC curve) than the traditional CVD Cox model, for application in the same dataset as the training or learning occurred in. Many top predictors for the Super Leaner model were not known risk factors (ie., not commonly included in traditional CVD risk prediction models) such as low-skilled job, birth country, education and income level. There was equal accuracy of prediction across socio-demographic heterogeneity in minority groups.

For prediction beyond the dataset used in learning (i.e. year 2015), machine learning still outperformed the traditional Cox models – but the magnitude of improvement was diminished compared to that in 2014.

Conclusions

This study found that the use of machine learning with administrative datasets increased predictive power (ie, AUC) over traditional Cox regression models. This may allow for improved and more timely risk assessment at the individual level in settings where rich social data is linked to health data (eg, with annual risk estimates for patients provided to their primary care workers). It may also facilitate improved information for policy planning and resource allocation around targeting preventive and treatment efforts.

10:30 AM –12:00 PM MONDAY [Supply Of Health Services]

Universität Basel | Kollegienhaus – Hörsaal 120

Organized Session: The Public Health Workforce

SESSION CHAIR: **Ian Weijie Li**, The University of Western Australia

DISCUSSANT: **Lois Meyer**, University of New South Wales; **Rory David Watts**, The University of Western Australia; **Lee Ridoutt**, Human Capital Alliance

Tracing the Emergence of Public Health Leaders through a Work-Based Professional Doctorate: A Longitudinal Study in Professional Formation

PRESENTER: **Lois Meyer**, The University of New South Wales

Introduction

The structure and capacity of the health workforce to address changing patterns of disease and emerging global health risks has become a significant policy issue within Australia and internationally. It has been argued within this environment it is now critical to rethink the way public health professionals are educated and developed, including the fostering of senior roles within the workforce to not only use, but generate, service-based research. Despite this, the potential role of professional doctorates to strengthen public health leadership to connect policy, practice and research has had scant attention in Australia.

This paper reports on a longitudinal research study tracing the profile and experiences of doctoral candidates in one work-based professional doctorate offered through an Australian university. Begun in 2009 as an innovative collaboration between a government health system and the university, the Doctorate in Public Health (DrPH) was designed to foster a cadre of senior public health leaders who could generate applied research to provide evidence-informed population health practices for the state. In 2013 the DrPH was opened to attract emerging health leaders more broadly, shifting the program to partnerships with a diversity of health services. It is within this evolving landscape of the program that the perspectives and formation of the doctoral candidates as public health leaders is considered.

Aims

This research aims to illuminate the subjective experiences and outcomes of participating in a professional doctorate within the broader context of the field of public health within Australia. In particular it seeks to trace the ways in which the doctorate configures professional formation and capacities for taking up leadership roles within the workforce and the implications for health system strengthening and practice.

Methods

This study is being conducted as a longitudinal study tracing the learning and career trajectories of forty-five practitioners who have completed or are currently participating in the DrPH program. The research commenced in 2009 and to date has been conducted through an iterative series of in-depth interviews, focus groups and desktop methods on the practitioners' subjective experiences, career trajectories and outcomes. Systematic cross case analysis that draws on qualitative longitudinal research methods and life course approaches have been used to distil patterns of continuity and change from the individual to the collective on trajectories and outcomes to date.

Findings and Conclusion

It has been found that a golden thread weaves across the findings of the individual and collective learning and career trajectories attesting to the central role of embedded workplace research in this professional doctorate for becoming, and being seen to be, a public health practitioner-researcher and leader. Giving voice to and tracing the trajectories of forty-five professional doctoral students and alumni in a study spanning a decade has proven a demanding yet highly valuable endeavor. The methodological decision to undertake longitudinal iterative research has afforded rich insights on the role of the professional doctorate in shaping the emergence and outcomes for taking up leadership roles within the public health workforce.

Public Health Jobs: What Are They and Where Have They Gone?

PRESENTER: **Rory David Watts**, University of Western Australia

Introduction and Aims

Effective workforce planning requires an informed estimate about current and future demand. For the public health workforce (those whose primary function is the prevention, promotion and/or protection of the health of populations), demand estimates are difficult, owing to the broad definition, and lack of clear information about worker supply. One method of assessing demand is to look at job advertisements, from which one can infer what types of jobs are being saught, what criteria are required to apply for them, and how much they pay. Comparisons over time can also give us a sense of whether priority areas have changed, and whether the volume of jobs is changing. Therefore, we aimed to describe current advertisements for public health jobs in Australia and New Zealand, and compare these with previous findings.

Methods

We searched fourteen job advertisement boards in September 2018 in Australia and New Zealand, which consisted of commercial, government, and professional body websites. We included job advertisements for jobs which we regarded as 'more public health than not' in their role, primary functions, and program areas. Data collected related to job title, advertiser, job sector, contract tenure and salary. Furthermore we compared our data collected with demographic data, remoteness indicators, and findings from an Australian study published in 2005.

Findings and Conclusion

We found 329 jobs advertisements in Australia and New Zealand. Common roles included project officers, researchers and managers. Two thirds of positions were for fixed term contracts, and the majority of jobs were in Government, Tertiary and Not-for-profit sectors. Median annual salary was $101,427. Findings between Australia and New Zealand were similar in terms of market share of jobs (roughly 1% of healthcare jobs), salary, and urbanisation of jobs.

The amount of public health job advertisements does not appear to have increased in the past fifteen years. While jobs appear to pay more, and are more broadly distributed in job sectors, they require higher degrees, and are much more likely to be fixed-term positions.

Importantly, while advertisements are a useful lens to provide information about demand, a job advertisement is not a job. Job descriptions are prone to buzzwords and hyperbole, and 'essential criteria' more closely represent a bare minimum of what would be required. For these reasons, job advertisements should be considered a supplementary source of data about demand, and are best used when compared across time using the same methods.

Occupational Tasks and Duties of Master of Public Health Graduates in Australia

PRESENTER: **Ian Weijie Li**, The University of Western Australia

Introduction

There have been calls to increase research efforts into the public health workforce, so as to aid policy efforts, such as public health workforce planning. However, research in this area is complex, due in part to the multi-disciplinary nature of public health work. For example, individuals in the Master of Public Health come from diverse backgrounds, with some hailing from clinical backgrounds such as medicine or dentistry, others from health related backgrounds such as podiatry, pharmacy or health science, and yet others from non-health disciplines, such as economics and law. How these prior qualifications, together with the Master of Public Health, translate into employment is unclear. A prior Australian study identified that nearly half of Master of Public Health graduates from Australian universities do not work in a health-related industry or occupation. At the same time, the type of work individuals with a public health qualification do in the labour market is also poorly understood. Having a better understanding of the nature of work for Master of Public Health graduates would be beneficial for policy-making and planning.

Aims

This study extends the current knowledge on the public health workforce by looking at the type of work that these Master of Public Health graduates do. Specifically, the study will examine the nature of tasks and duties performed by Master of Public Health graduates in their employment. Further, the nature of tasks and duties performed will be examined for disaggregated groups of graduates who: i) are in health or non-health related occupations; ii) who report being in an occupation that utilises their public health qualification or not.

Data and Methods

This study uses data from a census of graduates from Australian universities, the Graduate Outcomes Survey. Three waves of the data, from 2016 to 2018, was used for this study. The Graduate Outcomes Survey provides information on the activities graduates are engaged in around six months after the completion of their degrees, including their labour market and employment activities. Thematic analysis will be undertaken on free text responses provided by Master of Public Health gradates relating to the main tasks and duties they perform in their occupation. This will provide an indication of the relative frequency of tasks and skills that Master of Public Health graduates undertake in their employment. Sub-analyses based on delineated groups by sector of employment, industry and occupational groups will also be performed, enabling comparisons of the nature of work performed by public health graduates across those groups.

Implications

The findings from this study will enhance the understanding of the nature of work public health graduates perform. These findings could be used to facilitate planning for the public health workforce, and also point to priority areas for education and training, for public health graduates.

How Are MPH Graduates Absorbed into the Labour Market in Australia?

PRESENTER: **Rory David Watts**, University of Western Australia

Introduction and Aims

The public health workforce and the functions they provide are multiform. Both the workforce and their functions can range between specialised and common-sense, frontline and high-level. All are important to the public's health. To this end, there are professional qualifications – namely, the Master of Public Health (MPH) – which aim to educate persons with diverse backgrounds in the diverse functions of public health.

Ideally, an MPH graduate would become employed in a role and area which was commensurate with their training and education, but this may not always be the case. If a graduate finds themselves in a role for which they have excess training and education, they would be considered 'underemployed'. For the higher education labour market more generally, this has become a common feature, and it may be the case too for MPH graduates. Similarly, underemployment might occur if MPH graduates are not employed in a field where they can appropriately use their education and training. Li & Awofeso found that for Australian MPH Graduates, nearly 50% were not employed in the health sector: Were they making a bigger difference in a different field, had they returned to the field of their previous education, or could they simply not find employment in the field?

Our aim was to describe the incidence of, and factors contributing to underemployment for Australian graduates of a Master of Public Health degree. Furthermore, we wished to describe the impact of underemployment towards earnings.

Methods

The Graduate Destination Survey (GDS) is distributed to all persons graduating from an Australian Tertiary Institution, and gathers information such as what degree a person is graduating from, where they are employed, and how much they earn. Importantly, it also gathers information about how important graduates felt their qualifications, and acquired skills are to their current job.

We utilised nine years of the Graduate Destination Survey, 2007-2015. We defined our cohort by limiting data to survey responses from persons who had graduated from a Master's course, and who had indicated that public health was their major. We first built a probit model to measure the contribution of features toward likelihood of underemployment. Underemployment was assessed from answers to three Likert scale questions in the GDS measuring perceived importance of acquired skills, field of study, and qualification in their occupation. Secondly, we built an ordinary least squares regression to measure the effect of underemployment on earnings.

Implications

Underemployment can result in lower wages, productivity, satisfaction and higher workforce turnover. If students are more aware of labour market outcomes, and their potential for mismatch, they can make more informed choices about study. Higher education decision makers also benefit from labour market research, as they can better tailor curriculum to students. For MPH graduates, we can also assess whether there exist valuable opportunities in non-health fields which they can apply their skills and training to.

References

Li, I., & Awofeso, N. (2014). Labour market outcomes of public health graduates: evidence from Australia. *Perspectives in Public Health*, *134*(5), 283-288. DOI: 10.1177/1757913913491864

10:30 AM –12:00 PM MONDAY [Specific Populations]

Universität Basel | Kollegienhaus – Seminarraum 208

Costs and Cost-Effectiveness in Global Health

SESSION CHAIR: **Gesine Meyer-Rath**, Boston University

The Economic Argument for Fixed Low-Dose Triple Combination Antihypertensive Medication in Patients with Mild to Moderate Hypertension in Sri Lanka: A Within-Trial and Modelled Economic Evaluation of TRIUMPH

PRESENTER: **Dr. Thomas Lung**, The George Institute for Global Health

AUTHORS: Stephen Jan, Tracey Laba

Introduction

Elevated blood pressure (BP) is a major contributor to cardiovascular disease (CVD) and is the leading risk factor for mortality worldwide, with a disproportionate burden faced in low- and middle-income countries. Fixed low-dose combination therapy using inexpensive BP-lowering drugs is a potential strategy to improve BP control at a population level due to increased efficacy, lower adverse events and improved medication adherence.
Low-dose combination therapy for elevated BP is publicly funded in India, yet the economic case for what price to set in the Sri Lankan context has not yet been conducted. Using the healthcare system perspective we conducted a modelled (10-year) economic evaluation of a low-dose triple pill therapy versus usual care management for patients with mild to moderate hypertension in Sri Lanka.

Methods

The TRIUMPH (TRIple Pill vs. Usual care Management for Patients with mild-to- moderate Hypertension) trial in Sri Lanka found a greater reduction in systolic blood pressure (SBP) (-8.8mm Hg (95% CI -11.2 – -6.4) over a 6-month period. Each version of the triple pill consisted of low dose amlodipine (2.5/5mg), telmisartan (20/40mg) and chlorthalidone (12.5/25mg).
A discrete-time simulation model was developed to extrapolate trial-based findings of reduced SBP to long-term health care costs, CVD events and mortality. 10-year CVD risk prediction equations recalibrated to the Sri Lankan population were used. Lower CVD risk and all-cause mortality as a result of reduced SBP was taken from a systematic review and meta-analysis of BP lowering trials.
Costs (in $USD) associated with CVD-related clinic visits, BP medications and inpatient hospitalisations were included in the analysis, using Sri Lankan specific data. Cost of the triple pill was set at 20c/day, a 15% mark-up on the cost of the combined individual BP-lowering components, accounting for research and development costs. Disability adjusted life years (DALYs) was used for the outcome. Sensitivity analyses was conducted on a number of different model parameters, including triple pill price, adjusted to 5c and 50c/day.

Results

The incremental cost-effectiveness per ratio (ICER) per DALY averted over a 10-year period was estimated to be $5,156, well within the Sri Lankan cost-effectiveness threshold ($11,520 per DALY averted). The ICER was highly sensitive to the price of the triple pill, estimated at $467 (5c/day) and $14,544 (50c/day) per DALY averted. At the cost-effectiveness threshold, the triple pill price was 42.34c/day. ICERs were robust to the changes in CVD-related hospitalisation costs, discount rate, DALY weight and risk reductions associated with lowered SBP. In sub-group analyses, the triple pill was more cost-effective for people aged 60 years and over ($4,433) and for individuals with a baseline SBP of 160 mm Hg or higher ($2,556).

Conclusion

The triple pill is a cost-effective and viable option for first-line management of hypertension for individuals in Sri Lanka, particularly for older age groups and those with higher SBP at baseline. It offers a promising and affordable solution to addressing the growing CVD burden in Sri Lanka. Increased competition and entry of generics into the market should increase the triple pill's cost-effectiveness over time.

Economic Evaluation of an Intervention to Improve Early Detection and Intervention for Young Infants at High Risk of Neurodevelopmental Delay and Disability in Uganda

PRESENTER: **Mr. Kenneth Roger Katumba**, MRC/UVRI & LSHTM Uganda Research Unit

AUTHORS: Cally Tann, Margaret Nampijja, Janet Seeley, Giulia Greco

Introduction: Each year, millions of children are affected by birth complications which increase their risk of cerebral palsy and other disabilities. The majority live in developing countries like Uganda, with limited resources to support affected children and their families. This study was carried out to ascertain the cost-effectiveness of the ABAaNA Early Intervention Programme – a cluster-randomised controlled trial to improve the functioning, nutritional status and quality of life of infants with developmental disability and their caregivers; and to determine the economic impact of caring for a child with developmental disability in Uganda.

Methods and Analysis: This research present the results of an economic evaluation nested under the ABAaNA Early Intervention Programme, a facilitated-group, community-based rehabilitation programme for children with developmental disabilities that has been developed by researchers in Uganda and the UK for use in low-income countries. The aim of this study is twofold: to conduct the cost-effectiveness of the

ABAaNA Early Intervention Programme for high-risk infants with developmental disability in two hospitals in Uganda compared to the current standard care; and to estimate the economic impact of Neurodevelopmental Delay and Disability in infants on Ugandan households. We are collecting direct and indirect costs to the provider on drugs and supplies used; equipment and capital; trainings carried out and transport used in provision of services. Project costs are collected prospectively from project accounts. Research and implementation costs are excluded. For the user, the opportunity costs of the accompanying adult for participating in the programme by the transport costs, and other directly incurred expenses are included. Transport, personnel and time costs associated to home visits were recorded. We adopted a cost of illness approach to estimate the economic burden of neurodevelopmental delay and disability in infants. We identified, collected, and estimated three categories of costs: health-care costs, productivity-related costs, and other costs. The time frame for data collection was 12 months but we modelled lifetime costs of cerebral palsy. Data collection was completed in December 2018, data analysis is current underway and will be completed by March 2019.

Conclusion: The findings from this study will be useful to inform policymakers, healthcare providers and researchers about the economic burden to households of disabilities in children, and the cost-effectiveness of a community-based rehabilitation programme in a resource-limited setting. The findings will inform the roll-out of this and similar interventions.

Assessing the Inequality in Health Care Seeking Costs for Type 2 Diabetes Mellitus in Rural Bangladesh

PRESENTER: **Rohit Syed-Hasan**, UCL

AUTHORS: Edward Fottrell, Sanjit Kumar Shaha, Abdul Kuddus, Hannah Jennings, Naveed Ahmed, Joanna Morrison, Kohenour Akter, Badrun Nahar, Tasmin Nahar, Carina King, Prof. Jolene Skordis-Worrall, Neha Batura, Gerard Abou Jaoude, Dr. Jahangir A. M. Khan, A.K. Azad Khan, Anthony Costello, Kishwar Azad, Hassan Haghparast-Bidgoli

Abstract

Objective: This study aims to measure inequality in costs of seeking care for diabetes in rural Bangladesh. It specifically, assesses whether the costs are progressive or regressive, the extent to which the costs are catastrophic and explores the coping mechanisms used to finance the costs.

Methods: The data for this study were collected as part of the baseline survey for the D-Magic trial; a cluster randomised trial conducted in four rural upazillas in the Faridpur district, Bangladesh. Information on the access to health care for diabetes, the costs for seeking care (direct medical and direct non-medical) in last 30 day and a number of socio-economic variables were collected from the participants. The survey included around 12,000 participants, among them 326 individuals formally diagnosed with type 2 diabetes mellitus (T2DM). The care seeking costs were analysed by the wealth quintiles as a measure of socio-economic status. In addition, the Kakwani index and quintile (decile) ratios were used as measures of inequitable costs of seeking care. Also, catastrophic spending on care seeking was calculated using a threshold of 10% of total household income.

Results: The results showed that health care seeking costs for diabetes was fairly regressive with diabetic individuals from the poorest households having a higher percentage of their income on care seeking, in comparison to the those from the least poor households. On average, the individuals from the poorest households spent 1.8 times more on seeking care than the least poor. On average, the individuals with diabetes spend 12% of their household income on cost of seeking care; 19% for the individuals in the poorest households compared to 10% for those in the least poor households. Catastrophic spending was calculated in each quintile and there were in total 132 individuals that spent more than 10% of their household income on health care seeking costs for diabetes. This meant that around 45% of individuals with diabetes in this study (or 65% of individuals who paid for seeking care in last 30 days) were at risk of catastrophic and impoverishing health expenditure. The most common coping mechanism for diabetic individuals were using ‘household income’ (80 %) and 21 individuals had two or more sources to finance their care seeking costs.

Conclusion: Regressive spending and high incidence of catastrophic health expenditure underlines the economic burden faced by the individuals with T2DM when seeking care in low resource settings such as Bangladesh. Investing in the pre-payment systems, in addition to, prioritising the prevention and early detection of diabetes can reduce the catastrophic financial burden on the affected families, considering rise of diabetes’ incidence in Bangladesh.

Keywords: Inequality, Type 2 diabetes mellitus (T2DM), Catastrophic spending, Health Care Costs, Progressive, Regressive, Kakwani Index

Estimating the Lifetime Disease Burden of Child Maltreatment in Japan

PRESENTER: **Dr. Ruoyan Gai**, National Center for Child Health and Development

AUTHORS: Xiuting Mo, Yoshiyuki Tachibana, Timothy Bolt, Yoshimitsu Takahashi, Takeo Nakayama, Rintaro Mori

Bacground and objective: Child abuse has been shown to have lifelong adverse health effect on individuals, as well as significant social and economic burden on individuals, families, and societies. The study aims to estimate potential disease burden of child abuse cases initiated in 2016.

Methodologies: Lifetime direct costs and indirect costs were calculated based on a societal perspective. The former includes medical and social welfare costs, and the latter refers to disability-adjusted life years (DALYs), productivity loss and child abuse death. Medical and social welfare costs derived from official data and literature review. For indirect costs, DALYs data were obtained from the Global Burden of Disease (GBD). An attributable risk approach, known for population attributable fractions (PAF), was used to measure how health outcomes and their associated costs attribute to child abuse. The calculation requires risk ratio (RR) of a disease or outcome given exposure to the risk factor (child abuse), or an odds ratio (OR) which can be converted into an approximate estimate of RR, and the prevalence of the risk factor. These parameters were

acquired from systematic reviews and meta-analysis. Then using the pooled RRs and ORs, we matched each child abuse related health outcomes with the closest cause categorised in GBD project. we considered related health outcomes including suicide attempts, problematic drug use, violence victimization, sexually transimitted infections, problematic alcohol use, depression, anxiety, respiratory disease, liver or digestive diseases, cancer, cardiovascular diseaes, and diabetes. After DALYs lost attributable to child abuse calculated,we then converted it into monetary value, multiplying one DALY with Gross Demostic Product (GDP) per capita. As for productivity loss due to child abuse death, we multiplied the death toll and discounted potential lifetime income. Child abuse death toll was obtained from government figures. Discounted potential lifetime (from 18 years old t 65 years old) income was calculated, with an assumption of a long-term growth in labour productivity of 1% per year. Discout rate for productivity losses and DALYs were 3% at the base case and subject to senstivity analysis.

Results: Three major disease burden due to substantiated child abuse cases were attributable to suicide attempts (18,861 DALYs, 95% confidence interval: 11,848-28,582 DALYs), cancers (4,297 DALYs, 95% CI: 2,698-6,373 DALYs) and depression (3,492 DALYs, 95% CI: 2,703-4,454 DALYs). Estimates based on literature review showed a similar tendency of disease burden. The total direct costs with were estimated to be US$10.87 billion, and US$1.37 billion for the indirect costs (productivity loss), accounting for 11.23% of total lifetime costs ($12.25 billion). On average, the potential lifetimes cost per victim of child abuse is estimated to be US$99,944.90 at discount rate of 3%, and such the figure increases with adoption of higher discount rate and the estimated cases (rather than the reported) of child abuse.

Conclusion: This study demonstrates that the disease burden due to child abuse in Japan is substantial, indicating the importance of prevention and intervention strategies to address this hidden issue.

10:30 AM –12:00 PM MONDAY [New Developments In Methodology]

Universität Basel | Kollegienhaus – Seminarraum 209

Organized Session: Interactive Organized Session: The Inclusion of Intersectoral Costs and Benefits of Health Interventions in Economic Evaluations

SESSION CHAIR: **Luis Salvador-Carulla**, Australian National University

Conceptualizations of the Societal Perspective within Economic Evaluations: A Systematic Review

PRESENTER: **Ruben Drost**

Authors: Ruben M.W.A. Drost, Ingeborg M. van der Putten, Dirk Ruwaard, Silvia M.A.A. Evers and Aggie T.G. Paulus

Objectives: The aim of this study was to investigate how the societal perspective is conceptualized in economic evaluations and to assess how intersectoral costs and benefits (ICBs), that is, the costs and benefits pertaining to sectors outside the healthcare sector, impact their results.

Methods: Based on a search in July 2015 using PubMed, Embase, CINAHL, and PsychINFO, a systematic literature review was performed for economic evaluations which were conducted from a societal perspective. Conceptualizations were assessed in NVivo version 11 using conventional and directed content analysis. Trial-based evaluations in the fields of musculoskeletal and mental disorders were analyzed further, focusing on the way ICBs impact the results of economic evaluations.

Results: A total of 107 studies were assessed, of which 74 (69.1 percent) provided conceptualizations of the societal perspective. These varied in types of costs included and in descriptions of cost bearers. Labor productivity costs were included in seventy-two studies (67.3 percent), while only thirty-eight studies (35.5 percent) included other ICBs, most of which entailed informal care and/or social care costs. ICBs within the educational and criminal justice sectors were each included five times. Most of the trial-based evaluations analyzed further (n = 21 of 28) reported productivity costs. In nine, these took up more than 50 percent of total costs. In several studies, criminal justice and informal care costs were also important.

Conclusions There is great variety in the way the societal perspective is conceptualized and interpreted within economic evaluations. Use of the term "societal perspective" is often related to including merely productivity costs, while other ICBs could be relevant as well.

Acknowledgement: There are no conflicts of interest to declare.

Health-Related Resource-Use Measurement Instruments for Intersectoral Costs and Benefits in the Education and Criminal Justice Sectors

PRESENTER: **Dr. Susanne Mayer**, Department of Health Economics, Center for Public Health, Medical University of Austria
Authors: Susanne Mayer, Aggie T. G. Paulus, Agata Łaszewska, Judit Simon, Ruben M. W. A. Drost, Dirk Ruwaard, Silvia M. A. A. Evers

Background. Intersectoral costs and benefits (ICBs), i.e. costs and benefits of healthcare interventions outside the healthcare sector, can be a crucial component in economic evaluations from the societal perspective. Pivotal to their estimation is the existence of sound resource-use measurement (RUM) instruments; however, RUM instruments for ICBs in the education or criminal justice sectors have not yet been systematically collated or their psychometric quality assessed. This review aims to fill this gap.

Methods. To identify relevant instruments, the Database of Instruments for Resource Use Measurement (DIRUM) was searched. Additionally, a systematic literature review was conducted in seven electronic databases to detect instruments containing ICB items used in economic evaluations. Finally, studies evaluating the psychometric quality of these instruments were searched.

Results. Twenty-six unique instruments were included. Most frequently, ICB items measured school absenteeism, tutoring, classroom assistance or contacts with legal representatives, police custody/prison detainment and court appearances, with the highest number of items listed in the Client Service Receipt Inventory/Client Sociodemographic and Service Receipt Inventory/Client Service Receipt Inventory–Children's Version (CSRI/CSSRI/CSRI-C), Studying the Scope of Parental Expenditures (SCOPE) and Self-Harm Intervention, Family Therapy (SHIFT) instruments. ICBs in the education sector were especially relevant for age-related developmental disorders and chronic diseases, while criminal justice resource use seems more important in mental health, including alcohol-related disorders or substance abuse. Evidence on the validity or reliability of ICB items was published for two instruments only.

Conclusion. With a heterogeneous variety of ICBs found to be relevant for several disease areas but many ICB instruments applied in one study only (21/26 instruments), setting-up an international task force to, for example, develop an internationally adaptable instrument is recommended.

Criminal Justice Costs and Benefits of Mental Health Interventions

PRESENTER: **Luca Janssen**

Authors*: L.M.M. Janssen, I. Pokhilenko, R.M.W.A. Drost, A.T.G. Paulus, V. Brodzky, A.-L. Park, H.-H. König, L. Salvador-Carulla, J. Simon, S.M.A.A. Evers

Background: Mental health disorders and its treatments produce costs and benefits in both healthcare and non-healthcare sectors. The latter one is often referred to as intersectoral costs and benefits (ICBs). Limited research is available on the inclusion of these intersectoralICBs in economic evaluations. This study focuses on the identification and classification of ICBs of mental health-related interventions within the criminal justice sector in a broader European context. The aim of the study is to further conceptualize an internationally applicable list of ICBs of mental health-related interventions in the criminal justice sector. Additionally, we aim to facilitate the inclusion of ICBs in economic evaluations across EU by prioritizing important ICBs. This study was conducted as part of the PECUNIA-project, which aims to develop new standardised, harmonised and validated methods and tools for the assessment of costs and outcomes in European healthcare systems.

Methods: Data has been collected via a systematic literature search on PubMed. Additionally, a grey literature search was carried out in six European countries. In order to validate the international applicability of the list and prioritize the ICBs, a survey was conducted with an international group of experts from the criminal justice sector.

Results: The literature search allowed identifying additional ICBs and creating a comprehensive list of items. A multi-dimensional list is constructed, distinguishing between costs as consequence of crime, and costs in response to crime. Based on the expert survey, the international applicability was of the list was validated and determined most important ICBs from the economic perspective.

Conclusion: This study laid further foundations for the inclusion of important societal costs of mental health-related interventions within the criminal justice sector. More research is needed to facilitate the use of ICBs in economic evaluations even more.

Acknowledgements: PECUNIA project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 779292. There are no conflicts of interest to declare.

*=under discussion

Educational Costs and Benefits of Mental Health Interventions

PRESENTER: **Ms. Irina Pokhilenko**, Maastricht University

Authors*: I. Pokhilenko, L.M.M. Janssen, A.T.G. Paulus, R.M.W.A. Drost, J. Simon, H.-H. König, V. Brodszky, L. Salvador-Carulla, A.-L. Park, S.M.A.A. Evers, on behalf of the PECUNIA Group

Introduction. The burden of mental health disorders has a wide societal impact affecting primary individuals as well as their significant others. Mental health interventions naturally produce costs and benefits in the health care sector, but those can also lead to costs and benefits in non-healthcare sectors, which are referred to as intersectoral costs and benefits (ICBs). Limited research is available on ICBs. In this study, we attempted to assess the economic impact of mental health interventions on the educational sector in a broader European context.

Objectives. We aimed to develop an internationally applicable list of ICBs of mental health-related interventions in the educational sector and to facilitate the inclusion of ICBs in economic evaluations across EU by prioritizing important ICBs. This allowed us to gain insight into the impact of mental health interventions on costs and benefits within the educational sector.

Methods. In earlier research, some ICBs of mental health interventions were identified, which were used as a basis for this study. Additional data was collected via a systematic literature search of PubMed. Furthermore, a grey literature search was carried out in six European countries. In order to validate the international applicability of the list and prioritize the ICBs, a survey was conducted with the international group of

experts from the educational sector. The outcomes of the expert survey were used to create the condensed list containing the most important ICBs.

Results. The literature search allowed identifying additional ICBs and creating a comprehensive list of items. In order to improve its usability, we constructed a multi-dimensional list distinguishing between tangible (i.e. special education) and intangible items (i.e. cognitive deficits). Based on the expert survey, we validated the international applicability of the list and determined the most important ICBs from the economic perspective.

Conclusion. Depending on a mental disorder, mental health interventions can affect a large number of educational facilities. This study laid further foundations for the inclusion of important societal costs of mental health interventions within the educational sector. The list of ICBs developed in this study could be used to select relevant educational facilities for economic evaluations of specific mental health disorders.

Implications for Further Research. Further research is needed to define, measure, and valuate the identified ICBs in order to facilitate the practical application of the list in economic evaluations.

Acknowledgments: This research was conducted as a part of PECUNIA project, which aims to develop new standardised, harmonised and validated methods and tools for the assessment of costs and outcomes in European healthcare systems. PECUNIA project has received funding from the European Union´s Horizon 2020 research and innovation programme under grant agreement No 779292. There are no conflicts of interest to declare.

*=under discussion

10:30 AM –12:00 PM MONDAY [New Developments In Methodology]

Universität Basel | Kollegienhaus – Seminarraum 212

Organized Session: Expanding the Health Economist's Toolbox: Experiences from the Evaluation of Health Financing Interventions in Low and Middle Income Countries

SESSION CHAIR: **Manuela DeAllegri**, Heidelberg Institute of Global Health, Heidelberg University

Political Economy Approaches to Explore PBF's Adoption, Adaption and Implementation in Fragile Settings

PRESENTER: **Sophie Witter**

Performance-based financing (PBF) is increasingly implemented in low-income countries and has been at the centre of animated debates in the academic literature and beyond. Initially, most PBF research has focused on assessing its impact on outputs and outcomes, as well as unintended effects. More recently, the body of literature has expanded to cover issues concerning PBF-related 'processes' such as its global diffusion and the role of policy entrepreneurs, as well as the stages and drivers of its scale-up. However, fewer studies have documented the political economy dynamics of PBF's adoption, adaption and implementation at country level.

From a methodological perspective, we argue that PEA is helpful to elucidate the political dynamics and power relations between actors, but also the distribution of resources, the economic 'winners' and 'losers' as well as the rent-seeking strategies and imbalances in financial gains that underlie PBF implementation. The influence of contextual structures and narrative 'framings', ideologies and values is also revealed. These elements contribute to explain the different implementation outcomes and sustainability (understood as the continuation of PBF over time), as well as appropriation and ownership of different actors/groups. The advantages of PEA also lie in the possibility of combining insights from multiple theories and approaches (including, for example, interpretive policy analysis and framing theory) and to be flexibly tailored to the context and issues of interest (e.g., problem-driven PEA), thus providing findings that are relevant to guide practice.

Our analysis compares the cases of Sierra Leone (2010-2017) and Zimbabwe (2008-2018). These two case studies are of particular interest because of their respective PBF histories, Sierra Leone's characterised by a "start-stop-start again" trajectory and Zimbabwe's by a successful expansion to national level, one of the few sub-Saharan African countries currently implementing PBF nation-wide. Additionally, both countries are considered fragile settings, which allows us to explore that framing and reflect on the impact of fragility features on the processes of PBF's adoption and implementation.

We find that, in Sierra Leone, a resource-strapped environment at the Ministry of Health drives the internal divisions and the support/opposition to PBF adoption and implementation. In addition, donors' fragmentation, their 'venue shopping' strategies to push diverse agendas, as well as the rapid and misaligned donor funding cycles are not conducive to the development of national understanding and ownership over PBF. These elements are compounded by the dissonance in framing of PBF (i.e., how PBF is interpreted, defined and understood) by different actors. In contrast, in Zimbabwe the health system was able to adapt the model, seeking to maintain a systemic approach and avoid fragmentation. This has been facilitated by the retained managerial and professional capacity, which continued despite the aid dependency. PBF adaptation has engendered national ownership over time and, while the main 'winners' of PBF remain the frontline providers, who gained small but critical additional resources, the adaptations also ensured that district level managers were not marginalised by the shift of resources.

Implementation of the Fee Exemption for Caesarean Section Policy in Benin: Using Realist Evaluation to Open the Black Box

PRESENTER: **Jean-Paul Dossou**

Background

While there is strong evidence that user fees reduce access of poor patients to life-saving interventions, user fee exemption policies (UFEPs) usually show mixed implementation results. This was the case for the UFEP for caesarean section in Benin - despite the allocation of sufficient financial resources in the first years of implementation. Our study aimed at understanding why and in which context conditions the implementation of this policy failed.

Methods

Realist evaluation is a type of theory-driven evaluation. It considers that the outcomes of policies result from underlying causal mechanisms that are triggered in specific context conditions. It formulates results in terms of "what works, for whom, in what respects, to what extent, in what contexts, and how". Causal mechanisms include reasoning of actors - key drivers of change - who make particular decisions in response to the resources or opportunities that the policy provides. As such, realist evaluation fits well research on implementation of health financing policies: it allows for exploring not only the policy formulation and priority-setting process, but also how and why actors, within the organisational setting and in the broader societal context, implement policies (or not).

Adopting the realist evaluation approach, we developed an Initial Programme Theory which we tested through a multiple embedded case study design. We selected two hospitals with contrastive implementation outcomes. We used data from 52 semi-structured interviews, a patient exit-survey, a costing study of caesarean section at district level hospital and a financial flow tracking study.

Results

We identified two explanatory configurations. First, in the public hospital, which has a highly administrative and public-oriented management system and where citizens express high expectations and use various means to demand accountability, we found a positive implementation scenario, mainly due to a high commitment of managers and providers to the policy. In the faith-based hospital, we found that managers were guided by financial interests more than by the inherent social value of the policy. Combined with perceived poor enforcement from the national level, implementation was faulty: managers formally adopted the policy without changing their operational practices. Our findings confirm the powerful influence of health providers and local health managers, acting as 'street-level bureaucrats', on the implementation of policies. Policy compliance, persuasion and responses to incentives drive the attitudes of actors at the operational level. Policy compliance depends on the perception actors have of enforcement by the administrative hierarchical authority and the bottom-up pressure created by local accountability relationships. Persuasion depends on the alignment of the policy with the value system of the implementing organisation and with personal values. Incentives may determine the adoption by managers of non-state-owned facilities to the extent that they influence the hospital's revenue.

Conclusions

Failure to anticipate the differential responses of implementers to new policies will prevent UFEPs to be implemented properly.

Combining Social Network Analyses with Qualitative Data to Explore the Contribution of the Performance-Based Financing Community of Practice to Policy Learning and Emulation in Africa

PRESENTER: **Lara Gautier**, University of Montreal, School of Public Health

***Background*:** Communities of practice are flowering in the post-2015 era, and their role in diffusing healthcare financing reforms has been seldom investigated. Over the past decade, one of these reforms – performance-based financing (PBF) – has rapidly spread in African countries. PBF is a healthcare-financing reform suggesting a shift from the traditional input-based transfer of financial resources for health service provision to an output-based approach conditional on providers' performance. This study explores the ways in which the CoP contributes to PBF policy learning and emulation – two key mechanisms of policy diffusion – in African countries.

***Methods*:** A mixed methods convergent design was used to analyse the CoP's participation to policy learning and emulation. A social network analysis (SNA) was performed. SNA builds from graph theory; it studies the relations between actors, and how they influence the overall network. In this study, SNA was used to visualise members' ties with other members and with non-members of the CoP online forum. Citing someone in a post was conceived as driving both policy emulation (i.e., by acknowledging that this person is part of a common PBF community) and policy learning (i.e., by recognising that someone else's contribution expands PBF knowledge). Using R, graphic representations of the network (including 287 people citing or cited in 1,346 posts) enabled to unravel the *structure* (linked to policy emulation) and *openness* (linked to policy learning) of this PBF community. These quantitative results were confronted to a thematic analysis of qualitative interview data (N=40), CoP's key documentation (concept note, key blog posts, working papers) (N=25), and observation notes (N=4).

***Results*:** In terms of network *structure*, the large size of the strong component reflected a solid sense of community, which served as breeding ground for emulation among CoP members. Many informants indicated that the CoP played an instrumental role in harnessing a critical mass of PBF practitioners, offering international organisations a pool of African experts to tap into. The CoP's main vision was to create an online community gathering multiple forms of knowledge and promoting South-South exchanges on PBF. However, findings from the SNA enabled to nuance this endeavour. First, only 18,1% of cited people were non-members, and they were mostly cited by the same person (the one with the highest centrality degree), showing a limited *openness* of the community to externally-produced knowledge. Second, the promoted South-driven community did not exactly match the network's structure, which was dominated by North-based actors. They were those driving the learning agenda.

***Discussion*:** This empirical research enabled to identify the critical dimensions of CoPs which can facilitate health system reforms' diffusion. However, it is difficult to draw causal patterns: the CoP is not the only PBF network active on the continent: its effective contribution to policy diffusion is difficult to isolate from other PBF networks' actions.

Process Tracing – an Innovative Method to Understand Causal Mechanisms Underlying Impact of Health Interventions

PRESENTER: **Julia Lohmann**, London School of Hygiene and Tropical Medicine

There is an increasing interest in evaluations of health financing interventions to not only quantify causal impact, but to also identify and understand the causal mechanisms underlying impact. Among emerging methods is process tracing, which comes from a historical science tradition and has recently been introduced to the social sciences. As a qualitative method, process tracing involves establishing confidence in evidence on causal mechanisms in single-case designs without control group, in the tradition of Bayesian probability logic, by looking at "empirical fingerprints" left by activities of actors throughout the implementation process. Process tracing acknowledges that there may be more than one causal chain contributing to the effect under investigation. In the context of impact evaluation, this means that process tracing involves judgement on contribution rather than attribution. In contrast to qualitative approaches where the researcher aims to embark data collection with a "clean slate", process tracing caters to the frequent research reality in which the researcher already has good ideas about possible and plausible causal processes at the outset of the research. Specifically, process tracing involves developing and testing relatively specific hypotheses about the steps between the hypothesized cause and observed outcomes.

We employed process tracing in the context of an impact evaluation of results-based financing in Burkina Faso. The study used an explanatory mixed-methods design, where impact was first quantified in a quasi-experimental design (pretest-posttest with comparison) with a nested experimental component (randomized controlled trial), to be followed by a qualitative component to better understand how impact was (or was not) brought about. Having closely followed the implementation process, the research team had already gained quite some insight into implementation processes, barriers, facilitators, and mechanisms. Instead of a standard explanatory qualitative study, we therefore decided to employ process tracing, formalizing already existing knowledge about program implementation and using this knowledge to formulate a limited number of specific hypotheses pertaining to the causal mechanisms about particularly striking and pertinent impact findings. We then adopted a multi-method approach to collecting evidence for hypothesis testing, using as main data collection tools document review, secondary data analysis, key informant and in-depth interviews, and focus group discussions.

We will present the process tracing approach and its value in the context of impact evaluation in more depth, illustrating the different practical steps with concrete examples from our study in Burkina Faso.

10:30 AM –12:00 PM MONDAY [Demand & Utilization Of Health Services]

Universität Basel | Vesalianum – Grosser Hörsaal EO.16

Organized Session: New Insights on Eliciting Stakeholder Valuations for Genomic Testing

SESSION CHAIR: **Sarah Wordsworth**, University of Oxford

Genomic Sequencing in Advanced Cancer: Do Patients and the Public Prefer the Same?

PRESENTER: **Paula Lorgelly**

Title: Genomic sequencing in advanced cancer: Do patients and the public prefer the same?

Authors: Paula Lorgelly [presenter], James Buchanan, Melissa Martyn, Sophie O'Haire, Kortnye Smith, Jayesh Desai, Clara Gaff, iPREDICT Flagship collaborators

Abstract

Genomic testing technologies are rapidly advancing, but there has been limited translation of these tests into clinical practice. A key challenge is understanding how the behaviour of various stakeholders could impact on the economic value of testing. This study compares the preferences of patients with those of the general public for different features of a genomic test to sequence advanced solid cancer tumours.

Using a discrete choice experiment (DCE) we elicited preferences from the public and advanced/metastatic cancer patients as part of the iPREDICT (Incorporating complex PRofiling of patients to Enroll onto molecularly-DIrected Clinical Trials) Melbourne Genomic Health Alliance flagship. Patients completed a postal DCE survey while the public – who were purposively sampled to be representative of advanced cancer patients – completed the survey online. Both patients and the public completed 12 choice questions in which they had to choose between two possible test scenarios. Scenarios were specified in terms of five attributes: time to receive results, cost, likelihood the test result will change treatment, length of time spent describing test, and type of health care team who explains the test. Mixed logit regression analysis was used to develop models of choice behaviour for each subsample, and tests for scale heterogeneity were performed to evaluate whether differences in preferences related to taste heterogeneity or to differences in the randomness of choice behaviour.

The final sample consists of 233 cancer patients (response rate of 82%) and 254 members of the general public (response rate of 33%). In a ranking task, patients ranked the attributes in a different order to the general public. Differences were also identified in the preferences elicited in the DCE, with regression coefficients varying in magnitude and significance. This translated to different WTP estimates for patients and the public.

Patients, who are the stakeholders who undergo genetic testing, value different attributes of a genomic test compared to the general public, who represent funders in tax-funded health systems. This creates a conundrum for decision makers when designing genomic testing services, which this presentation will describe and which the discussant of the paper (Dean Regier) will expand upon.

Do Health Professionals Value Genomic Testing? a Discrete Choice Experiment in Inherited Cardiovascular Disease

PRESENTER: **James Buchanan**, Health Economics Research Centre, Nuffield Department of Population Health, University of Oxford

Title: Do health professionals value genomic testing? A discrete choice experiment in inherited cardiovascular disease

Authors: James Buchanan [presenter], Edward Blair, Kate L Thomson, Elizabeth Ormondroyd, Hugh Watkins, Jenny C Taylor, Sarah Wordsworth

Abstract

Background

Next generation sequencing (NGS) approaches have been applied in clinical research. As the costs of these genomic tests have fallen, attention has turned towards translating the tests into clinical practice. A key step in their translation is to understand the preferences of health professionals, because in many countries patient access to these tests is strictly controlled by specialist healthcare teams. This information can help decision-makers to predict test uptake in different clinical contexts, which will impact the cost-effectiveness of such tests. Well-defined adult-onset familial disease, such as inherited cardiovascular disease, is a clinical context where this information is particularly valuable, as the optimal NGS approach is unclear. In this study, we aimed to determine which attributes encouraged or discouraged the uptake of genomic tests for inherited cardiovascular disease, and whether uptake differed by genomic test type.

Methods

We conducted a web-based discrete choice experiment in health professionals in the UK who order NGS tests for inherited cardiovascular diseases. Respondents completed 12 choice tasks where they selected a preferred test from three genomic tests (whole genome sequencing, whole exome sequencing, panel testing) and a no test option. Tests were specified in terms of five attributes: the detection rate for pathogenic mutations, the detection rate for variants of unknown significance, cost, the quantity of counselling received and disclosure of secondary findings. Mixed logit regression analysis was used to analyse the choice data.

Results

We found that NGS uptake increases if tests identify more pathogenic mutations, identify fewer variants of unknown significance, or cost less. Considerable heterogeneity was observed around respondent preferences for several of these parameters, including the detection rate for both pathogenic mutations and variants of unknown significance. Respondents were willing to pay £117 for every 1% increase in the detection rate for pathogenic mutations, and were willing to tolerate a 36% increase in the detection rate for variants of unknown significance if the detection rate for pathogenic mutations increased by 10%. Overall, when the current specifications of different types of genomic test were evaluated within our model of choice behaviour, panel testing had the highest predicted uptake rate.

Conclusions

Our results indicate that NGS tests are valued by health professionals for well-defined adult-onset familial diseases. However, these professionals have strong preferences for panel testing, even though the pathogenic mutation detection rate is likely to be higher when whole genome sequencing and whole exome sequencing are used. This is because it is perceived that the latter two NGS approaches have a high detection rate for variants of unknown significance. The discussant for this presentation, Ilias Goranitis, will explore whether this finding has implications for designing of genomic testing services and if there is a risk that decision-makers could make an incorrect resource allocation decision unless the preferences of key stakeholders are incorporated into health technology assessments.

A Stated Choice Experiment to Predict Genomic Testing Uptake and Willingness-to-Pay: Evaluating the Role of Familiarity, Awareness, and Individual Risk-Attitudes and Beliefs Using Linear and Non-Linear Model Specifications

PRESENTER: **Ilias Goranitis**, The University of Melbourne

Title: A stated choice experiment to predict genomic testing uptake and willingness-to-pay: Evaluating the role of familiarity, awareness, and individual risk-attitudes and beliefs using linear and non-linear model specifications

Authors: Ilias Goranitis [presenter], Stephanie Best, John Christodoulou, Zornitza Stark, Tiffany Boughtwood

Abstract

Genomic technologies can offer significant benefits to the population, including information about the risk of developing a condition, information to guide medical management, and the opportunity to make informed choices within the family and beyond. These benefits, however, may come at an additional cost to the individual in terms of increased anxiety and uncertainty. This presentation describes a stated preference discrete choice experiment that was developed to explore individual preferences associated with genomic testing and predict its uptake among a representative sample of the Australian adult population (n = 500) under different scenarios related to test and context attributes. An implicit underpinning of conventional analytical methods in choice modelling is that individuals are risk-neutral with respect to model parameters and familiar with the alternatives being compared. Evidence from the context of genomics suggests that these assumptions may not be well substantiated. Knowledge and attitudes have been found to influence participation in genomic testing, and there is also early evidence to suggest that individuals participating in genomic testing tend to transform probabilities associated with risk and benefit. These are in line with evidence from transportation research, which concludes that the inclusion of attitudinal characteristics offers a richer evaluative space to understand individual behaviour. In this study, familiarity with genetic conditions and their effect on patients and families, awareness of genomic testing and its role in guiding clinical and personal decisions and, finally, personal risk-attitudes and beliefs are used to explore preferences associated with the uptake of genomic testing. A standard and a mixed multinomial model were initially estimated without attitudinal variables. The models were then extended to include attitudinal variables in a linear and non-linear specifications drawing upon expected utility and prospect theories and recent advances in the use of these theories and methods within transportation economics. The discussant for this presentation, James Buchanan, will tease out how important the use of alternative models and theories is likely to be in the context of eliciting stakeholder valuations for genomic testing.

Patient Demand for Precision Medicine: The Role of Evidence Uncertainty in Decision-Making

PRESENTER: **Dean Regier**

Title: Patient demand for precision medicine: The role of evidence uncertainty in decision-making

Authors: Regier DA, PhD, Veenstra DL, PharmD, PhD, Saha J, PhD, Basu A, PhD, Carlson JJ, MPH, PhD

Abstract

Background

An important challenge to realizing the use of genomic testing in a precision medicine context is the uncertainty arising from a lack of an evidence base and few guidelines on clinical adoption. The literature has argued that these conditions require greater patient tolerance for uncertain outcomes. Our objective was to estimate patient demand for information derived from genomic testing from the perspective of patients in the United States (U.S.).

Methods

We used a discrete-choice experiment to elicit patients' stated choices for precision medicine. We defined attributes through conducting three focus groups with 14 patients. Following thematic analysis and think aloud interviews, the following attributes were included in each task: type of genomic test, probability of having a biomarker, expert agreement on changing care based on test results, quality of life gains, average life expectancy gains with uncertainty, and cost of testing. We also included an opt-out option to allow for non-demanders. A D-efficient experimental design with informative priors was used to construct the choice tasks. A mixed logit model estimated indirect utility, with coefficients informing the willingness to pay (WTP) and uptake for varying configurations of health and non-health outcomes. We calculated the price elasticity of demand to understand how responsive uptake is to price in context to a changing evidence base using Oncotype DX as a case study.

Results

1124 patients (out of 1849 responding to the email invitation) drawn from the U.S. public completed the survey (cooperation rate of 61%). The most important attributes were: expected survival gains with uncertainty, cost of testing, and medical expert agreement on treatment change. Patients' WTP for most experts agreeing compared to few was $1100 (95% CI 916,1286). Patients were willing to pay up to $265 (95% CI 46,486) to resolve statistical uncertainty around average life expectancy gain. The predicted uptake of Oncotype Dx was 9% in 2005 and 66% in 2014. The real-world uptake was 7% in 2005 and 71% in 2014, resulting in a mean squared prediction error of 0.11. We estimate the demand for Oncotype Dx was elastic (1% increase in price resulted in >1% change in demand) when the genomic test was first introduced, and inelastic (1% increase in price resulted in <0.1% change in demand) as the evidence base became established through randomized controlled trials and guidelines regarding clinical adoption.

Conclusion

Patient demand for precision medicine in significantly influenced by uncertainty. Patients' disutility for uncertainty suggests that clinicians should communicate uncertainty at the time of decision-making. The discussant for this paper, Paula Lorgelly, will explore whether this approach can be used to inform the value of precision medicine applications and project the trajectory of demand as its evidence base becomes established.

12:00 PM –1:30 PM MONDAY [Special Sessions]

Universität Basel | Kollegienhaus – Hörsaal 102

Asian Delegates' Regional Meeting

12:00 PM –1:30 PM MONDAY [Special Sessions]

Universität Basel | Mensa – Cafeteria

Mentoring Lunch

1:30 PM –3:00 PM MONDAY [Organization Of Health Care Markets]

Universitätsspital Basel | ZLF – Gross

Organized Session: Different Drug Reimbursement and Pricing Approaches and Their Impact

SESSION CHAIR: **Aslam Anis**, University of British Columbia

Pharmaceutical Reimbursement Reform in the US – an Evaluation of the Options

PRESENTER: **Patricia Danzon**, Wharton School, University of Pennsylvania

President Trump recently proposed that Medicare Part B (which covers physician-dispensed drugs, including many high-priced biologics) should set its reimbursement for drugs based on their prices in other countries i.e. international referencing. This proposal prompted a public statement to policymakers from "members of the economic community who recognize the dangers of price controls." They argue that "History has shown that price controls on any commodity or service produce unintended but consistently detrimental effects. In general, setting price controls at below-market rates leads to shortages, squeezes the cost bubble toward some other portion of the economy, and imposes a deadweight cost on society."

This paper argues that, while international reference pricing has many deleterious effects, these are not the standard effects of price controls as argued by this statement. More fundamentally, such analysis of price controls on pharmaceuticals, in terms of the standard economic arguments against price controls, is fundamentally flawed because it ignores the role of insurance in pharmaceutical markets. Insurance undermines patients' price-sensitivity, making demand highly inelastic and leading to above-optimal price levels unless payers act as patients' agents and intervene to constrain prices. Thus for heavily insured products whose producers have market power, some form of price constraint can be welfare enhancing.

In this paper, we briefly review the factors that have contributed to the failure so far of both public and private payers in the US to implement potentially welfare-enhancing limits on prices. These include the pluralistic insurance market, with public and private payers that face both statutory and competitive limits on their ability to constrain prices. Further, current reimbursement rules and pricing incentives differ, depending on whether a drug is dispensed by an outpatient pharmacy, a physician's office or a hospital. Any reform must take account of these differences.

The paper then draws on theory and evidence to evaluate recent proposed reforms of Medicare's reimbursement for pharmaceuticals, including: international reference pricing for Part B drugs; paying physicians a flat dispensing fee rather than a percentage of the drug price; and allowing Medicare Part D plans (which cover outpatient pharmacy drugs) to use tiered formularies for drugs in "protected classes" (while retaining the requirement that all FDA-approved drugs in these classes must be covered). We also consider two proposals that could apply to Medicare and to private payers: banning rebating by drug manufacturers to pharmacy benefit managers/health plans in return for preferred formulary position; and value-based pricing. Finally, we briefly discuss proposals advanced by those who oppose any form of price control and seek instead to make markets work better to constrain drug prices, both within Medicare and in the private insurance market. This analysis draws on experience of similar reimbursement reforms in other countries, where relevant, but also identifies where characteristics specific to the US require special analysis.

Understanding Shortages in the UK Generics Market

PRESENTER: **Adrian Towse**, The Office of Health Economics

The UK Government's current policy on unbranded generic medicines is to rely on competition to keep prices low. The Government then claws back some of the discounts that pharmacists get from buying low cost generics. Companies that participate in Schemes M and W submit quarterly information relating to *net* sales and prices of medicines to the DHSC i.e. including discounts. The DHSC uses this information to set reimbursement prices according to a formula that maintains the incentives for individual pharmacies to procure generic drugs efficiently, by seeking to secure a price lower than this average price.

Most of the regulation of unbranded generic medicines is "ex post" relying on competition law.

There have been a number of high profile examples of significant price increases in the last years, which reflects the fact that relying on competition does not always work to keep prices low. Issues arise in particular if the numbers of suppliers of a drug are low.

The total value of the generics market (primary and secondary care) shrank by 2.8% in 2016 compared with 2015. The main factor driving this is a reduction in the value of the primary care generics market of 6.7% over the same period. For most classes there was either low or negative volume growth outweighed by even greater negative growth in "prices". Hence, for almost all classes, overall growth in 2016 was negative. The decline in the generic market in 2017 at list prices continued. However, there were significant price rises for some primary care generics in 2017/18. A National Audit Office (NAO) announced reported in June 2018 that the price increases came from a small number of medicines which pharmacists were unable to purchase at the Drug Tariff Price. They were forced to seek "concessionary pricing". The DHSC agreed to 709 price concessions in 2017-18 as compared to 282 in 2016-17. The NAO estimated that this cost £315m over and above the Drug Tariff prices for those medicines. Ten medicines accounted for "around half of this net spend." The DHSC identified "three main underlying causes" which were (i) regulators "suspending the licences of three manufacturers of generic medicines" (ii) "a fall in the value of sterling" and downward pressure on prices in other countries leading to market exit to an extent that "the reduced capacity and competition then increased prices within the UK market."

This paper seeks to unpick the various factors using data on concessionary price increases, trends in Category M and W prices, and interviews with relevant stakeholders. It explores whether there is a trade-off between the "static" objective of keeping prices low and the "dynamic" objective of obtaining security of supply over time, and if so which policies are likely to achieve the optimal balance.

An Economic Analysis of "Tiered Pricing" Schemes for Generic Drugs

PRESENTER: **Aidan Hollis**, University of Calgary

AUTHORS: Javad Moradpour, Wei Zhang, Dr. Aslam Anis, Paul Grootendorst

Insurers use several methods for to set prices for generic drugs. That any price setting is required is surprising, since generic drugs are homogeneous and should be the model of a perfectly competitive industry. The problem is that insurers tend to reimburse the pharmacy or consumer, and so do not interact directly with generic suppliers. As a result, in many countries generic suppliers compete to get business from pharmacies. The joint interests of pharmacies and suppliers combined lead to high prices, with profits split between the manufacture and pharmacy. The response to this varies. Some insurers simply require a minimum percentage reduction in price from the patented product. Another approach is for the insurer to contract directly with competing generic suppliers and to issue a tender; this is used in the Netherlands and New Zealand, for example. In England and Wales and in Australia, a benchmarking scheme is used in which the reimbursement price is based on average transacted wholesale price in a previous period. And in Canada, Portugal, and Austria, generic drugs are priced at a proportion of the branded product price, with the price level being set at different tiers based on the number of competing firms. This last approach is studied in this paper.

There are significant differences in the tier structures chosen by different jurisdictions. For example, in Canada, the generic reimbursement price is set at 75% of the brand price if there is only one generic entrant, 50% if two, and 25% if three or more. In Austria, the tiers are set at 52%, 44%, and 40%. The idea of such a scheme is that generic firms will continue to enter as long as their average cost is below the next price tier. The benefit of having more, smaller steps in such a scheme is that with more tiers the price will be closer to the average cost. However, making the steps smaller means that getting low prices requires more entrants. It is not clear what the optimal set of steps is.

Our analysis uses public data on drug pricing to inform a simulation study in which we examine different structures of tiers. We expect that the results will inform tiered pricing models and support optimization of this approach.

The Impact of Tiered Pricing Framework on Generic Entry in Canada

PRESENTER: **Wei Zhang**, University of British Columbia

AUTHORS: Huiying Sun, Daphne Guh, Larry D Lynd, Aidan Hollis, Paul Grootendorst, Dr. Aslam Anis

Background: Generic pharmaceutical markets in Canada are subject to various 'price-cap' regulations referred to as the maximum allowable list price (MALP). While the MALPs varied by province, they were initially set at levels that were high by international standards until the province of Ontario lowered its MALP to 25% of the brand drug price in 2006. By 2013, provincial MALP values were as low as 18% (Alberta) and as high as 35% (Saskatchewan). The MALP system has been criticized as being fundamentally flawed because drug plans do not have the information needed to set appropriate MALPs. When the MALP is set too high, the drug plan overpays. Conversely, when the MALP is set too low, firms either do not enter the market or exit the market, often creating drug shortages. To address these shortcomings, the Pan-Canadian Pharmaceutical Alliance (pCPA), a coalition of the provinces/territories in Canada, implemented a tiered-pricing framework (TPF) for new generic drugs in April 2014, under which the MALP is initially set high (75%) and declines as the number of generic firms supplying the market increases (50% for 2 firms and then 25% for >2 firms).

Objective: To evaluate the impact of the TPF on generic entry and drug expenditures in Canada from public drug plans' perspective.

Methods: Our study period included the period before the TPF (January 1, 2012–March 31, 2014) and the TPF period (April 1, 2014–June 30, 2016). The National Prescription Drug Utilization Information System Database includes formulary data and claims data on drugs covered by the publicly-funded drug plans in 9 provinces of Canada. The formulary data track formulary coverage start date and end date for each drug. Claims data include the drug cost accepted by the drug plans. We grouped eligible drugs into a "market" if they had the same active ingredient(s) and strength, route of administration, and dosage form. Cox proportional hazards models with time-varying covariates (policy

period was the time-varying variable) were used to measure the time from the first international (7 major countries) generic launch to the first generic formulary listing in Canada. Total drug expenditures for the selected study market cohort and a comparison cohort during the two policy periods were estimated according to the total claims reimbursed by drug plans.

Results: A total of 189 markets in Canada were eligible for TPF and generic entry and thus selected for the analyses. Generic drugs in small markets (≤40 percentile value of the claims of all markets before generic entry) were more likely to be listed during the TPF period (relative hazard (95% CI): 3.81 (1.51-9.62)). There was no significant difference in generic drug listing between pre-TPF and TPF periods in large markets (0.97 (0.61-1.56)). Drug expenditures in our study market cohort decreased by 11.1% in Canada over the two policy periods while drug expenditures in the comparison cohort increased by 19.5%.

Conclusion: TPF speeds up the generic entry and generates the benefits of generic competition while avoiding the pitfalls of the previously employed price-cap regulations.

1:30 PM –3:00 PM MONDAY [Specific Populations]

Universitätsspital Basel | ZLF – Klein

Organized Session: Economic Issues Affecting Cancer Diagnosis and Treatment

SESSION CHAIR: **Thomas DeLeire**, Georgetown University

DISCUSSANT: **Cathy Bradley**, University of Colorado Denver; **Lindsay M Sabik**, University of Pittsburgh; **Erin Strumpf**, McGill University

Using Fee Cuts to Reduce Low-Value Care: The Case of Intensity Modulated Radiation Therapy

PRESENTER: **Mr. David Howard**, Emory University

AUTHOR: Christopher Paul Filson

Intensity modulated radiation therapy (IMRT) is a costly form of radiotherapy commonly used to treat breast, prostate, and head and neck cancers. There is little or no evidence that it improves outcomes compared to commonly-used alternatives, yet IMRT diffused rapidly into routine practice in the 2000s. Previous research indicates that adoption by physicians was partly motivated by the high fees they earn from delivering IMRT.

In the United States, IMRT is provided in freestanding radiotherapy clinics and hospital outpatient departments. Between 2006 and 2013, the Medicare payment for IMRT delivered in freestanding clinics declined by 34%. The decrease was motivated in part by concerns about the overuse of IMRT. During the same period, the payment for IMRT delivered in hospital clinics increased slightly. The goal of this study is to determine whether the payment cut led to a decline in the use of IMRT.

Using SEER-Medicare data, we evaluate the impact of the payment cut on the use of IMRT in Medicare patients with early stage prostate cancer. We limit the sample to patients receiving active treatment.

We find that IMRT use among patients treated at urology clinics that own IMRT equipment, which ought to be the most responsive to changes in payment levels, increased from 36% in 2006 to 77% in 2010-2013. Use among patients treated at urology clinics that refer patients to unaffiliated freestanding radiotherapy clinics, which were also affected by the payment cuts, increased from 36% in 2006 to 77% in 2010-2013. Use among patients treated at urology clinics that refer patients to hospital-based clinics, which were unaffected by the payment cut, increased from 32% in 2006 to 50% in 2010-2013. Consistent with the unadjusted trends, a regression model rejects the hypothesis that use of IMRT grew more slowly at clinics that were subject to the payment cut.

Our results indicate that a large payment cut did not affect the use of IMRT. We do find evidence, consistent with previous work, that patients treated by urologists who own IMRT equipment and profit the use of IMRT are more likely to receive IMRT. IMRT is a technology with high fixed but lower marginal costs. Despite the payment cut, it probably remains profitable for freestanding practices.

Comparison of Treatment Patterns of Women with Ductal Carcinoma in Situ (DCIS) Enrolled in Medicare FFS Versus Medicare Advantage

PRESENTER: **Dr. Jean M Mitchell**, Georgetown University

AUTHOR: Thomas DeLeire

Medicare beneficiaries may enroll in the traditional fee-for-service (FFS) program, or they may opt for a private Medicare Advantage (MA) plan. The latter include health maintenance organizations (HMOs), preferred provider organizations (PPOs), private fee-for-service (FFS) plans and hybrid plans. MA plans receive a capitated payment for each enrollee, which the plan uses to pay providers for services rendered to MA beneficiaries. This payment covers all Part A (inpatient hospital) and Part B (physician and outpatient services) benefits. MA plans that provide prescription drug benefits receive an additional payment from Medicare. Enrollment in private MA plans has more than doubled since 2004 from 13 percent (5.3 million) to 33 percent or 19 million beneficiaries in 2017 (MedPAC 2018). Over this same period, government payments to MA plans increased from $77 billion to more than $200 billion (Brennan, Ornstein, and Frakt 2018).

Despite this growth, a key question with significant implications for the Medicare program, is whether MA plans operate more efficiently than FFS. In theory, MA plans should be more efficient and less costly than traditional FFS because they can restrict enrollees' choice of providers, may require prior authorization for high cost procedures and may require plan members to obtain care from a network of "high value" providers (MedPAC 2018). While findings from published studies suggest there are significant differences in type of and quality of care received by MA enrollees and traditional FFS beneficiaries, there are two important limitations to these studies. First, some studies only compared FFS to HMO type MA plans, whereas the remainder did not control for MA plan type. Second, prior research failed to consider beneficiaries who switch from FFS to a MA plan or vice versa. Inclusion of switchers represents a potential source of bias because information only claims (encounter data) to identify treatments received by beneficiaries enrolled in MA plans were not available for years prior to 2015. Notably, this changed in April 2018 when CMS announced its decision to release MA encounter data from 2015.

This study addresses this significant gap in knowledge. We compare treatment patterns using cancer registry data from five large states merged with Medicare enrollment records for women with newly diagnosed ductal carcinoma in situ (DCIS) continuously enrolled in either traditional FFS or the same MA plan. A focus on DCIS is compelling because the incidence of DCIS has increased dramatically as almost 20% of newly diagnosed breast cancer cases are DCIS. In addition, over diagnosis and overtreatment are of particular concern for DCIS because the standard of care is to treat. Thus, although their lesions are unlikely to become cancerous a high proportion of women diagnosed with DCIS undergo aggressive treatment (mastectomy or lumpectomy) followed by a course of radiation therapy (RT) with or without hormone therapy. Our analysis focuses on cases of DCIS newly diagnosed during the years 2006-2014. The registry data includes detailed clinical data, types of treatments received and outcomes. For this cohort we obtained matched monthly enrollment records (MA or FFS) from CMS.

Medicaid Expansion and Cancer Screening Among Safety Net Patients in the US South

PRESENTER: **John Graves**, Vanderbilt University

AUTHORS: Laura A Hatfield, J. Michael McWilliams

Background: The southeastern United States is home to nearly half of the nation's uninsured population and has the highest rates of cancer and chronic disease of any region. These trends have persisted as the Affordable Care Act's (ACA) health insurance expansions have insured over 10 million otherwise uninsured people nationwide since 2014. The ACA's impact in the South has been more muted, however, because the majority of southeastern states have declined to implement the law's expansion of Medicaid to 138 percent of the federal poverty line (FPL).

Methods: We analyzed longitudinal survey and vital status data from the 12-state Southern Community Cohort Study (SCCS) for 10,506 non-elderly adult participants, 86% of whom were enrolled at community health centers. In difference-in-differences analyses, we compared self-reported health insurance and cancer screening and diagnosis outcomes in 4 expansion and 8 non-expansion states before (2010-2013) and after (2015-2017) ACA provisions to expand Medicaid were implemented. We modeled outcomes jointly with death to address bias due to truncation by death. We also used a novel permutation inference procedure to minimize the risk of false discovery due to small cluster bias. This procedure quantified the extremeness of results relative to all 495 possible comparisons of 4 treated vs. 8 untreated states.

Results: SCCS participants reported high rates of disability, poor health, chronic disease, and uninsurance. Medicaid expansions were associated with a differential increase of 6 percentage points self-reported health insurance coverage, with nearly all of this increase attributable to increased Medicaid coverage. Expansions were associated with a higher proportion of participants receiving colonoscopy testing (+1.3 percentage points, or ppts.). We found no differential changes in the frequency of mammography or pap smear testing among low-income women participants in expansion states. Among males, however, prostate cancer screening profiles differentially changed. Males in expansion states were more likely to receive annual Prostate-Specific Antigen (PSA) testing (+2.7ppts) and less likely to receive regular (every two years or more) Digital Rectal Exam (DRE) testing (+2.5ppts). Finally, we found no evidence of changes in self-reported cancer diagnoses among participants in Medicaid expansion states. Reported point estimates above were extreme values in the permutation inference distribution (i.e., percentile ranking of 5% or below).

Conclusions: Among low-income adults in the US South, Medicaid expansion was associated with differentially higher Medicaid coverage and more frequent cancer screening rates among males.

Cancer Treatment Innovation, Education and Labor Market Outcomes

PRESENTER: **Dr. R. Vincent Pohl**, University of Georgia

AUTHOR: Sung-Hee Jeon

Cancer is one of the most common causes of death, but for many cancer sites, mortality rates have been declining due to improved treatment options. The numbers of available drugs for the treatment of breast and prostate cancer, for example, have doubled in the last two decades. Cancer patients who have access to these new treatments may not only benefit in terms of improved morbidity and mortality outcomes but also by finding it easier to stay in the labor force, for example due to less severe side effects. In this paper, we first estimate the effect of cancer treatment innovations on the labor market outcomes of breast and prostate cancer patient. Second, we test whether innovation and education are complements, leading to unequal access to innovative treatments across educational attainment. It is possible, for instance, that highly educated cancer patients are better able to identify medical providers offering novel treatment options or adhere to complicated treatment regimens.

We merge data from the Canadian Cancer Database with individual tax returns and census data, allowing us to precisely measure both the type and timing of the cancer diagnosis as well as pre- and post-diagnosis labor market status, annual earnings, and educational attainment. To estimate the effect of innovation in cancer treatments on labor market outcomes, we employ a triple-differences strategy. Specifically, we compare the labor market outcomes of cancer patients and a control group consisting of individuals never diagnosed with cancer before and

after the diagnosis. We then take a third difference across two measures of innovation: the number of approved drugs and the number of patents related to breast and prostate cancer treatment. We then estimate the labor market effect of treatment innovation separately by educational attainment.

Our results show an overall positive effects of cancer treatment innovation on the employment status of cancer patients. Between 1992 and 2010, pharmaceutical innovation lowered the negative labor market effects of a prostate cancer diagnosis by 3 percentage points at the extensive margin. Broader innovation as measured by the number of patents increased labor force participation among prostate cancer patients by 2 percentage points. The effects among breast cancer patients aged 35 to 44 are similar, but do not find statistically significant effects among older women. Second, we find that these benefits are confined to cancer patients with more education than a high school degree. For those with a high school degree or less, the effects of treatment innovation are an order of magnitude smaller and not statistically significant. Hence, our results imply that innovation in cancer treatment has important economic benefits, but these benefits are not equally distributed across educational attainment.

1:30 PM –3:00 PM MONDAY [Demand & Utilization Of Health Services]

Universitätsspital Basel | Pathologie – Unten (U)

Cancer

SESSION CHAIR: **Justin Trogdon**, University of North Carolina-Chapel Hill

The Out of Pocket Costs for Breast Cancer Patients in Australia: An Examination of the Influence of Rurality and Socioeconomic Disadvantage.

PRESENTER: **Daniel Lindsay Dr**, James Cook University

AUTHORS: Nicole Bates, Emily Joy Callander

Background: In Australia, breast cancer is the most commonly diagnosed cancer and the 2nd leading cause of cancer mortality in females. While there are high breast cancer incidence rates in Australia, the mortality rate for this disease is relatively low, and has been decreasing in the past few decades. There is a growing awareness of the financial burden that cancer treatment and related expenses can have on patients, with the term ‘financial toxicity’ being coined to describe such burdens While improvements in survival have been well documented, inequality is still evident when examining outcomes relating to breast cancer. While there is an abundance of research that has explored the difference in outcomes and treatment options relating to breast cancer based on location and disadvantage, little research has been done to explore the difference in costs incurred by these population group. the current study aimed to explore the OOP costs and level of service use for breast cancer patients in Australia based on their socioeconomic and rurality status

Methods: This study utilised a linked administrative dataset, CancerCostMod, which contains a census of all patients diagnosed with cancer in Queensland, Australia, between 1 July 2011 and 30 June 2012 (N = 25,553). This base population was linked to the individual's patients records from the Queensland Health Admitted Patient Data Collection, Emergency Department Information System, and Medicare Benefits Scheme (MBS) from 2011 to 2015. In order to explore out of pocket costs in more detail, all MBS items were further classified into a type of health service. The influence of rurality and socioeconomic disadvantage on out of pocket costs for breast cancer patients were examined using regression models. Differences in health service use and cost of different types of health service based on rurality and socioeconomic disadvantage was also explored using regression models.

Results: There was a total value of approximately 3,000 female breast cancer patients in this sample. The results indicate that costs for breast cancer patients were larger for those living in more metropolitan areas and areas with less socioeconomic disadvantage. Within the final regression model, socioeconomic status was found to be significantly predictive of out of pocket costs, while rurality was non-significant. When comparing frequency of service use across all MBS items combined, there were no significant differences based on rurality; however, those from the most socioeconomically disadvantaged areas used services significantly less often than those from the least disadvantaged areas.

Conclusions: Females patients with breast cancer from more socioeconomically disadvantaged areas spend less, but also access less services, than those patients from more advantaged areas. Rurality does not seem to have an influence on cost or access to services, suggesting that those from the poorest socioeconomic backgrounds should be targeted when considering the appropriate level of usage of breast cancer services.

Socio-Economic Inequality and the Utilisation of Breast Cancer Screening: Evidence from 14 Low-Resource Countries

PRESENTER: **Mr. Rashidul Alam Mahumud Mr.**, University of Southern Queensland

AUTHORS: Khorshed Alam, Syed Afroz Keramat, Gail M Ormsby, Jeff Dunn, Jeff Gow

Abstract

Introduction

Breast cancer is the most commonly occurring cancer among women in low-resourced countries. Reduction of its impacts is achievable with regular screening and early detection. This study assesses the role of socio-economic inequality on accessing breast cancer screening (BCS) services and identified potential factors contribute to inequalities.

Methods

Population-based cross-sectional multi-country analysis was used to study on the utilisation of BCS services. Regression-based Blinder-Oaxaca decomposition analysis was used to examine the magnitude of the impact of inequalities on the utilisation of BCS services and to identify potential factors contributing to these outcomes. Observations from 140,974 women were used in the analysis from the latest population-based Demographic and Health Survey from 2008-09 to 2016 in 14 low-resource countries.

Results

The population-weighted mean utilisation of BCS services was low at 15.41%. Women with higher socio-economic status (SES) has higher access rates (15%) than those with lower SES (9%). Blinder-Oaxaca decomposition analyses revealed that a high degree of inequality in accessing and utilising BCS services exists in all study countries. Women from low educational backgrounds, a lack of mass media coverage, uninsured, and rural communities were significantly associated with lower levels of access.

Conclusions

There is a high degree of socio-economic related inequality in accessing BCS amongst reproductive women in these 14 low-resource countries. The findings may assist policymakers to develop risk-pooling financial mechanisms and design strategies to increase community awareness of BCS services. These strategies may contribute to reducing inequalities associated with achieving higher rates of BCS services utilisation.

Comparison of 5-Year Hospital Costs of Colorectal Cancer Detected in a Population-Based Randomized Health Services Study

PRESENTER: **Suvi Mäklin**, National Institute for Health and Welfare (THL)

Background. Colorectal cancer (CRC) screening was implemented in Finland in 2004 as a population-based randomized design using biennial fecal occult blood test (FOBT, Hemoccult®) for 60-69 years old men and women. After a positive test result, a colonoscopy was programmed within routine health care. Control arm did not receive any intervention. The effectiveness of the program was evaluated in 2015 and, with a median follow-up of 4.5 years, no effect on CRC mortality was found. However, a substantial effect difference between males and females was found, inconsistent with the evidence from randomized clinical trials.

Objective. This study aims to estimate five-year treatment costs and hospital resource utilization of patient diagnosed with CRC in the Finnish CRC screening study, in the screening and the control group. The costs are estimated by the study arm (screening, control), stage of the disease at diagnosis and gender.

Data and methods. All patients diagnosed with colorectal cancer between randomization and end of 2011 in the screening and control arms were included. During this time, 321 311 people were randomized; 160 762 in the screening arm and 160 459 in the control arm. A total of 1360 colorectal cancers were diagnosed. All use of hospital resources during years 1999-2014 is derived from the national hospital discharge register and the screening test results from the national CRC screening center. Descriptive statistics for outpatient visits, inpatient episodes, and colonoscopies are reported. Resource utilization is compared between the screening and the control groups, separately for men and women. Several regression analyses are used to compare the likelihood of any hospital use.

Results. The mean 5-year per-person treatment cost was €18,924 (95 % CI €17,620 - €20,228), and lower for cancers detected within the public screening program (€17,079) than for those detected in the control arm (€21,083). For CRC in stages I through IV, the mean treatment costs were €12,272, €16,428, €23,531, and €24,903, respectively. No significant differences were observed in costs between men and women. More patients in the control group had at least one inpatient episode (96% vs 93%, OR 0.59) and the mean number of outpatient visits was higher in the control arm than in the screening (20 visits per patient during the first year compared to 17, $p<0.001$).

Conclusion. The treatment of CRC was less costly in the screening arm than in the control arm. Smaller proportion of the screening arm had hospital inpatient days and the number of outpatient visits was lower.

Determinates of Patient Choice for Breast Cancer Surgery in Tuscany: Quality and Equity Implications

PRESENTER: **Dr. Chiara Seghieri**, Scuola Superiore Sant'Anna
AUTHORS: Francesca Ferre, Sabina Nuti

Equity and quality in healthcare are key goals embraced by universal healthcare systems, however inequalities in access and unwarranted variations in quality of care are well documented in the Italian national healthcare system (NHS).

National quality standards have been applied at hospital level for selected clinical procedures for which there is evidence of an inverse relation between volumes and clinical outcomes. Specifically for breast cancer, the Italian NHS indicates a minimum number of breast surgeries per year (> 150) for the identification of breast cancer units. However, high dispersion of surgical interventions across hospitals still exists

highlighting the need to understand the determinants behind cancer patients' choice for hospital for breast surgery, including socio-demographic characteristics, distance and provider performance indicators.

Objectives: This contribution aims to provide evidence on the determinants of breast-cancer patient choice regarding hospital services, focusing on the trade-offs and relationships between distance and hospital performance for breast cancer treatments in different patient groups. Specifically, we are interested in analysing how SES, using education as a proxy, affect the access to high (low) performing providers in Tuscany region (italy).

Methodology: We ran a retrospective analysis using the administrative data on hospital admission of about 3,100 women undergoing breast cancer surgery. The administrative data were integrated into a GIS environment, in order to visualize the geographical distribution of the hospitals performing such interventions. We apply mixed logit regression to investigate patients' choice of breast-cancer surgery provider (hospital). By merging the information on hospital performance characteristics and patient demographics, we modelled patient choice between alternative hospitals services as a mutually exclusive choice. We focused on the effect of travel time, hospital performance indicators (hospital yearly volume of breast cancer surgical interventions, quality of surgical procedures considering the ratio of breast-conserving surgery on overall breast cancer surgery and waiting time for surgery after clinical evaluation). The analysis include interactions with patient age, comorbidity level and education level.

Main expected results: Preliminary results reveal that the breast cancer patients preferred hospitals nearby and with shorter waiting times (p=0.000). In addition, the coefficient for volume is statistically significant: providers with a low number of surgical procedures are selected to a lesser extent (p=0.000). After the inclusion of patient sociodemographic characteristics, we observe differences in patient mobility (travel time) depending on age and education level. Longer waiting times for surgery negative influence the choice to select a hospital for younger women (p=0.000) and low-educated women (p=0.009). Women that are more educated select high performing hospitals. Comorbidity level has no significant effect in explaining choice of hospital.

These preliminary results reveal that age and socioeconomic status have a significant effect in choice of hospital providers by breast cancer patients. Older and lower educated women appear to receive low quality care for surgical breast cancer treatments in Tuscany. The socioeconomic disaggregation of statistical data (vertical equity) highlights the existence of inequalities in access to high performing hospitals in Tuscany. These findings could be used to optimize the allocation of resources.

1:30 PM –3:00 PM MONDAY [Evaluation Of Policy, Programs And Health System Performance]

Universitätsspital Basel | Klinikum 1 – Hörsaal 1

Organized Session: International Comparison of High-Need, High-Cost Patients: What Can We Learn about Health System Performance?

SESSION CHAIR: **Kosta Shatrov**, University of Bern

Managing High-Need, High-Cost Patients: An International Perspective

PRESENTER: **Dr. Jose Figueroa**, Harvard Medical School

A key challenge facing many health systems is how to best design services to provide care to high-need, high-cost patients. Currently, there is limited comparable data on the prevalence of high-need patients across countries, and how their patterns of utilization and costs differ across health systems. This presentation will outline the methods and data used by the *International Collaborative*on *High Cost High Need populations* to conduct international comparisons of high cost high needs patients across the twelve countries participating in the collaborative, which include the United States, England, Canada (Ontario), France, Norway, Sweden, Australia (New South Wales), New Zealand, the Netherlands, Germany, Switzerland and Spain (Aragon).

Based on a patient taxonomy of high-need patient populations outlined by the National Academy of Medicine (NAM), four high-need patient personas (vignettes) were identified that embodied the identified definitions. The four high-need personas included an older person with dementia, a frail elder who experienced a hip fracture and subsequent hip replacement, an older person with multiple major chronic conditions including a hospitalization with congestive heart failure, and finally, a young adult with serious mental illness, defined as having either schizophrenia or bipolar disorder. A common methodology was applied to identify and follow patients across the different countries. Where possible, the analysis is extended to explore the entire pathway of care, spanning primary care services, specialty services, acute hospital care, and post-acute care.

Results

The most comparable and complete data source for all countries was data from the inpatient sector. Therefore, the personas that were most uniformly identifiable across all countries were the two personas that started with an index hospitalization: the frail elder with a hip fracture followed by replacement and the hospitalized patient with heart failure and diabetes as a comorbidity. On the other hand, for the older person with dementia and the young person with serious mental illness, the identification strategy was heavily reliant on the type of data available within countries.

Conclusions

Taken together these findings suggest that there is promise to using this type of methodology to identify differences across countries with regards to patterns of delivery of care for high cost high need patients. Looking at the entire trajectory of care enables us to better understand some of these differences, which are more pronounced than patterns of inpatient care. However, caution needs to be applied in any interpretation of these results, given differences in data collection.

Variations in Care and Outcomes of Hip Fracture Patients across 12 Countries

PRESENTER: **Zeynep Or**, Institut de Recherche et Documentation en Economie de la Sante div>

Background

Hip replacement is one of the most common cause of hospitalisation for the elderly population. The coordination of care before and after hospitalization for a hip fracture is important for improving the quality of patient care and the efficiency of the health system. This paper looks at the variations in utilization, costs and outcomes of patients who have been hospitalized for hip fracture in 12 countries. Pooling together quantitative data and qualitative information from selected countries it aims to provoke debate on margins (and levers) for improving efficiency of care for this population.

Method and Data

Using the persona approach outlined in Presentation 1 data was collected in each country.

Results

The mean age of patients with hip fracture was the lowest in the Netherlands at 74.4 years and highest in Spain (Aragon) at 82.8 years. The majority of the population across all countries was on average female. There were also differences in the number and type of comorbidities across the countries. This is partly driven by the number of comorbidities that can be coded and also the type of care setting that can be used to identify comorbidities. On average, the US had the most number of comorbidities (6.0) followed by Germany (5.9). In Switzerland, Australia, Sweden, Norway, and New Zealand, only inpatient codes could be used to identify comorbidities. There were large variations in hospital and primary care utilization as well as in drug prescriptions and expenditures. The lowest hospital expenditure (adjusted in 2016 PPP) was reported in the Netherlands, which had the youngest population, and at more than double the Duthch expenditure, New Zealand had the highest levels of spending. The Netherlands, Switzerland, and England had the lowest rates of readmission at all intervals while Australia had the highest rates of readmissions. England and Canada had among the highest rates of 30 day mortality

Conclusions

This work is an important contribution to other cross-country comparisons that highlights differences in service delivery for elderly patients with hip fracture.

Variations in Care and Outcomes of Patients with Congestive Heart Failure and Diabetes across 12 Countries

PRESENTER: **Dr. Carl Rudolf Blankart**, University of Bern

Background

The proportion of the population with multi-morbidity is growing within countries, making care provision more complex. Many systems are facing the challenge of optimizing service delivery for multi-morbid patients, and the need to integrate services to do so. The paper looks at the variations in utilization, costs and outcomes of elderly patients who have congestive heart failure and diabetes. Where possible, a further subsample is explored of patients that have congestive heart failure, diabetes and chronic obstructive pulmonary disease.

Pooling together quantitative data and qualitative information from selected countries it aims to outline the differences in care trajectories across countries, to better inform what optimal systems for this population look like.

Method and Data

Using the persona approach outlined in Presentation 1 data was collected in each country.

Results

There is the possibility to exploit the variation across and within countries for the congestive heart failure persona as we observe three different points of progression. There was some variation in the number of hospitalizations for CHF patients with diabetes, across the countries. The trajectories of care the congestive heart failure persona showed considerable variation with some countries making much more use of primary care services, and others higher use of home health services. The US and Switzerland had the most expensive hospital visits. The US also had noticeably higher spending in outpatient pharmaceuticals, though it was not an outlier with regards to the number of unique drug prescriptions. There were also certain observable patterns with regards to outcomes. England had higher 30-day mortality, although given the small sample size of these personas, and some of the variability in reporting of mortality, these numbers should be interpreted with caution. The US had

readmission rates that were about above average relative to other countries, despite existing incentive programs aimed at lowering these readmissions in place (specifically for heart failure patients).

Conclusions

This work is an important contribution to other cross-country comparisons that highlights differences in service delivery for multi-morbid patients, particularly those with CHF and diabetes.

Variations of Spending on Care across Countries: The Role of Prices

PRESENTER: **Irene Papanicolas**, London School of Economics

Background

One of the most pressing challenges facing most health care systems in the past years have been rising costs. As the population ages, and demand for health care services grows there is a pressing need to understand the drivers of these costs across systems. This paper looks across the spending data collected for two of the high-need personas: a frail elder who experienced a hip fracture and subsequent hip replacement, and an older person with multiple major chronic conditions including a hospitalization with congestive heart failure, to determine how much the variation across countries can be explained by differences in the prices for medical goods and services.

Method and Data

Using the pricing data collected for the personas, broken down by type of care, we standardized spending using economy wide purchasing power parities and health specific purchasing power parities, both collected by the OECD. We then compared the differences in variation in spending across countries using the two estimates to examine the extent to which health care prices could explain the differences in spending.

Results

When we compare the standardization of spending using economy wide PPPs to health specific PPPs we find that much of the variation in spending across countries can be explained. Specifically, the use of the health specific PPPs explains a large portion of the spending in U.S. and Switzerland relative to the economy wide PPPs.

Conclusions

This work is an important contribution to other cross country comparisons that highlights differences in pricing across countries, and in which countries and sectors higher prices drive up health care costs.

1:30 PM –3:00 PM MONDAY [Health Care Financing & Expenditures]

Universitätsspital Basel | Klinikum 1 – Hörsaal 2

Organized Session: Making Fiscal Space Work for Health

SESSION CHAIR: **Joseph Kutzin**, World Health Organization

DISCUSSANT: **Sanjeev Gupta**, Center for Global Development; **Jeremy A. Lauer**, World Health Organization

Mobilizing Fiscal Space for Health

PRESENTER: **Hélène Barroy**

AUTHOR: Ajay Tandon

Mobilizing fiscal space for health

Paper 1 Dr Helene Barroy, World Health Organization, Switzerland, barroyh@who.int

Dr Ajay Tandon, World Bank, USA atandon@worldbank.org

Abstract Against the backdrop of financing the MDGs, the idea of creating and using existing fiscal space for priority spending within a country's fiscal system gained momentum. General fiscal space was defined by seminal work from Heller (2005) as "*the availability of budgetary room that allows a government to provide resources for a desired purpose without any prejudice to the sustainability of a government's financial position".* This definition came with the understanding that inherent to fiscal space was the link to fiscal sustainability. Heller explored the concept of creating fiscal space specifically for the health sector and identified five sources, namely 1) raising revenue; 2) reprioritization of expenditure; 3) borrowing; 4) seigniorage; and external grants. Building on this definition, Tandon and Cashin (2010) took a more granular approach towards health expenditure. In their mathematical definition of

fiscal space for health, they included a sub-set of three factors expected to shape public expenditure for health i.e. GDP, overall public expenditure, public expenditure's health share.

The definition of "*fiscal space*" has evolved in recent literature. IMF has broadened the previous definition by recognizing that fiscal space is more than mobilizing taxes and/or reducing spending in nonessential areas. The new definition factors in multiple dimensions and their interactions, giving it a more dynamic character. These developments have implications for the health sector and it is essential for the research community to be aware of them. Further, there is now greater evidence on the effectiveness of different pillars of fiscal space for health expansion with some more effective than others. Consolidating this evidence would be useful for countries to tailor and prioritize their mobilization strategies.

Against this backdrop, and as a joint effort among the World Health Organization (WHO), World Bank and the Center for Global Development (CGD), an ongoing review of the existing frameworks aims to incorporate emerging factors as well as new evidence on the actual drivers of fiscal space for health. It aims to provide practical guidance to health policy-makers in developing a more informed and Public Financial Management-relevant dialogue on fiscal space for health with finance authorities in LMICs.

The work presented in this session starts with an update of the definition of fiscal space, bringing to the attention of health policy-makers some of the key implications of the new IMF approach on fiscal space. It then summarizes country evidence on the retrospective effectiveness of the different strategies used to mobilize fiscal space for health in LMICs, delineating revenue mobilization strategies and expenditure-based approaches. In the last part, we will provide key recommendations to inform future dialogue around fiscal space for health in LMICs, outlining several key factors that could help further strengthen existing approaches from both a content and a process standpoint.

Fiscal Space for Health and Efficiency: Conceptualizing the Missing Link

PRESENTER: **Jonathan Cylus**
AUTHOR: Hélène Barroy

Paper 2 Fiscal space and efficiency: conceptualizing the missing link

Dr Jonathan Cylus, London School of Economics/London School of Hygiene and Tropical Medicine, UK, cylusj@who.int

Dr Helene Barroy, World Health Organization, Geneva, Switzerland, barroyh@who.int

The World Health Report in 2010 noted inefficiency as one of three core issues hampering progress towards UHC. The report discussed how existing resources could be spent more efficiently and equitably while minimizing systemic waste caused by misaligned incentives. Recent literature echoes the report's concerns, indicating that efficiency gains can translate to achieving the same level of outputs with a smaller level of inputs, thereby freeing up resources to be re-allocated for other purposes in the sector. However, literature on linking efficiency with fiscal space remains scarce and mostly qualitative in nature, lacking guidance on how to assess causes of inefficiencies and quantify the benefits of addressing them. Most fiscal space for health studies identify broad sources of technical inefficiency but very few quantify possible gains or looks at how to transform these possible gains into expanded fiscal space for the sector, i.e. where and how to incorporate the money freed up in the budget. The question largely pertains to Public Financial Management (PFM) concerns, and more specifically to the ability to reallocate across existing budgetary lines and programs.

Abstract While the conceptual link between fiscal space and efficiency is valid, there is increasing empirical evidence showing that the link is not automatic. Efficiency does not necessarily mean spending less and freeing resources for other sectorial purposes. The process requires not just identifying inefficiencies, but taking corrective actions under a sector re-allocation mechanism and robust measurement of the resources freed-up.

The paper presented unpacks the links between fiscal space and efficiency, elicits the transformation process from identified inefficiencies to expanded fiscal space for health, and provides guidance for future fiscal space for health assessments as to how to incorporate and treat efficiency. Specifically, it conceptualizes the links between health system efficiency and fiscal space for health and elicits the pathways under which identified inefficiencies have the potential to translate into fiscal space for health. Based on country experiences, it identifies and classifies the forms of inefficiencies and associated policy responses (from literature and country experiences) that could be fiscal space enhancing, and the transformation process that supports the "freeing-up" (and re-allocation) of resources.

How Can Primary Health Care Efficiency Improvements Lead to Expansion of Fiscal Space: The Case of Ghana

PRESENTER: **Jacob Novignon**, Kwame Nkrumah University of Science and Technology

Paper 3 How can Primary Health Care efficiency improvements lead to expansion of fiscal space: the case of Ghana

Jacob Novignon, University of Ghana, Ghana, jnovignon@gmail.com

Abstract

Health centres in Ghana play an important role in health care delivery especially in deprived communities. They usually serve as the first line of service and meet basic health care needs. Unfortunately, these facilities are faced with inadequate resources. While health policy makers seek to increase resources committed to primary healthcare, it is important to understand the nature of inefficiencies that exist in these facilities. Therefore, the objectives of this study are threefold; (i) estimate efficiency among primary health facilities (health centres), (ii) examine the potential fiscal space from improved efficiency and (iii) investigate the efficiency disparities in public and private facilities.

Data was from the 2015 Access Bottlenecks, Cost and Equity (ABCE) project conducted by the Institute for Health Metrics and Evaluation. The Stochastic Frontier Analysis (SFA) was used to estimate efficiency of health facilities. Efficiency scores were then used to compute potential savings from improved efficiency. Outpatient visits was used as output while number of personnel, hospital beds, expenditure on other capital items and administration were used as inputs. Disparities in efficiency between public and private facilities were estimated using the Nopo matching decomposition procedure.

Average efficiency score across all health centres included in the sample was estimated to be 0.51. Also, average efficiency was estimated to be about 0.65 and 0.50 for private and public facilities, respectively. Significant disparities in efficiency were identified across the various administrative regions. With regards to potential fiscal space, we found that, on average, facilities could save about GH₵11,450.70 (US$7633.80) if efficiency was improved. We also found that fiscal space from efficiency gains varies across rural/urban as well as private/public facilities, if best practices are followed. The matching decomposition showed an efficiency gap of 0.29 between private and public facilities.

There is need for primary health facility managers to improve productivity via effective and efficient resource use. Efforts to improve efficiency should focus on training health workers and improving facility environment alongside effective monitoring and evaluation exercises.

1:30 PM –3:00 PM MONDAY [Health Care Financing & Expenditures]

Universitätsspital Basel | Klinikum 1 – Hörsaal 3

Provider Payment Reform

SESSION CHAIR: **Apostolos Tsiachristas**, University of Oxford

The Impact of ACO Physician-Hospital Integration on Healthcare Spending and Utilization

PRESENTER: **Dr. Meng-Yun Lin**, Boston University
AUTHORS: Amresh D. Hanchate, Austin B. Frakt, Dr. Kathleen Carey

Rationale

Accountable care organizations (ACOs) are expected to bend the US healthcare spending curve through better management and coordination of health services rendered by providers across settings. It is argued that vertical integration between physicians and hospitals better equip ACOs to achieve this goal. However, evidence on reduced medical expenditure from provider integration is limited.

Objective

To evaluate the association between physician-hospital integration and healthcare spending and utilization of ACO patients.

Methods

In 2009, a private carrier in Massachusetts launched an ACO-like contract with providers. The organizational structure of participating entities varies; some consist of physician groups alone, while others include both physicians and hospitals. These Massachusetts commercial ACOs are an ideal sample for studying the impact of integration on ACO performance because they are subject to similar contract terms and operate in the same state, significantly reducing heterogeneity. Sixteen organizations entered the contract between 2009 and 2013.

We selected nonelderly enrollees in health-maintenance-organization or point-of-service plans with the carrier and served by one of the sixteen ACOs. The study sample included 516,413 Massachusetts residents aged 18 to 64.

We defined integration level by the proportion of PCPs in an ACO who exclusively billed outpatient care services with a hospital outpatient department (HOPD) code, suggesting employment or practice ownership by a hospital. We used generalized linear models to compare outcomes of individuals served by low- versus high-integrated ACOs, adjusting for patient demographic and clinical characteristics, county and year fixed effects, ACO features, and zip-code socioeconomic status. Given that patients have a choice of providers, we adopted an instrumental

variable (IV) approach to account for potential selection bias resulting from systematic unobserved differences in patient cohorts across providers by integration level.

Outcomes

Outcomes are annual spending on and utilization of inpatient and outpatient care services. Inpatient care includes admissions to a general acute-care hospital; outpatient care covers visits to a doctor's office or HOPD. Spending measures comprise insurer reimbursement and patient out-of-pocket payments and are adjusted for inflation. Overall spending is the sum of inpatient and outpatient care spending. For utilization, we counted numbers of corresponding services for each enrollee in a given year.

Results

42% of the study sample were served by six high-integrated ACOs.

Physician-hospital integration is associated with increased overall healthcare spending. Annual medical spending among high-integrated ACO members was 6.9% ($p<0.001$) higher, compared to those served by low-integrated entities. The observed higher expenditure was mainly driven by spending on outpatient care. High-integrated ACO serving members had 8.9% ($p<0.001$) higher expenditures on ambulatory care, equivalent to an increase of $181 per person-year. However, there was no significant difference in inpatient spending.

Higher integration is associated with a reduction in utilization of inpatient and outpatient care by 20.4% ($p<0.001$) and 6.1% ($p<0.001$), respectively. The estimated decreases are equivalent to an annual reduction of approximately ten hospitalizations per 1,000 individuals and roughly half a visit per person.

Conclusions

Higher integration was associated with reduced utilization of ambulatory care services but higher outpatient spending, implying the observed higher expenditures might result from higher prices.

The Impact of Kazakhstani Provider Payment Reform on Hospital Outcomes: An Interrupted Time Series Approach

PRESENTER: **Daliya Kaskirbayeva**, University of Leeds

AUTHORS: Tim Ensor, Silviya Nikolova

Introduction: Kazakhstan has put efforts to reform the inherited Soviet health system model since gaining independence in 1991. During the transition period, the reimbursement of hospitals in Kazakhstan was based on number of staff and hospital beds. At this time, Kazakhstan was still operating within the Soviet health system and experiencing problems with lack of incentives for providers to spend funds efficiently and improve the quality of care, and absence of competition between providers. The method of setting the budget incentivised high levels of hospitalization, frequent visits to doctors and longer stays in hospitals. Therefore, with the aim to address the excess capacity in the hospital sector, and to increase its productivity the new provider payment system was introduced in Kazakhstan in 2012. However, there is hardly any evidence to determine whether the intended enhancement of hospital care production has changed significantly following the introduction of new payment system, Diagnosis Related Groups (DRG). This study aims fill this academic lacuna evaluating payment system change in Kazakhstan for the period of 2011-2012.

Methods: We used a quasi-experimental design, an interrupted time-series approach with matching, to evaluate immediate and delayed impact of the policy change. Our outcomes of interest are number of inpatient cases, number of day cases, surgery specialties by age group, standardized mortality and average length of stay. The new payment system was introduced gradually. Prior to the national wide introduction, the new payment system was piloted in 20 hospital facilities during the period of 4 months. This study employs administrative hospital data for the period of 2011-2012, undertaking analysis from 35 weeks prior to pilot implementation, 13 weeks between implementation of the pilot and roll out to across the country and 48 weeks following the roll out. The hospitals that participated in the piloting stage of DRG implementation from September 2011 to January 2012 were defined as the treatment hospitals (n=20). Hospitals that did not participate in piloting stage were defined as control hospitals (n=360). We performed matching technique to find the closest pair of treatment and control hospitals to balance them on a set of baseline characteristics. We employed interrupted time-series analysis for three hospital levels separately: regional hospitals, city hospitals and district hospitals.

Findings: We found no evidence that the 2012 provider payment reform affected the city hospital outcomes. However, the number of inpatient cases in regional hospitals increased statistically significant after the roll out. We also found evidence of statistically significant increase in the number of inpatient and day case in district hospitals after the pilot and roll out stage. Our findings suggest that the first wave of adopters, in general, responded to the nationwide DRG implementation faster than the second wave.

Conclusion: We found no evidence that the implementation of case-based payment system increased day cases and shortened average length of stay in hospitals. There is, however, evidence suggesting that the policy lead to increase in inpatient and day cases in some in regional and district hospitals respectively.

How Did Hospitals Respond to Prospective Payment System Under the Japanese Universal Healthcare System?

PRESENTER: **Dr. Rong Fu**, Waseda University, Faculty of Political Science and Economics
AUTHOR: Dr. Haruko Noguchi

Background

The Prospective Payment System (PPS) is a significant policy to contain healthcare spending by altering reimbursement incentives in a way to implement a fixed payment regardless of the actual expenses hospitals incur in providing healthcare. Japan, with a rapid increase in healthcare spending, launched a PPS in April 2003, known as the Diagnostic Procedure Combination Per-Diem Payment System (DPC/PDPS). The fixed payment therein is set per-diem and adopted only to part of the medical procedures in inpatient care. Namely, the system has no interference with outpatient-care payments.

Objective

Fifteen years after the adoption, the performance of DPC/PDPS is still unclear. Accordingly, we aim to evaluate the DPC/PDPS by answering three key questions: (1) In face of the partially adopted program, will hospitals allocate more resources to medical procedures paid outside of DPC/PDPS for a larger reimbursement? (2) With the per-diem rate, are hospitals really motivated to reduce the hospital length of stay (LOS)? (3) Would the reallocation of resources (if any) affect patients' health outcome adversely?

Data

We use a set of nationally representative administrative records in Japan to answer the questions. Specifically, medical claims records (1997-2010) are used to verify the cost effects of DPC/PDPS. The records are randomly selected from the population medical claims, which documents thoroughly the type/volume of medical procedures provided, and summarizes the corresponding costs. A sample of 392,395 claims is extracted for estimations. In addition, discharged patient survey linked to the concurrent hospital statistics (1996-2014) are used to evaluated the efficiency and quality effects of the DPC/PDPS. The patients survey consists of the whole episode of inpatients who discharge in September of the survey year from randomly selected hospitals; the hospital statistics provides concurrent hospital information. A sample of 784,749 patients is extracted for estimations.

Method

We apply the difference-in-difference approach to purify the impacts of DPC/PDPS. Regarding the treated group, we focus on a group of hospitals being most credible to show the performance of DPC/PDPS—82 advanced treatment hospitals enrolled mandatorily into the program in 2003. The change in reimbursement method is thus an exogenous shock. The control group contains a group of acute-care hospitals provide similar healthcare to the treated but being outside of the DPC/PDPS.

Results and Conclusions

We find that the DPC/PDPS is not cost saving as expected, due to the partial adoption. The hospitals could respond in a "real" fashion—reduce volume of the PPS procedures to avoid deficit; or in a "nominal" fashion—assign the PPS procedures from inpatient care to outpatient care. We also find a 4-day decline in LOS, indicating an improvement on operational efficiency. The reduction is larger at upper quantiles of the LOS. Finally, we confirm a moderate deterioration in healthcare quality. Following the adoption of PPS, the hospitals tend to discharge patients with symptoms lightened or unchanged, rather than being fully cured.

1:30 PM –3:00 PM MONDAY [Specific Populations]

Universitätsspital Basel | Klinikum 1 – Hörsaal 4

Organized Session: Assessment of Health and Long-Term Care Systems Performance in Aging East Asia

SESSION CHAIR: **Hongsoo Kim**, Seoul National University School of Public Health

DISCUSSANT: **Heinz Rothgang**, SOCIUM Research Center on Inequality and Social Policy , University of Bremen

Variations and Factors Associated with Health Care Utilization for Hip Fracture Surgeries in Japan, South Korea, and Taiwan

PRESENTER: **Dr. Hayato Yamana**, The University of Tokyo
AUTHORS: Nanhee Yoon, Shou-Hsia Cheng, Seyune Lee, Hideo Yasunaga, Dr. Hongsoo Kim

Backgrounds: Approximately 4.50–6.26 million hip fractures will occur worldwide by 2050, and half of them will occur in Asia. Building a sustainable health care system while delivering quality care to older adults is a shared top policy agenda in developed economies. Japan, South Korea, and Taiwan have comparable health systems with universal health coverage using a social health insurance scheme, but they apply different payment systems for hip fracture operations. Therefore, evaluating the performance of these systems through cross-national comparison can give lessons for system innovations and sustainability.

Objectives: This study aimed to do an initial examination of the variations in health care utilization for hip fracture surgeries in Japan, South Korea, and Taiwan, and to conduct an assessment of the factors associated with performance differences in the three health systems.

Methods: Comparable population-based health administrative data from a representative sample from each system were analyzed. We selected hip fracture patients aged 50 or older who were admitted to acute care hospitals in 2013 and received one of the three common hip fracture surgeries. The final study sample included 1,179 patients from Japan, 408 patients from South Korea, and 838 patients from Taiwan. Their health care utilization data were linked with data from their socio-demographic profiles as well as hospital characteristics. Outcome variables included length of stay, total cost, and average cost per day for a hospital stay. We first investigated variations among the three systems in each outcome variable. Then we conducted multi-level multivariate analyses to analyze individual and hospital characteristics related to the outcome variables for each country.

Results: Large variations were found in the outcome variables of the three health systems. The average length of stay of hip fracture patients was 33.2 days in Japan followed by South Korean (24.9 days) and Taiwan (9.1 days). The average cost per day was highest in Taiwan (511 USD), followed by Japan (494 USD) and South Korea (338 USD). People with higher comorbidities paid more in Japan and South Korea. Adjusting for patient attributes, hospital size and the volume of surgeries were significant in all three countries. Patients admitted to hospitals with higher volumes were discharged earlier and paid less; however, patients in larger hospitals paid more per day. In South Korea, the location, ownership, and teaching status of a hospital also significantly influenced the outcome variables.

Conclusion: This study shines a light on existing large variations in the length of stay and cost of in-hospital surgical care for middle-aged and older hip fracture patients across high-income Asian economies with similar social health insurance-based healthcare models. Such variations are likely due to differences in the payment systems for hip fracture surgeries, along with differences in delivery systems, practice patterns of providers, and/or cultural norms for elder care across the health systems observed. The next step planned based on the initial results will be discussed along with methodological challenges/considerations and policy implications of this new direction of research.

An Evaluation of Ten Years of Long-Term Care Insurance in Korea: A Comparative Perspective

PRESENTER: **Soonman Kwon**, Seoul National University School of Public Health
AUTHOR: Dr. Hongsoo Kim

Background: South Korea proactively introduced public long-term care insurance (LTCI) in 2008, when older people were only about 10.3% of the total population. The LTCI program provides a comprehensive package of home- and institution-based care mainly targeting older people who need assistance in daily living. Over the past decade, the program has continued to expand its population and service coverage, and no catastrophic financial event has occurred so far.

Objectives: This paper provides the historical context of the country's switch from a tax-based, local-government-operated LTC program targeting low-income older people to the current universal public LTCI run by the National Health Insurance Services, the single public insurer. The key features of the LTCI and its achievements and future agenda are critically analyzed, based on which policy lessons for other aging countries are discussed.

Methods: We conducted a literature analysis of key policy reports and empirical studies on the context of the introduction of the social LTCI, key policy reforms, and recent debates from a public health point of view. Based on a framework for LTCI performance assessment, we also extracted and analyzed key statistics on financing and provision of the social LTCI longitudinally at the national, LTC organizational, and person level using the OECD HCQI, national LTCI year books, a national survey of living conditions and welfare needs of Korean older persons, and other sources.

Results: The rapid introduction of the LTCI in Korea can be explained by multiple key drivers: population aging, changing health and care needs, increasing health care expenditures, changing social/family norms, and a political-economic context favorable to LTCI introduction. Implementing an LTCI with universal coverage regardless income level, itself, is a major achievement of the welfare state in South Korea, known as a country with a developmental welfare regime. The newly introduced social LTCI has been implemented successfully without any catastrophic events. Due to concerns about the financial burden incurred by introducing LTCI, the population coverage was only about 4.2% of people aged 65+ in 2008, putting a priority on covering under the LTCI those with the highest care needs. The coverage rate continued to increase up to 7.5% in 2017, but such coverage is still much lower than comparable social health insurances in Japan and Germany. The infrastructure for LTC provision, including LTC institutions and the workforce, has also developed in a relatively short time. The LTCI was financially sustainable until 2017. Yet in terms of the sustainability of the LTCI and quality improvement of the services provided, the social LTCI is expected to face several challenges.

Discussion: Several major reforms have been made to strengthen the LTCI in Korea recently. Expansion of coverage, especially for those with dementia, and improvement of quality of care have been the key policy goals in a series of reforms. Key future policy agendas for the Korean LTCI system are as follows: expansion of coverage, quality improvement, coordination of the National Health Insurance and LTCI, and strengthening the roles and responsibilities of local governments.

A Comparison of Long-Term Care System Performance in Japan and Korea: Policy Context, Framework, and Early Results

PRESENTER: **Dr. Hideki Hashimoto**, the University of Tokyo School of Public health
AUTHORS: Seyune Lee, Dr. Hongsoo Kim, Nanhee Yoon, Mutsumi Tokunaga

Background: Responding to the changes in care needs of older people and household capacities for informal care due to demographic change, Japan and South Korea, two countries in East Asia, introduced their public long-term care insurance (LTCI) programs in 2000 and 2008, respectively. Both LTCIs offer universal coverage for older citizens using functional assessments and eligibility criteria without a means test. However, several features of the financing and service provision are different.

Objectives: This presentation aims to introduce a policy context, framework, and methodological approach for comparing long-term care system performance in Japan and Korea, specifically focusing on equity in terms of regional variation in access, utilization, and cost. We will also present initial findings and discuss theoretical and methodological challenges and potential strategies to overcome them.

Methods: We first critically compared policy contexts and the development of LTC systems using document analysis. We then developed a cross-national LTCI performance assessment framework and indicators, and extracted and synthesized data from the LTCI annual and monthly statistics books and OECD health statistics as well as other sources over seven years since 2008. For regional comparison, we are in the process of developing regional-level analytic datasets at the prefecture and provincial levels in Japan and South Korea, respectively, from regional statistics and national claims data of each country's LTCI.

Results: The newly developed framework for LTC system comparison has four sub-domains and thirty indicators. Our national-level longitudinal comparisons using the framework highlight the different paths of population and service coverage. The Japanese system started by expanding access to formal LTC, though a subsequent demand explosion quickly threatened financial sustainability, resulting in a policy shift to cost containment by controlling the consumer's ex-post moral hazard (e.g., by raising copayments and tightening eligibility criteria) and supply-induced demand (e.g., reducing reimbursements for costly services). Korea began its public LTCI implementation on a much smaller scale than Japan, and its primary policy agenda since its inception has consistently been the expansion of population and service coverage. The coverage expansion is characterized by higher institutional rather than community-based LTC utilization compared to Japan (service coverage) and making the threshold of eligibility less strict for people with lower care needs (population coverage). Early results of regional variation analysis indicate that the centralized system in Korea did not necessarily result in less regional variation compared to the highly decentralized system in Japan.

Conclusion: Japan and Korea introduced public LTCI programs to meet a common demographic challenge, though demand structures, supplier incentives, and financial sustainability issues have made different paths to equity in access, financial contribution, and outcomes, leading to distinctive directions and priorities for reforms in balancing population/service coverage and financial sustainability. With the results of ongoing comparative claims-data analyses between the two countries, further policy lessons for meeting the social challenge of rapid population aging will be discussed.

Preventing Cardiovascular Diseases By Expanding the Use of Medication for Hyperlipidemia: A Natural Experimental Study in Taiwan

PRESENTER: **Shou-Hsia Cheng**, National Taiwan University

AUTHOR: Pei-Pei Kuo

Background: Cardiovascular diseases (CVDs) has been causing heavier disease burdens globally. Dyslipidemia is one crucial risk factor, and many clinical studies have proven the primary and secondary CVDs prevention benefits of hypolipidemic drugs. Targeting to reduce the occurrence of CVDs, Taiwan National Health Insurance (NHI) expanded the criteria for the use of hypolipidemic drugs for high-risk patients, including patients with CVDs history or diabetes in 2013.

Objective: This study aims to evaluate the impact of the expansion of the use of hypolipidemic drugs on medication usage, CVDs incidence, and the health care expenditure for diabetic patients.

Methods: According to the new NHI reimbursement rules for the use of hypolipidemic drugs for high-risk patients, this study selected patients with diabetes but without CVDs history as the intervention group, and patients with hypertension but without CVDs history and diabetes as the control group. Using August 1, 2013, as the transition point between the pre- and post-policy periods, we performed a difference-in-differences analysis to estimate the effect of the medication expansion policy during 2010 and 2016. Outcome valuables included the number of patient receiving medication, CVDs incidence, and the health care expenditure.

Results: A total of 118,912 and 150,930 subjects were included in the intervention and control groups respectively. After the expansion, the number of patients receiving medication in the intervention group significantly increased compared with the control group (OR=1.095, P<0.001). The rate of CVDs incidence had been reduced significantly (OR=0.984, P=0.002), but the cost for CVDs did not show significant reduction (ß=-0.087, P=0.150) after the policy implementation.

Conclusion: The expanded coverage of hypolipidemic drugs significantly increased the number of medications for high-risk diabetic patients, and slightly reduced the CVDs incidence in Taiwan. Long-tern evaluation for the medication expansion policy is recommended.

1:30 PM –3:00 PM MONDAY [New Developments In Methodology]

Universität Basel | Kollegienhaus – Hörsaal 001

Organized Session: Effects of Discrete Choice Experiment Design and Modeling on Healthcare Preferences, Model Results, and Prediction of Actual Healthcare Decisions

SESSION CHAIR: **Kathleen Thomas**, The University of North Carolina at Chapel Hill

DISCUSSANT: **Kirsten Howard**, University of Sydney

Mimicking Real Life Decision-Making in Health: Allowing Respondents Time-to-Think in a Discrete Choice Experiment

PRESENTER: **Dr. Jorien Veldwijk**

AUTHORS: Jennifer Viberg Johansson, Bas Donkers, Dr. Esther de Bekker-Grob

Background: In Discrete Choice Experiments (DCE) oftentimes, respondents are asked to make instant choices about complicated hypothetical treatments, while in real-life they are provided a certain amount of time-to-think (TTT) about their options before making a decision. To potentially reduce hypothetical bias and the influence of psychosocial factors in a DCE, a TTT approach may be used. This approach has been shown to be effective in environmental economics and interview-led DCE studies. However, evidence is lacking on whether this is a workable and valuable approach in current state-of-the-art online DCE studies within the health care setting. Therefore, this study aims to empirically test the extent to which the outcomes of a DCE differ when respondents are allowed TTT about their choice options compared to respondents who are not allowed TTT.

Methods: In total, 613 participants of the Swedish CArdioPulmonary bioImage Study (SCAPIS) completed a DCE survey (267 in TTT-arm and 346 in no-TTT (NTTT)-arm), measuring their preferences for receiving secondary findings of a genetic test. A Bayesian efficient design was used which generated 60 unique choice tasks that were divided over four questionnaire versions. Each respondent answered 15 choice tasks in total. Each choice task contained two hypothetical genetic test options, which were described by four attributes: type of disease, disease penetrance probability, preventive opportunities, and effectiveness of the preventive measure. Respondents were randomly allocated to TTT or NTTT. Respondents assigned to the TTT arm were asked to read all the information (including the choice task examples) regarding the DCE, after which their questionnaire ended. They received a new link to complete the rest of the survey after seven days. Panel Latent Class (LCM) models were estimated to determine attribute level values and their relative importance. Additionally, choice certainty, attribute level interpretation, choice consistency (based on heteroscedastistic multinomial logit model (HMNL)) and potential uptake rates were compared between the TTT and NTTT samples.

Results: 92% of the respondents (245 out of 267) in the TTT sample indicated they had used the TTT period, of which most respondents stated that they had read the information they received (72%) and discussed with their family (24%). Respondents in both samples indicated to be very certain about their choices. The LCM revealed three classes in both samples. Preference reversals were found for three out of the four attributes in one of the classes in the NTTT sample with a class membership probability of 34%. Relative importance scores of the attributes differed between the two samples, which led to differences of >30% in potential participation rates. Finally, the HMNL model showed significant ($P<.001$) scale effect in the pooled dataset of the TTT and NTTT samples, implying respondents in the TTT sample to be significantly more consistent in their choices as compared to the respondents in the NTTT sample.

Conclusions: Offering respondents TTT in a DCE influences decision-making and preferences. Future DCEs regarding complex health related decisions are advised to consider this TTT approach (i.e. mimicking real-life decision-making) to enhance the validity of the elicited preferences.

Examination of the Number of Halton Draws Required for Valid Estimation of Random Parameters in Mixed-Logit Models of Data from Discrete Choice Experiments

PRESENTER: **Dr. Alan Ellis**, North Carolina State University

AUTHORS: Dr. Esther de Bekker-Grob, Kirsten Howard, Ms. Kathleen Thomas, Emily Lancsar, John Rose

Background:

Increasingly, health economists analyze discrete choice experiment (DCE) data using mixed-logit models, with Halton draws to simulate random parameters. This approach assumes uncorrelated random parameters with certain (often normal) distributions. Using too few Halton draws may violate these assumptions, causing bias, inaccurate standard errors, and suboptimal or even incorrect recommendations for healthcare decision-making. However, the literature provides little guidance about how many draws to use. Data from a recent review of health-related DCEs indicate that authors rarely report the number of draws used. When reported, number of draws is highly variable and unrelated to number of random parameters.

Objective:

To develop guidance about the number of Halton draws to use in mixed-logit models.

Methods:

We conducted simulations using R to (1) assess normality of random parameters, (2) measure correlations among random parameters, (3) assess bias and relative efficiency in a real-data example, and (4) compare simulation scenarios to current practice. To assess normality, we simulated random parameters using 50 Halton sequences with 50 to 10,000 draws. We created heatmaps and line plots summarizing univariate (Shapiro-Wilk) and multivariate (Henze-Zirkler) normality tests. To show correlations among random parameters, we created a heatmap and line plot. To assess bias and relative efficiency, we analyzed actual DCE data in mixed-logit models with 5, 10, and 15 random parameters and 250 to 10,000 draws. To compare to current practice, we overlaid plots with systematic-review data on 40 recent health-related DCEs.

Results:

Univariate normality. With 500 draws and 10 random parameters, or 1,000 and 12 respectively, at least one random parameter departed from normality. With 500 draws and 17 random parameters, or 1,000 and 22 respectively, half of the random parameters departed from normality.

Multivariate normality. With 7 or more random parameters, the Henze-Zirkler p-value decreased. Keeping the p-value above .05 with 11 random parameters required 4,000 draws. 16 recently published DCEs (40%) likely used insufficient draws to achieve multivariate normality.

Correlations among random parameters. Keeping correlations below 0.1 required 500 draws with 13 random parameters and 1,000 draws with 17 random parameters. 5 recently published DCEs likely had correlations greater than 0.1 between random parameters and 2 likely had correlations greater than 0.2.

Real-data example. In models with more random parameters and fewer draws, we observed bias and incorrect standard errors. With 15 random parameters, estimates were unstable even with 10,000 draws.

Discussion:

For normality and independence of random parameters and full distributional coverage, estimating more random parameters requires more Halton draws. Estimating <10 random parameters with 1,000 to 2,500 draws may prevent problems. Among 40 recent DCEs, only 35% met both criteria. DCEs with mixed-logit analyses require greater attention to and reporting of the number of draws as a function of the number of random parameters. Future studies should develop clear guidelines and explore alternative methods. Meanwhile, prudence dictates systematically choosing the number of Halton draws, using more than is customary, and using large numbers of draws to verify results. Failure to do so may result in biased estimates and incorrect standard errors.

Is Patient Choice Predictable? The Impact of Discrete Choice Experiment Designs and Models

PRESENTER: **Dr. Esther de Bekker-Grob**, Erasmus School of Health Policy & Management, Erasmus University Rotterdam
AUTHORS: Joffre Swait Jr., Habtamu Tilahun Kassahun, Michiel Bliemer, Marcel Jonker, Dr. Jorien Veldwijk, Karen Cong, John Rose, Bas Donkers

Objectives: Increased use of discrete choice experiments (DCEs) in healthcare requires establishing whether stated preferences are predictive of observed healthcare utilization. This study aimed to determine whether the number of alternatives in a DCE choice task should reflect the actual decision context, and how complex the choice model needs to be to be able to predict real-world choices.

Methods: Two randomized controlled trials (RCTs) involving choices for influenza vaccination and colorectal cancer screening were used. Each RCT had three study conditions: DCE choice tasks with two alternatives, three alternatives, or both. In each RCT, 1,200 respondents were randomly assigned to one of the conditions. The data was analysed in a systematic way using random-utility-maximization choice processes.

Results: Irrespective of the number of alternatives per choice task, the choice to opt for influenza vaccination and colorectal cancer screening was correctly predicted by DCE at an aggregate level, if scale and preference heterogeneity were taken into account. At an individual level, three alternatives per choice task and using heteroscedastic model plus preference heterogeneity seemed to be most promising (correctly predicting in 81.7% and 87.9% of the cases).

Conclusions: Our study shows that DCEs are able to predict real-world choices if at least scale and preference heterogeneity are taken into account. Patient characteristics (e.g. numeracy, decision-making style, general attitude for and experience with the health intervention) seem to play a crucial role. Further research is needed to determine if this result remains in other contexts, and to optimise choice prediction at an individual level.

1:30 PM –3:00 PM MONDAY [Economic Evaluation Of Health And Care Interventions]

Universität Basel | Kollegienhaus – Hörsaal 102

Quality Life and Value

SESSION CHAIR: **Reed Johnson**, Duke University

Do Care-Related Preference-Based Measures Complement or Substitute Each Other? A Comparison of the Ascot-Carer, CES and CarerQol

PRESENTER: **Lidia Engel**, Deakin University

AUTHORS: Stacey Rand, Renske Hoefman, Jessica Bucholc, Anne Muldowney, Anna Ugalde, Nikki McCaffrey

Background: Informal carers are integral to healthcare service provision. Although caring for a person can be fulfilling and some carers have a positive experience, evidence has shown that informal caregiving can also lead to distress and deterioration of carer physical and mental health. Given recent moves to incorporating the costs and effects experienced by carers providing informal care in health policy decisions, including funding decisions, new *care*-related preference-based quality of life measures have been developed, such as the Adult Social Care Outcomes Toolkit for carers (ASCOT-Carer), Carer Experience Scale (CES) and the Care-related Quality of Life (CarerQoL). While all these measures can be used alongside health-related quality of life preference-based measures, little is known about the extent of overlap between the constructs measured by these instruments.

Aim: To investigate whether the ASCOT-Carer, CES and CarerQol provide complementary information or can be treated as substitute outcome measures.

Methods: Data were derived from an online survey of carers residing in Victoria, Australia in 2018. An exploratory factor analysis was conducted to ascertain the underlying latent constructs of the three measures and to assess whether these instruments capture something unique, i.e., a construct or constructs not captured by another instruments. The axes of the initial factor analysis were rotated using the geomin oblique rotation, which permits correlations between common factors. Weighted least square means and variance adjusted model estimation was applied to account for the ordinal nature of the item-level data. To determine the appropriate number of factors to retain, the Kaiser criterion was used (based on eigenvalues greater than 1) and three model fit indices supplemented with an exploration of models with a clean factor structure i.e., item loadings are greater than 0.3 on at least one factor and no cross-factor loadings.

Results: Data from 348 carers who completed all items across the three measures were used for this analysis. Using the pooled items of all three measures, a three-factor structure was optimal, based on the criteria applied. The ASCOT-Carer loaded onto one factor (factor 1), except for the item *personal safety*, which loaded onto another factor (factor 2) that was shared with the CES *fulfillment from caring, control over the caring, and getting on with the person you care for.* The remaining CES items loaded onto factor 1 and were shared by the six ASCOT-Carer items. All seven items of the CarerQol loaded onto a separate factor (factor 3) and were not shared with items from the other two measures.

Conclusion: Although a certain degree of overlap was observed between the ASCOT-Carer and CES, generally, the three care-related preference-based measure seem to tap into different constructs of care-related quality of life and should not be considered as substitutes. Further validation studies are warranted to assess the appropriateness of these measures across different caring situation, also in combination with 'traditional' *health-related* quality of life measures as used among patients.

Measuring Health Outcomes: Is EQ-5D Safe for Use in Non-European Healthcare Systems?

PRESENTER: **Ms. Zhuxin Mao**, University of Leeds

1) Introduction

With an increasing awareness of the importance of people's satisfaction and feeling, health-related quality of life (HRQoL) questionnaires were developed to assess individuals' subjective feelings of their own health status. Most of the commonly used HRQoL questionnaires were developed in Europe or North America and were translated into other countries to be used worldwide. Arguably, the whole adaption process was based on the assumption that these health questionnaires were culture-free products and the health concept was of cultural equivalence.

The research then aimed to explore cultural diversities in defining and measuring health to argue that a HRQoL measure developed in one culture might not work well in another culture. EQ-5D is one of the most commonly used Western-developed HRQoL measures. This questionnaire was used as an example to be tested in China, whose culture was considered to be significantly different from that in the West.

2) Methods

A scoping review was designed to identify generic HRQoL measures that were developed in China to establish a preliminary conceptual framework of HRQOL in a Chinese culture context. A qualitative study was then conducted to investigate how Chinese lay people would describe and appraise health to supplement additional health dimensions that lay people considered to be important. The two studies jointly developed a conceptual framework of health in China, with whom the descriptive system of EQ-5D was compared.

3) Results

A total number of 15 generic HROoL Chinese-developed questionnaires were documented and 19 participants were involved in an in-depth interview study. A conceptual framework of health was developed which contained the following themes: "with good body constitution", "having the spirit", "without physical senses of discomfort", "having a good mood", "being able in doing things without restrictions", "being a social person" and "having a proper mentality".

4) Discussions

It was clear that there were unique health dimensions for the Chinese people, which were not commonly mentioned in the Western-developed HRQoL questionnaires such as EQ-5D. For example, the word “spirit” and “body constitution” were agreed to be important aspects of health among the Chinese participants. Chinese respondents also paid great attention to social relations and family life, which may be because of the society features and cultural characteristics of China. The study suggested that there were potential cultural differences in understanding and describing health between China and the West.

5) Conclusions

The study indicates the potential cultural diversities in defining health between China and the West. Further work is planned to establish the relative importance of health dimensions identified as judged by Chinese people. The legitimacy of applying the Western developed HRQoL measures can then be further examined.

By arguing health can be defined differently among different cultural groups, the study has also raised the following questions: how safe are the existing HRQoL measures to be used and can they appropriately present health outcomes? Additional work needs to be done to justify how health should be defined and who should define health in health outcome measurement.

Utility Values for Economic Evaluation of Obesity Interventions in Adolescents

PRESENTER: **Anagha Killedar**, University of Sydney

AUTHORS: Dr. Thomas Lung, Alison Hayes

Background: Globally, childhood obesity has been recognised as a major public health problem, with a large variety of interventions to address this that have been trialled in children. In many countries, including Australia, the prevalence of overweight and obesity increases with age, yet adolescence is an under-researched age group. Furthermore, our work has shown that the association between weight status and health-related quality of life becomes stronger from childhood to adolescence. Therefore, it is important that economic evaluations use age-specific quality of life utility decrements for each weight status so that the benefits of interventions at later ages are accurately reflected. A recent systematic review and meta-analysis found a significant but small difference in utility of children with obesity compared to healthy weight but there were insufficient studies to permit age-specific utilities to be determined. The use of the same utility decrements for the entire child population, however, is likely to misrepresent the cost-utility of interventions addressed at adolescents.

Objective: To identify age-specific utility decrements for adolescents (10 to 17 years) with overweight and obesity compared to those at healthy weight.

Methods: We used data from the Longitudinal Study of Australian Children (LSAC); a study in which two nationally representative cohorts of children have been interviewed every two years starting from birth and age four. In Waves 6 and 7 of this study, child health utility (CHU9D) was recorded for both cohorts. We conducted cross-sectional, linear regression analyses accounting for the complex survey data at each wave and cohort to investigate associations between weight status and CHU9D. The analyses included participants aged between 10 to 17. The analyses were adjusted for characteristics known to be associated with HRQol including sex, socioeconomic position, long-term medical condition, language spoken to child and maternal smoking status.

Results: Our results show that utility decrements for each weight status change with age. For example, in the analysis of 10-11 year olds (3309 observations), there were small non-significant differences in CHU9D scores between healthy and underweight, overweight and obese weight status categories, after adjusting for known predictors of health related quality of life. However, in the 14-15 year olds (3050 observations), adolescents with obesity had small but significantly lower CHU9D scores than those who were at healthy weight, after adjustment. Adolescents with obesity had, on average, a 0.042 point lower utility than those at healthy weight (95% CI 0.014 to 0.071) (P=0.003). In the same age group, a small, non-significant difference of 0.015 points (95% CI -0.004 to 0.034) (P=0.12) was found for adolescents with overweight compared with those at healthy weight.

Conclusion: We propose four new age-specific utility values to be used for economic evaluation of obesity prevention and treatment interventions in adolescents. The values obtained are similar, but not as extreme, to utilities observed from studies focussed on smaller age groups. In light of the small utility decrements identified, our results suggest that only interventions that cause considerable reductions in obesity prevalence will have reasonable cost-utility.

Estimating the Monetary Value of a QALY in Germany

PRESENTER: **Mr. Sebastian Himmler**, Erasmus School of Health Policy & Management

AUTHORS: Jannis Stöckel, Job van Exel, Werner Brouwer

Objective:

Evaluating the outcomes of cost-effectiveness analyses of health interventions requires an appropriate threshold value. One possible source for such a threshold is an estimate of the monetary value of a quality-adjusted life-year (QALY), as for instance used in the Netherlands and Sweden. These estimates are typically obtained through stated preference elicitation, e.g. willingness to pay experiments. Our study adds to the literature by choosing a different approach and, to the best of our knowledge, providing the first monetary QALY valuations for Germany on the basis of a well-being valuation approach.

Methods:

We applied a well-being valuation method to general health, using life satisfaction data as a proxy for experienced utility and the marginal rate of substitution between health and income to estimate a monetary value of health. The German Socioeconomic Panel, a nationally representative longitudinal survey, was used. We constructed SF-6D health utilities for 33,490 individuals answering the SF-12 questionnaire. To exploit the panel structure of our data a fixed effects regression was employed. Several robustness checks were conducted to explore differences across subgroups and the sensitivity of our results to changes in underlying assumptions.

Results:

Results from the fixed effects regression using household equivalized income in a linear form resulted in an implied monetary value of a QALY of € 63,456 in the German population. Considerable differences were found between age groups with QALY values of € 44,199 and € 92,242 for individuals aged below and above 50 respectively. Gender affected estimates with monetary QALY values of € 69,774 for females and € 56,690 for males. Using raw net instead of equivalized household income lead to a QALY value of € 107,883. In former East Germany the monetary value of a QALY was estimated to be € 21,978 and in former West Germany € 78,588. This discrepancy is attributed to a higher observed impact of income and a lower observed impact of health on life satisfaction in former East Germany.

Discussion:

The value of a QALY in Germany found in this study is consistent with values found in studies in other countries in Europe. Despite QALYs not being used in cost-effectiveness analyses in Germany, our study provides insight to policy makers about the value of benefits generated in the health care sector. It also provides further evidence on the general applicability of the well-being valuation method for estimating the monetary value of a QALY. The considerable differences in value observed between age groups and regions emphasize the importance of discussing the appropriateness and normative implications of using a single (average) threshold value as guidance for reimbursement decisions in health care.

1:30 PM –3:00 PM MONDAY [Specific Populations]

Universität Basel | Kollegienhaus – Seminarraum 103

Economic Analysis of Child Health Policy

SESSION CHAIR: **Patricia Ritter**, University of Connecticut

Does Free Healthcare Affect Children's Healthcare Use and Health Outcomes? Evidence from the Medical Subsidy Program for Children in Japan

PRESENTER: **Cheol-Min Kang**

AUTHORS: Akira Kawamura, Dr. Haruko Noguchi

Background

Many developed countries provide health insurance with generous coverage, often free of charge, for children, because it is widely recognized that investments to child health would result in good quality of living when they become adult, such as healthy life, high educational attainments, and even success in labor market. However, our knowledge whether generous healthcare policies actually benefit health outcomes of children is limited, in contrast to numerous scientific evidence from studies regarding adults or elderly.

Purpose and Method

Exploiting the unique variation in the eligibility of subsidy program for children among municipalities in Japan, we investigate the effect of free healthcare for children on their healthcare use and health outcomes of children in preschool age from 0 to 6 years old. Because each city introduced and expanded the subsidy program for children at different eligible age in different timing, there are large variations in subsidy eligibility at city-age-time level, which allow us to estimate behavioral responses to the free access to healthcare by difference-in-differences framework.

Data

We newly collect data on subsidy status at 33 cities with relatively large population of more than 0.5 million in 1990's through reviewing text file of minutes from each city council at homepage. Although the regions focused by this study are limited, we can cover 19% of preschool child population in Japan. We then merge this information with 4 nationally representative individual-level data on healthcare use and health status – Patient Survey, Statistics of Medical Care Activities in Public Health Insurance, Comprehensive Survey of Living Conditions, and Census and Vital Statistics –.

Results

We find that free child healthcare would significantly increase outpatient use measured by visit intervals, the number of outpatients, and monthly spending. The size of effects tends to be lager particularly among infants aged from 0 and 1. Further, the size of effect on the number

of outpatients is larger at repeated visits rather than the first visit. This result implies that the subsidy program would make children with any disease to use healthcare more frequently, while moral hazard such that healthy children use unnecessary outpatient service might not be occurred. On the other hand, we find no evidence of an increase in inpatient use under the subsidy program. We then find the subsidy program significantly improve children's subjective symptoms, such as fever, cough, and nose problems. In addition, we observed that the subsidy program could decrease mortality rate for infants aged 0 by 1.1 per 1,000 children.

Discussion

A back-of-the-envelope calculation from our estimates suggests that annual cost per saved life is 55 million JPY. Considering the value of statistical life for Japanese person is roughly 103 – 350 million JPY by previous studies, the subsidy program would be a cost-effective policy. Taken together, our study suggests that free child healthcare is valid for improving children's healthcare use as well as health, while its effect is limited for adults or the elderly as shown in previous studies.

The Causal Effect of Early Intervention Therapies on Low-Income and Very Low Birth Weight Infants

PRESENTER: **Marcelo Coca Perraillon**, University of Colorado Anschutz Medical Campus

AUTHOR: Shannon K Sainer

Approximately 1.4% of infants are born very low birth weight in the United States. Very low weight at birth is associated with a host of long-term health and neurodevelopmental difficulties that have important consequences for life-long health care expenditures and loss productivity. To ameliorate the effects of low birth weight, pediatric organizations recommend follow-up developmental services. One of the most common sources of follow-up therapy and developmental services for very low birth weight infants in the United States is Part C early intervention therapies. Part C authorizes states, with the incentive of financial support, to provide a state-wide system of developmental services for infants and toddlers with developmental delays and disabilities. Although there is evidence on the effectiveness of early intervention therapies based on randomized clinical trials, little is known about the effectiveness of these therapies as they are actually implemented by states, in part due to the difficulties of establishing causal effects from observational data. In this study, we use a fuzzy regression discontinuity design to estimate the effectiveness of early intervention therapies on growth and neurological development. We exploit the fact that low birth weight threshold strongly predicts eligibility and use of Part C early intervention therapies. Although eligibility criteria varies across states, low birth weight, defined as a weight below 1,200 or 1,500 grams at birth, is one of the key eligibility factors in most states. We use 2002-2016 data from the Nurse Family Partnership, a program that provides prenatal and postnatal visitation to low-income women by registered nurses, to obtain information on infant birth weight, eligibility and use of Part C early intervention therapy, and demographic characteristics of mothers. Our outcomes of interest are weight and neurodevelopment, as measured by the Age and Stages Questionnaire, at 6, 12, 18, and 24 months after birth. We restrict our analysis to windows of varying widths around the eligibility threshold based on weight. Our analysis of 82,292 births over the study period shows that infants below the eligibility threshold are 15 percentage points more likely to use Part C. Importantly, mother and infant characteristics are similar close to the eligibility thresholds, providing support for the regression discontinuity design. Our preliminary second stage estimates show that infants that receive therapy have similar weight and neurological development during the follow up period than infants that are not very low weight at birth. These results show that early intervention therapies, as implemented by states, are effective in ameliorating the effects of very low birth weight. Our results suggest that early intervention therapies are a high-value intervention given the relatively low cost of these interventions compared to the life-long negative health and productivity effects of low birth weight when left untreated.

Direct and Indirect Effects of Mandatory Immunization Requirements for Children Entering Childcare Programs

PRESENTER: **Nicole L Hair**, Arnold School of Public Health

Vaccination requirements for daycare and school entry play a key role in efforts to control vaccine preventable disease in the United States. Several states automatically implement child care and school mandates for ACIP-recommended vaccinations. Most states, however, separately regulate each individual vaccine, contributing to considerable variation in the set of immunizations required in each state.

Over the last fifteen years, thirty-eight states have adopted laws requiring the pneumococcal conjugate vaccine (PCV) for children in daycare facilities. By exploiting the staggered timing of vaccination laws across states, we obtain quasi-experimental estimates of the effect of a daycare mandate on the likelihood that a child completes the PCV series prior to age three. Further, we estimate the indirect, or spillover, effects of mandating PCV vaccination on immunization rates for diphtheria, tetanus and pertussis vaccine (DTaP) and Haemophilus influenzae type B vaccine (Hib), two non-targeted vaccines with recommended immunization schedules similar to that of the PCV series.

We analyze the 2003-2016 National Immunization Surveys (NIS), a nationally-representative sample that tracks vaccination coverage among 2-year-old children. In addition to provider-verified immunization histories, the NIS documents a variety of childhood sociodemographic characteristics. Our models control for a number of individual- and family-level characteristics expected to influence vaccine completion, including the child's sex and age, sibship (size and position), race/ethnicity, maternal marital status, maternal education, and an indicator of whether the family had moved since the child's birth.

Using the provider-verified immunization histories in the NIS and the staggered implementation of daycare immunization requirements across states (2003-2016), we implement a difference-in-differences strategy. We fit a nonlinear logistic model with a binary indicator of a child's immunization history as the dependent variable. The binary policy or "treatment" variable is equal to one if a child lived in a state with mandatory PCV vaccination for children in daycare facilities. State fixed effects capture any time-invariant unobservable state characteristics that might lead to consistently higher vaccine uptake in one state versus another. Year fixed effects adjust for any evolving trends, e.g. in public perception of immunization and/or parental vaccine behaviors, that are common to all states.

We supplement the difference-in-differences approach with a regression-based event-study analysis. For this analysis, we replace the binary policy variable with a series of year indicators, i.e. leads and lags, defined relative to a "treated" state's implementation of a PCV daycare mandate. This framework allows us to test for differences in pre-treatment trends as well as to examine the dynamics of estimated treatment effects.

This is the first study to present plausibly causal estimates of the effect of mandatory immunization requirements for children entering childcare programs. We find that state laws requiring immunization prior to daycare attendance are effective in increasing targeted vaccine coverage among young children. We also find evidence of cross-vaccine spillovers. Specifically, we find that that the implementation of daycare mandate for PCV significantly increases DTap vaccine coverage among young children.

The Effect of Cash Transfers on Mental Health: Opening the Black Box – a Study from South Africa

PRESENTER: **Julius Ohrnberger**

AUTHORS: Eleonora Fichera, Laura Anselmi, Matt Sutton

Title

The effect of cash transfers on mental health: Opening the black box – a study from South Africa

Objective

Poor mental health is a pressing global health problem and especially dominant among the poor population living in Low-and-Middle-Income-Countries (LMICs). About 85% of the population suffering from depression live in LMICs. The WHO predicts that by 2030 neuropsychiatric disorders will be the number one cause of DALYs globally. Evidence of the strong relationship between poor mental health and poverty makes mental health a global development problem. However, there is a gap in the literature in understanding how poverty alleviation programmes affect mental health. We aim to fill the gap in the literature by decomposing the treatment effect of the South African Child Support Grant a nationwide unconditional cash transfer targeted to the poor, on adult mental health.

Methods

We use a sample of 4,535 individuals living below the South African poverty line in four waves (2008-2014) of the South African National Income Dynamics Study (NIDS). Mental health is measured by the 10-item version of the Centre for Epidemiological Depression Scale (CES-D).

We use an instrumental variable approach to assess the effect of the cash transfer on adult mental health. We construct a mediation framework for the cash transfer and mental health relationship, building on empirical findings and health economic models. We then apply exploratory factor analysis to derive four factor dimensions through which cash transfers may affect mental health, namely lifestyles, socio-economic status, physical health and living conditions. We apply mediation analysis using the product of the coefficient method to compute the mediation effects through each pathway and Heckman's decomposition approach to identify unobserved mediation effects.

Results

Opening the black box of cash transfer effects on mental health, we find that physical health and lifestyle choices mediate the relationship of the poverty alleviation programme with adult mental health. The cash transfer significantly improves lifestyle choices and physical health. Both show strong positive associations with mental health. Of the total positive treatment effect on CES-D of size 0.82 (one standard deviation in CES-D), 16% is attributable to improvements in physical health and lifestyle choices, with each taking an equal share of 8%. Our results are robust to baseline mediator corrections and baseline-treatment interactions. We test for and find that the assumptions required to infer causality are supported as we don't find mediator-moderation by treatment or mediators nor error correlation of mediator and outcome equations. Results from a placebo-test controlling for child-age effects support the assumptions on the instrument chosen required by the instrumental variable approach.

Discussion

The derived mediation framework is important for systematically estimating mediation effects in future programme evaluation studies. In the context of strong treatment gaps (95%) in mental health in LMICs, targeting programmes on improving physical health and lifestyle choices can have significant positive effects on mental health outcomes. Moreover, when provided unconditional cash transfers, individuals make investment choices in lifestyles and physical health that are positive for their mental health.

1:30 PM –3:00 PM MONDAY [Production Of Health, Health Behaviors & Policy Interventions]

Universität Basel | Kollegienhaus – Seminarraum 104

Obesity/Diet/Exercise/Nutrition #1

SESSION CHAIR: **Emily Lancsar**, Australian National University

Preferences for Standard and Behavioural Economic Inspired Policies Designed to Reduce and Prevent Obesity

PRESENTER: **Emily Lancsar**, Australian National University

AUTHORS: Jemimah Ride, Nicole Black, Leonie Burgess, Anna Peeters

The obesity epidemic is a significant public policy issue facing the international community with a number of associated adverse outcomes, including increased risk of chronic disease and death, resulting in substantial associated costs. A range of policies have been suggested to reduce and prevent obesity including those informed by standard economics and those harnessing behavioural economics to nudge individuals to change their behaviour to improve their health. What is not known is which policy interventions taxpayers find acceptable and would prefer to fund via their taxes. We present a study which used a best-best discrete choice experiment to investigate social acceptability of eight policies. The alternatives between which respondents were asked to choose were described by three attributes: policy type, effectiveness in terms of impact on the obesity rate and cost in higher taxes. The experimental design allowed for testing of the impact on choice of each attribute in isolation and in combination. Data were collected from an online panel of 1000 respondents representative of Australian taxpayers in age and gender. We harness the full preference order obtained from the best-best choice task to estimate a latent class rank ordered logit model. Predicted probability analysis was used to explore social acceptability of the eight policies while welfare analysis was undertaken to investigate willingness to pay higher taxes for particular policies. We find evidence of tax payer support for funding obesity prevention/reduction policies via higher taxes, but this was not universal across the sample. A three class model was preferred both in terms of model fit and interpretation. Classes 1 and 2 were more likely to personally benefit from policy to reduce and prevent obesity as suggested by being unsatisfied with their weight and holding the government responsible for helping them, while Class 1 additionally were more likely to be obese and be younger. Conversely, Class 3 were more likely to be older; less likely to want to change their weight; did not see government as responsible for addressing obesity; and were less likely to be obese. Class 3, not surprisingly overall preferred no new policy, were more sensitive to increased taxes and had the lowest willingness to pay for new policies, in contrast to Classes 1 and 2 which both preferred new policy in this area. The implied preference order across the 8 policies was similar across the three classes with some exceptions. Across classes traffic light labelling and banning advertising to kids were most preferred. Of the behaviourally inspired policies improving the nutritional environment and funding physical activity infrastructure were generally ranked in the middle of the 8 policies while paying individuals to exercise and introducing prepaid cards (which can only be used for healthy food choices) were consistently the least popular policies across classes. Taxing sugar sweetened beverages was relatively unpopular except for latent Class 1 who were most likely to benefit from such a policy. Implications in relation to informing optimal investment and targeting of policy to prevent and reduce obesity are highlighted as are methodological insights.

Randomized Controlled Trial Evaluating the Effect of Implicit and Explicit Taxes on the Purchasing of 'High-in Calories' Products

PRESENTER: **Dr. Eric Andrew Finkelstein**, Duke-NUS Medical School

AUTHORS: Felicia Jia Ler Ang, Brett Matthew Doble

Background:

Taxes on less healthy food products have been shown to be effective in various settings. However, it is unclear if observed reductions in the quantity of taxed products purchased is a result of price increases due to the tax or the accompanying messaging. To address this question, we conducted a randomized controlled trial evaluating the incremental effectiveness of 3 different tax/messaging strategies on the proportion of high-in-calorie products purchased. We also assessed whether the effectiveness of explicit tax/messages is moderated by individuals' level of support for such a tax.

Methods:

936 adults residing in Singapore were individually randomized and asked to shop in one of four versions of a fully functional on-line grocery store (NUSMart) with over 4,000 products. Participants were deceptively told there is a positive probability that they would be expected to purchase the chosen products. The four arms are 1) no tax control; 2) implicit taxes showing only post-tax prices (i.e., 20% higher than control prices) on high-in-calorie products; 3) fake taxes showing pre-tax prices and a label falsely indicating that the price includes a 20% tax on high-in-calorie products; and 4) explicit taxes showing the same label as in 3) and an actual 20% price increase applied to the high-in-calorie products. In each intervention arm the same 20% of products highest in calories within each product category (e.g., within beverages) are targeted. Multivariate regression models were used to estimate the differences in the proportion and quantity of targeted products purchased across arms and the price elasticities resulting from the 20% tax. A secondary regression included interaction terms between the intervention arms and a dummy variable indicating support for the tax to see if effects are larger for those who are supportive of this strategy.

Results:

The proportion of high-in-calorie products purchased was 11.72% in the control arm. It was a non-statistically significant 0.04 percentage points lower in the implicit arm compared to control (95% CI -2.42 to 2.34), 3.01 percentage points lower in the fake tax arm compared to the control (95% CI -5.26 to -0.76), and 3.38 percentage points lower in the explicit tax arm compared to the control (95% CI -5.72 to -1.03). The corresponding elasticity estimates are -0.29 for the fake tax arm and -0.74 for the explicit tax arm. Individuals who actively support the taxes showed much greater responsiveness to the explicit and fake taxes than those who did not (combined elasticities across these arms comparing supporters and non-supporters is -3.23 vs -0.76 and $p<0.001$).

Conclusions:

Results show that reductions in proportions and quantities of high-in-calorie products purchased are largely attributable to explicit messaging rather than to price increases. This suggests that non-salient small taxes are unlikely to improve diet quality but that if taxes are salient, they can

improve diet quality even if suppliers absorb much of the tax. However, because elasticities are much larger for those who support the tax, it is possible that those most likely to benefit may be least influenced by the tax, salient or not.

Education, Dietary Choices and Physical Activity

PRESENTER: **Stephanie von Hinke**, University of Bristol

This paper examines the relationship between education and the nutritional composition of the diet, focusing on potential compensatory responses between calories in (i.e. dietary intakes) and calories out (i.e. physical activity). It exploits the 1972 British compulsory schooling law that raised the minimum school leaving age from 15 to 16 to examine the effects of education on diet and exercise around middle age. Using a regression discontinuity design, the findings suggest that the reforms led to a worsening of the quality of the diet, with increases in total calories, carbohydrates, fats, saturated fats and some proteins. However, I find that these changes are compensated by a discontinuous increase in physical activity. Back-of-the-envelope calculations suggest little to no effect on the balance of calories. As such, the findings show that focusing on the two components of energy balance provides additional information that is concealed in the analyses that only use a measure of obesity. I discuss the implications of these findings.

The Dynamics of Income-Related Inequality in Obesity

PRESENTER: **Dennis Petrie**, Monash University

AUTHORS: Linkun Chen, Prof. Paul Allanson, Ulf Gerdtham

In developed countries there is a perception that the poor are more likely to be overweight compared to the rich. However, many studies in developed countries have found little cross-sectional relationship between obesity and socioeconomic status with young females appearing to be the only group where there is some evidence that the poor are more likely to be obese than the rich. This paper goes beyond the cross-sectional level of inequality and explores the dynamics of income and obesity over time to better understand the evolving nature of the relationship between these factors. We extend recently developed inequality decomposition methods which break down the changes in the relationship between income and obesity over time into those related to income changes, those related to obesity changes and co-movements in income and obesity. We use Australian individual longitudinal data for 2006, 2011 and 2016 to explore how obesity and household income evolved over this period.

From a cross-sectional perspective we again find evidence that in general poor young females are more likely to be obese compared to their rich counterparts while for older females and males there appears to be little relationship between income and obesity. In addition, we find little changes in this cross-sectional relationship between 2006, 2011 and 2016. However, by examining changes at the individual level using our decomposition methods we can see that the cross-sectional analysis masks systematic relationships which have occurred at the individual level over time.

For young males we find that those who were obese to start with were more likely to have moved down the income distribution over time and those who were poor to start with were more likely to become obese over time. But when we only look at the cross-sectional change over time we do not see these changes because these effects are cancelled out by those moving up the income distribution also being more likely to become obese at the same time. For young females we find a similar pattern with those who were poor to start with being more likely to have become obese over time but that this is counteracted by the fact that, in general, those who became obese also moved up the income distribution.

Despite the relatively short periods of time and that there appears to be no substantial change in the level of income-related obesity inequality at each point in time, we do observe several relationships between obesity and income at the individual level which provide important information to policy makers. In particular we find that some of the initial poor are potentially trading off higher incomes for weight gain over time and policy makers need to consider interventions which help prevent weight gain in the hard working poor.

1:30 PM –3:00 PM MONDAY [Economic Evaluation Of Health And Care Interventions]

Universität Basel | Kollegienhaus – Seminarraum 105

The Use of Economic Evaluation in Non-traditional Areas

SESSION CHAIR: **Paula Lorgelly**,

Issues in the Development and Application of a New Outcome Measure for Use in Patients, Carers, Social Care Users and Public Health

PRESENTER: **Clara Mukuria**, The University of Sheffield

AUTHORS: Tessa Peasgood, John Brazier, Donna Rowen, Jill Carlton

Health Technology Assessment (HTA) where Quality Adjusted Life Years (QALYs) are used as the outcome measure relies on a health measure such as EQ-5D to measure quality of life. Although this is mostly sufficient within the health sector, there are recognised instances where existing health measures are considered too narrow or where other beneficiaries such as informal carers are excluded e.g. in health conditions where the care burden is large. Measures have been developed to capture these types of outcomes (such as CarerQoL for carers and ASCOT for social care) but relying upon different outcome measures limits the ability to conduct cross-sector evaluations.

The Extending the QALY project aims to develop a new generic measure that can be used in economic evaluation across health, social care and public health, based on the views of users and beneficiaries of these services. This includes patients and social care users as well as carers who may be recipients of social care services e.g. respite care. This necessitates going beyond health to include wellbeing related outcomes.

A targeted qualitative review drawing on literature on the impact of a range of health conditions, social care use and being a carer on quality of life was undertaken. This identified seven high level domains (with sub-domains): feelings and emotions, cognition, activity, self-identity, relationships and social connections, 'coping, autonomy and control' and physical sensations which form the basis of the measure. The measure will be valued using standard approaches to generate a QALY weighting on a zero (equivalent to dead) to 1 (full quality of life) scale using preferences from the general public.

The breadth of the new measure should enable it to be used across a range of health conditions and sectors. However, there are a number of interesting and unresolved issues raised in developing a generic measure designed to allow cross-sector evaluation. We discuss these in relation to the Extending the QALY instrument and its development.

Items that relate to a specific perspective or role cannot be included within a generic measure. This includes: for carers, referring to specific positive or negative aspects of being a carer (such as being supported in ones caring role); for patients, referring to whether own health status limits activity; for social care users, referring to how the respondents perceives they are treated by care staff (such as being treated with dignity). Using items that tap into the relevant construct but which use generic wording has advantages and disadvantages – we explore these in relation to the face validity and psychometric evidence around the Extending the QALY instrument.

The use of a broad generic measure also raises some interesting issues around future application in HTA including trade-offs between different groups (patients versus carers) and the potential relevance of a broad health and wellbeing measure outside of healthcare and for public health interventions. We discuss how these issues impact upon the development of a new measure.

The Indirect Costs of Work-Related Stress: Evidence from a Swiss Workplace Survey

PRESENTER: **Dr. Beatrice Brunner**, Zurich University of Applied Sciences

AUTHORS: Dr. Simon Wieser, Ivana Igic, Anita C. Keller

Due to continuing structural changes in the working environment, work-related stress has become an increasingly important workplace hazard. While in Switzerland about a quarter of all employees reported to frequently or very frequently experienced stress at work in 2000, ten year later the proportion already amounted to one third, with increasing tendency.

We use a representative survey of Swiss employees to estimate the effects of work-related stressors and resources on work productivity, focusing on sickness absenteeism and presenteeism. We measure work productivity and workplace characteristics with well-established instruments and apply both OLS and fixed effects models.

We find that adverse health effects are mainly caused by an imbalance between job stressors and resources, and not by the level of job stressors per se. Our preferred estimates imply an elasticity of health-related productivity losses with respect to job stressors of 1.1, with both social and task-related job stressors being about equally important. The elasticity of health-related productivity losses with respect to job resources is estimated at -0.5, with task-related resources dominating social resources. We further find the combination of low job resources and high job stressors to be particularly harmful. Furthermore, employees with low occupational self-efficacy are more negatively affected when working in a "low job resources and high job stressors" combination than employees with high occupational self-efficacy. Finally, the results from a simple counter-factual exercise suggest that job stress might account for as much as 24% of the health-related productivity losses.

The Health and Economic Benefits of Building Walkable Neighbourhoods: A Modelled Comparison between Brownfield and Greenfield Developments

PRESENTER: **Belen Zapata-Diomedi**, Griffith University

AUTHORS: Claire Boulange, Billie Giles-Corti, Kath Phelan, Simon Washington, Lennert Veerman, Lucy Gunn

Background: A consensus is emerging in the literature that urban form can impact health by either facilitating or deterring physical activity (PA). However, there is a lack of evidence measuring population health and the economic benefits relating to alternative urban forms. We examined the issue of housing people within two distinct types of urban development forms: a medium-density brownfield development in an established area with existing amenities (e.g. daily living destinations, transit), and a low-density suburban greenfield development. We predicted the health and economic benefits of a brownfield development compared with a greenfield development through their influence on PA.

Methods: We combined a new Walkability Planning Support System (Walkability PSS) tool with a quantitative health impact assessment model. We used the Walkability PSS to estimate the probability of residents' transport walking, based on their exposure to urban form in the brownfield and greenfield developments. We developed the underlying algorithms of the Walkability PSS using multi-level multivariate logistic regression analysis based on self-reported data for transport walking from the Victorian Integrated Survey of Transport and Activity 2009–10 and objectively measured urban form in the developments. We derived the difference in transport walking minutes per week based on the probability of transport walking in each of the developments and the average transport walking time per week among those who reported any transport walking. We then used the well-established method of the proportional multi-cohort multi-state life table model to translate the difference in transport walking minutes per week into health and economic benefits.

Results: If adult residents living in the greenfield neighbourhood were instead exposed to the urban development form observed in a brownfield neighbourhood, the incidence and mortality of physical inactivity-related chronic diseases would decrease. Over the life course of the exposed population (21,000), we estimated 1,600 health-adjusted life years gained and economic benefits of A$94 million.

Discussion: Our findings indicate that planning policies that create walkable neighbourhoods with access to shops, services and public transport will lead to substantial health and economic benefits associated with reduced incidence of physical inactivity related diseases and premature death.

A Comprehensive Intersectoral Evaluation on the Social Value of 'the Healthy Primary School of the Future' Initiative

PRESENTER: **Marije Oosterhoff**, Maastricht University Medical Center

AUTHORS: Onno C.P. van Schayck, Hans Bosma, Manuela Joore

Background: Traditional frameworks for assessing cost-effectiveness are not fully applicable for the evaluation of school-based lifestyle interventions as outcomes beyond health and intersectoral consequences cannot be easily integrated.
Objective: Examine the social return on investment (SROI) created by the 'Healthy Primary School of the Future' (HPSF) initiative after two years of intervention.
Methods: Key elements of the HPSF initiative are the provision of a healthy lunch and daily structured physical activity sessions at schools, which are new to the Dutch primary school setting. At Healthy Primary Schools of the Future (HPSF), both changes were implemented, whereas Physical Activity Schools (PAS) only offered daily structured physical activity sessions. A SROI analysis was conducted by identifying key stakeholder groups, assessing investments and outcomes, and summarizing results in a SROI calculation and SROI story. Within the quasi-experimental study, outcomes were measured quantitatively (e.g. annual child and parental questionnaires) and qualitatively (e.g. stakeholder interviews). Outcomes that could be expressed in monetary terms using standard cost prices, or the so-called financial returns, were used for the calculation of social return to investment. Outcomes that were measured qualitatively or which could not be expressed in monetary terms, the non-financial returns, were included in the SROI story which described the creation of social value.
Results: Besides the child, key stakeholder groups came from the education, healthcare, household & leisure, and labour sector. The SROI story showed that, as a result of positive changes in children's health behaviours, body mass index, and school behaviours (e.g. more positive social interaction) HPSF and PAS created social value, particularly for the healthcare and education sector. With a two-year follow-up HPSF and PAS showed limited financial return on investment, but the time frame is too short to examine the full return on investment as it may take a longer time before all financial returns can be observed.
Conclusions: The SROI methodology facilitates a comprehensive intersectoral evaluation of school-based lifestyle interventions which recognizes and integrates the value of intermediate, non-health, and intersectoral outcomes. Further research should be carried out to examine if SROI evaluations meet the information needs of policy makers and can adequately inform and support decision-making processes on school-based lifestyle interventions.

1:30 PM –3:00 PM MONDAY [Supply Of Health Services]

Universität Basel | Kollegienhaus – Seminarraum 106

Emerging Issues in Health Care Labor Markets 2: Substitution, Competition

SESSION CHAIR: **Siping Dong**, The National Institute of Hospital Administration

Who Benefits When Inertia Is Reduced? Competition, Quality and Returns to Skill in Health Care Markets

PRESENTER: **Sebastian Fleitas**, University of Arizona

Increased competition may lead to incentives for firms to increase quality by incorporating higher quality inputs. This is particularly relevant in health care markets, since the supply of high quality physicians is relatively inelastic in the short run. Therefore, an increase in the relative demand for high-quality physicians could lead to an increase in their relative wages without increasing their total hours of work. Using a policy change in the Uruguayan health care system, I assess the effects of increased competition via lock-in reductions on a market for inputs. I leverage the facts that insurance companies, hospitals and physician services are completely vertically integrated in Uruguay and that in 2009 the government generated an exogenous change in the regulated mobility regime, increasing the competition in the market and providing incentives to increase quality. I combine administrative records on wages and hours of work in all hospitals for all specialists with data on the scores that specialists obtained in the test they must take to be admitted into the medical specialty graduate school, which I use as an exogenous measure of their quality. Consistent with the idea of an inelastic relative supply in the short run, I show that the increased competition shifted the relative demand for high-quality medical specialists, increasing the returns to skill. I do not find strong evidence of an increase in quality, approximated as relative hours of high-skill versus low-skill physicians.

Free Entry, Specialization, and the Geographic Distribution of Physicians

PRESENTER: **Dr. Toshiaki Iizuka**, The University of Tokyo

AUTHOR: Katsuhiko Nishiyama

The geographic distribution of physicians is uneven in virtually all countries, and it has been viewed as a major health policy issue because access to care is a key determinant of health outcomes. Many governments have attempted to address this issue by providing subsidies to attract and retain physicians in small towns. However, regardless of the importance of the issue and government efforts, very few studies have

examined whether government policies, such as financial incentives, medical education, and regulation, affect physician practice locations and improve the geographic distribution of physicians.

This paper attempts to fill this gap by estimating a structural model of physician entry. As a major departure from previous studies, we explicitly model physician decisions to enter into a small geographic market and estimate structural parameters. Using Japanese data, we first estimate the parameter values for the profit function – including both demand- and cost-side parameters – that govern physician entry decisions. Using the estimated parameter values, we then calculate an "entry threshold" for each specialty, the minimum market size required for a profitable entry.

Exploiting the structural model, we then conduct counterfactual experiments. First, we examine the extent to which government subsidies – in the form of higher provider payments or lower entry costs – can attract and retain physicians in small towns and alleviate the uneven geographic distribution of physicians. Second, we examine how population aging affects the geographic distribution of physicians and access to care. The population is rapidly aging, and this trend is projected to continue in most member states of the Organization of Economic Cooperation and Development (OECD). Using the predicted population of each municipality in 2040, we simulate how demographic changes affect the geographic distribution of physicians.

We find that, first, specialized physician services require a larger market size, which leads to an uneven physician distribution. Second, physicians make entry decisions by taking into account the implicit costs of living in small towns, which also leads to an uneven distribution of physicians. Counterfactual simulations indicate that government subsidies can affect the geographic distribution of physicians; however, subsidies alone may not be sufficient to guarantee access to care in smaller towns, given the level of subsidy provided by governments in the past. Alternatively, if generalist physicians can cover broader specialty services, then access to care will be substantially improved. We also find that the population aging expected in many countries does not negatively affect access to care for the elderly but can substantially worsen access for younger patients.

Where There Is No Nurse – Task Shifting Obstetric Care to Auxiliary Nurses and the Impact of a Large-Scale Mentoring Program on Quality of Care at Primary Health Centers in India.

PRESENTER: **Dr. Krishna Rao**, Johns Hopkins Bloomberg School of Public Health

AUTHORS: Swati Srivastava, Nicole Warren, Kaveri Mayra

Scarcity of trained clinicians in LMICs often results in de-facto shifting of clinical tasks from higher to lower cadres. In human resource deficient regions of India, auxiliary nurse-midwifes (ANMs) are tasked with managing deliveries at primary health centers, a function reserved for doctors or staff-nurses. This raises concerns about the quality of care, especially in a policy environment that aggressively encourages institutional deliveries through cash incentives. ANMs are trained as paramedical health workers and are typically responsible for immunizations and providing antenatal care.

This study examines if a large-scale mentoring program improved the ability of ANMs to provide quality obstetric care. The study is based in the state of Bihar, India, where a large-scale mentoring program (AMANAT) was implemented at primary health centers between 2015 and 2017. For a duration of six to nine months, nurses and ANMs in the intervention facilities received on-site mentoring to improve the quality of basic emergency obstetric and newborn care. The nurse-mentors worked alongside mentees, observed them and provided instruction by demonstration through the co-management of cases, and structured learning sessions covering a range of topics related to managing normal and complicated deliveries.

We assessed the impact of the mentoring program on nurse ability using a unique combination of clinical vignettes and Objective Structured Clinical Examinations related to managing cases of normal delivery, postpartum hemorrhage, and neonatal resuscitation. We used a quasi-experimental post-test with matched comparison group design. In 2017 we carried out a cross-sectional survey of primary health centers in Bihar; a total of 239 facilities (intervention and comparison) were surveyed and 190 (134 intervention and 56 matched comparison) facilities included in the study. From these matched facilities, a total of 335 ANMs (237 mentored and 98 comparison) and 42 staff-nurses (28 mentored and 14 comparison) were included.

Mentoring improved the percentage of correct actions taken by ANMs to manage normal deliveries by 17.5 (95% CI: 14.8, 20.2), post-partum hemorrhage by 25.9 (95% CI: 22.4, 29.4), and neonatal resuscitation 28.4(95% CI: 23.2, 33.7) percentage points. There was no significant difference in the ability of mentored ANMs and staff-nurses. However, significant scope for improvement remained - mentored ANMs and staff nurses were able to provide a little more than half the correct actions on all three cases. Ability was highest in the period immediately after mentoring and declined subsequently.

Mentoring programs can improve the ability of ANMs to provide quality obstetric care and to levels that are comparable to trained nurses. However, mentoring has limited impact on sustaining quality practices. This makes continuing education programs critical.

Role Substitution, Skill Mix and Provider Efficiency and Effectiveness: Lessons from NHS Maternity Services

PRESENTER: **Graham Cookson**, Office of Health Economics

AUTHOR: Ioannis Laliotis

Medical and non-medical staff play a crucial role in the delivery of healthcare services and they are considered essential factors in the production process of health outcomes. The research so far points towards a positive relationship between higher levels of registered nurse

staffing and higher quality care. However, the association between higher midwife staffing and reduction in length of stay is not widely supported (Sandall *et al.*, 2014). Literature on the medical workforce is more limited compared to that on nurses and it comes from both the US and the UK settings (i.e Jarman *et al.*, 1999; Pronovost *et al.*, 2002). Evidence regarding the optimal levels of staffing for doctors come primarily from the US setting (i.e. Harris *et al.*, 2004; Sucov *et al.*, 2009). The issues of complementarity and substitutability of nurses, midwives and doctors are even less documented, even in large scale studies. Yet, this is important since healthcare outcomes may be sensitive to ratios between nurses and medical staff. From an economic perspective, despite the crucial role of skill mix and the changing composition of the workforce over the last years, little is known with respect to the complementarity or substitutability of staff groups within the English NHS.

This paper revisits the relationship between workforce and maternity outcomes in the English NHS in an attempt to contribute knowledge to an important policy question for which there has been a paucity of research. Maternity services provide a useful context because the production processes are relatively homogeneous across providers, outcomes and outputs are easier to define and measure, and because the inputs including staffing are readily identifiable and separable in the data.

The main objective is to try to address some of the drawbacks of previous studies by using richer sources of data and adopting an estimation strategy in order to tackle the issue of endogeneity. More specifically, we estimate generalized linear production functions in the spirit of Diewert (1971), in order to examine the relationship of both staffing levels and skill mix with the total number of maternities. However, unlike the hitherto presented cross-sectional studies, we utilize a panel dataset at the hospital level covering the period between 2004 and 2012 and employ the dynamic panel estimation framework proposed by Arellano and Bond (1991) and Blundell and Bond (1998). Based on the results obtained from system GMM regressions we find that the estimates often reported in cross-sectional studies can be misleading. According to our results, consultants and doctors have the highest marginal productivities, while the productivity of support workers has a negative sign and it is not statistically significant. Moreover, we present evidence for some degree of complementarity between registered midwives and support workers and consultants. According to our results, midwives can replace doctors and doctors can replace consultants in the production of maternity services.

1:30 PM –3:00 PM MONDAY [Evaluation Of Policy, Programs And Health System Performance]

Universität Basel | Kollegienhaus – Regenzzimmer 111

Organized Session: Evaluating Impact and Value-for-Money of Population- and System-Level Interventions in Low and Middle Income Countries

SESSION CHAIR: **Marc Suhrcke**, Centre for Health Economics

Improving the Quality of Primary Healthcare in South Africa: A Quasi-Experimental Evaluation of the Impact of the Ideal Clinic Realisation and Maintenance Programme

PRESENTER: **Maninie Molatseli**, PRICELESS SA, Wits Health Consortium

AUTHOR: Mr. Nicholas Stacey

Authors: Maninie Molatseli, Nicholas Stacey, Karen Hofman, Ijeoma Edoka

In many low- and middle-income countries achieving universal health coverage will require not only significant improvements in access to healthcare but improvements in the quality of care available. South Africa is at present re-structuring its healthcare system with the aim of achieving universal healthcare coverage through a single-payer National Health Insurance (NHI) scheme. The NHI seeks to create “a unitary system, financed through a central fund, where patients can select from a package of care offered by accredited health facilities”. For South Africa’s over 3000 public primary healthcare facilities, there is concern that accreditation will only be possible should significant improvements in the quality of the care they are able to offer occur. As such, a number of primary healthcare reform efforts are underway. One critical component of these reforms has been the phased introduction of the Ideal Clinic Realisation and Maintenance Programme (ICRMP). The ICRMP targets improvements in PHC administrative process; health service delivery; human resources for health; and infrastructure. Enrolment of facilities in the ICRMP in a given fiscal year sees their status assessed and scored by an extensive checklist, district-level support provided to facility managers to effect improvements on checklist performance and closes with their status re-assessed by an external peer review team. The ICRMP seeks to improve performance on facilities checklist such that their scores move above a threshold that would classify them as “Ideal”. This aim of this study is to assess the impact of facility participation in the ICRMP on the quality of primary healthcare services provided. Exploiting the staggered roll-out of the ICRMP and drawing on administrative data (that of both the ICRMP itself and of the South African District Health Information System), we apply facility fixed-effects difference-in-difference methods to assess the impact of the programme on various measures of the quality of care. We find that relative to control facilities participation in the ICRMP results in a 7-point improvement in the checklist score, and an 18-percentage-point increase in the probability of a facility being classified as “Ideal”. While these findings are indicative of the program resulting in improvement in the quality of primary healthcare available, the translation of these effects to improvements in health outcomes is still to be assessed.

Primary Health Care Coverage in Brazil: Assessing the Family Health Program Impacts on Mortality at the Municipality Level

PRESENTER: **Mr. Fernando Antonio Postali**, University of Sao Paulo

Authors: Maria Dolores Montoya Diaz, Fernando Antonio Slaibe Postali, Flavia Mori Sarti, Adriano Dutra Teixeira, Rodrigo Moreno-Serra

We investigate the impact of Family Health Program (FHP) coverage on premature adult mortality due to amenable causes in Brazil, at the municipality level, during the period from January 1999 to December 2015. Created in 1994, the Brazilian FHP is a community-based, publicly financed program based on household visits by multidisciplinary health professional teams, designed to foster universal health coverage through primary health care activities, including prevention and health promotion. There are currently over 91 million people registered in the FHP. We use rich microdata on mortality among adults from Ministry of Health datasets, categorized according to age, causes directly and indirectly related to death (ICD 10 codes) and municipality of residence. We define premature mortality as death occurring between 25 and 64 years of age. FHP coverage is measured as the number of FHP teams per municipality population. For the estimations, we employ fixed effects models and flexible dose-response models that allow for gradients of treatment effects according to levels of FHP coverage. We use these models to assess the mortality impacts of variations in FHP coverage over the 17-year period, using mortality data aggregated at the municipality level and controlling for sociodemographic characteristics, municipality income level and presence of other government programs (coverage of the conditional cash transfer program Bolsa Familia, and coverage of the Mais Medicos program of incentives for attracting physicians to deprived areas). The results show statistically significant associations between increased FHP coverage and reduced premature mortality of patients with diabetes complications, certain infectious and parasitic diseases, musculoskeletal system diseases, genitourinary system diseases, and other indefinite causes. Among the control variables, we find that the share of government expenditure in total health expenditure is negatively related to premature mortality of patients with hypertension and/or diabetes, cardiac insufficiency, coronary problems and diabetes complications. Municipality income level is positively related to premature mortality rates for most causes of death considered. Overall, our results provide evidence about the effectiveness of the Brazilian FHP strategy that is useful to inform the current national debate about the allocation of government health funds. More generally, our study highlights the potential of large-scale, community-based primary care strategies to bring about important population health improvements and spur progress towards universal health coverage.

Impact Evaluation of the 2014 National Health Insurance Scheme on Access, Financial Protection and Equity in Indonesia

PRESENTER: **Taufik Hidayat**, Center for Health Economics and Policy Studies Universitas Indonesia

Authors: Budi Hidayat, Taufik Hidayat, Nurcahyadi, Royasia Viki Ramadani, Hendratno, Noemi Kreif, Andrew Mirelman, Rodrigo Moreno-Serra and Marc Suhrcke

In 2014, Indonesia introduced a national health insurance program (JKN) with the aim of increasing access to healthcare services, protecting people from the catastrophic health payment, and closing inequitable use of healthcare services. We evaluate the impact of the JKN on healthcare service utilization, out-of-pocket (OOP) expenditure, financial risks protection, and equity in the use of healthcare services.

Given the lack of availability of the randomized control trial (RCT) data in supporting the evidence of the JKN program impact, we use a quasi-experimental design. The existence of a panel-data structure of Indonesia Family Life Survey (IFLS), collected between 1993 and 2007 (pre-JKN) and 2014/2015 (post-JKN), allows us to explore the impact of JKN using a difference-in-difference approach. We apply two approaches to deal with potential selection bias by using instrumental variable approaches as well as score matching (PSM-DID). We also exploit the nation-wide population-based household survey, the Indonesia national socio-economic survey (Susenas), to identify the causal relationship between the JKN and the outcome measures used in the study. Since Susenas is a cross-sectional survey, we construct a pseudo-panel between 2013 and 2017. In addition, the instrumental variable (IV) using the two-stage least squares and the generalized method of moment (GMM) become a part of the estimation strategy. To measure the degree of inequity, and to estimate how JKN and other variables contributed to or reduced inequality, we estimate both a concentration index and decomposition of the concentration index. The later is used for investigating whether inequalities identified by the former amounts to inequities by taking into account needs variables. Equity is then graphically shown using a concentration curve.

Results from this study confirm the positive effect of JKN on access and financial protection. The effect is stronger among the poor group than among the general population, and hence JKN also closes inequitable use of care. Given increasing demand among insured reflects either good message (due to a medical necessity) or bad-things (due to a supplier induced demand-SID or moral hazard), appropriate instruments to be further tested should include two broad policies to maintain the former and to prevent the later. Further policy reform is needed; first to ensure the readiness of supply to accommodate demand following program expansion so that the insured can enjoy the full benefits of JKN, and second, address provider’s and consumers incentives to remove unintended demand effects, eg due to moral hazard behavior.

Economic Evaluation and Equity Impacts of Population- and System-Level Interventions in Low- and Middle-Income Countries: Concepts, Challenges and an Application to Primary Health Care in Brazil

PRESENTER: **Andrew Mirelman**, Centre for Health Economics at the University of York

Authors: Andrew Mirelman, James Love-Koh

Two common health policy objectives are to improve population health and to reduce unfair health inequalities. Techniques that address both of these concerns have emerged in recent years within the framework of health economic evaluation. Some of the interventions with the largest potential equity impacts are those delivered at the population- or health system-level, where there is emerging interest in novel methods for both impact evaluation and economic evaluation. This paper considers the practical and methodological issues that arise when conducting distributional analysis in the economic evaluations of these types of interventions. There is a particular focus on the additional challenges that are seen primarily when conducting evaluation in low- and middle-income countries.

We describe and, where possible, propose solutions to a wide range of potential challenges. These include: (i) incorporating limited treatment effect heterogeneity estimated from quasi-experimental impact evaluation studies; (ii) maximising the policy relevance of an evaluation given the (often) ex post nature of the impact study; (iii) accounting for complexities in intervention funding and opportunity costs that are relevant for equity.

These issues will be illustrated through a distributional cost-effectiveness analysis (DCEA) of the Programme Saude Familia (PSF) in Brazil – a community-level primary care system intervention introduced in the 1990's. The DCEA will utilise estimates of the effects of the PSF on mortality at the regional level to model the impact on health inequalities between Brazilian states and is the first DCEA to quantify uncertainty in the inequality impacts. Population health effects in terms of disability-adjusted life years are estimated by combining the impact estimates with state-specific data on baseline disease prevalence and mortality. We also explore a range of scenarios that account for different levels and distributions of health opportunity costs that arise from the intervention being funded through municipal, regional and federal health budgets.

1:30 PM –3:00 PM MONDAY [Economic Evaluation Of Health And Care Interventions]

Universität Basel | Kollegienhaus – Fakultätenzimmer 112

Organized Session: Fighting Infectious Diseases through Immunization: The Latest Global and Country Evidence on the Costs of Delivering Vaccines in Low- and Middle-Income Countries

SESSION CHAIR: **Annette Ozaltin**, ThinkWell

DISCUSSANT: **Dr. Logan Brenzel**, Bill and Melinda Gates Foundation

Overview of Existing Immunization Delivery Cost Evidence: Findings from a Systematic Review on Immunization Delivery Cost in Low- and Middle-Income Countries

PRESENTER: **Kelsey Vaughan**, ThinkWell

As part of the ICAN, ThinkWell conducted a systematic review which aimed to answer a question frequently asked by global and country immunization stakeholders: What are the unit costs of vaccine delivery across different LMICs and through a variety of delivery strategies? The systematic review included peer-reviewed articles and grey literature that included IDCs published between 2005 and 2019. The review was limited to LMIC study settings, resulting in 63 articles/reports (resources). Additional information extracted from the resources included contextual information about the study setting, costing methodology, and the reported cost results. All cost findings were converted to a common year (2016) and currency (U.S. dollars [USD]) to ensure comparability across studies and different settings.

The extracted data are housed in the IDCC, available as an interactive Microsoft Excel workbook and web tool, making easily accessible only the most relevant and important information related to the unit cost results. Included in the IDCC are 456 immunization delivery unit costs (e.g., delivery cost per dose, per capita, per full immunization of a vaccine or fully immunized child (FIC), and per person in the target population). The majority of data comes from low-income countries and Sub-Saharan Africa. The majority of unit costs are presented as cost per dose and represent health facility-based delivery. IDCs are higher in countries with a higher gross national income per capita and school-based, outreach/mobile, campaign, and child health day/week or national immunization day/week delivery strategies are more expensive than facility-based delivery. The IDC range for single, newly introduced vaccines is $0.49 to $1.38 (economic costs) at health facilities in low-income countries and $1.25-$3.22 (financial costs) at health facilities in LMICs. For schedules of four to eight vaccines delivered to children under the age of one, the IDC per dose ranges from $0.75-$9.45 (full, economic costs), or $8.13-$96.16 per FIC (defined as children who have received DTP3).

From immunization delivery unit cost data in the IDCC, ThinkWell developed ten cost benchmarks (cost ranges) by pooling four or more comparable unit costs from different resources. The cost ranges are for delivery of specific vaccines or schedules, by delivery strategies and for different country income levels and regions. Comparability across unit costs was checked across several different areas including methods, contextual criteria, and characteristics of the vaccines costed (e.g., vaccines included and their delivery).

The Cost of Fully Immunizing Children in Indonesia through Outreach and School-Based Vaccine Delivery

PRESENTER: **Ms. Amila Megraini**, Jakarta

AUTHOR: Nugroho Soeharno

The introduction of decentralization in Indonesia means the fight against infectious diseases – both funding and implementation – is taken up by the district level. However, there is frequently a lack of sufficient subnational budget for operational costs to implement some aspects of the immunization program. Although numerous vaccine-specific costing studies have been conducted in Indonesia, no studies have estimated the subnational operational costs of delivering the full Expanded Programme on Immunization (EPI) schedule.

This study aimed to estimate the average subnational IDCs per FIC incurred by district and city health offices associated with achieving high coverage levels. The study looked specifically at outreach activities at integrated health posts (*posyandu*) and doses delivered through school-based programs, along with some routine facility-based immunization through community health centers (*puskesmas*).

Data was collected from 24 facilities in two provinces, extracted from existing reports and the health information system and through interviews with key focal points of the immunization program at all levels (central, provincial, district/city, and sub-district health facility).

Results present the delivery costs associated with achieving high coverage of vaccines in the fight against infectious diseases in two provinces in Indonesia. In addition to informing district-level budgeting and planning for immunization, findings are informative to discussions at the national level about fiscal space for new vaccine introduction. For example, it was found that most transportation-related costs are incurred by staff, rather than the health system, due to a lack of resources. For discussion with the EPI program is additional district support for transportation.

Key lessons learned include the importance of consultations with EPI and key stakeholders about the policy question(s) the research can inform and timing study findings to align with budget and planning processes and other key policy events. Joint analysis of costing data with EPI and other stakeholders helped increase understanding and interpretation of findings, as well as buy-in of results.

Vaccines Reaching the Last Mile in Tanzania: Fighting Infectious Diseases By Understanding the Cost of Immunization Services to Nomads and Other Hard to Reach Populations

PRESENTER: **Dr. Fatuma Manzi**

Fighting infectious diseases in nomads and other mobile populations is a particular challenge in Tanzania, where these groups account for up to 19% of the population. A better understanding of the operational costs of delivering vaccines to these groups through non-facility based strategies – such as outreach and mobile delivery – is needed to ensure the availability of sustainable, equitable, and predictable financing for immunization. As a part of the ICAN, researchers in Tanzania estimated the costs of different vaccine delivery strategies to reach children up to 18 months of age in rural and urban areas in Tanzania.

In a nationwide sample of 54 health facilities, cost data was collected through interviews and record review. The economic and financial cost per dose and per FIC (defined as children receiving second dose of measles) was estimated separately for health facility-based, outreach, and mobile delivery.

Findings show outreach and mobile are much more costly than facility-based delivery due to the additional staff time and transportation required and the limited number of children immunized at these sessions. Planned outreach and mobile activities are often cancelled due to lack of available vehicles and/or fuel.

Study findings are informative for national planning, since vaccination activities are currently largely funded by vertical programs and development partners, but will be increasingly domestically funded as Tanzania transitions away from external funding. They are also important inputs to advocacy plans which call for additional resources for vehicles and fuel for outreach and mobile activities.

Key lessons learned are that immunization budgets and funding allocations are largely managed outside of the Ministry of Health, necessitating the involvement of a large group of stakeholders. Converting study findings to the specific budget lines required at subnational level, and making findings available at the right time during the budgeting cycle, was important to ensuring their use in planning processes. Early and ongoing involvement of the EPI manager in the study – shaping the scope and research question – helped ensure results would be useful to the Ministry of Health.

The Costs of Replacement of TT Vaccine for Women Aged 15-35 with Td Vaccine for Children Aged Seven in Vietnam

PRESENTER: **Hoang Van Minh**

In Vietnam, the Td vaccine has not been included in the EPI; as such, diphtheria outbreaks have occurred in some mountainous areas. Hence, the Vietnam EPI plans to introduce Td vaccine in the routine program to sustain protection against diphtheria. As Vietnam has eliminated maternal, neonatal tetanus since 2005 and the EPI budget is limited, TT vaccine for women aged 15-35 is being considered for replacement by Td vaccine for children aged seven. The ICAN team conducted a study to estimate the cost to replace the TT vaccine with Td vaccine.

This research estimated the program costs (total costs, incremental costs, and unit costs) of Td vaccination provided to children aged seven, including a program of introduction of Td for seven-year-olds and future cessation of TT vaccination of women of child bearing age. This required historical costing of TT vaccination to women of child-bearing age and Td campaigns for diphtheria outbreaks and normative costing of a future program of Td vaccination to school-aged children (including one-off introduction costs). These standalone costing studies combine to estimate the overall budget impact of the introduction of the new vaccine.

Cost data was collected from 33 communes across the country, including a health center (*commune health station*) and public primary school in each. Cost findings from the individual studies provide useful insight into the cost of delivering vaccines at health facilities, in schools, at other outreach sites and through campaigns.

In 2017, total delivery costs for TT vaccine for women aged 15-35 was USD 1,582,182 and for Td vaccine campaign was USD 145,314. The delivery costs for Td vaccine for children aged seven were simulated for 2017 at USD 1,552,273. All costs were assumed to increase annually by 3% during the period 2018-2022. At the first transitional year, the current strategy of TT vaccine for women aged 15-35 and Td campaign at high-risk areas was assumed to remain with 80% of coverage. The new strategy of Td vaccine for children aged seven was assumed to reach 20% of coverage. The cost savings from the replacement was about USD 36,096. For the years after the transitional year, the old strategy was

assumed to completely replace the new strategy. The cost savings from the replacement was larger than USD 203,131 and was sensitive to targeted coverage of the old and new strategy.

It was concluded that replacing TT vaccine for women aged 15-35 with the Td vaccine for children aged seven may help to save the EPI budget whilst protection from diphtheria is enhanced. Because of the large amount of costing data collected for this study, it is intended for use as an input to other policy questions in Vietnam regarding universal health coverage, new vaccine introduction, and more. As Vietnam plans to introduce at least one new vaccine in the coming years to expand their fight of infectious diseases, the budget impact of the Td introduction can help inform budgeting and planning for this and other new vaccines.

1:30 PM –3:00 PM MONDAY [Economic Evaluation Of Health And Care Interventions]

Universität Basel | Kollegienhaus – Hörsaal 114

Organized Session: Making the Best Choice: Outcome Selection for Economic Evaluation of Obesity Prevention and Treatment over the Life Course

SESSION CHAIR: **Emma Frew**, University of Birmingham

Can Early Childhood Obesity Prevention be Cost-Effective in the Short Term?

PRESENTER: **Alison Hayes**, University of Sydney

AUTHOR: Dr. Eng Joo Tan

Background: There is global interest in the benefits of early childhood obesity prevention. A Cochrane systematic review has shown a significant but small overall effect in children under 5 years but provided no information on cost-effectiveness nor the costs of intervention delivery. We have developed an individual–level model – the Early Prevention of Obesity in Childhood (EPOCH) model to project BMI, QALYs and direct healthcare costs from early childhood to late adolescence. The model is informed by Australian population representative data on children, systematic reviews and other published literature.

Objective: To use the EPOCH model and intervention effect sizes determined from a systematic review, to project expected health benefits (QALYs and BMI reduction) and healthcare cost-savings accruing until late adolescence. Secondly, to determine the range of intervention costs per child for ICERS to be within standard cost/QALY thresholds.

Data and Methods: The base case (control) scenario was modelled using data from children aged 4/5 years from an Australian population representative survey, the Longitudinal Study of Australian Children(LSAC). The average intervention effect size of 0.26kg/$m^2$from a Cochrane review of interventions for preventing obesity in children (aged 0-5 years) was applied to the LSAC data, using a distribution shift method. The intervention effect was reflected only through the two base populations – intervention and control. Using the EPOCH model, ICERS were calculated over 5 and 10 years, for a range of intervention costs ranging from $AUD100 to $AUD2000. Costs and effects were discounted to net present values. We determined the probability of being cost-effective at a threshold of $AUD50,000/QALY for each intervention delivery cost and over two time horizons (5 and 10 years).

Results: At age 10 years incremental BMI and incremental QALYs were 0.32 kg/$m^2$and 0.009 units. At 15 years incremental BMI and QALYs were 0.35 kg/$m^2$and 0.0140 units. The model predicted some cost offsets due to savings in direct healthcare costs as a result of the intervention. Over the 5-year time horizon, an intervention that produced a difference in BMI of 0.26 units at age 4 years had a greater than 90% probability of being cost-effective for interventions costing up to AUD$400 (US$249). Considering the 10-year time horizon, the same intervention effect size had a greater than 90% probability of being cost-effective for interventions costing up to AUD$660 (US$412). Interventions costing more than $1100 for this effect size were extremely unlikely to be cost-effective. Whilst the EPOCH model also predicted incremental BMI, willingness to pay per unit BMI has not been established -thus cost-effectiveness based on BMI could not be determined.

Conclusion: Based on effect sizes from the Cochrane review, obesity prevention in early childhood can be cost-effective provided intervention delivery costs per child are modest. These are important considerations in the design of early childhood obesity prevention programmes. Cost-effectiveness improved with extended time horizon – an important message for policy makers. Willingness to pay studies for BMI reduction would greatly enhance the ability to interpret cost-effectiveness ratios based on incremental cost/BMI unit saved.

Cost-Effectiveness and Cost-Utility of an Early Childhood Obesity Prevention Programme: Modelled Economic Evaluation of the Prevention of Overweight in Infancy (POI) Trial

PRESENTER: **Dr. Eng Joo Tan**, University of Sydney

AUTHORS: Rachael Taylor, Barry Taylor, Vicki Brown, Alison Hayes

Background: Evidence of cost-effectiveness of early childhood obesity prevention is scarce. Most childhood obesity prevention programs are, by necessity,conducted over a short time period without extended follow-up. As benefits from these programs will likely extend beyond the intervention period it is important for these to be captured in a corresponding CEA or CUA. Most published economic evaluations pertain to either trial-based cost-effectiveness analyses, or modelled economic evaluations that take a lifetime horizon and account only for healthcare costs and quality of life in later life. The Prevention of Overweight in Infancy (POI) was a 4-arm randomized controlled trial including sleep,

nutrition and physical activity education delivered in the first 2 years of life. Children in the sleep intervention had significantly lower BMI-z scores at age 4 years whilst other arms of the trial had no significant effect.

Objective: To carry out modelled economic evaluation using individual-level data from POI conducted in New Zealand. As benefits from this program will likely extend beyond early childhood, we carried out cost-effectiveness and cost-utility over a child and adolescent time horizon.

Data and Methods: The economic evaluation used the EPOCH model, based on population-representative data from the Longitudinal Study of Australian Children, a published meta-analysis of the association between utility and weight status and national direct health care costs. We initialized the model with individual level data from children aged 4 years old from the sleep and control arms of POI. No persistent intervention effect was assumed, and simulations were run separately for the sleep and control groups to age 15 to determine mean BMI, QALYs and direct healthcare costs. The cost of delivering the sleep intervention was determined in 2018 Australian dollars using standard micro-costing techniques. Incremental cost-effectiveness ratios (ICERs) were determined, with costs and outcomes discounted at 5%.

Results: At age 15, the model predicted notable differences in BMI but only small QALY differences between the two groups. Simulated mean BMI in the sleep and control groups was 22.7kg/m^2 (95% CI 22.2 – 23.2) and 23.2 kg/m^2(95% CI 22.8 – 23.7) respectively, a difference of 0.54 units. Simulated mean QALYs in the sleep and control groups were 10.10 (95% CI 10.08 – 10.12) and 10.11 (95% CI 10.09 – 10.13) respectively, a difference of 0.01 QALYs. The mean cost of the sleep intervention was AUD$115 per child. Over the 11 years, mean total discounted costs (including intervention cost) were slightly higher at AUD$7,610 per child in the sleep group compared to AUD$7,528 per child in the control group. The ICERs were AUD$258 (US$161) per unit BMI avoided and AUD$8,930 (US$5,569) per QALY gained.

Conclusions: Despite the relatively small difference in QALYs between the two groups, the sleep intervention was highly cost-effective based on a nominal AUD$50,000/QALY threshold. Regarding ICER for BMI, the sleep intervention would appear to be more cost-effective than similar interventions in this age group using the same outcome, but willingness to pay thresholds are unknown. The strengths and weaknesses of using the two different outcome measures will be discussed.

Cost-Effectiveness of the Chirpy Dragon Obesity Prevention Intervention in Chinese Primary School-Aged Children: A Cluster-Randomised Controlled Trial

PRESENTER: **Dr. Mandana Zanganeh**, University of Birmingham

AUTHORS: Peymane Adab, Bai Li, Emma Frew

Background: Rapid socioeconomic and nutritional transitions in urban Chinese populations over a relatively short period have contributed to the rising prevalence of obesity among children. However, relatively few intervention studies have been undertaken and, in China, only one of these included economic evaluation. Economic evaluation is important as a means to aid decisions about public resource allocation.

Objective: To estimate the costs and cost-effectiveness of the ‘CHIRPY DRAGON’ obesity prevention intervention, developed for school children in China.

Data and methods: We conducted an economic evaluation alongside a cluster-randomised controlled trial of this intervention, targeting children in 40 primary schools in China. The 12-month programme, delivered by five Chinese trained project staff, included educational and skills-based workshops aimed at children aged 6-7 years and their carers (parents or grandparents) to promote physical activity and healthy eating in children within and outside school; a school food improvement component involving school caterers; and a school daily physical activity initiative. Control schools continued with usual activities. We estimated cost-effectiveness based on cost per Quality-Adjusted Life Year (QALY) and BMI z-score change. Utility-data was collected using the CHU-9D for children and EQ-5D-3L for carers; applying the UK value set for both. Resource use data was collected from both public and societal perspectives. All costs are reported in Chinese Yuan at 2016-2017 prices and converted into Pounds/US Dollars using Gross Domestic Product Purchasing Power Parities (GDP PPPs). To estimate cost-effectiveness, we calculated the incremental cost-effectiveness ratio (ICER) based on the fully adjusted costs and effects. In the absence of an agreed Chinese threshold for the value of a QALY, decision uncertainty was assessed using established UK and US thresholds, and presented using Cost Effectiveness Acceptability Curves (CEAC).

Preliminary results: 40 schools with 1641 children were randomised (intervention: 20 schools, 832 children). For the public sector perspective, complete cost and outcome data were available for > 95% of children, thus no imputation was needed. Assuming an average class size of 45, the incremental cost of the intervention was 35.53 Yuan (£7.04/ US$10.01) per child. QALY and BMI z-score mean difference between groups were 0.004 (0.000 to 0.007, p= 0.034) and - 0.13 (-0.26 to 0.00, p= 0.048) in the baseline adjusted models respectively, and 0.004 (-0.000 to 0.008, p= 0.056) and -0.13 (-0.26 to -0.01, p = 0.041), in the further adjusted models respectively. The ICER was £1,760 (US$2,502) per QALY, which is far below the £20,000 per QALY and $50,000 per QALY thresholds for cost-effectiveness in the UK and US respectively. The ICER was £54 (US$77)/BMI z-score change. The CEAC showed a 95% probability of the intervention being cost effective at a willingness to pay threshold of £20,000 per QALY. The economic evaluation from a societal perspective is in progress.

Conclusions: A number of methodological challenges were encountered within the economic evaluation. The economic evaluation from a public sector perspective suggests that the intervention is a highly cost-effective use of public resources in reducing the problem of childhood obesity in China.

Evaluating the Impact of Weight Loss Interventions – What Economic Endpoints Are Meaningful in Clinical Trials?

PRESENTER: **Magda Aguiar**, University of Birmingham

AUTHORS: Ryan Ottridge, Susan Mollan, Natalie Ives, J L Mitchell, C Rick, Alexandra J Sinclair, Emma Frew

Background: Evaluating the impact of weight loss in clinical trials is methodologically challenging. Trials have a limited time-frame in which the observed weight variation is often minimal, and hard to sustain in the long term. There is a need to define and evaluate weight loss beyond the clinical scope as changes in BMI that are not statistically significant can have meaningful impact on other important aspects of life such as social wellbeing, empowerment, and self-esteem. Idiopathic intracranial hypertension (IIH) occurs predominantly in women with obesity and can cause migraines and in severe cases, blindness. It has a marked impact on women's health and wellbeing. The treatment options are bariatric surgery and a commercial weight loss programme, and can be paid for by a socially insured health system, such as the UK National Health Service (NHS), or privately by individuals. IIH offers a unique research context to assess several economic outcome measures: quality adjusted life years (QALYs); Capabilities; and the Willingness to Pay (WTP) method; as well as to explore different conceptual frameworks for economic evaluation.

Aims: We aim to explore the use of different outcome measures for economic evaluation in weight loss trials, using the treatment of IIH as a case study.

Methods: As part of the 'IIH: Weight' randomised clinical trial, data was collected from patients on their quality of life using the EQ-5D-5L, capabilities using the ICECAP-A, and WTP. An economic evaluation will be undertaken to estimate cost per QALY (cost-utility analysis); a cost per year of full capability; and a cost per sufficient capability (cost-capability analysis). A cost-benefit analysis will then be conducted using the WTP measure as a monetary unit of outcome. Moreover, descriptive statistics will be generated to understand the correlation between the different outcome measures.

Results/Discussion: The treatment recommendations from each type of economic evaluation will be directly compared and critiqued in light of the context for decision making. This study will have methodological and policy implications in terms of how economic evaluations are designed for complex interventions with costs and consequences that fall outside the health sector.

1:30 PM –3:00 PM MONDAY [Production Of Health, Health Behaviors & Policy Interventions]

Universität Basel | Kollegienhaus – Hörsaal 115

Education, Schooling and Work #2

SESSION CHAIR: **Md Zabir Hasan**, Johns Hopkins Bloomberg School of Public Health

Unintended Consequences of the Chilean Labour Reform: The Impact of Reducing Working Hours on Health

PRESENTER: **Mr. Nicolas Libuy**, University College London

Does working long hours lead to health problems? This question is relevant to several related bodies of literature in psychology, epidemiology, and economics. While working prolonged hours is known to be associated with poor health, there have been few attempts to causally link long work hours with individual's well-being and objective health measures. I study this relevant policy question by exploiting the compulsory reduction in standard weekly working hours from 48 to 45 in Chile. I focus on tobacco use and frequency of exercise as objective measures of health, and self-assessment health, as a subjective measure of health. I use difference-in-difference methods to overcome potential endogeneity and reverse casualty issues present in previous literature.

I find that the reform caused an average reduction of 3.0 hours per week, and as mandated by the law, did not cause a reduction in earnings. Overall, I do not find an effect on objective measures of unhealthy behaviours such as smoking or sedentary lifestyle, nor on subjective measures of health such as self-assessed health (SAH); however, this masks important effects across different subgroups. In particular, I find that the reform improves health among women and low educated workers by lessening objective unhealthy behaviours such a sedentary lifestyle and tobacco consumption. Women affected by the reduction on standard working hours, reduced, but non-significantly, the probability of tobacco consumption by 3.8 percentages points and increased, significantly, the probability of regular exercise by 10.1 percentage points. The increase in regular exercise is more pronounced among women doing exercise at least once per week (8.6 percentage points). More importantly, working women affected by the reform reduced the probability of having multiple health risks by 9.9 percentage points. For workers with lower education, the reform reduced the probability of smoking by 5.9 percentage points and 5.1 the probability of smoking 5 or more cigarettes per week. Although the reduction on standard working hours is associated with improvement on objective measurement of health behaviours for women and low educated workers, my analysis does not suggest a significant effect on self-assessment health.

Mandated Sick Pay: Coverage, Utilization, and Substitution Effects

PRESENTER: **Catherine Maclean**, Temple University

AUTHORS: Stefan Pichler, Dr. Nicolas Robert Ziebarth

Objectives

To estimate the impact of sick pay mandates on coverage rates, utilization, labor costs and the spread of diseases in the United States. US sick pay mandates typically allow employees to earn one hour of paid sick leave per work week, up to seven days per year. On the one hand, an economic justification for publicly provided access to paid sick leave is "presenteeism" and negative externalities associated with the spread of contagious diseases. Workplace presenteeism is one important channel through which infectious diseases spread. In addition, sick pay mandates may help providing paid leave minimum standard and reduce inequality in the labor market. On the other hand, critics argue that government mandated sick pay could hurt employment or wage growth. They argue that the private companies would private paid sick leave voluntarily if they are valued by employees and optimal.

Methods

We use difference-in-differences methods and variation across regions and over time to assess the causal effects of sick pay mandates on coverage rates, utilization, labor costs and the spread of diseases. Sick pay mandates were passed and implemented in San Francisco (2007), Washington D.C. (2008), Seattle (2012), New York City (2014), Portland (2014), Newark (2014), Philadelphia (2015), and Oakland (2015). On the state level, Connecticut (2012), California (2015), Massachusetts (2015) and Oregon (2016) implemented sick pay mandates. We use the National Compensation Survey and doctor-certified influenza-like illness (ILI) rates at the week-state level.

Results

In the first two post-mandate years, the likelihood to obtain sick pay coverage increased significantly by 9 percentage points from a baseline level of 64 percent; coverage remains stable at this level for at least four more years. We find that newly covered employees take about two additional sick days in the first quarter of the year. These additional sick days increased labor costs by about 23 cents per hour worked for marginal firms. However, we find very little evidence that mandated sick pay crowded-out other non-mandated paid leave benefits. In addition, we find evidence that infections decreased significantly as a result of the mandates.

Conclusions

Sick pay mandates are effective in increasing coverage rates. Employees are significantly more likely to take sick days when they are covered. We also find clear evidence that ILI rates decrease significantly in response.

The Challenge of Scaling up Early Childhood Development Interventions and a Potential Solution

PRESENTER: **Prof. Jolene Skordis-Worrall**, Deputy Director, University College London Institute of Global Health

AUTHORS: Roy Head, Tessa Swigart

One of the perennial challenges facing the public health community is taking proven health interventions to scale. For interventions which require a behavioural change by the public, mass media has often been proposed as part of the solution: it is certainly one of the very few ways of reaching millions of people at a time. There has been no scientific consensus, however, on its effectiveness: until recently, no randomised controlled trial, anywhere in the world had shown that mass media can change behaviours.

The trial conducted in Burkina Faso by DMI and LSHTM provides that missing evidence. Over a three year period, treatment-seeking messages on malaria, diarrhoea and pneumonia were broadcast on radio ten times daily, every day, in 7 intervention clusters, and the results compared to baseline and to 7 control clusters. The impact was measured by using data on more than 600,000 consultations collected by public health centres. It showed a 56% increase in malaria consultations ($p<0.001$), 39% increase in pneumonia consultations ($p<0.001$), and 73% increase in diarrhoea consultations ($p<0.001$) in the first year of the campaign.

We will also discuss our plans to test the impact of mass media on parental behaviours related to early child development (ECD), to see it has a role to play in taking ECD interventions to scale.

Health Outcomes of Educational Mismatch: A Direct Effect or a Matter of Reporting Heterogeneity? Evidence from the Russian Federation

PRESENTER: **Mariia Vasiakina**, University of Insubria

AUTHOR: Silvana Robone

Our paper aims at contributing to the literature on socioeconomic determinants of health and innovates over the recent studies on educational mismatch by investigating the impact of both over-education and under-education on both subjective and objective health outcomes of employees - self-assessed health (SAH) and hypertension. We conduct a longitudinal gender-specific analysis on a sample of currently working employees from the Russia Longitudinal Monitoring Survey (RLMS-HSE) (2000-2014) and estimate dynamic correlated random effects ordered probit and probit models for SAH and hypertension, respectively. Our results provide evidence that both over-education and under-education are related to the objective health measure but the effect can only be observed for the male sub-sample, i.e. over-educated men are 1.5 percentage points more likely to be hypertensive than their matched counterparts, while under-education reveals a ‘protective’ effect against hypertension which equals to 1.9 percentage points. No impact of educational mismatch on SAH is observed in both gender groups. Due to lack of consistency between the estimates for subjective and objective health outcomes, we make the hypothesis that SAH might be affected by the issue of reporting heterogeneity. To test this hypothesis, we adopt the hierarchical ordered probit (HOPIT) model estimation which requires the use of anchoring vignettes. Since the RLMS-HSE does not contain vignettes, we proxy our original subjective health measure with some EQ-5D indicators - pain, anxiety and depression (all self-reported) - and merge the RLMS-HSE (2005) (where the EQ-5D questions were asked) with vignettes from the Russian profile of the World Health Survey (2003). When performing such merge, we follow the method proposed by

Harris et al. (2015). Our findings from the HOPIT models for men indicate that, after purging the data from reporting heterogeneity, under-education directly affects anxiety and depression, providing a 'protective' effect against them. However, such effect seems to be totally absorbed by the pessimistic reporting style of men. Hence, reporting heterogeneity might be a possible explanation for the lack of consistency between the estimates for SAH (where we do not find any effect of under-education) and hypertension (where the effect is positive and significant) in the male sub-sample.

1:30 PM –3:00 PM MONDAY [Production Of Health, Health Behaviors & Policy Interventions]

Universität Basel | Kollegienhaus – Hörsaal 116

Economics of Ageing: Dementia and Cognitive Impairment

SESSION CHAIR: **Sabrina Lenzen**, The University of Queensland

A Dynamic Microeconomic Analysis of the Impact of Physical Activity on Cognition Among Older Europeans

PRESENTER: **Sabrina Lenzen**, The University of Queenland

AUTHORS: Brenda Gannon, Christiern Rose

Aim: The aim of this paper is to analyse the dynamic relationship between physical activity and cognition using data from 5 waves of the Survey of Health, Ageing and Retirement in Europe between 2004 and 2015.

Background: Cognitive impairment is the forerunner of dementia, which is of growing societal concern, especially due to its increasing prevalence and costs caused by an ageing of the population. Conditional on the health investment framework of the Grossman model, we consider physical activity (PA) to be an investment in good health. The model assumes a dynamic relationship of health where past health has a direct influence on the current health, also called state dependence. Previous studies, however, do not account for the effects of preceding cognition. An additional challenge in estimating the effect of PA on cognition are several endogeneity problems caused by unobserved heterogeneity, reverse causality and measurement error of PA. There is a paucity of economics literature addressing those issues with appropriate econometric techniques, estimating a causal effect.

Method: Based on the economic theory by Grossman we apply a standard microeconomic approach to dynamic panel data to estimate the effect PA has on cognition among older Europeans over an 11-year period. To overcome the endogeneity of PA and account for the dynamics of cognition, we propose a system - generalized method of moments (GMM) estimator for dynamic panel data models, using the lagged levels and differences of the endogenous explanatory variables as instruments, while controlling for a wide range of socio-economic and lifestyle factors and transforming out the fixed effects. For our analysis, the memory status of respondents measured on a scale from 0 to 20 is used as a proxy for cognition. To understand the effects of state dependence and endogeneity we use three other models: a classical ordinary least square (OLS) regression, a first-difference and a system-GMM model with the assumption that PA is exogenous.

Results: We find for all models that PA is associated with better memory status of respondents. Using our preferred system-GMM estimator we find evidence of a causal link from PA to cognition. It is estimated that being moderately physically active at least once a week compared to not increases the memory status of male respondents on average by 0.225 standard deviations (SD) and of female respondents by 0.335 SD. We find higher intensity PA - also being vigorously active - having a larger effect, an increase of 0.481 SD and 0.519 SD for males and females respectively. In general, estimates are much larger having accounted for state dependence and endogeneity of PA. This is especially due to two forms of measurement error, biasing estimates towards zero.

Conclusion: This paper provides empirical evidence of the causal effect of PA on cognition. Our results show that engaging in moderate and vigorous PA at least once a week has a significant impact on the memory of respondents. This supports the need to promote PA in order to prevent cognitive decline and the onset of dementia.

Self-Assessed Cognitive Ability and Financial Wealth: Are People Aware of Their Cognitive Decline?

PRESENTER: **Fabrizio Mazzonna**, Universita' della Svizzera italiana

We investigate whether people correctly perceive their own cognitive decline and the potential financial consequences of misperception. Using longitudinal data from the Health and Retirement Survey, we examine the relationship between self-ratings of memory ability and assessed memory performance and show that older people tend to underestimate their own cognitive decline. We then investigate the financial consequences of this underestimation. We show that respondents who experience a severe cognitive decline across waves, but are unaware of it, are more likely to experience financial losses. Substantial wealth losses across waves are mainly reported by people in the third and fourth quartiles of the distribution of total wealth, and amount to an average decline of 4% in mean total wealth across waves. These losses are mainly driven by large decreases in the real value of financial wealth (about 10% on average across waves), particularly in the value of stocks, mutual funds and investment trusts owned. Finally, we examine potential explanations for the patterns of wealth changes observed among respondents who are unaware of their cognitive decline. Our findings support the view that financial losses among unaware respondents reflect bad financial decisions, not rational disinvestment strategies.

Total and Post-Discharge 30-Day Episode Payments for Beneficiaries with Alzheimer's and Dementia

PRESENTER: **Mr. Neil Kamdar**, University of Michigan

AUTHORS: John Syrjamaki, Dr. Elham Mahmoudi

Objective: There has been a paucity of evidence for post-discharge cost and utilization of healthcare services for older adults with Alzheimer's and dementia (AD) with Medicare Managed Care or Medicare Fee-For-Service (FFS) beneficiaries following a broad set of surgical procedures. We hypothesized that patients with AD would have higher utilization and costs across patient care settings attributable to their condition. After controlling for clinically relevant factors contributing to selection bias, we sought to quantify the incremental episode payments associated with AD compared to those without AD. The overarching goal of this study is to identify the most effective post-discharge process for patients with AD.

Study Population: We utilized administrative claims data between January 2012 and June 2017 from the Michigan Value Collaborative (MVC), a Blue Cross Blue Shield of Michigan (BCSBM) Collaborative Quality Initiative (CQI) including BCBSM PPO and Medicare FFS patient population across 31 different medical and surgical services for 77 hospitals in Michigan. We identified all patients with AD with any evidence of a diagnosis code throughout their enrollment during the study period using International Classification of Diseases (ICD-9-CM, ICD-10-CM) codes.

Methods: Using the Medicare Fee Schedule to perform price standardization, 30-day episode payments were divided into various components based on patient care setting and claim type: post-acute care, professional, index facility, readmission, and total payments. Post-acute care includes skilled nursing facility admissions, inpatient/outpatient rehabilitation, emergency department (ED) visits, home health services, and other outpatient visits. All payments were risk adjusted using multivariable logistic regression using Hierarchical Condition Categories, age, gender, insurance type, and prior 6 month payments. To account for potential skew in the standardized, risk adjusted payment distribution, payment winsorization was performed at the $99^{th}$and 1^{st}percentiles. Controlling for selection bias, we performed propensity score matching at a caliper of 0.001 without replacement adjusting for all surgical service lines, HCCs, insurance type (BCBSM-PPO vs. Medicare FFS), and age at the time of surgery. Sensitivity analysis via varying caliper at 0.05 was also performed. Pre and post propensity matched differences in the aforementioned episode payments were examined using standardized mean differences.

Results: There were noteworthy differences in 30-day total episode payment as well as post-acute care and readmission episode payments. Adjusted episode payments for patients with AD were substantially higher compared to those without evidence of disease ($22,374 vs. $19,593; 95% CI Difference: ($2,656, $2,906)). Post-acute care and readmission payments were also substantially higher among AD patients ($4,548 vs. $3,289; 95% CI Difference: ($1,204, $1,314) and ($1,807 vs $1,186; 95% CI Difference: $574, $670), respectively. There were slight differences in the index surgical payments ($12,799 vs. $12,418; 95% CI Difference: $380-$445).

Conclusion: While surgical costs do not differ significantly between AD and other patients, post-operative episode costs are notably higher for patients with AD. There is strong evidence to suggest that resource intensity and utilization in the postoperative period for AD patients should require further examination. Proper post-operative management of AD patients could improve health and well-beings of adults with AD and reduce the financial burden.

Cognitive Functioning in Older Age: A Life Span Health Production Function Approach

PRESENTER: **Nasim B. Ferdows**, University of Southern California

Background. Cognitive impairment which is the intermediate stage between cognitive decline associated with aging and dementia, is often related to declines in quality of life among older adults, and Alzheimer's disease, thought to be the most common underlying pathology for elders' cognitive dysfunction, is already the sixth leading cause of death in the US. Greater longevity increases the lifetime risk of memory diseases that compromise the cognitive abilities vital to well-being. Thus, with the growing population of older adults, we should be more concerned about their cognitive health. Being cognitively healthy in later life is a lifelong process. Life-course theory postulates that our ultimate health outcomes are, in part, a response to an accumulation of advantages and disadvantages that begin early in life. The life-course perspective describes a dynamic process between social status and health, emphasizing that personal development is a lifelong process, and such development interacts with the social environment to create trajectories of well−being.

Objective. To explain the value of taking a life-span approach to study cognition in later life, and to address the associations between childhood characteristics and cognitive achievement at older age; quantifying the direct and indirect effects of childhood characteristics on cognitive achievement.

Methods. The outcome is level of cognitive functioning, measured by the score obtained on the Telephone Interview of Cognitive Status (TICS) derived from a self-responded cognition questionnaire (range = 0-35). We estimated cognitive functioning as the output of a health production function, produced by childhood health and socioeconomic status, adult socioeconomic achievements (education, income, wealth), current factors (social engagement, disability, disease), and pertinent demographics. Using structural equations mediation modeling, we quantify how childhood factors contribute to cognitive functioning, both directly and indirectly through their effects on mediating adult outcomes.

Population Studied. 9,105 individuals from 2012 Health and Retirement Study, a nationally representative survey of older Americans.

Findings. Favorable childhood characteristics have positive implications for cognitive functioning at older age. The effects of childhood factors are manifested directly and indirectly through early- and mid-adulthood socioeconomic achievement. Having educated parents and good health during childhood increased cognitive functioning at older age both directly and indirectly through education, income and wealth. Current behaviors like being socially engaged increased level of cognition and having major disease or disabilities were associated with lower levels of cognition. Being female, married and white were associated with higher cognitive functioning.

Conclusion. We found cognition at older age was a function of both childhood and adult factors including later life factors. The association between childhood characteristics and cognition were both direct and indirect; they operate through the education choices made as a young adult, and through income and wealth, which typically accumulate steadily over one's working years. Because education, income and wealth positively affect cognition, they transmit the imprint of childhood circumstances onto cognitive functioning in later life. Therefore, these findings underscore the value of taking a life-cycle approach to study cognition in later life. They suggest that the pathways from childhood factors to cognitive health at older age could be more complex than previously reported.

1:30 PM –3:00 PM MONDAY [Evaluation Of Policy, Programs And Health System Performance]

Universität Basel | Kollegienhaus – Hörsaal 117

Organized Session: Leveraging Strategic Purchasing to Ensure People Access to Affordable and Quality Healthcare Services

SESSION CHAIR: **Budi Hidayat**, Center for Health Economics and Policy Studies (CHEPS), Faculty of Public Health, Universitas Indonesia

PANELISTS: **Professor Nila Djuwita Faried Anfasa Moeloek**, Minister of Health of the Republic of Indonesia; **Fachmi Idris**, CEO of the Indonesian Social Security Administrator for Health, BPJS Kesehatan; **Dede Yusuf, ST, M.IP**, Chairperson Commission IX of the House of Representatives of the Republic Indonesia; **Cheryl Cashin, MA, PhD**, Managing Director of the Results for Development (R4D), Washington DC

1:30 PM –3:00 PM MONDAY [Evaluation Of Policy, Programs And Health System Performance]

Universität Basel | Kollegienhaus – Hörsaal 118

Organized Session: TB Treatment Adherence and Quality

SESSION CHAIR: **Eddy Van Doorslaer**, Erasmus University Rotterdam

Nudges As a Tool to Improve TB Treatment Initiation. Results from an RCT.

PRESENTER: **Ronelle Burger**, Economics Department, Stellenbosch University

AUTHORS: Adam Wagstaff, Dr. Eddy Van Doorslaer

TB persists despite being relatively easy to detect and cure, the reason being that journey from the onset of symptoms to cure involves a series of steps, with patients being lost to follow-up at each stage and delays occurring among patients who are not lost to follow-up. One cause of drop-off and delay occurs when patients delay or avoid returning to clinic to get their TB test results.

Methods: We fielded two SMS interventions in 3 Cape Town clinics to see their effects on whether people returned to get their TB results, and how quickly. One SMS was a simple reminder; the other aimed to overcome "optimism bias" by reminding people TB is curable and many millions die unnecessarily from TB. Recruits were randomly assigned at the clinic level to a control group or one of the two SMS groups (1:4). Data on return-to-clinic date were obtained via fieldworker interactions with patients and cross-checked with patient files. In addition to estimating effects on the full sample, we also estimated effects on HIV-positive patients. HIV status was obtained from Cape Town's health information system and South Africa's South Africa's Electronic Tuberculosis Register (ETR.Net).

Findings: SMS recipients were more likely to return to clinic in the requested two days than the control group. The effect was smaller in the intent-to-treat analysis (310/511 or 60.7% vs. 80/150 or 53.3%, p=0.108) than in the per protocol analysis (203/319 or 63.6% vs. 57/114 or 50%, p=0.011). The effect was smaller among the sample as a whole than among HIV-positives (76/113 or 67.3% vs. 13/42 or 31%, p<0.001). The second SMS message had larger effects in the per-protocol analysis. Over the return-to-clinic time intervals tested (2, 5, 10 and 20 days), we see a 1.7 point difference, on average, among the full sample in the per-protocol analysis, and a 9.1 point difference, on average, in the HIV-positive subsample, although none of the differences is statistically significant.

Interpretation: At 2 U.S. cents per message, SMS reminders are an inexpensive option to encourage TB testers to collect their results, especially when worded to counter optimism bias.

A Model of Treatment Adherence: Application to Tuberculosis in South Africa

PRESENTER: **Wen Qiang Toh**, Erasmus University Rotterdam

The few existing economic models of adherence to medical treatment either capture only a one-shot decision, or are unable to account for discontinuation of treatment after symptoms have receded. To plug these gaps, I formulate a multi-period model that allows treatment adherence to be considered in relation to treatment initiation, and for non-adherence to occur even after medication appears to have been effective, at least in relieving symptoms. I incorporate quasi-hyperbolic discounting and find that present bias reduces the likelihood of both treatment initiation and adherence. The more sophisticated is an individual, the more present bias works at the initiation margin rather than the adherence margin. I

calibrate the model to the treatment of tuberculosis in South Africa and use it to identify key drivers of failure to complete a course of medication in that context. This points to cost shocks and beliefs in partial treatment effectiveness as significant causes of non-adherence, while present bias and naivety do not contribute significantly.

Using Standardized Patients to Measure the Quality of Tuberculosis Care: Lessons from 3,193 Provider Visits in Three Countries

PRESENTER: **Benjamin Daniels**

In low- and middle-income countries (LMICs), health care markets are widely believed to provide low quality care to people with tuberculosis (TB), resulting in 1.7 million annual TB deaths globally. (WHO 2017) LMICs have very different health care systems, and many have made significant progress in increasing affordable access to TB care. Whether that care is high quality is another question, as is how quality can be improved for vulnerable populations. Quality is difficult to define and measure, especially in decentralized systems, and "structural" measures such as equipment and medicine availability do not reliably predict clinical performance. (Das and Gertler 2007) Today, the gold standard for the measurement of clinical quality is the use of 'standardized patients' (SPs) — people recruited locally and trained to make identical clinical presentations incognito to a large number of healthcare providers. (Das et al 2015) This work summarizes lessons learned from implementing standardized patients presenting as patients with tuberculosis at a wide variety of clinical settings in India, China, and Kenya. (Kwan et al 2018; Sylvia et al 2017; Daniels et al 2017)

We summarize four global findings here using a combined sample of 3,193 SP-provider interactions across those three countries. First, quality is low: only 35–50% of SPs presenting to a health care provider for the first time were managed in accordance with national and international standards of TB care. Second, "incorrect" care takes a wide variety of forms – SPs do not generally receive potentially appropriate "wait and see" or "palliative" approaches from providers, but they receive a medley of care patterns that include broad-spectrum antibiotics as well as contraindicated quinolone antibiotics and steroids, which can mask TB symptoms from future diagnosis (although they do not typically receive inappropriate anti-TB medications). Third, there is a wide range of estimated quality in each provider stratum: more-qualified providers and higher-level facilities performed significantly better than others in all three settings, but in every group there were both high- and low-quality providers.

Finally, we present results from an experiment where SPs present providers with laboratory tests. In this experiment, SPs clarify that they do not know what the tests imply, thus preserving the asymmetry of information between the patient and the provider, while at the same time, increasing the availability of diagnostic information for the provider. Our experiment shows that greater diagnostic information improves correct case management and decreases unnecessary medicine use among private sector providers. This result is inconsistent with a model of pure profit maximization among providers.

1:30 PM –3:00 PM MONDAY [Supply Of Health Services]

Universität Basel | Kollegienhaus – Hörsaal 119

Organized Session: Quality of Health Care: Measurement, Its Variation with Patients' Socio-Economic Status and the Role of Incentives.

SESSION CHAIR: **Eeshani Kandpal**, Development Research Group, The World Bank

Does Provider Effort Constrain Healthcare Quality? Evidence from Antenatal Care Visits in the Democratic Republic of Congo and Nigeria

PRESENTER: **Eeshani Kandpal**, The World Bank

AUTHORS: Jeanette Walldorf, Gil Shapira

Low quality healthcare provision may arise for at least three reasons: poor infrastructure, inadequate training, and a lack of effort. Using direct observations of first antenatal care (ANC) visits in 585 primary health centers in the Democratic Republic of Congo and Nigeria, we benchmark observed care against the WHO ANC protocol. Then, we estimate the share of consultations in which the providers know they should perform an action, have all needed equipment and supplies, and yet do not perform the necessary action. Low effort explains a third of observed under-performance, including in risk screening— for example, asking about complications in prior pregnancies— which does not entail supplies or equipment. Finally, we examine the correlates of effort provision to show that knowledge and experience are imperfect predictors of effort, and that, ceteris paribus, female providers outperform males. These results show that improving health outcomes may require policies eliciting greater provider effort to bolster infrastructure investments.

Inequality in Quality of Health Services: Wealth, Content of Care and Price of Antenatal Consultations in the Democratic Republic of Congo

PRESENTER: **Gil Shapira**

AUTHORS: Günther Fink, Eeshani Kandpal

Using unique direct clinical observation data linked to detailed demographic surveys of households, we show the existence of a significant wealth-quality gradient in the context of antenatal care in the Democratic Republic of Congo: a 1 SD increase in household wealth increases ANC quality by 0.14 SD, and women with secondary education obtain 0.33 SD higher quality ANC than those without schooling. We show that

these large quality differences can be decomposed into three principal factors: lower facility quality in poorer areas, increased propensity to seek care at higher quality facilities among wealthier women, and within-facility discrimination. At the facility level, the total price paid for consultations increases both with the quality of the services provided and the wealth of the woman. Comparison of areas with different wealth distributions suggests that the wealth-price relationship is driven by profit maximization rather than by charging higher fees to wealthier women to subsidize the cost of serving the poor.

Encouraging Service Delivery to the Poor: Does Money Talk When Health Workers Are Pro-Poor?

PRESENTER: **Damien de Walque**, The World Bank

AUTHORS: Sheheryar Banuri, Philip Edward Keefer, Paul Jacob Robyn

Do service providers respond to pecuniary incentives to serve the poor? Service delivery to the poor is complicated by the extra effort required to deliver services to them and the intrinsic incentives of service providers to exert this effort. Incentive schemes typically fail to account for these complications. A lab-in-the-field experiment with nearly 400 health workers in rural Burkina Faso provides strong evidence that the interaction of effort costs, ability, and intrinsic and extrinsic incentives significantly influences service delivery to the poor. Health workers reviewed video vignettes of medical cases involving poor and nonpoor patients under a variety of bonus schemes. Bonuses to serve the poor have less impact on effort than bonuses to serve the nonpoor; health workers who receive equal bonuses to serve poor and nonpoor patients see fewer poor patients than workers who receive only a flat salary; and bonuses operate largely through their influence on the behavior of pro-poor workers. The paper also presents novel evidence on the selection effects of contract type: pro-poor workers prefer the flat salary contract to the variable salary contract.

1:30 PM –3:00 PM MONDAY [Supply Of Health Services]

Universität Basel | Kollegienhaus – Hörsaal 120

Physician Decision-making and Personalized Medicine

SESSION CHAIR: **Joachim Winter**, University of Munich

Commercial Physician Prices and Low Value Service Use and Spending

PRESENTER: **Amelia Bond**, Weill Cornell Medicine

AUTHORS: Fabrizio Toscano, Yongkang Zhang, Manyao Zhang, Lawrence Casalino

US commercial prices paid to physicians vary widely within geographic markets. Recent work by Capps et al (2018) suggests this variation is likely to grow as physician markets become more consolidated. Work to date demonstrates that larger practices generally receive higher reimbursement, however little work exists exploring the relationship between quality and price in the physician market. This work uses the level of low value care as a proxy for physician quality.

Furthermore, understanding the relationship between prices and total spending on low value services is important as new financial models incentivize the reduction of wasteful spending. With variation in prices, a high-priced physician who provides fewer low value services could still have higher total low value care spending.

This study estimates the association between physician prices and 1) the number of low value services per patient and 2) total spending on low value services per patient. We used the most comprehensive commercial US claims data from the Health Care Cost Institute (HCCI) to create a 2014 price index for all primary care physicians. The price index was the median geographically adjusted price of a mid-level office visit, the code most billed by PCPs. For low value service measures, we adapted publicly available measures originally constructed for a Medicare population (Schwartz et al., 2014). We focused on the set of 19 measures that are most likely to be ordered or directly provided by a PCP and calculated the number and price of low value services provided. Finally, we attributed patients to physicians based on the plurality of office visits.

All regressions are the patient level and our preferred specification includes physician price quintiles, a patient's risk score and demographic information as well as measure and geographic region fixed effects. A patient attributed to the highest priced physicians received on average 24% fewer ($p<0.001$) low value services relative to the lowest priced physicians. In preliminary analysis, this relationship reversed when looking at the total spending on low value services. Patients attributed to the highest priced physicians spent 7% more ($p<0.001$) on low value care services relative to those attributed to the lowest priced physicians.

This work is another example of higher spending associated with higher quality health care. We find that patients attributed to high priced physicians spend more on low value services even though fewer services were provided. To reduce private health care spending, all physicians, no matter their pricing power (and likely group size), should be incentivized to reduce low value services.

Sources of Persistent Physicians' Prescription Behavior: Evidence from Belgium

PRESENTER: **Mr. Pieter Herman Jaak De Vlieger**, University of Michigan

Generic drugs have the potential to save costs for both patients and insurers. Yet, a wide range of studies has documented that physicians are slow in moving patients from brand name drugs to generic equivalents. Reasons for this are unclear: physicians may be slow in adopting generics as a result of habits or bias towards brand name drugs, or switching patients' prescription drugs could be met with resistance from

patients or harm patient health. I provide new evidence on the importance of physician-specific and patient-specific factors in physicians' persistence in prescription behavior. I use rich barcode-level transaction data linking physicians to the complete prescription history of patients to evaluate the impact of a Belgian policy that targeted prescribing behavior. This policy mandated that physicians prescribe a minimum percentage of cheap drugs in a given year. I observe that the market share of generics increased soon after the law was put in place – from only 12% in 2005 to about 25% in 2006. In particular, I find that physicians increased the prescription rate of generics for patients that are new to a chronic drug (i.e., starters) by about 7 percentage points. Furthermore, I document that physicians do not systematically move away from on-patent drugs to comply with the mandate; instead, they substitute away from brands for which an exact generic equivalent exist. As a result, the quality of care remains constant. I interpret this pattern as evidence that physicians exhibit *"physician inertia,"* or – all else equal – prefer to prescribe a brand name rather than a generic drug. In contrast, I find that physicians switch chronic patients who had been using brand name drugs for a while (i.e., long-standing patients) at rates much lower than those observed for the starters. Physicians increase the prescription rate among these patients by only 1 percentage point. These findings suggest that physicians consider longstanding patients costlier to switch than they do starters, which I refer to as *"patient considerations."* Building on these empirical facts, I develop a model of the demand for generics drugs that incorporates both channels and structurally estimate these key primitives of the model. Using the estimated model, I simulate and analyze the introduction of a mandatory generic switching scheme on both the insurance budget and patient welfare. Finally, I also consider the tradeoff a policymaker faces in targeting physicians and patients.

Uptake of Evidence By Physicians: De-Adoption of Erythropoiesis-Stimulating Agents after TREAT Trial Showed They Are Ineffective and Unsafe

PRESENTER: **Pinar Karaca-Mandic**, University of Minnesota

Do physicians discontinue a previously-approved treatment in light of new evidence for unsafety? What factors affect physician's decision to de-adopt such treatment? Although de-adopting unsafe treatment matters to patients' health, the decision to de-adopt treatments remains understudied. Since 1989, erythropoiesis-stimulating agents (ESAs) have been used to treat anemia among patients with chronic kidney disease (CKD). In November 2009, the TREAT trial provided evidence that ESA treatments were not only ineffective at reducing mortality or cardiovascular or renal events but were also associated with higher risk of strokes and cancer deaths. In this paper, we examine the effect of the TREAT trial and the subsequent Food and Drug Administration (FDA) black box safety warning (6/2011) on physician's decision to de-adopt the use of ESA treatments among patients with CKD.

Our work differs from existing studies on ESA treatment trends in two important ways. First, our analysis focuses on variation of de-adoption across physician's characteristics as well as across health insurance types and CKD types. Second, we consider the de-adoption of ESA collectively as well as separately for Epoetin Alfa (EPO), the conventional type, and Darbepoetin Alfa (DPO), a newer synthetic form that requires less frequent administration, as physicians may substitute one for another.

Our analysis draws from several sources of data. We first construct two analytical samples of patients diagnosed with CKD by month. The first sample came from 2007-2015 commercial and Medicare Advantage administrative claims from the OptumLabs® Data Warehouse (OLDW), a comprehensive, longitudinal, real-world data asset with de-identified claims and clinical information; we separate this sample by commercial and Medicare Advantage health insurance. The second sample came from a 20% national sample of the fee-for-service (FFS) Medicare claims from 2007-2013. For both samples, we also look separately at patients with CKD stages 3 to 5 as these patients have highest ESA use rates compared to other patients. Next, we used a two-step attribution procedure to link these patient-month observations to the physicians most likely responsible for administering or prescribing ESAs. Lastly, we obtain characteristics of the attributed physicians from Doximity®, an online social networking site for healthcare professionals. Doximity® provides information on physicians' sex, age, specialty, and the number of years since residency.

Using interrupted time series regressions, we found that the de-adoption of both EPO and DPO among CKD patients already started even before the TREAT trial for both OLDW and FFS Medicare samples. Furthermore, we found that the de-adoption of EPO sped up while the de-adoption of DPO slowed down after new evidence of unsafety from the TREAT trial. After the FDA black box warning, the EPO de-adoption resumed the rates prior to the TREAT trial, while the DPO de-adoption continued to slow down. We document substantial difference in magnitude across patient's health insurance and CKD types.

Turning to physician's characteristics, we found statistically significant difference in the de-adoption trends across physician's specialty (nephrologist or not) and gender. In contrast, we found little and inconsistent evidence that de-adoption trends differ across physician's age and experience.

What Passed Is Past? The Role of Recent Adverse Events in Physician Treatment Decisions

PRESENTER: **Ms. Manasvini Singh**, Emory University

Overview: In this paper, I evaluate how within-physician information shocks – specifically, adverse clinical events - influence a physician's subsequent treatment decisions. I find that recent patient deaths and surgical complications significantly influence a physician's subsequent practice behavior, independent of patient clinical indication. Moreover, the influence of recent adverse events on physicians' behaviors dissipates quickly, suggesting that physicians are initially overreacting to these salient, extreme outcomes. While the effect of an adverse event fades quickly, I find that the cumulative effect of adverse events is significant and economically meaningful. I conclude that physicians incorporate internal information into practice patterns using a variety of decision-making heuristics, with important implications for physician learning, resource use, and overall patient welfare.

Background: Prior research has examined how physicians allocate their scarce resources and make clinical decisions in complex informational environments. These decisions often have far-reaching clinical and economic consequences. I investigate the mechanics of physician decision-making in environments with noisy feedback where I hypothesize that physicians focus heavily on extreme outcomes when retrospectively evaluating the "correctness" of their decisions. This selective focus may be especially prominent in noisy systems because scarce cognitive resources lead physicians to search for salient signals, or because physicians have strong prior beliefs that extremes in noisy systems are less likely to be driven by randomness (and are thus more informative signals).

Methods: Using 100% inpatient EHR data from two U.S. academic hospitals from 2015-2018, I empirically investigate this hypothesis in two clinical settings – namely, labor/delivery and the ICU - where the causal drivers of patient outcomes are unclear, negative outcomes are often extreme, and feedback is noisy. I estimate the effect of experiencing a prior adverse event on a physician's subsequent treatment decisions separately in each of the two settings, conditional on a rich set of patient characteristics and time-invariant physician practice patterns. As a secondary analysis, I also look at the symmetries in response to both positive and negative "expected" and "unexpected" prior outcomes.

Results: I find that physicians heavily weight recent, extreme, and negative prior outcomes in deciding on the treatment for a patient. Specifically, in the labor/delivery setting, physicians who experience a patient complication in a vaginal delivery are more likely to switch to C-section in their next delivery. Conversely, physicians who experience a patient complication in a C-section are more likely to switch to vaginal in their next delivery. In the ICU setting, physicians are significantly more likely to send the next patient to the ICU if the previous patient dies, regardless of both the current and prior patient's clinical indications. These behavioral effects fade rapidly over the subsequent few patients. Experiencing prior adverse events also leads to significant spillovers in a physician's chosen level of treatment intensity for the next patient – as evidenced by increasing length of stay, number of tests ordered and total charges. Finally, there is evidence that physicians do not respond optimally to prior adverse events – they increase subsequent treatment intensity equally for "expected" and "unexpected" adverse events.

1:30 PM –3:00 PM MONDAY [Specific Populations]

Universität Basel | Kollegienhaus – Seminarraum 208

Economic Analysis of Program Impact in Africa

SESSION CHAIR: **Giulia Ferrari**, LSHTM (London School of Hygiene and Tropical Medicine)

Fertility Impact of Donor-Supported Contraceptives in Sub-Saharan Africa

PRESENTER: **Carolina Cardona**, Johns Hopkins Bloomberg School of Public Health

AUTHOR: J.M. Ian Salas

Background

Sub-Saharan Africa (SSA) has the highest total fertility rate (TFR) and a relatively slow contraceptive uptake, even though a substantial amount of aid for family planning (FP) goes to the purchase of contraceptives. Some believe that contraceptive supplies will not help reduce the TFR until SSA develops a preference for having smaller families, but others believe the limiting factor is inconsistent availability and unaffordability of contraceptive methods. We examine to what extent subsidized contraception has helped SSA countries manage their fertility, if this relationship varies by country characteristics, and if women from disadvantageous background are the most affected by contraceptive fluctuations.

Methodology

We collected data for 34 countries over 13-years from 2003-2016. Fertility behavior was captured with the General Fertility Rate (GFR) for women aged 15-44 using information from 85 Demographic and Health Surveys. These surveys provide full-birth histories, allowing for the estimation of quarterly GFRs for five years preceding the survey. Quarterly contraceptive supply coverage was estimated with shipment volumes of donated contraceptives by using the couple-years of protection (CYP) for each method.

To measure the effect of subsidized contraception on fertility, GFR was regressed on CYP coverage and a full set of quarter-year and country fixed effects. The regression analysis accounted for lags in the CYP coverage of up to 3 years to account for the time it takes to distribute contraceptives within each country and to allow for the existence of inventories before stock outs could become an issue.

In addition, we perform a subgroup analysis and stratify countries into two subgroups based on regional location and rank in 2005 (upper or lower half) on health spending per capita and GDP per capita. For the women from disadvantageous background analysis, individual-level data from DHS will be used across all SSA countries included in the study.

Results

We find that birth rates are significantly lower after a country receives donated contraceptives. On average, a 5 percentage-point increase in contraceptive supply coverage (the share of women 15-49 with provisions for contraceptives from the public sector) is associated with a 3.3 percentage point drop in the general fertility rate. This impact corresponds with 7.5% of the average general fertility rate.

This negative association is stronger for countries in West & Central Africa (compared to East & South Africa), those with lower GDP per capita, and those with higher health spending per person. This suggests that aid for FP supplies may go further in countries with greater FP need, but also in countries with more-developed health systems. We hypothesize that women from disadvantaged backgrounds will have relatively higher risk of pregnancy and live births following drops in contraceptive supply coverage.

Discussion

This study provides evidence on the importance of donated contraceptive supplies to reduce fertility in SSA. Findings suggest that greater donor spending on FP commodities will be associated with a decrease in fertility for SSA, and this will go further in countries with greater FP need, as long as those countries continue strengthening their health system.

Impact of Ethiopia's Minimum Age of Marriage Law on Adolescent Reproductive Health: A Quasi-Experimental Study

PRESENTER: **Dr. Slawa Rokicki**

In sub-Saharan Africa, a girl's risk of marrying before the age of 18 is 38%, nearly twice that of the world average. Child marriage results in adverse consequences for women's physical, emotional, and social well-being. In an effort to combat child marriage, in recent years there has been a surge of legislative reform efforts on the legal minimum age of marriage in sub-Saharan Africa, including in Kenya (2014), Cameroon (2016), Tanzania (2016), Zimbabwe (2016), and Malawi (2017). However, little is known about whether child marriage laws are effective in sub-Saharan African countries, which face challenges of cultural legitimacy, weak justice systems with no enforcement mechanisms, and a lack of birth certificates to prove age.

In 2000, Ethiopia's government passed a law increasing the minimum age of marriage from 15 to 18 for girls, with no exceptions for customary laws or parental consent. We evaluated the impact of the law on adolescent reproductive health indicators and newborn mortality rates. We used cross-sectional data from 15 countries and spanning 24 years of cohorts, allowing us to assess the impact of the law over 9 years. The main outcome of interest was risk of adolescent birth (giving birth before age 18). We used difference-in-differences (DID) and synthetic control methods (SCM) to compare cohort trends in Ethiopia to those in 14 comparison countries and applied exact permutation methods to calculate p-values.

On average over the post-period, implementation of the law was associated with a 9 percentage point reduction in absolute risk of adolescent birth (p=0.01). Both SCM and DID produced consistent results. In addition, girls who were exposed to the law were less likely to have married before the age of 18 (-11 percentage points; p=0.01) and less likely to initiate sex before the age of 18 (-10 percentage points; p=0.01). There was no evidence that exposed cohorts were at higher risk of ever terminating a pregnancy or having unmet need for contraception. There was also no impact on neonatal or infant mortality rates. Extensive sensitivity analysis corroborated our main results. In a heterogeneity analysis, we found that implementation of the law was associated with a similar reduction in adolescent birth for both urban and rural areas (-8.8 vs -10.1; p=0.18). In contrast, the law appeared to have no effect for girls who had no schooling compared to a large effect for those who had at least some primary schooling (0.17 vs -12.2; p=0.002). We discuss how our results align with how the law was promoted in Ethiopia.

Worldwide, the practice of child marriage has continued to decline; however, the burden of child marriage is shifting from South Asia to sub-Saharan Africa, where progress has been the slowest. Our study indicates that strong legal frameworks can aid in facilitating social change around child marriage. Overall, our results are consistent with the policy perspective that changes in child marriage legislation must coincide with improvements in girls' access to education.

Opportunities for Technical and Allocative Efficiencies in the Community Health Worker Program in Mali: Evidence from Cost, Financing, and Geospatial Analyses

PRESENTER: **Patrick Pascal Saint-Firmin**, Palladium -Health Policy Plus

AUTHORS: Patrick Pascal Saint-Firmin, Sara Stratton, Christine Ortiz

Background: Economic analyses of sub-Saharan community health worker (CHW) programs are rare. Since 2009, Mali's health system has relied on CHWs to deliver a package of preventive, promotive and curative essential community health services (ECS), for which they are also provided medical supplies. With some exceptions, salary, training, and other costs are funded by donors, affecting sustainability. Transitioning to domestic funding sources requires strengthening government institutions to plan for, manage, and finance the CHW program, which must achieve allocative and technical efficiency such that public funds are used rationally. The USAID Health Policy Plus (HP+) project studied CHW program costs and financing trends holistically, including geographical allocation challenges.

Methodology: HP+ conducted three linked studies of the CHW program: (1) situational analysis, (2) funding availability and geospatial mapping, and (3) costing and financial gaps. Data collected between 2016 and 2017 included CHW numbers and geographical deployment, expenditures mapped by region and source, funding commitments, and financing required in compliance with national standard care protocols and intended scale. Funding and cost data were combined with GIS technology to provide visual interpretation of allocative efficiency issues when comparing CHW distribution to population densities. Financing gaps between 2016-2020 were estimated.

Results: In 2015, US$13M (million) was spent on 2,337 CHWs in 2,026 villages across five regions. Communities contributed partially (11%) and 10+ external partners contributed 88%. Drugs and commodities were the biggest cost driver (63% donor financed) with salaries and equipment as second largest (20%). CHW program coordination and planning is difficult for the Ministry of Health and Public Hygiene. No

external donors or implementing partners operated across all regions or program areas in 2015. Results across regions revealed that numbers of clustered or dispersed CHWs (or health facilities) do not necessarily map to population density, causing inefficiencies.

In 2015, the program spent $13M ($5,949/CHW), 55% more than the $8.4M needed if standard care protocols had been followed ($3,823/CHW rising to $5,229 by 2020). Funding commitments will decline from $13M in 2015 to projected $9.7M in 2020. Efficiencies are needed therefore to reduce costs and meet targets for coverage. ECS package lists 23 services provided at an average cost per service estimated at $10.5 (2015) decreasing to $2.5 (2020) thanks to potential benefits of increased workforce productivity, and technical efficiency by complying to national standards. There is benefit from reallocating funds, as currently start-up training, medicines, supplies, and consumables are over-funded vs. need, while salaries and equipment, supervision, management and recurrent training face a gap of $18.8M by 2020.

Conclusion: Compartmentalized funding sources and non-transparent costs of service provision have historically made resource mobilization and deployment planning for CHWs difficult for governments in donor-dependent countries like Mali. Aligning technical and financial partners with national strategic priorities requires improved coordination, and evidence such as cost data in accessible form. HP+ is generating such evidence which will lead to 1) improved prioritization of community health interventions, 2) cost-savings through improved allocation of resources, 3) increased budgetary transparency.

Determinants of Sustainable Health Financing in Guinea: A Framework for Measuring the Sustainability of Sector-Wide Approaches During Post-Ebola Recovery.

PRESENTER: **Steven Hansch**, International Business & Technical Consultants, Inc

AUTHORS: Ms. Annette Bongiovanni, Zhuzhi Moore, Dr. Swati Sadaphal

Background: Guinea, Liberia, and Sierra Leone were most affected by the 2014-2016 Ebola outbreak, which led to a collapse of government systems, including health. The United States Agency for International Development (USAID) is implementing multiple post-Ebola recovery (Ebola Pillar II) activities with these three objectives: preventing the loss of development gains; recovering existing institutions; and building sustainable systems. These efforts aim to increase the countries' ability to respond and recover from similar crises in the future. International Business and Technical Consultants, Inc. (IBTCI) conducted two external performance evaluations (PE1 and PE2) to measure the Ebola Pillar II contribution in building sustainable health systems in the three countries. In Guinea, there was 24 Pillar II activities focused on health, governance, and food security. Health activities focused primarily on frontline worker support, management, coordination and partnerships, social and behavior change communications, and institutional enhancements.

Methods: PE1 and PE2 used a mix of qualitative methods such as desk review (800 documents), key informant interviews (370), and focus group discussions (215) and quantitative methods namely household (n=11,721) and health facility (n=529) surveys. An analytical framework to measure sustainability was developed to examine seven proximate and distal determinants that contribute to sustainability.

Results: This presentation would showcase the Guinea Health Finance and Governance case study. Bongiovanni will discuss the factors that contributed to the Government of Guinea's (GoG) decision to increase its pre-Ebola health budget from 2.5% of national spending to 8.2% post-Ebola. According to our sustainability framework, there are three proximate determinants (policy, institutional support, and financing) that contributed to this change. Pillar II projects aligned with the GoG's Recovery and Resilience Strategy. USAID partners rehabilitated health facilities and introduced community-led health facility management committees, provided basic equipment and drugs, and improved infection prevention and control through training and supportive supervision. There was a six million dollar project providing institutional support to increase MOH management capacity of health emergencies. The project targeted four areas of health systems strengthening – institutional strengthening, governance, financing, and human resources for health – all of which are WHO's health system building blocks. The project worked with the Legislative Assembly's Health Commission to build legislators' capacity to develop a realistic health budget and advocate for its funding. The Health Commission increased Guinea's health budget to 8.2% in 2017. While the proportion of funding allocated dropped in 2018 to 7.2%, the actual dollar amount increased. The decrease in the MOH percent allocation appears to be a reduction across ministries to reduce the overall national budget deficit. The MOH's strategic plan and budget for 2018 includes post-Ebola health system strengthening activities and funding for additional health workers.

Discussion: According to IBTCI's sustainability framework, Pillar II activities included explicit or implicit strategies for building sustainability: institutional strengthening, governance, financing, and capacity building of human resources. GoG's commitment to increased financing in health will advance Guinea's self-reliance and will have lasting effects after post-Ebola health sector recovery efforts have ended.

1:30 PM –3:00 PM MONDAY [New Developments In Methodology]

Universität Basel | Kollegienhaus – Seminarraum 209

Health Insurance and Copayments

SESSION CHAIR: **Carlyn Mann**, United States Agency for International Development (USAID)

The Increasing Relative Prices of Brand Name Drugs Compared to Generics Under the Mandate of Zero Out-of-Pocket Payments after the Affordable Care Act

PRESENTER: **Dr. James Zhang**, The University of Chicago

AUTHORS: Mark Chee, Christopher Moriates, Neel Shah, Vineet Arora

The highly competitive U.S. Pharmaceutical market has experienced increasing utilization of generic medications. The implementation of the Affordable Care Act, which mandates zero out-of-pocket payments (OOPs) for certain preventive medications, provides a unique opportunity to examine how the market responds to a federal policy which places both higher-priced brand-name drugs and relative lower priced generics at zero OOPs. We hypothesize that for those drugs with a zero-OOP mandate and high market concentration among brand name drugs, the relative prices of brand name drugs to generics will rise due to the zero-OOP mandate, resulting in overall higher total costs to society even despite substantial increases in the relative utilization of generic drugs. We examined relative prices of brand name to generic drugs for three types of drugs: oral contraceptive pills (OCs), breast cancer prevention drugs, both under the mandate of zero OOPs; and statins, a class of drugs with a large market size and high concentration in the brand name market, with no OOP mandate, during the four-year period of pre- and post-implementation of the ACA. We found that the relative prices of brand name OCs increased from 146% to 322% of generic OCs from 2011 to 2014, and such relative prices for breast-cancer prevention drugs increased from 888% to 1300% from 2011 to 2013, until the sole brand name drug lost patent protection in March of 2014. Both brand name markets for these two drugs are highly concentrated. On average, the total cost of care to society increased. In contrast, for statins, which have a similarly large market size and a high concentration in the brand name market, but no zero-OOP mandate, the relative prices of brand name and generics drugs decreased from 476% to 380% from 2011 to 2014. Future policy formulations should take such market responses into account to maximize benefits for Americans, encourage price competition, and reduce perverse economic incentives.

Unintended Impacts of the Abolition of Copayment on Outpatient Utilization in South Korea: Evidence from a Regression Discontinuity in Time

PRESENTER: **Dr. Moon Joon Kim**, Duke Kunshan University

In June 2007, the South Korean government, hoping to reduce the state's share of health care costs, passed an amendment to the state-run health care system to transition from a copay to a coinsurance system for outpatient services. This new policy effectively raised the out-of-pocket health care costs to South Koreans from 22 percent to 30 percent for outpatient services. This paper estimates the impact of health insurance reform on outpatient health care utilization. Using a regression discontinuity in time, I find that the abolition of the copayment program significantly increased system-wide outpatient health care utilization by up to 90 percent and reduced medical expenditures by 23 percent per visit. The copayment abolition incentivized beneficiaries to obtain more medical treatments during the grace period and to enroll in supplementary private health insurance covering patient-sharing medical costs, allowing access to more medical services with lower marginal costs. Therefore, the abolition of copayment and the emergence of supplementary private insurance caused moral hazard and adverse selection problems, leading to South Korea becoming the country with the highest per capita utilization of outpatient health services worldwide since 2012.

Ex-Ante Moral Hazard in Healthcare Insurance: Evidence from Obamacare

PRESENTER: **Teresa Longobardi**, Universidad de Puerto Rico, Recinto de Río Piedras

As a result of the Patient Protection and Affordable Care Act (ACA) that was fully implemented in January, 2014 the United States has provided the setting for a natural experiment to test the prevalence of ex-ante moral hazard in health insurance. As a result of ACA, between 2014 and 2017 the percentage of uninsured dropped from 15% to 9%. This population based study will present empirical research that examines the effect of health insurance on lifestyle prevention behaviors in both the general population of the United States and the non-pregnant, non-elderly, working age obese population of the United States. Using data from the National Health and Nutrition Examination Survey (NHANES) for the years 2007 through 2016, this study explores the issue of ex-ante moral hazard focusing on lifestyle prevention behaviors. To estimate the effects of health insurance on lifestyle prevention behaviors, we use a structural equation model (SEM) that simultaneously accounts for each individual's lifestyle prevention behavior. With the objective of determining whether the adverse net effect of ex-ante moral hazard is present in the lifestyle prevention behaviors as a consequence of health insurance, we identify and observe healthy lifestyle prevention behaviors such as losing weight, engaging in physical activity, as well as unhealthy lifestyle behaviors such as: sedentariness, excess calories consumed, and poor diet. Taking full advantage of the rich data available, we opt for seemingly unrelated regressions (SUR), using Stata v.13 and the Conditional Mixed Process Estimator (CMP) user created command for Stata. Before estimating the regressions, we confirm whether selection bias *attributable to a person having insurance*, existed. Heckman's selection bias correction (1979) is used to correct for the fact that we are unable to see how a person without insurance would behave in terms of lifestyle prevention *if they actually had insurance*. This method allows correcting for selection bias if necessary. For the years prior to Obamacare, we have results that show the existence of a net adverse impact of ex-ante moral hazard in terms of sedentary behavior among the insured population of the United States. These results were robust to model specification.

1:30 PM –3:00 PM MONDAY [New Developments In Methodology]

Universität Basel | Kollegienhaus – Seminarraum 212

Organized Session: The Global Health Cost Consortium Methods and Results to Produce Cost Curves and Unit Cost Estimates for HIV and TB Services.

SESSION CHAIR: **Sergio Bautista**, National Institute of Public Health

DISCUSSANT: **Nicolas Menzies**, Harvard University; **Katharina Hauck**, Reader, Imperial College London

Exploring the Intervention Costs of PMTCT and HTC: Explaining and Predicting Unit Costs for Implementing Scenarios Using Pooled Data from Several Studies

PRESENTER: **Mr. Carlos Pineda**, National Institute of Public Health

AUTHORS: Gisela Martinez, Diego Cerecero, Drew Cameron, Lalit Dandona, Hoang Van Minh, Van Thu Nguyen, Carol Dayo Obure, Stella Settumba, Dr. James G Kahn, Gabriela B Gomez, Ms. Sedona Sweeney, Anna Vassall, Dr. Lori Bollinger, Dr. Carol Levin, Sergio Bautista

Introduction

Program planners, policy makers and funders need quality cost data to effectively and efficiently implement HIV prevention programs. This study takes advantage of the collective power of available, published costing studies on PMTCT and HTC interventions to estimate explanatory and predictive models of unit costs to assess costs of PMTCT and HTC in a wide variety of settings, even for countries where no data is available.

Methods

We identified high quality studies from the GHCC Unit Cost Study Repository literature search that report facility-level costs of PMTCT or HTC programs. We contacted the authors to request the primary data used in their analyses. A standardization process was conducted to gather all the databases obtained and produce a pooled dataset. We tested two types of models: explanatory models to identify cost drivers of unit costs and predictive models to extrapolate unit costs to implementation scenarios defined by the type of facility, urbanicity, ownership, and country. For the predictive models, in addition to the costs drivers, we used country-level variables, such as PMTCT/HTC coverage, HIV prevalence, and health sector salary index. We tested several OLS and GLM specifications to identify the best model, based on the accuracy of the predictions.

Results

We gathered data from eight studies across eight countries and 940 facilities (526 HTC and 414 PMTCT). We estimated the average unit cost and the cost curves of eight different implementation scenarios per country, for a variety of outputs: the cost per person tested, per person diagnosed as HIV positive and per HIV positive person linked to antiretroviral prophylaxis (in the case of PMTCT), the overall mean costs for these outputs were $20, $628 in HTC and $57, $1063, $1418 in PMTCT respectively. We found a considerable variation in unit costs between and within countries. We used explanatory models to identify the determinants of costs in both interventions, such as scale, type of facility, ownership, urbanicity, year of data collection, and GDP per capita. We consistently found economies of scale across several specifications. We observed a positive statistical association between GDP per capita and unit costs in both interventions. We used this variable altogether with other country-level indicators in predictive models. We extrapolated unit costs for a total of sixteen different implementation scenarios by country.

Conclusion

We found that scale, the type of facility, ownership, and urbanicity are consistently significant unit cost drivers of PMTCT and HTC programs. We were able to extrapolate unit costs for countries for which we did not have any data. The validations process showed a good performance of our predictions, obtaining non-significant differences between the predicted and observed values in 80% of extrapolations

Is There Such a Thing As a Unit Cost? Using Facility-Level Pooled Data to Explain and Predict HIV Treatment Unit Cost for Different Implementation Platforms

PRESENTER: **Diego Cerecero**, National Institute of Public Health (INSP) Mexico

AUTHORS: Mr. Carlos Pineda, Carol Dayo Obure, Elliot Marseille, Lung Vu, Dr. James G Kahn, Anna Vassall, Gabriela B Gomez, Dr. Lori Bollinger, Dr. Carol Levin, Sergio Bautista

Background

The need for accurate cost information for planning and resource allocation of HIV programs has increased in the last decade. Costing studies often fail to provide information in a timely fashion since they are expensive and slow to implement. Understanding the variation of costs and identifying determinants of such variation is relevant for planning HIV treatment programs scale up and allocating resources efficiently. The objective of this work is to combine facility level cost data for ART programs from several costing studies from five countries, to identify the determinants of unit cost and to extrapolate costs for a variety of settings to countries with and without cost information.

Methods

We identified high-quality ART cost studies through a literature review. Authors were contacted to share their data on costs and service delivery characteristics. We standardized and merged the datasets into an aggregated database which included 169 facilities in five countries. We estimated the ART program unit cost for all the facilities, considering three main inputs – personnel, drugs and recurrent costs– and explored their determinants of variation using OLS and GLM regression models. Translog cost functions were used to estimate the relative contribution of each input cost. We used quantile regression models to explore unit cost drivers across different levels of efficiency. Finally, based on relevant determinants identified, we ran OLS regression models to extrapolate unit costs to countries with no cost information considering different implementing scenarios. We expressed all the costs in 2017 US dollars.

Results

The average unit cost in our analytical sample (129 facilities) was 240 USD (IQR:149, 233). Swaziland was the country with the highest cost per patient on ART (USD 543; IQR: 309, 716) and Uganda showed the lowest unit cost (USD 187; IQR: 157, 216). We also observed that facilities facing higher costs of ARV drugs showed a higher cost per patient (USD 316; IQR: 164, 326). The breakdown of unit cost was 25% for staff, 23% recurrent costs, and 54% drugs. Our results also showed evidence consistent with economies of scale – in the full sample and across different levels of efficiency. Finally, we used our regression model to extrapolate unit costs to different implementing scenarios. We validated our extrapolations comparing the observed and predicted values and found a median error of 26% (IQR 11% - 40%) which represents 53 USD.

Conclusion

We found strong associations between ART several facility-level characteristics – scale, ownership, and ARVs costs – considering different levels of efficiency. The validation of our extrapolation model showed that our predictions were not statistically different from observed values and allowed us to provide cost estimates for those countries no information on HIV treatment costs.

Estimating the Costs of Interventions for Tuberculosis Care: A Systematic Review of Methods and Unit Costs

PRESENTER: **Edina Sinanovic**, University of Cape Town

AUTHORS: Lucy Cunnama, Mariana Siapka, Benjamin Herzel, Jeremy Hill, Angela Kairu, Dickson Okello, Dr. Willyanne DeCormier Plosky, Dr. Lori Bollinger, Dr. James G Kahn, Sergio Bautista, Dr. Carol Levin, Anna Vassall, Gabriela B Gomez

Background

Cost data availability is limited in tuberculosis, and a heterogeneous distribution of data across settings and varying unit cost data quality can lead to poor decision making. The robustness, precision and reliability of the data, as well as standard reporting of cost methods and results all influence the quality of the data and our availability to transfer such information between settings for a more efficient use of limited data. Understanding the quality of cost data and reporting can help to inform, which methods need strengthening. In this paper, we present a review of methods used in current costing studies, extracted and standardized available cost data to estimate setting-specific costs for first line treatment across settings without data.

Methods

A systematic review was conducted using key words relating to tuberculosis (TB), cost, and treatment in eight electronic databases (Pubmed, EMBASE, Econlit, The National Health Service Economic Evaluation Database and The Cost-Effectiveness Analysis Registry, Cochrane Library, Web of Science and LILACS) as well as in grey literature. A comprehensive extraction tool was developed to describe the methods used and extract the unit costs standardized and disaggregated by inputs. Only those studies that contained primary cost data were included. Data was extracted on study scope, sampling, methods, inclusion of costs, valuation and analysis as well as unit costs and input costs. We performed a meta-regression of the cost per person-month of first line treatment to predict costs in settings without data.

Results and discussion

We identified 107 articles containing empirically collected provider costs relating to TB, 55 of which included unit costs for first-line treatment (36%) and Xpert MTB/RIF (15%). These 55 studies were conducted in 25 different countries, with 15 studies published in the last 5 years. 16 of these studies were longitudinal in nature while 39 were cross sectional. 24 used normative costing methods, 28 utilised real-world costing and 3 used mixed methods. In terms of site sampling, 16 used a sample of convenience, 5 costed the entire programme, 7 used random sampling and 23 used purposive sampling. While the purpose of the costing studies was well defined, there was heterogeneity in the methods used to estimate costs, especially with respect to the reported exchange rate (60% of studies), discount rate (which ranged from 3-10%) and methods to measure and allocate costs. Unit costs for FLT vary broadly from less than USD50 to more than USD1000. Using study and country level variables, we present estimates for low- and middle-income countries.

Conclusion

A review of TB costing studies indicates that transparency in methods is limited due to lack of standard reporting of methods and results, and in cases where methods are reported well, a variation in approaches for measuring costs. The newly developed reference case on costing may help

encourage researchers to be explicit and transparent in how they estimate the cost of global public health interventions. Our estimates on costs and projections are available in the existing Global Health Cost Consortium unit cost repository, a publicly accessible platform.

Moving Away from the Unit Cost. Estimating Country-Specific VMMC Average Cost per Service Curves Accounting for Variations in Implementing Platforms

PRESENTER: **Sergio Bautista**, National Institute of Public Health, Cuernavaca

AUTHORS: Mr. Carlos Pineda, Lily Alexander, Steven Forsythe, Gabriela B Gomez, Michel Tchuench, Chris M Chiwevu, Dr. James G Kahn, Anna Vassall, Dr. Carol Levin, Dr. Lori Bollinger

Background. The policy-relevance of cost information hinges on it being specific and timely. However, cost studies are expensive and slow to implement. Results from those studies are often not available at moments of critical decision-making. Moreover, those costs estimates are usually aggregated and unspecific to and unrepresentative of implementation realities – most of them based on ad hoc samples of facilities. As a result, policy-makers must rely on flawed, unspecific unit costs even though in reality, unit costs are a direct function of service delivery characteristics and scale levels. The implication of using unspecific unit cost is that not only are policy-makers using poor estimates, but they have no information to assess the level of uncertainty and the likely direction and magnitude of the potential bias imposed by random estimates.

Objective. The objective of this work is to analyze primary facility-level and secondary data on costs of HIV services from several independent studies, combined with aggregated results from published studies (secondary data), to extrapolate cost curves to other countries in Sub-Saharan Africa and specific implementing scenarios within those countries.

Methods. We identified 18 high-quality VMMC, HTC, PMTCT and ART cost studies through a literature review. Authors were contacted to share their data on costs and service delivery characteristics. We standardized the disparate datasets into an aggregated database which included 1,537 facilities from in 14 countries. We estimated the average cost per service for each facility and conducted OLS and GLM regression models to predict average costs curves against scale for each combination of three platform characteristics in each country; type of facility, ownership, and urbanicity – eight different combinations per country. Thus, one implementing scenario was for example, public, rural clinics in Kenya. To extrapolate the estimates to countries not included in the sample, we combined the primary data with secondary data from the literature. We used multivariate regression methods to predict unit costs for each country by iteratively excluding it from the sample, running the models and predicting the observed values. We validated extrapolations by comparing predicted against observed costs.

Results. Overall, our results showed evidence consistent with economies of scale. Furthermore, the cost curves showed a considerable variation of costs estimates across implementation scenarios within countries. We were able to validate the extrapolations and found that the predictions from our models were not statistically different from observed values.

Conclusion. Our results showed significant variation in unit costs across and within countries in all four interventions. The results reveal the potentially large bias implicit in using unspecific unit cost data. Ours is a novel alternative to assess costs of services explicitly considering the implementation reality of programs and provide a path to move away from overly simplistic estimates of unit costs. Furthermore, estimating unit costs for a set of scenario provides upper and lower bounds for unit costs that allow users to have increased confidence in the data.

1:30 PM –3:00 PM MONDAY [Demand & Utilization Of Health Services]

Universität Basel | Vesalianum – Grosser Hörsaal EO.16

Information and Behavior

SESSION CHAIR: **Matthew Quaife**, London School of Hygiene & Tropical Medicine

Tell Me Where to Get My Flu Shot: The Effect of Information on Preventive Care

PRESENTER: **Lukas Kauer**

From a public health perspective, the flu vaccination rate is viewed as too low in many countries. Based on two large linked randomized control trials, we test whether the vaccination rate can be increased by a letter informing consumers about a new access to the flu shot in a pharmacy. We find that receiving the letter increases the immunization rate by 2.5%-points (15%) with significant provider substitution for people vaccinated in the previous year. Specifically indicating the nearest pharmacy on the letter increases the vaccination rate in the pharmacy by 24.3% and the overall immunization rate by roughly 10% (compared to the letter without information on the nearest pharmacy). Consumers tend to stick to the indicated pharmacy even if a closer one becomes available. In addition, individuals who received the letter in two subsequent flu seasons are almost four times more likely to receive a flu shot in a pharmacy in the second season than their peers who received the letter in the first season only. However, the reminder is not successful in further increasing the overall immunization rate.

Are Patients Forward-Looking?

PRESENTER: **Suraj Upadhyay**, Tilburg University

AUTHORS: Martin Salm, Tobias Klein

1. Objectives

Patient cost-sharing schemes are prevalent in many countries. Common schemes, such as deductibles, imply non-linear prices. For example under a deductible, patients have to pay for health care themselves up to the deductible limit, after which health care is free. These non-linear prices generate dynamic incentives: health care spending today can affect the price of health care in later periods. Whether individuals take these dynamic incentives into account is an open question; theory suggests that under some assumptions forward-looking individuals should respond to the expected end of year price (EEOYP) rather than the current price when faced with non-linear prices. Our objective is to test whether individuals respond to the EEOYP in the Dutch health care context.

2. Methods

We use administrative data from a large Dutch health insurer for the years 2008 until 2015, exploiting a setting that provides variation in the change in EEOYP while keeping changes in current price constant. Consider for instance Beth, who crosses the deductible in a given year; then, her current price is 0. At the beginning of the next year, as contracts reset annually, her current price will be 1. This sharp jump in current prices is always from 0 to 1, regardless of which year she crossed the deductible. Similarly, in the year she crosses the deductible, her EEOYP is also 0. However, at the beginning of the next year, her EEOYP jumps to some number between 0 and 1, which depends on the deductible limit in the new year, since EEOYP is equal to 1 minus the probability of exceeding the deductible limit by the end of a given year. The fact that deductible limits changed yearly, as set by the Dutch Government, provide us with the opportunity to test 2 hypotheses:

a. If Beth did not respond to the EEOYP, her change in consumption brought on by resetting contracts would be similar across years.

b. If she did respond to EEOYP, we would expect her to change her consumption by less when her EEOYP was low.

With this in mind, we point out a donut hole regression discontinuity design that we then use to estimate percentage changes in average daily consumption around the turn of the year. Based on these, we assess which of our hypotheses holds.

3. Results

We find that the size of the discontinuity varies with the EEOYP, in line with the second hypothesis, after controlling for changes in the current price. Further, we find that years with similar EEOYP admit similar changes in consumption at the turn of the year.

4. Discussion

One conclusion from our paper is that discussions on optimal demand-side contracts in health care can be very misleading when ignoring the dynamic incentives they imply, especially when individuals do respond to such incentives.

A Test of Different Behavioral Theories in Determining Health Plan Choices

PRESENTER: **Dr. Stefan Boes**, University of Lucerne

Many countries have health insurance systems that require individuals to make decisions regarding their health care coverage by choosing a suitable health plan. However, there is ample evidence from behavioral science that individuals have difficulties in making choices under uncertainty. In the context of health insurance, this may lead to suboptimal coverage, higher than expected health care expenditures, and poorer health outcomes.

From a behavioral economic perspective, there are six possible determinants that have been discussed in the literature that may influence the type of health plan an individual chooses: loss aversion, risk attitude, ambiguity aversion, debt aversion, omission bias, and liquidity constraints. The aim of this paper is to empirically test these determinants in a statistical model for deductible choice and basic versus managed care plans in the Swiss mandatory health insurance system. Switzerland is a particularly interesting case to study this question because of its choice-based health insurance system. Every resident needs to choose a health plan, and there is a variety of plans from different providers, with open enrollment period every year. Using a nationally representative dataset with information about health plan choice, indicators related to the behavioral determinants, as well as rich background information of the individuals including past health care demand, the study finds significant support for the predictions from behavioral theories on the variation in deductible choice and the selection of a managed care plan. Preliminary results suggest that more risk averse individuals and individuals with a lower health insurance and financial literacy seek higher coverage, whereas individuals that are more familiar with the system tend to choose more likely a high-deductible plan. There is also evidence that income is a strong determinant of health plan choice, related to various of the behavioral theories.

The study has implications regarding the design of health insurance systems, which need to carefully take into account the behavioral limitations of individuals in making health plan choices, which are often linked to poor health insurance literacy. Thus, designing a system that empowers individuals to make informed and suitable choices is critical to avoid unnecessary health care expenditures, and ultimately improve health outcomes.

3:30 PM –5:00 PM MONDAY [Health Care Financing & Expenditures]

Universitätsspital Basel | ZLF – Gross

Organized Session: Multiple Funding Flows and Incentives — How Does the Provider Payment Mix Shape Provider Behavior in Low- and Middle-Income Countries?

SESSION CHAIR: **Kara Hanson**, London School of Hygiene and Tropical Medicine

DISCUSSANT: **Joseph Kutzin**, World Health Organization; **Ayako Honda**, Sophia University; **Obinna Onwujekwe**, University of Nigeria; **Joël Arthur Kiendrebeogo**, Heidelberg Institute of Global Health

Multiple Funding Flows Matter: A Conceptual Framework to Assess Financing Flows to Providers and to Develop Options to Align Them.

PRESENTER: **Edwine Barasa**, KEMRI-Wellcome Trust Research Programme

Background

A consensus is gradually emerging on the need to move towards more strategic purchasing in LMICs. Often, reform discussions focus on new payment methods to be introduced, paying little attention to their interactions with those already in place. However, experience shows that applying a system perspective is necessary to investigate issues related to multiple, concurrent payment methods.

Based on this observation, the WHO/HGF and the RESYST research consortium have developed an approach that moves away from a focus on a single instrument in an attempt to recognize the combined effects of multiple concurrent funding flows on provider behaviors and their implication for the performance of a country's health system.

The questions guiding the research were:

1. What are the different payment methods operating in a national health system? How are they designed – i.e. what are their features?
2. How do these designed payment methods translate into actual funding flows for providers – i.e. what attributes do they display at the provider level?
3. How do these funding flows operate concurrently – i.e. what economic signals does the mix of flows send?
4. What is the response of providers to each individual funding flow? And to the overall economic signal?
5. What are the implications of providers' response for health system objectives – i.e. quality, equity and efficiency?

Objectives

The presentation aims to improve conceptual clarity on notions related to MPPS, as well as to propose a modular analytical framework to analyze MPPS in LMICs, fruit of the collaboration between WHO/HGF and RESYST.

Content

The presentation first starts with conceptual definitions and a description of the theoretical foundation underpinning the WHO HGF/RESYST conceptual framework.

It then provides a detailed explanation of the four-step methodology:

- First, mapping out the funding flows – i.e. payment methods translated into practice from the providers' perspective – and their attributes – i.e. the critical parameters of each flow;
- Second, exploring the set of incentives generated by each funding flow, as well at the economic signals generated by the combination of these incentives;
- Third, identifying providers' behavioral response, as well as the implications of this response for the the health system's objectives;
- Fourth, based on the analysis, identifying policy options to improve MPPS in LMICs.

The presentation also proposes an overview of the methods to be applied under specific sets of circumstances, and lists questions that could guide the analysis. Finally, it proposes to the audience – based on the expected findings – a methodology to identify policy options to improve the MPPS in LMICs.

Discussion / conclusions

The framework has the potential to offer relevant insights for policy makers interested in reengineering the purchasing function of their health system. It provides guidance for a structured analysis of a complex reality – the MPPS – and on the most appropriate policy recommendations to improve the steering of the MPPS.

Links between Multiple Funding Flows and Providers' Behaviors in LMICs: Lessons from Six Countries

PRESENTER: **Mr. Fahdi Dkhimi**, World Health Organization

Background

In LMICs, funding flows are often looked at in isolation. Little attention is paid to how they interact and combine with one another and generate a set of incentives that influence provider behaviors. Looking at the combined signal generated by multiple funding flows is needed for improved steering of the purchasing function.

Over the past year, the RESYST research consortium and WHO Department of Health Systems Governance and Financing have applied a conceptual framework to a set of country studies which investigated the mix of funding flows that reach healthcare providers in six countries. These studies served as a basis for policy dialogue on how to harness the potential of this mix for UHC.

Objectives

The aim of the presentation is to share empirical findings from the six case studies that investigated the links between multiple funding flows and health provider behaviors, and the subsequent implications on health system performance – i.e. equity, efficiency and quality in health care service provision.

Methodology

The analysis builds on findings derived from the application of the WHO-HGF/RESYST conceptual framework in country studies carried out in Burkina Faso, Kenya, Morocco, Nigeria, and Tunisia. The different country studies adopted different research focuses using the modular approach of the overall framework, allowing both breadth of scope and depth of analysis. They collated information collected through mixed methods, each individual study having captured both quantitative data collected from various sources (secondary data analysis, national health information system) and qualitative information from interviews with key stakeholders of the purchasing function in the respective national health systems.

Results

The studies confirm the assumption that multiple concurrent payment methods are in place in all six countries. These payment methods translate into funding flows which are often misaligned with one another, therefore creating a set of incentives that is not always coherent with the health system's objectives. Provider response results from a rational choice influenced by the funding flows attributes and attached incentives. The studies identify multiple examples of provider responses which show that these latter adopt behaviors which maximize their income through cost-shifting, patient-shifting, revenue-shifting and service- shifting, or even discriminating against patients. These behaviors often have negative implications for the health system's performance.

Discussion / Conclusion

Misalignment of funding flows generates incoherent incentives for healthcare providers in LMICs. Improved coordination of funding flows is indispensable to transform financial incentives into a powerful instrument able to influence providers towards behaviors consistent with the UHC goal. Several strategies to address the MPPS misalignment challenge were identified during the policy dialogue that followed the dissemination of the empirical findings in the six countries. They show that creating more coherent incentives will require actions not only related to financial instruments but also interventions on the governance of the MPPS.

Steering of Mixed Provider Payment Systems: What Comes Next?

PRESENTER: **Dr. Rahab Mbau**, KEMRI Wellcome Trust Research Programme
AUTHOR: Aurélie Klein

Background

The six country studies allowed identifying key topics for future research and country work.

From a methodological point, the proposed framework provided new insights on the incentives generated by the MPPS. Further research – borrowing from different economic fields, e.g behavioral economics – could contribute to more accurate design of the attributes attached to funding flows.

Regarding the policy implication, the studies identified policy strategies that have the potential to improve MPPS alignment, taking the political economy dimension into consideration. A key condition for this potential to realize is to address governance issues through the definition of new governance arrangements for the purchasing function.

Objectives

IHEA provides an ideal platform for engaging participants in discussions around these key topics.

- *Future research agenda*: what methods and data sources can be used to measure provider behavior as a result of incentives generated by MPPS?

- *Policy implications*: what are the policy recommendations of these findings? How can the political economy dimension be factored into these recommendations?
- *Governance of MPPS*: what governance model/measures should be implemented to overcome the challenges posed by multiple, ill-coordinated funding flows? Who should coordinate the mix of funding flows to ensure coherence among the flows, and how? What government capacity is required to provide effective stewardship over mixed funding flows?

Methodology:

The main presenter will introduce the methodology and topics of the discussion. The target audience will engage in smaller groups around three tables in a world café format. Each participant will have the possibility to participate in two of the three proposed discussions above (one rotation). At each table, a moderator will introduce and guide the discussion, while a rapporteur will take note and prepare a structured feedback for the whole audience to be presented in the final part of the session.

The session will close with a synthesis of the group discussion presented by the rapporteurs and critical reflections by a discussant.

The discussion will be introduced by Aurélie Klein from WHO Health financing, while the moderators and rapporteurs for the group discussions are:

- Ayako Honda, Sophia University, Japan
- Joel Kiendrébéogo, Université Ouaga 1 Professeur Joseph Ki-Zerbo, Burkina Faso
- Rahab Mbau, KEMRI-Wellcome Trust Programme, Kenya
- Obinna Onwujekwe, University of Nigeria

Joe Kutzin, coordinator of the Health Financing Unit at WHO Geneva will act as a discussant for the session

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3:30 PM –5:00 PM MONDAY [Health Care Financing & Expenditures]

Universitätsspital Basel | ZLF – Klein

Organized Session: Adoption of New Technology in Cancer Care: Access to Care, Cost Impact, and Health Inequality

SESSION CHAIR: **Marcelo Coca Perraillon**, University of Colorado Anschutz Medical Campus

Impact of New Technology Diffusion on the Economic Burden of Renal Cell Cancer

PRESENTER: **Ya-Chen Tina Shih**

AUTHOR: Ying Xu

Objective: The influx of new oncologic technologies has changed the treatment landscape of renal cell cancer (RCC) in the last decade. The literature has documented growing use of robotic-assisted nephrectomies among patients with local stage RCC and targeted anticancer medications for patients with metastatic RCC (mRCC). This study examined the impact of various forms of new oncologic technologies on the economic burden of RCC.

Methods: Using the linked Surveillance, Epidemiology, and End Results (SEER)-Medicare database, we employed both prevalence and incidence approaches to estimate the costs of RCC from the payor's perspective. We first constructed a longitudinal database with cost data per patient per month (PPPM) for a prevalence cohort of RCC patients obtained from 2007-2012 SEER-Medicare, identified treatment modality as surgery, radiation, and systemic therapies from medical and pharmacy claims, and further categorized treatment into new vs. conventional therapy within each modality. We then conducted longitudinal analysis using generalized estimation equation (GEE) with Gamma family and Log link to determine which category of new technology was the major cost driver for RCC over time. Lastly, we switched to the incidence approach to compare the cost attributable to RCC by care phases (initial, continuing, and terminal) for two time periods: 2002-2006 vs. 2007-2011, representing the era pre- vs. post-new treatment. Using the incremental costing method, we constructed a control cohort of non-cancer patients (matched by age, gender, race, and state of residence) to estimate cancer-related costs.

Results: After controlling for age, race/ethnicity, gender, region, comorbidity, neighborhood socioeconomic status, tumor grade and stage, care phase, and time trend, longitudinal analyses using GEE showed that new technologies in systemic therapy was associated with higher PPPM costs as well as significant cost increase over time. The adjusted cost PPPM for conventional systemic therapy increased from $3,122 (95% CI: $2,615 - $3,629) in 2007 to $3,599 in 2012 ($3,095-$4,103) and for systemic therapy with targeted agents increased from $6,115 ($5,288 - $6,942) to $9,525 ($8,210 - $10,839) in the same duration. New technologies in surgery were not associated with higher PPPM costs nor an increase in cost over time. Although new technologies in radiation had significantly higher costs, its use was not associated with higher costs over time. Incidence-based analysis showed that the annual cost in pre-new treatment period was $44,667, $10,775, $69175, and $31,764, respectively, for the care phase of initial, continuing, terminal (died from RCC), and terminal (died from other causes). Estimates for post-period were $51,293, $24,710, $87,449, and $40,317. Stratified analysis with vs. without Part D prescription drug claims showed that for mRCC patients, costs for initial and continuing care phase would have been lower over time without Part D claims. ($56,456 vs. $50,575 (w/o Part D) vs. $67,946 (w/) initial, $23,789 vs. $9,687 (w/o) vs. $39,234 (w/) continuing).

Conclusions: We found that the increase in the costs of RCC was largely driven by new technologies in systemic therapies. Furthermore, therapeutic substitution between oral targeted anticancer medications and infused systemic therapies likely explained the rising economic burden among mRCC patients.

The Impact of Health Reform on Breast Cancer Treatment: Evidence from Massachusetts

PRESENTER: **Dr. Lindsay M Sabik**, University of Pittsburgh

AUTHORS: Kirsten Y Eom, Bassam Dahman, Jie Li, Gj van Londen, Cathy Bradley

Background: There are substantial disparities in breast cancer treatment in the United States by insurance and socioeconomic status. Differences in costs (including for guideline-recommended adjuvant therapy) across treatment modalities impacts the financial burden of care, thus insurance status is an important predictor of treatment received. Previous research shows women with private insurance are more likely to undergo reconstruction post-mastectomy than Medicaid-insured or the uninsured. Private insurance is also associated with higher rates of breast-conserving surgery (BCS). Further, uninsured and underinsured patients undergoing BCS are less likely to receive guideline-recommended radiation treatment after surgery. Yet, much previous research in this area is subject to confounding due to selection into insurance categories. Insurance coverage expansions provide a natural experiment for estimating the causal relationship between insurance availability and patterns of care.

Methods: We employ a quasi-experimental framework to assess the effects of Massachusetts (MA) Health Reform, which substantially increased rates of insurance coverage in the state, on breast cancer treatment. Specifically, we examine whether women undergoing surgery for breast cancer receive BCS, whether those receiving mastectomy undergo reconstruction, and whether BCS patients receive guideline-recommended adjuvant radiation therapy. Data come from the Massachusetts Cancer Registry and the Surveillance Epidemiology and End Results (SEER) cancer registries for 2001-2013. Two control groups are constructed from the SEER data based on different criteria for selecting comparison states. We exploit variation across states and age groups to estimate the relationship between health reform and treatment choice using both difference-in-differences (DD; across states) and difference-in-difference-in-differences (DDD; across states and age groups) approaches.

Results: Over the study period, non-elderly BCA patients were less likely to undergo BCS and more likely to undergo mastectomy with reconstruction across all states. We observe statistically significant in rates of BCS across most models, and an increase in rates of reconstruction post-mastectomy, and receipt of guideline-recommended radiation among non-elderly women in MA relative to comparison groups in other SEER states and elderly patients, who were not directly impacted by the reform. Estimates from DD and DDD models suggest a 0.5 to 4.3 percentage point increase in the receipt of BCS (relative to 73% in MA at baseline, pre-reform); 4.0 to 7.0 percentage point increase in reconstruction after mastectomy (relative to MA baseline of 35%); and -1.1 to 9.4 percentage point increase in radiation after BCS (relative to MA baseline of 72%).

Conclusions: Massachusetts Health Reform was associated with increased rates of BCS, reconstruction, and adjuvant radiation. Increased availability of health insurance coverage and generosity of covered benefits under reform may have impacted access to and out-of-pocket costs of care. Given differences in treatment by income and insurance, these findings suggest that insurance expansions may reduce disparities in the treatment received for breast cancer.

Provider and Practice Factors Associated with Oncologist Discussions of the Costs of Genomic Testing and Related Treatments

PRESENTER: **Robin Yabroff**, American Cancer Society

AUTHORS: Janet de Moor, Helmneh Sineshaw, Andrew Freedman, Zhiyuan Zheng, Xuesong Han, Carrie Klabunde

Background: Medical financial hardship, including difficulty paying medical bills, distress, and delaying or forgoing care because of cost, is common among cancer survivors in the US. Professional organizations recommend that oncologists discuss the expected costs of cancer care with their patients, but little is known about the physician and/or practice factors associated with those discussions. To address this research gap, we used data on cost discussions from a survey of oncologists about their use of genomic testing to inform cancer treatment — an increasingly common practice in the US. Because genomic testing and related treatments can be expensive and are not always covered by health insurance plans, understanding potentially modifiable physician and/or practice factors associated with cost discussions is critical.

Methods: We identified 1220 oncologists from the 2017 National Survey of Precision Medicine in Cancer Treatment who reported discussing genomic testing with their patients. Multivariable polytomous logistic regression analyses were used to assess associations between physician and practice characteristics and the frequency of cost discussions.

Results: Among oncologists who discussed genomic testing with patients, 50.0% reported often discussing the likely costs of testing and related treatments; 26.3% reported sometimes discussing costs; and 23.7% reported never or rarely discussing costs. In adjusted analyses, oncologists who used next-generation sequencing gene panel tests were more likely to have cost discussions with their patients often (OR=2.1; 95% CI: 1.5, 3.1) or sometimes (OR=1.7; 95% CI: 1.1, 2.5) compared to rarely or never. Other physician and practice factors associated with more frequent cost discussions were treating solid tumors or both solid tumors and hematological cancers, having training in genomic testing, working in practices with electronic medical record (EMR) alerts for genomic tests, and working in practices with ≥10% of patients who were insured by Medicaid or self-paid, or uninsured (all $p<0.05$).

Conclusions: Physician and practice factors are associated with frequency of discussing the costs of genomic testing and related treatments. Consideration of modifiable physician and practice factors, such as training in genomic testing and use of EMR alerts, may help improve physician-patient cost discussions.

Rurality, Race, Access to Care, Poverty, and the Use of Newly Approved Antineoplastic Agents: Patient and County-Level Factors, 2007-2013

PRESENTER: **Cathy Bradley**, University of Colorado Denver

AUTHORS: Megan Eguchi, Marcelo Coca Perraillon

Background: Cancer treatment is being transformed with the approval of new immunotherapies and other targeted agents. Newer targeted agents for metastatic non-small cell lung cancer (mNSCLC) and colorectal cancer (mCRC) represent marked advancement in cancer treatment for metastatic patients. However, these new treatments come at a considerable cost and are often not considered cost effective in the US. Although rapidly adopted, these treatments are not evenly prescribed across the population. This study estimates the use of high-cost antineoplastic agents and tests whether African-Americans and patients who reside in rural and low-income areas receive state-of-the-art treatments for metastatic cancer. We merged multiple datasets to explore the mechanisms that explain prescribing patterns in historically underserved populations.

Methods: We used the linked population-based Surveillance, Epidemiology, and End Results-Medicare (SEER-Medicare) data for years 2007-2013 to select continuously enrolled patients, aged 66 or older, in fee-for-service Medicare Parts A, B, and D with a first primary diagnosis of mNSCLC and mCRC who survived at least 30 days following diagnosis. We included in the analysis all patients who received an antineoplastic agent. Our key outcome was the use of a new newly approved and high-cost antineoplastic agent, defined as a treatment costing $5,000 or more a month within 12 months following diagnosis. To explore the effect of county-level characteristics, we merged data from the Robert Wood Johnson Foundation County Health Rankings and the Area Health Resource File. We estimated individual-level random-effects logistic models with the use of a high-cost agent as the outcome.

Results: Our sample consisted of 7,407 mNSCLC and 3,549 mCRC patients. Between 2007 and 2013, the probability of receiving a high-cost mNSCLC agent increased by 30 percent points while for mCRC increased by only 6 percent points. African-Americans and patients residing in rural or isolated areas were less likely to receive high cost agents in models controlling for age, sex, and comorbid conditions. In models controlling for area-level poverty, race differences were no longer statistically significant, but urban-rural differences persisted. Urban-rural differences, however, were explained by access to specialized care, such as the presence of a teaching hospital or receiving treatment in a National Cancer Institute designated center. These factors were strong predictors of receiving high-cost agents. On the other hand, for mCRC patients, none of these factors was a predictor of high-cost treatment use, likely due to the widespread use of high-cost agents for this population during the study period.

Conclusions: Although newly approved drugs are rapidly adopted, vulnerable populations are less likely to initially receive these treatments, potentially leading to differences in survival. We demonstrate that race and residency have a lesser role in contributing to these disparities. Instead, lack of access to specialized care in rural areas is associated with a lower probability of receiving state-of-the-art treatments. Therefore, disparities may be ameliorated by improving access through technology such as telemedicine or policy approaches that encourage care coordination, including referrals to specialty centers.

3:30 PM –5:00 PM MONDAY [Demand & Utilization Of Health Services]

Universitätsspital Basel | Pathologie – Unten (U)

Demand and Utilization Among Those with Multiple Chronic Conditions

SESSION CHAIR: **Justin Trogdon**, University of North Carolina-Chapel Hill

Cost, Experience and Health Effects of Re-Orienting a Health System with Integrated Care for Patients with Multimorbidity

PRESENTER: **Jonathan Stokes**, The University of Manchester

AUTHORS: Vishalie Shah, Leontine Goldzahl, Søren Rud Kristensen, Matt Sutton

Background

Health systems globally face rising demand, an ageing population with increasing multimorbidity, combined with economic uncertainty and restrained spending. This has spawned a policy movement towards ‘integrated care’ which aims to achieve a concurrent rise across the ‘triple aim’ of the health system: patient experience, health, and reducing costs of care. The most recent integrated care models aim to change the whole (geographically defined) system, ‘population health management models’, implementing multiple synergistic interventions across the system simultaneously aiming to improve outcomes for the entire population. Current literature reflects previous smaller-scale implementation of integrated care (e.g. targeting high-risk groups only), but the effects of these broader implementations at the population level are unknown.

Methods

We select two population health management ‘Vanguard’ models in the UK (both with similar aims but implementing different sets of interventions) to evaluate separately and compare findings. We use two nationally representative sources of data, 1) GP Patient Survey (GPPS), administered by post to a sample of patients from all GP practices in England annually (biannually until 2016) to measure patient experience (inter-organisational support with chronic condition management) and health (EQ-5D); 2) Hospital Episode Statistics (HES) data, administrative data recording all patient contacts with NHS hospitals to measure total costs of secondary care. For both datasets, we have data at the individual-level which we collapse by GP practice, multimorbidity status, over 65 status, gender and time.

We analyse the data using a quasi-experimental design, difference-in-differences. We compare intervention practices to control (‘usual care’) practices from the rest of England. Our pre-period is from the start of financial year 2012/13 to end of financial year 2014/15 (i.e. three years) and we have 1-2 years of post-data dependent on outcome measure.

Multimorbid patients theoretically have the most to gain from integration of care, so we focus on this group of patients for subgroup analysis.

Results

We find differing effects depending on site. In one site, for the total population we find no significant change for experience and health outcomes, but a decrease in costs of secondary care (-£40 per registered patient); for multimorbid patients, however, we find a small increase in patient experience (+2%) but a slight decrease in health (-0.1%) together with the decrease in costs of secondary care (-£59). For the second site, we find decreased experience (-0.4%) and health (-1%) combined with increased costs overall (+£13), and similarly for the multimorbid patients (-3%; -1%; and +£18, respectively).

Discussion

Findings indicate that the mix of population health management interventions implemented will determine outcomes achieved. There are indications of trade-offs between the triple aim outcomes. Baseline outcome levels may also be a determinant of success, in both sites post-intervention outcomes tended to shift towards the national mean on each measure (perhaps suggesting previous over/under-utilisation of services). We will discuss findings in the context of our previous qualitative analysis across each site and implications for developing models of care moving forward.

Cancer, Care Coordination, and Medication Use for Multiple Chronic Conditions

PRESENTER: **Justin Trogdon**, University of North Carolina-Chapel Hill

AUTHORS: Jennifer L Lund, Ke Meng, Parul Gupta, Benjamin Y Urick, Joel F Farley, Krutika B Amin, Stephanie B Wheeler, Katherine E Reeder-Hayes

Objectives

Among Medicare beneficiaries diagnosed with cancer, more than 60% are living with three or more additional chronic conditions. Given the favorable prognosis for many early-stage cancers, continuous and coordinated management of comorbidities, like diabetes, across the trajectory of cancer care is important. Yet, few studies have characterized how a cancer diagnosis influences medication adherence among older adults with comorbid diabetes. We evaluated changes in adherence to for three cardiometabolic conditions (i.e., diabetes, hyperlipidemia, and hypertension) among older adults diagnosed with the four most common non-metastatic cancers (i.e., breast, colorectal, lung and prostate cancer) and matched cancer-free cohorts in the 6-months pre- through 24-months post-cancer diagnosis or matched date (i.e., the index date).

Methods

Using linked cancer registry and administrative healthcare data from the Surveillance, Epidemiology, and End Results program (SEER)-Medicare database from 2008-2013, we identified older adults (aged 66+ years), who: (1) were aged 66+ years, (2) had prevalent diabetes, hypertension or hyperlipidemia, (3) were dispensed a prescription for a medication to treat the chronic condition from 18-months to 6-months prior to the index date, and (4) were alive for at 24-months post-index date. Four cancer-free cohorts were identified using coarsened exact matching on age, sex, race, region, and presence of the same chronic condition and medication dispensing. Medication adherence was measured using the ambulatory proportion of days covered (aPDC), measured in 6-month windows from 6 months pre- through 24-months post-index date. Changes in aPDC attributable to a cancer diagnosis were estimated for each cancer and matched non-cancer cohort using difference-in-difference methods, log-binomial regression models, and generalized estimating equations. We will also evaluate whether the level of care coordination modifies changes in adherence using claims-based measures of provider interactions based on shared patients and Abadie’s (2005) semi-parametric difference-in-difference estimator.

Results

Prior to cancer diagnosis, the proportion of patients adherent (aPDC ≥80%) to non-insulin diabetes medications ranged from 70-73% among cancer cohorts and was 72% among all cancer-free cohorts. Following diagnosis, the proportion of adherent patients remained stable in the breast, colorectal, and prostate cohorts, but decreased in the lung cancer cohort. For lung cancer patients, we observed a 6% and 7% decrease in the proportion of patients adherent in the initial and continuing versus pre-diagnosis phases relative to matched cancer-free cohort. No statistically significant results were observed for patients with diabetes among the other cancer types. Preliminary results suggest heterogeneous effects of cancer diagnosis on medication adherence across comorbid conditions and cancer types.

Conclusions/Implications

Changes in proportion of adherent patients following a cancer diagnosis varied by cancer type. In general, over time the proportion of patients with diabetes adherent to medications remained stable among breast, colorectal and prostate cancer patients and decreased among lung cancer patients relative to the cancer-free cohorts. Future work will further stratify findings based on stage of disease and extent of care coordination. These findings could inform targeted interventions to improve care coordination and comorbid disease management in older adults with cancer.

Test Performance and Resource Utilisation of Post-Treatment Cancer Surveillance Using CT or PET/CT Imaging in Asymptomatic Melanoma Patients.

PRESENTER: **Mbathio Dieng**

AUTHORS: Nikita Khanna, Robin Turner, Sally Lord, Robyn Saw, Omgo Nieweg, John Thompson, Louise Emmett, Alexander Menzies, Jay Allen, Rachael Morton

Background: In Australia, government expenditure for diagnostic imaging has increased substantially, doubling over the period 2000-2018 (AU$1,159M to $3,641M per annum). Frequent surveillance imaging of cancer patients who have completed treatment is thought to be beneficial to identify and treat distant metastatic disease earlier, hopefully, improving overall survival. However, direct evidence of benefit from surveillance imaging in melanoma patients is lacking, due to a lack of randomised trials. Additionally, several harms may exist including exposure to ionising radiation, patient anxiety, false positive results requiring further action and increased costs to both the health-system and patients who pay out-of-pocket. International consensus-based guidelines for follow-up after surgical treatment of stage III melanoma, vary from no imaging, to 4 monthly imaging for up to 5 years. This study aimed to calculate the test performance of a post-treatment melanoma surveillance strategy of annual CT or PET/CT imaging in asymptomatic patients and to quantify health-system resource use.

Methods: Asymptomatic stage III melanoma patients who had completed definitive surgical treatment and enrolled in a prospective annual CT or PET/CT imaging program, at Melanoma Institute Australia (MIA), Sydney, 2000-2015, were identified. Test sensitivity, specificity, positive predictive value (PPV) and negative predictive values (NPV) were calculated for each year of surveillance. Resource utilisation documentation included surveillance imaging and doctor's visits for the index test, as well as subsequent tests, visits, and procedures undertaken as a reference standard or to investigate false positive or incidental findings on the index CT or PET/CT. Resource use was quantified through detailed patient records in the MIA prospectively collected patient database. Unit prices obtained from the Australian Medical Benefits Schedule (in AU$) and mean per patient and total costs will be calculated with precision estimates, for presentation at the IHEA meeting in July 2019.

Results: Of 335 participants, mean age 52 years, 65% males and mean follow-up of 3.46 years, 100 (30%) developed distant disease. Imaging sensitivity for years 1-5 was 0.80(95%CI 0.64-0.90), 0.81(0.64-0.91), 0.82(0.59-0.94), 0.92(0.65-0.98) and 0.75(0.22-0.98), respectively. Specificity for years 1-5 was 0.86(95%CI: 0.82-0.89), 0.91(0.86-0.94), 0.91(0.86-0.94), 0.88(0.82-0.92); 0.92 (0.85-0.96), respectively. PPV was 0.23-0.50 over the 5 years, driven by the decreasing prevalence of distant metastases over time; NPV was 0.97-0.99. For 335 participants, 1021 CTs, 35 PET/CTs, 109 PETs and 1066 scheduled doctor's visits, were performed for surveillance. An average of 4.51 (SD:1.80, range 1-10) scans per person were performed. An additional 136 tests were undertaken to investigate false positive results including 16 invasive procedures: 2 operations, 2 biopsies, and 12 fine-needle aspiration biopsies.

Conclusion: Surveillance imaging for 5 years following initial treatment in asymptomatic stage III melanoma patients produces more false positive than true positive results.. Surveillance imaging leads to substantial additional healthcare resource utilisation to confirm and interpret diagnostic test results, and occasionally leads to unnecessary invasive procedures. It may represent low-value care. Patients should be fully informed of the likely benefits and harms of post-treatment follow-up imaging schedules. The results from this study will inform a full cost-effectiveness analysis of different surveillance imaging strategies for melanoma patients.

Using Diagnoses to Estimate Healthcare Cost Risk in Canada

PRESENTER: **Dr. Sharada Weir**, OMA

AUTHORS: Mr. Yin Li, Mr. Mitch Steffler, Shaun Shaikh, Jim Wright, Jasmin Kantarevic

Background and Objectives

Until recently, the options for summarizing patient complexity in Canada were limited to health risk predictive modeling tools developed outside of Canada. This study aims to validate a new model created by the Canadian Institute for Health Information (CIHI) for Canada's healthcare environment.

Approach

Our study included the rolling population eligible for coverage under Ontario's universal provincial health insurance program in fiscal years (FYs) 2006/07-2016/17 (12-13 million per annum). To evaluate model performance, we compared predicted cost risk at the individual level, based on diagnosis history, with estimates of actual patient-level cost using 'out-of-the-box' cost weights created by running the CIHI software 'as is'. We next considered whether model performance could be improved by recalibrating the model weights, censoring outliers or adding prior cost.

Results

We were able to closely match model performance reported by CIHI for their FY 2010/11-2012/13 development sample (concurrent R2=48.0%; prospective R2=8.9%) and show that performance improved over time (concurrent R2=51.9%; prospective R2=9.7% in 2014-16). Recalibrating the model did not substantively affect prospective period performance, even with the addition of prior cost and censoring of cost outliers. However, censoring improved concurrent period explanatory power for the FY 2014/15-2016/17 validation sample (from R2=53.6%, without censoring, to R2=66.7%, after censoring). We also found that the concurrent model performed best using 5-year prevalence of health conditions (i.e., a five-year look-back at diagnosis codes), whereas prospective model performance was optimized using a two-year look-back window.

Conclusion

We validated the CIHI model for two periods, FY 2010/11-2012/13 and FY 2014/15-2016/17. Out-of-the-box model performance for Ontario was as good as that reported by CIHI for the development sample based on 3-province data (Ontario, Alberta and British Columbia). We found that performance was robust to variations in model specification, data sources, and time.

3:30 PM –5:00 PM MONDAY [Evaluation Of Policy, Programs And Health System Performance]

Universitätsspital Basel | Klinikum 1 – Hörsaal 1

Organized Session: Advances in Incentives for Treatment Providers

SESSION CHAIR: **Dominic Hodgkin**, Brandeis University

Using Nudges and Incentives to Increase Access to Medication Assisted Treatment for Opioid Use Disorder

PRESENTER: **Prof. Marisa Domino**, University of North Carolina-Chapel Hill

AUTHORS: Sean Sylvia, Kristen Jarman, Sherri Green

Opioid overdoses currently claim the lives of 115 Americans per day. This epidemic is alarming, not just in its effects on the lives of individuals and families, but also on the light it has shined on the disturbing lack of treatment options in many areas. A number of effective treatments are available for opioid use disorder, but many require special training beyond a professional degree. In addition, the complex comorbidities and life circumstances faced by those with an opioid use disorder can deter many providers from investing the time needed to learn how to diagnose and treat individuals needing these services. To date, fewer than 5% of North Carolina's 8087 primary care physicians, nurse practitioners, and physician assistants have undergone the waiver training required to provide medication assisted treatment (MAT) for opioid use disorder. In addition, many waiver-trained providers are not yet prescribing, due in part to the lack of on-going education or support, so the effective rate of treatment provision is substantially lower than 5%. ECHO is an evidence-supported hub-and-spoke model of professional development that uses video conferencing technology to bring experts into even the most rural areas to support primary care providers. ECHO for MAT is program in NC that uses the ECHO model to develop a provider workforce that is equipped to provide MAT to those in need of treatment, preventing further accidental deaths from overdose. The time commitment required to develop MAT proficiency can prove to be a barrier to its take up since provider time participating in waiver training and ECHO may represent lost revenue from not seeing patients. This challenge can especially prohibit participation from small and rural practices, often where treatment is most needed. We randomized eligible primary care providers in rural counties in North Carolina to one of four recruitment arms: two arms used pro-social nudges incorporating specific information from a provider's community to invite participation in an ECHO clinic, while two used standard recruitment approaches which did not include community specific measures. Crossing the pro-social and treatment arms, two study arms indicated that financial reimbursement for participation will be available, while two arms omitted mention of any financial support for participation. Study outcomes, which will be available in the spring of 2019, measure differences in successful recruitment by study arm, and engagement in the ECHO learning collaborative by the number of sessions attended. This study will contribute much-needed information on the incentives that can be used to create a behavioral health workforce that is ready to meet the challenges of the opioid epidemic.

Pay for Outcomes: How Might It Work in Substance Use Disorder Treatment?

PRESENTER: **Dr. Dominic Hodgkin**, Brandeis University

AUTHORS: Deborah Garnick, Constance M. Horgan, Alisa B. Busch, Maureen T Stewart, Sharon Reif

Background: In general medical care, there is a growing push to pay providers based on measures of patient outcomes rather than process measures. This approach has not yet been used much in substance use disorder (SUD) treatment.

Aims of the Study: We set out to examine whether a pay-for-outcomes approach could be feasibly applied to SUD treatment.

Methods: We reviewed several distinct literatures relevant to the study question. First, we reviewed economic theory papers that describe the conditions under which pay-for-outcomes is feasible in principle. Second, we examined papers which state the key outcomes expected from SUD treatment, and the measures of these outcomes that are available in administrative data systems. Third, we reviewed the few papers that report on actual experiences of paying SUD treatment providers based on patient outcomes.

Results: The economics literature notes that when patient outcomes are often strongly influenced by factors beyond provider control and risk adjustment performs poorly, pay-for-outcomes will increase provider financial risk. This is relevant to SUD treatment. In the literature on SUD performance measurement, some stakeholders focus on outcomes such as abstinence from substance use, while others argue that more 'intermediate' measures such as retention treatment should count as outcomes, given the chronic and relapsing nature of SUD. Good measures

are available for some of these constructs, but risk adjustment still faces challenges, including control for social determinants of health. Results from past payment experiments in SUD treatment illustrate some of the concerns raised in the more conceptual literature.

Discussion: There are special challenges in applying pay-for-outcomes to SUD treatment, not all of which will be overcome by developing better measures. Paying for outcomes would require defining those outcomes more broadly than in general medical care. It may also be necessary to continue linking a sizeable portion of payment to process measures, over which providers have more control.

Policy Implications: In pay-for-outcomes programs that use provider-reported data, payers should plan periodic audits to check the integrity of the measurement data being used for payment, including checking them against medical records. Also, these findings should lead to caution regarding the extent to which patient outcomes should be used to pay providers of SUD treatment. Limited use of pay-for-outcomes could be acceptable if the payment system also continues to reward providers based on important process measures, not just patient outcomes.

Cost-Effectiveness of Results-Based Financing in Zimbabwe: A Controlled Pre-Post Study

PRESENTER: **Prof. Donald S. Shepard**, Brandeis University

AUTHORS: Prof. Wu Zeng, Ronald Mutasa, Ashis Das, Chenjerai Sisimayi, Shepherd Shamu, Steven Banda, Jed Friedman

Background: The World Bank has piloted or implemented results-based financing (RBF) in 28 countries, with US$1.6 billion investment, as of May 2018. Despite increasing evidence on the success of RBF on raising utilization and quality of key health care services in many settings, there is little information on the cost-effectiveness of such programs. As RBF competes for resources against other compelling programs, such evidence is critical. Zimbabwe piloted its results-based financing (RBF) program from July 2011 through June 2014 to improve its maternal and child health (MCH) through a controlled trial. To understand the usefulness of RBF in Zimbabwe and globally, this study sought to assess the cost-effectiveness of the country's RBF program.

Methods: Using a pre-post design in 16 RBF and 16 matched control districts with 3.46 and 2.23 million inhabitants, respectively, the study's impact evaluation had found that RBF increased the share of institutional deliveries by 13.4% and post-partum tetanus vaccinations by 20.0% compared to control districts ($p<0.01$). Extending the impact evaluation with data from household and facility surveys, this cost-effectiveness analysis used the Lives Saved Tool and an expert panel to convert utilization and quality changes into lives saved and quality-adjusted life years (QALYs) gained.

Results: The residents of RBF districts gained 536 lives and 12,616 QALYs annually, with quantity and quality improvements each contributing about half the gains. The net annual cost was $2.32 per capita. The incremental cost-effectiveness ratios (ICERs) were $636/QALY gained for Zimbabwe's pilot RBF program and $479/QALY when projected to an ongoing program.

Conclusions: Both ICERs are below Zimbabwe's 40 per capita gross domestic product (GDP, $956 in 2012), making RBF a very cost-effective intervention for strengthening MCH services.

The Impact of Prospective Payment and Referral Incentives on the Inpatient Care Use in Rural China

PRESENTER: **Ms. Shuying Yin**, School of Public Health, Fudan University

AUTHORS: Min Hu, Winnie Yip, Wen Chen

Introduction:

China has been challenged to improve health system performance, including the provision of cost-effective health services. To this end, since the national $125 billion reform plan launched in 2009, pilot schemes in China have been introduced to realign consumer and/or provider incentives by modifying methods of finance or payment. Our aim is to assess whether the introduction of the economic incentives result in impacts on the propensity and intensity to the inpatient care.

Methods:

From November 2011, two pilot counties were selected from the province of Ningxia, China where county hospitals were given prospective global budgets for inpatient services within their deemed area of expertise identified, including those formerly delivered by hospitals above county level. In addition, a system of patient referral from county to higher-tier hospitals was also established, with lower copayment under referral redesigned to encourage patients to initially seek inpatient care at county hospitals. Another three counties with fee-for-service payment were selected in the control group. Two outcomes indicators, including self-reported propensity of inpatient care in the last year and the length of the latest inpatient stay, were measured through three waves of household surveys in 2009, 2011 and 2015, respectively. Totally 87,860 respondents were included. The Coarsened exact matching (CEM) was applied to control the bias between the treatment and control groups. A weighted "difference-in-difference" regression analysis was then employed to estimate the impact of the reforms on the use of inpatient care.

Results:

For the propensity to use inpatient care, we found a significant increase by 37.3% ($P<0.05$) in the probability of using inpatient care due to the reforms. Conditional on inpatient care use, among different levels of health facilities, there was a 15.6% ($P>0.1$) positive effect of the reform on the increase of inpatient care use at county hospitals, and a negative effect of 39.4% ($P<0.1$) on the inpatient care at hospitals above county level. For the treatment intensity of inpatient care, there was a 4.2% reduction to the log of the inpatient length in the treatment counties due to

the reform, but not significantly. Conditional on inpatient care use, among different levels of health facilities, we found a significantly negative treatment effect of 9.1% (P<0.1) to the log of the length of inpatient stay at county hospitals.

Conclusion:

Our work provides evidence that the combination of supply-side and demand-side incentives can impact the healthcare utilization pattern and intensity. In rural China, such incentives result in use of inpatient care away from higher-tier health facilities and less intense care delivered at lower-tier health facilities. These findings provide a practical way of combining supply-side and demand-side incentives for the purpose of promoting efficient health care use, especially for low- to middle-income countries.

3:30 PM –5:00 PM MONDAY [Health Care Financing & Expenditures]

Universitätsspital Basel | Klinikum 1 – Hörsaal 2

Organized Session: Measuring Health Care Spending By Health Condition: Methods and Preliminary Estimates from Switzerland, Norway, and the United States

SESSION CHAIR: **Joseph Dieleman**, University of Washington

Tracking US Health Care Spending By Health Condition and Payer

PRESENTER: **Mr. Joseph Dieleman**, University of Washington

AUTHORS: Ms. Abigail Chapin, Carina Chen, Angela Liu, Taylor Matyasz

Background: US health care spending has continued to increase and now accounts for 18% of the US economy. Despite the size and growth of this spending, little is known about how spending on each health condition varies by payer, and how these amounts have changed over time. Our goal is to estimate US spending on personal health care, according to three groups of payers - public insurance, private insurance, and out-of-pocket - and health condition, age and sex group, and type of care, for 1996 through 2015.

Data and Methodology: Government budgets, insurance claims, facility records, household surveys, and official US records from 1996 through 2015 were collected to estimate spending for 154 conditions. For each record, information about spending, the age, sex, and health condition of the patient, and the type of care was extracted. The fraction of the spending paid by public insurance, private insurance, and out-of-pocket payments was estimated for each health condition, age and sex group, type of care, and year based on household survey data and was used to estimate health condition spending by payer for each of these categories. Spending growth rates, standardized by population size and age structure, were calculated for each payer and health condition.

Results: From 1996 through 2015, $39.2 trillion spent on personal health care was disaggregated by payer, 154 conditions, age and sex group, and type of care. Among these 154 conditions, low back and neck pain had the highest health care spending in 2015, with an estimated $127.9 billion (uncertainty interval [UI], $115.9 billion-$140.6 billion) in spending, with 59.5% (UI, 55.9%-63.6%) from private insurance, and substantially less spending from public insurance [31.9% (UI, 28.3%-35.3%)] and out-of-pocket [8.6% (UI, 7.6%-9.7%)]. Diabetes mellitus accounted for the second-highest amount of health care spending in 2015 ($104.7 [UI, $98.6-$111.6] billion) with most spending (53.5% [UI, 47.6% - 59.5%]) from public insurance, and Alzheimer disease and other dementias accounted for the third-highest amount ($93.4[UI, $68.5-$112] billion), with most the spending (58.0% [UI, 40.3% - 67.2%]) from public insurance. The conditions with the highest spending levels varied by payer, age, sex, type of care, and year. After adjusting for changes in inflation, population size, and age structure, public insurance, private insurance, and out-of-pocket annual spending grew at an annualized rate of 2.69% (UI, 2.67%-2.70%), 2.27% (UI, 2.25%-2.29%), and 0.67% (UI, 0.65%-0.69%), respectively.

Discussion: Modeled estimates of US spending on personal health care showed substantial increases from 1996 through 2015, with population adjusted spending by public insurance growing the fastest. While spending on low back and neck pain, diabetes mellitus, and Alzheimer disease and other dementias, accounted for the highest amounts of spending, the payers and the rates of change in annual spending growth rates varied considerably. This information may help target efforts to curb US health care spending growth.

Decomposing Outpatient Care Spending By Diseases: The Potential of Swiss Health Insurance Claims Data

PRESENTER: **Dr. Simon Wieser**, Zurich University of Applied Sciences

AUTHORS: Michael Stucki, Maria Trottman, Eva Blozik

Background: Decomposing total health care spending by disease, type of care, age and sex can lead to a better understanding of what drives health care spending. A previous study decomposed total health care spending for Switzerland by 21 major diseases. The main obstacle to a higher granularity in the disease decomposition was the lack of diagnostic coding in outpatient care. However, health insurance claims data hold a variety of diagnostic clues, which may be used to identify diseases even in absence of diagnostic coding. We use health insurance claims data to identify approximately 50 specific diseases according to the exhaustive and mutually exclusive Global Burden of Disease classification.

Data and Methodology: We use claims data from two large private Swiss health insurers providing mandatory health insurance to approximately 19% of the population. This data includes detailed information on the cost and type of inpatient and outpatient treatments, examinations, and medication provided to insurees. Diseases are identified in a two-level classification, with major diseases (e.g. neoplasms) on

a first level, and more specific diseases on a second level (e.g. breast cancer, colon cancer, lung cancer, prostate cancer, other cancers). The clues used to identify diseases include medication (disease specific ATC codes), inpatient treatments (disease specific DRG codes), physicians' specialization (cardiology, oncology, etc.) and disease specific treatment and examination codes from the different tariff catalogues. We flag all insurees with these disease clues and identify diseases with single clues or a combination of clues. This identification is validated with clinical experts and with inpatient registry data (for DRG codes). The incremental costs of diseases are determined by direct attribution of costs and with multivariate regression analysis.

Results: Preliminary results show a high precision of disease identification for major diseases on the first classification level and for a number of diseases on the second classification level. Comprehensive results on disease specific spending by disease, type of care, age and sex will be available at the conference.

Discussion: Our results show the large potential of health insurance claims data in identifying diseases when no diagnostic coding is available. This may be particularly useful in the many countries without a systematic diagnostic coding of treatments. It may also be useful to validate estimates of disease specific spending based on population surveys and cohort studies. Furthermore, these results show the potential of health insurance claims data in assessing the treated prevalence of diseases. Due to the lack of data on disease-specific spending in outpatient care these results may be particularly valuable to inform Swiss health policies.

National Expenditures By Medical Conditions in Norway

PRESENTER: **Dr. Jonas Minet Kinge**, Norwegian Institute of Public Health

Background: The Norwegian health-care system can be characterized as semi-decentralized. The responsibility for specialist care lies, with the state – the owner of four regional health authorities, which in turn own the hospital trusts. Municipalities are responsible for primary care and enjoy a great deal of freedom in organizing health services. We explore the correlation between disease specific estimates of health expenditures and the burden of disease in Norway.

Data and methodology: This is based on data for Norway in 2013 from the Global Burden of Disease (GBD) project and the Norwegian Directorate of Health (NDH). NDH decomposed national health care expenditure accounts for each year defined by service type. Service types include three parts: a) hospital care; b) primary care; and c) prescription drugs as well as hearing and visual related products. The NDH-data for hospital care was taken from the Norwegian patient registry (NPR). Data for primary care was based on the registry for reimbursement of primary care physicians, chiropractors and physiotherapists (KUHR), and for prescription drugs a dataset for reimbursement of prescription drugs. Each of these datasets covers the full Norwegian population. The diagnostic categories were equivalent to the ICD-10 chapters.

Results: Mental disorders topped the list of the costliest conditions in Norway in 2013, both in terms of primary and total health service expenditures, while neoplasms caused the greatest burden in terms of DALYs. However, there was a positive and significant association between overall public expenditures and burden of disease. Neoplasms, circulatory diseases, mental and musculoskeletal disorders all contributed to large health care expenditures.

Discussion: By synthesizing and comparing data on mortality, non-fatal health loss and health care expenditures by medical conditions in Norway, this study demonstrates the potential for tracking health care spending in countries with mandatory health registries.

3:30 PM –5:00 PM MONDAY [Health Care Financing & Expenditures]

Universitätsspital Basel | Klinikum 1 – Hörsaal 3

Organized Session: Resource Tracking in Primary Health Care

SESSION CHAIR: **Hong Wang**, Bill and Melinda Gates Foundation

PANELISTS: **Karima Saleh**, The World Bank; **Carlyn Mann**, United States Agency for International Development (USAID); **Nathalie Vande Maele**, World Health Organisation; **David Collins**, Management Sciences for Health

3:30 PM –5:00 PM MONDAY [Organization Of Health Care Markets]

Universitätsspital Basel | Klinikum 1 – Hörsaal 4

Pharmaceutical Markets

SESSION CHAIR: **Enrique Seoane-Vazquez**, Chapman University

Entry Liberalization and Price Competition in the Portuguese over-the-Counter Drug Market

PRESENTER: **Ms. Ana Moura**, Tilburg University

AUTHOR: Pedro Pita Barros

In the past two decades, many European countries allowed Over-the-Counter (OTC) drugs to be sold outside pharmacies. The aim of this policy was to lower OTC retail prices through increased competition among retailers, as OTC prices are usually not regulated. However, evidence on such price effects is scarce, mostly descriptive, and often unable to confirm the expected downward trend in prices.

We specifically assess the impact associated with the entry of non-pharmacy retailers on OTC drug prices. Existing literature has so far neglected the role of non-pharmacy competitors in stimulating price reductions despite the fact that these tend to charge significantly lower prices than traditional pharmacies, thus having potential to exert competitive pressure on traditional pharmacies. We aim at filling this gap in the literature.

We use price data on five popular OTC drugs for all OTC retailers located in the municipality of Lisbon, for three distinct points in time (2006, 2010, and 2015). These price data were collected in face-to-face interviews at each retailer, and through the purchasing of the five OTC drugs in retailers who refused an interview, making this a unique dataset. Additionally, we have information on the type and GPS coordinates of each retailer. These are used to measure distances between retailers and count retailers within given radii, which define the relevant set of competitors for each retailer in our model specifications.

We use a difference-in-differences strategy. Our source of identification exploits the fact that different retailers were affected by the entry of different types of non-pharmacy retailers (supermarkets and outlets) at distinct points in time.

Our results show that competitive pressure in the market is mainly exerted by supermarkets, which charge, on average, 20% lower prices than traditional pharmacies. The entry of a supermarket among the set of competitors of a retailer is associated with an average 4 to 5% decrease in prices, compared to retailers whose set of competitors consists only of traditional pharmacies. This price reduction seems to be long lasting. The entry of an outlet, in contrast, is not associated with price decreases. Our results are broadly robust to different definitions of the set of competitors of a retailer. We deal with the potential endogeneity of entry and location decisions by supermarkets and outlets by i) estimating a reduced-form entry model in which experiencing entry of a supermarket or outlet is a function of past prices, and ii) implementing a propensity score matching difference-in-differences approach. The results from these additional analyses support the view that our estimates for the price reduction following non-pharmacy entry are causal.

Overall, our study provides evidence that OTC liberalization reforms can be successful at bringing competition forces into the market and lowering OTC drug prices. Our results are nevertheless specific to an urban setting, where many supermarkets entered the OTC market. Price reductions may not occur in rural areas, where supermarket entry took place on a smaller scale.

Can Price-Cap Regulation Increase Drug Prices?

PRESENTER: **Dr. Olga Rozanova**, Office of Health Economics

Background: In Canada the prices of generic drugs are subject to price-cap regulation. The maximum allowable price (MAP) – that is, the cap on the price of a generic drug – is equal to the share of the price of a corresponding branded product.

Objective: We study the effect of MAP regulation on the prices of branded drugs, the prices of generic drugs and the welfare of market participants.

Method: We analyse the question of interest in the game-theoretic framework with one branded drug manufacturer and one generic drug manufacturer. Timing of price decisions is sequential: the manufacturer of the branded drug sets the price first. The producer of the generic drug is the follower (i.e. it sets the price after observing the price chosen by the branded drug producer). We consider two setups: in the first there is no regulation of prices. In the second the price of the generic drug is subject to the price-cap regulation.

Results: We show that the introduction of the MAP on the generic drug changes the price incentives of the branded drug producer. On the one hand, the branded drug producer has incentives to lower its price since after introduction of the price-cap on generic drugs the competition between the generic and branded products becomes tougher. On the other hand, introduction of the MAP in the form where the price cap is defined as the share of the original product price gives incentives to the branded drug manufacturer to increase its price. This is the case since increase in the price of a branded drug allows branded drug manufacturer raising the bound on the price of the generic manufacturer and, as a result, relaxing competition between itself and the generic drug producer. So, MAP on the generic drugs has two opposite effects on the price of the branded products. We show that under some parameter values the second effect dominates, and the price of the branded drug is higher under MAP on generics than without MAP regulation. We identify how the difference in valuations of the branded and generic products, the degree of product differentiation, the market size and the level of the price cap affect the likelihood of this result happening. Furthermore, we demonstrate that in addition to an increase in the price of the branded drug, MAP on the generic drug may result in a lower consumer surplus (compared to the situation without price-cap regulation). We identify the conditions when this happens.

Conclusion: Price-cap regulation of generic drugs may increase or reduce drug prices and welfare, depending on the specific conditions of the market.

Market Valuation of FDA Orphan Drug Regulatory Events

PRESENTER: **Dimitrios Kourouklis**, MINES ParisTech
AUTHOR: Philippe Gorry

The US Orphan Drug (OD) Act was implemented in 1983 with the aim to incentivize research and development (R&D) for rare diseases. However, there is lack of empirical evidence on investigating any underlying effects and implications of such policies. The aim of this paper is to identify and measure the financial impact that is created, due to announcements, which are related to an FDA orphan drug i) designation, ii) market approval, and iii) end of exclusivity. To address our research question, we exploit the efficient market hypothesis, and therefore we use an event-study methodology, which is frequently applied in the finance literature. Our sample covers 730 events with non-missing returns for 146 firms in the period between 1984 and 2018. Specifically, 260 events are related to orphan designation, 317 are market approval events and 153 are the events related to end of exclusivity. For the construction and the analyses of our dataset, we utilized the FDA Orphan Drug Product designation database, and the Wharton Research Database (WRDS) database. Our findings suggest that OD market approval decisions result abnormal returns and cause increase on the stock prices**.** On the other hand, we do not find any significant effect, when the events of orphan drug designation and exclusivity end are considered. Overall, our results indicate that stock-market investors react positively to the OD market launch even if this therapeutic class addresses niche market. Therefore, OD status incentives, such as the seven year market exclusivity, as well as the tax-credit, might play an important role for forming the positive perceptions of the stock-market investors. However, this happens only when the regulatory provisions are effective i.e. the market approval. Apart from these, investors do not react to the events of OD designation, because they take into consideration the costs and the uncertainty of a drug R&D. Finally, the fact that the stock market does not negatively react to the end of OD market exclusivity would imply that firms do not rely on the OD market exclusivity, but on their patent protection, to secure their effective market monopoly as was recently suggested in the literature.

Pharmaceutical Pricing and Reimbursement List in China

PRESENTER: **Dr. Ying Yao**

AUTHOR: Makoto Tanaka

The growing burden of noncommunicable diseases, such as cancer and cardiovascular diseases, has raised concern in China. Anti-cancer and cardiovascular drugs are usually expensive, and patients must pay the full price out of pocket for drugs that are not covered by insurance. In an attempt to make these high-priced drugs more accessible, the government has expanded the reimbursement list that enables full or partial reimbursement of medicines. Despite the initiatives, there is little evidence that the expansion of reimburse list has drastically lowered drug prices. In this study, we empirically investigate the drug pricing following the expansion of reimbursement list in 2009. We exploit oncology and cardiovascular drugs procured in 31 provinces in China from 2006-2018. Using a difference-in-difference-in-differences approach, we find that pharmaceutical firms lowered the price by five percentage point after the drug was added to the reimbursement list. Branded drugs experienced greater price cuts than their generic counterparts. But we did not find price changes in drugs that exist on the original reimbursement list – suggesting that expanding drug list might have a limited effect on the price reduction of insured drugs.

The Price of Drugs and the Value of Human Lives

PRESENTER: **Prof. Harry E. Frech III**, University of California-Santa Barbara

AUTHORS: William S. Comanor, Mark V. Pauly

THE PRICE OF DRUGS AND THE VALUE OF HUMAN LIVES

H.E. Frech, III

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December 6, 2018

ABSTRACT

The distinction between price and value raises classic economic issues which lie at the heart of current debates over drug prices. In more competitive markets, prices are determined largely by costs so there is considerable net value or consumer surplus remaining. In less competitive markets, higher prices generate more profit or rent for sellers, leaving less for consumers. There is even the possibility that in some cases a price set for a drug could exceed the value gained by those who consume it, due to the moral hazard effects of health insurance. As the great bulk of pharmaceutical sales are made to public and private insurers who operate as agents for their customers, this factor could be important.

Consider a profit-maximizing drug company with monopoly power, arising from patent protection, which faces an array of potential buyers, principally insurers. Each insurer serves a different underlying population who attach different values to the drug, and each employs different benefit designs and reimbursement policies. We abstract from price discrimination, which is difficult to observe in any case. The seller’s profit maximizing price is impacted by the average demand price across the set of potential buyers. This relationship depends on the shape of the effective demand curve facing the seller, which in turn rests on the heterogeneity of the different underlying populations.

For any individual, and on average, the demand price should vary directly with the therapeutic advantages of the drug, as reflected in additional Quality Adjusted Life Years (or QALYs) resulting from its use rather than from the available alternatives. The incremental QALY is translated into a demand price according to the presumed value of a QALY.

In this research, we study the relationship of value to price in the pharmaceutical sector. Going beyond earlier studies which simply compared prices within crude classifications of new drugs designated as Major, Minor or Little therapeutic improvement, we use evidence on the number of QALY's for individual drugs as a determinant of established prices. Exploratory analysis of a subset of the Tufts data suggest that the number of QALY's gained explains about 29 percent of the variation in drug prices; while the estimated slope coefficient implies an average value of $57,000 per QALY gained. Based on these preliminary results, we find that pharmaceutical prices are strongly related to their essential values.

We also explore whether identifiable classes of drugs, or disease categories, affect observed relationships between price and QALYs gained or whether there are no such systematic relationships. We consider various other factors which may lead prices to depart from those predicted by the number of QALY's gained.

3:30 PM –5:00 PM MONDAY [New Developments In Methodology]

Universität Basel | Kollegienhaus – Hörsaal 001

Novel Approaches in Identifying Sensitive Outcomes

SESSION CHAIR: **Eugenio Zucchelli**, Lancaster University

Risk Preferences and HIV/AIDS: Evidence from Senegalese Female Sex Workers

PRESENTER: **Aurelia Lepine**, UCL

AUTHOR: Ms. Carole Treibich

Background: Female sex workers in Senegal are up to 9 times more likely to be infected with HIV/AIDS than the general population with an HIV/AIDS prevalence of 6.6%. Although sex work is regulated by a public health intervention in Senegal that allows sex workers to access to free condoms, 20% of sex workers did not use a condom during their last sex act. So far there is weak understanding of the factors of risky factors among sex workers in Senegal and globally, there is no evidence of the role of risk preferences on behaviours of populations at high-risk of HIV. The importance of stable psychological traits on risky behaviours, such as risk preferences, could explain the difficulty to change behaviours of high-risk groups, who may exhibit on average greater risk preferences than the general population.

Objective: Our study aims to measure risk preferences of sex workers and to investigate the role of risk preferences on risky sexual behaviours and HIV infection.

Method: Since our main study objective depends on the correct elicitation of risk preferences, we complement quantitative analysis by qualitative research to validate risk preferences measures in our study setting. We implement one of the largest lab-in the field experiments measuring risk preferences using both experimental and self-reported measures in a low-income country setting. A total of 805 sex workers were surveyed in 2015 and 2017 in Dakar, of whom 441 were surveyed twice at a two-year interval. Risk preferences were measured using simple incentivised risk elicitation tasks (Eckel & Grossman and Gneezy & Potters tasks) as well as domain-specific risk-taking scales. In addition, we collected extensive information on risky sexual behaviours, symptoms of sexually transmitted infections and HIV biomarkers.

Results: Our main result indicates that risk preferences have a role to play in health behaviours and are a main determinant of sexual behaviours of sex workers. We found that risk averse sex workers demand more HIV prevention services, have less clients and are much more likely to engage in safer sex acts. As a result, the findings show a negative relationship between risk aversion and STIs, including HIV/AIDS. Our results also indicate that risk preferences are fairly stable over time and mainly unaffected by major life's events. We show that the experimental measure and self-reported measures of risk preferences are poorly correlated and that the experimental measure is a better predictor of behaviours. Our results also highlight the challenge to measure risk preferences in low-income countries and suggest that the poor understanding of the task as well as contextually irrelevant designs are important elements to consider when implementing experimental economic tasks in low-income countries.

Conclusion: Our results confirm the role of risk preferences in the spread of HIV/AIDS epidemic and highlight the need for further research in order to identify effective interventions in populations with different levels of risk preferences.

HIV Infection Risk and Condom Use Among Sex Workers in Senegal: Evidence from a Double List Randomisation

PRESENTER: **Ms. Carole Treibich**, GAEL

AUTHORS: Aurélia Lépine, Khady Gueye, Cheikh Tidiane Ndour, Peter Vickerman

Background: Social desirability bias, that is the tendency to under-report socially undesirable health behaviours, significantly distorts information on sensitive behaviours gained from self-reports. As a result, self-reported condom use among high-risk populations is thought to be systematically over-reported. This is likely to be particularly noticeable for female sex workers (FSWs) in Senegal facing high stigma and a high risk of HIV/AIDS infection.

Objective: The main objective of the paper is to elicit unbiased condom use among FSWs using a list randomisation method to analyse the role of HIV infection and exposure to HIV prevention on condom use. Precisely we estimate if condom use differs between HIV positive and HIV negative FSWs. In addition, we estimate the role of FSWs' registration and participation to the pre-exposure prophylaxis demonstration project on condom use.

Method: We designed a list randomisation to elicit condom use from 787 FSWs surveyed in 2015 and 2017 in Senegal. With the list randomisation method, participants were randomly assigned to two groups (treatment or control) and were asked to report the number of statements they agreed with. Respondents assigned to the control group were presented three non-sensitive items while those allocated to the treatment group were presented the same three statements plus the sensitive item (e.g. "I used a condom during my last sexual encounter"). Comparing the average number of agreed sentences in both groups provides an estimation of the condom use rate in the treatment group. This methodology was implemented in 2015 and extended in 2017 through the use of a double list randomisation, the use of two different lists of non-sensitive items where respondents served sequentially as treatment and control group (or vice-versa) to increase estimates precision.

Results: We found that the percentage of FSWs using condoms in their last sexual intercourse with a client was 80% in 2015 and 78% in 2017, which was significantly lower than the 97% obtained in the face-to-face surveys in 2015 and 2017. When estimating condom use among sub-groups with the list randomisation method, we found that condom use among HIV positive FSWs is only 34%; 47 percentage points lower than the condom use among HIV negative FSWs. We also found that registered FSWs are more likely to use condoms than clandestine FSWs. However, we do not find any difference in condom use between FSWs who were enrolled in the pre-exposure prophylaxis (PrEP) demonstration project and those who were not enrolled.

Conclusion: Our study suggests that the list randomisation is an inexpensive and easy method to obtain less biased estimates of condom use and study its determinants among high-risk groups in low-income countries. The results also show that HIV positive sex workers have very low condom use rate, which explains the contribution of this group in the transmission of HIV/AIDS in Senegal. Our results also shows no relationship between PrEP and condom use.

Stress on the Sidewalk: Mental Health Costs of Close Proximity Crime

PRESENTER: **Panka Bencsik**

I apply novel, extremely micro-level datasets to provide new evidence on crime's impact on mental health. I find that each reported violent and sexual crime significantly increases the stress levels of those in the vicinity for three days after the crime was committed. The temporal aspect of the effect is specifically driven by violent and sexual crimes committed two days earlier, a lag which suggests the presence of a mediator of the information–word of mouth or the media. To measure that, I scrape news data and observe significant increases in nationwide stress levels in response to the number of articles published on the topic of crime in the domestic news section of multiple daily newspapers. I measure crime's effect on stress by merging a unique daily response panel dataset that has over 75,000 responses from 2010 to 2017 in the Thames Valley region of England with secure access data containing every reported crime in the same region with exact location, time, and event characteristics. I survey individuals' stress level using a smartphone application, Mappiness, where respondents answer to twice daily alerts with reporting how they feel, as well as who they are with, what they are doing, and whether they are indoors or outdoors. The data structure allows for a unique in its size and frequency information on how daily circumstances shape mental health, as well as how participation over time shows nuanced patterns not possible to capture with more conventional surveys. The result that violent and sexual crimes increase stress holds with extensive controls for individual fixed effects, circumstantial characteristics, and spatial fixed effects, including fixed effects for the smallest level of census geography in England that contain only an average of 250 people.

The Impact of Natural Disasters on Mental Wellbeing

PRESENTER: **Rachel Knott**, Monash University Centre for Health Economics

AUTHORS: David Johnston, Benno Torgler

The impact of natural disasters on mental wellbeing

David Johnston[a], **Rachel Knott***[a] and Benno Torgler[b]

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Changing climate conditions and the expanding urbanization of hazardous regions has seen a major increase in human exposure to natural disasters. While several studies have examined the effects of disasters on mortality, research into the impacts on mental wellbeing is scarce, particularly in developed countries. This paper utilizes a unique dataset from the Gallup Survey which interviews 1,000 randomly-sampled adults across America on a daily basis (350 days per year), to investigate the impacts of nearby disasters on mental wellbeing. From 2008 to 2015, Gallup routinely collected information on important psychological factors such as stress, sadness, worry, happiness, and enjoyment, which we use to construct an index for mental wellbeing. We match this data to county-level information on all U.S. government-declared federal disasters. We examine the mental wellbeing of people living in disaster-affected counties each week, for a period of eight weeks following the disaster.

We find a significant decrease in mental wellbeing for people living in disaster-affected counties in the 7 days following a disaster, which equates to approximately 7% of a standard deviation of the overall index. The effect dissipates after one week, suggesting that people living in

affected counties are largely resilient to natural disasters. We then refine our treatment group to include only those counties that were more severely impacted, defined as those receiving > $US1,000,000 (2015 dollars) in public assistance. The effect size increases to 9% of a standard deviation; however once again, the effect diminishes after one week. Next, we explore heterogeneity across education groups, and find the effect sizes for more educated individuals to be almost twice that of lower educated individuals. Finally, we disaggregate our analysis by disaster type, and find our results to be largely driven by severe storms. Our study has important policy implications for relief and recovery management in the wake of natural disasters.

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3:30 PM –5:00 PM MONDAY [Economic Evaluation Of Health And Care Interventions]

Universität Basel | Kollegienhaus – Hörsaal 102

Organized Session: Allocating Healthcare Resources to Genomic Testing Around the World: Latest Evidence and Current Challenges in Four Countries

SESSION CHAIR: **James Buchanan**, Health Economics Research Centre, Nuffield Department of Population Health, University of Oxford

Latest Evidence and Challenges for Allocating Healthcare Resources to Genomic Testing in Australia

PRESENTER: **Ilias Goranitis**, The University of Melbourne

AUTHORS: John Christodoulou, Tiffany Boughtwood, Clara Gaff, Zornitza Stark, Stephanie Best, Peta Phillips, Ms. You (Eunice) Wu

Advances in genomic technologies have transformed disease diagnosis and management, offering significant health and economic benefits. These benefits have given genomics a prominent place in the current strategic research priorities of the Australian Government, with $500M committed over the next 10 years for a Genomics Health Futures Mission, making this the largest single investment from the Medical Research Futures Fund to date. Nevertheless, effective adoption of genomic technologies into mainstream clinical practice is lacking, and there is a real need to understand challenges, opportunities, and values associated with the introduction of genomics. This presentation will begin by providing an overview of the current state-of-play for genomics in Australia from a health economics perspective, with a focus on two broad groups of challenges:

1. System challenges and their health economic implications, including:

- The complex interplay of funding responsibility between the national (‘Federal’) and jurisdictional governments;

- How conventional national funding and policy structures of the health system are not ‘fit for purpose’;

- The absence of a transparent mechanism in jurisdictional governments to ensure effective, efficient and equitable resource allocation for genetic services and genomic testing;

- A lack of familiarity among decision makers with genomic testing nuances, both in clinical and health economics terms,

- The fragmented application of genomics between governmental jurisdictions.

2. Study design and analytical methods challenges, including challenges related to:

- Small sample size and duration of patient follow-up;

- Lack of clear comparator groups;

- Narrow evaluative space,

- Limited exploration of decision uncertainty.

Evidence from an ongoing systematic review will be presented to illustrate how Australian health economic studies have attempted to address these challenges. The findings highlight the need to work within an extended health economics framework that will be able to incorporate health, non-health and process-related outcomes for both patients and family networks. The presentation will also draw from experiences within the Australian context to understand the value of genomic testing during focus group discussions with clinical experts and patient representatives. The steps taken to ensure that Australian Genomics is working within a comprehensive and extended evaluation framework will be detailed. Future directions in terms of linking health datasets and generating Big National Data will also be discussed.

Latest Evidence and Challenges for Allocating Healthcare Resources to Genomic Testing in Canada

PRESENTER: **Dean Regier**

AUTHOR: Ms. Deirdre Weymann

Introduction: Precision medicine poses many challenges for health technology assessment (HTA) in Canada. Demand for costly next generation sequencing (NGS) technologies is increasing and health systems are pressured to adopt precision medicine in the absence of sufficient evidence to support reimbursement. There is appropriately limited implementation and adoption of precision medicine in Canada, particularly in context to comprehensive whole genome and whole exome sequencing (WGS/WES). Through a structured literature review, our study objectives were to 1) examine whether Canada's uptake of precision medicine aligns with available HTA evidence; and 2) highlight the methodological challenges HTA studies encountered when evaluating NGS for precision medicine.

Methods: We searched Medline (PubMed) for Canadian studies generating economic evidence for precision medicine informed by NGS. Our search focused on studies published between January 2005 and August 2018 that examined the cost, cost-effectiveness and/or the preference-based value of precision medicine involving the application of NGS. We reviewed included studies and extracted information on study characteristics, methods, findings, and challenges. Given the differences across included studies, we summarized results according to evaluation type, clinical context, NGS technology, and test strategy. We then grouped HTA challenges encountered by authors when evaluating NGS.

Results: Our review included twenty-five published studies evaluating precision medicine in the Canadian context. Studies applied cost-effectiveness analysis (52%, n=13), stated preference analysis (20%, n=5), cost-consequence analysis (16%, n=4), and healthcare resource utilization or costing analysis (12%, n=3). The majority of analyses focused on NGS panels (52%, n=13), which aligns with current implementation of precision medicine in Canada. We identified eight studies that examined more comprehensive NGS technologies involving WES/WGS, with results confirming the high cost of these technologies and also the benefits of knowledge generated in addition to clinical effectiveness. All included studies highlighted challenges when producing HTA evidence for precision medicine, many of which remain unaddressed. Challenges related to: 1) accounting for the value of NGS outcomes, including especially the preference-based utility of non-health or informational outcomes; 2) uncertainty resulting from genomic-level heterogeneity and the potential role of big-data to address uncertainty; and 3) improving consistency of economic approaches, including the need for quasi-experimental study design.

Conclusions: Canadian studies are beginning to produce estimates of the cost, health, and preference-based utility of NGS-informed precision medicine, but barriers for high quality, reliable evaluations remain. Researchers require direction on methods for: incorporating the value of non-health outcomes into economic evaluation, managing amplified uncertainty around outcomes estimates, and standardizing data collection, study designs, and statistical methods. While these challenges are being addressed and real-world evidence for NGS continues to grow, reimbursement and disinvestment contracts that share risk between payers and manufacturers may be designed to better support resource allocation decisions in the presence of substantial decision uncertainty.

How Much Economic Evidence Is Really Needed to Change a Healthcare System? An Insight from the UK 100,000 Genomes Project

PRESENTER: **Sarah Wordsworth**, University of Oxford

AUTHOR: James Buchanan

Next generation sequencing (NGS) technologies such as whole genome sequencing (WGS) have resulted in new genomic-based tests that can inform the diagnosis of rare, genetic diseases and guide treatment decisions for certain types of cancer. However, few phase III clinical trials of NGS technologies have been undertaken. This limits the availability of data to inform cost-effectiveness analyses (CEAs), and presents a barrier to translating NGS into routine clinical practice. An alternative approach could be to use so called 'big data' from large observational cohort studies. These data include information on genomic tests (and their results), linked to clinical patient data, disease registries and routinely collected health system resource use data.

The UK 100,000 Genomes Project is the largest WGS project in the world. In December 2018 the project completed the sequencing of 100,000 genomes from around 85,000 people. Participants were NHS patients with a rare disease, plus their families, and patients with cancer. The sequencing data, when used in the context of economic evaluations, could provide information on where the use of WGS is most likely to represent value for money for the UK National Health Service (NHS).

In October 2018, the NHS launched a new Genomic Medicine Service for the NHS, with a network of Genomic Laboratory Hubs and a National Genomic Test Directory that includes WGS and also alternative genomic tests. From April 2019, the NHS will routinely offer WGS for a small number of conditions such as intellectual disability and early onset epilepsy for rare disease patients, and for haematological malignancies and sarcomas in cancer. However, this decision was made months before the last patient from the 100,000 Genomes Project had been sequenced, and before many of the sequencing results have been examined.

This presentation will consider what health economic evidence has been used to support the accelerated adoption of WGS into clinical practice in the UK NHS and the introduction of the new Genomic Medicine Service. An overview will be presented of the health economic evidence that was used to design the new National Genomic Testing Directory, and to decide which clinical conditions should be the first to be rolled out into routine NHS care. This presentation will also describe some early analysis of routinely collected patient resource data from the 100,000 Genomes Project. This hospital episode statistics (HES) data was used to establish the costs of the diagnostic odyssey for rare disease patients recruited into the Project, and to estimate where in the patient care pathway an earlier diagnosis could perhaps have been made if WGS had been used. The key methodological, technical, and practical challenges when using health resource use data from the 100,000 Genomes Project will also be reviewed, and the solutions that have been applied to try to overcome these challenges will be examined.

This presentation will conclude with a discussion on whether an extensive health economic analysis is necessary prior to enacting changes to an entire health system, or whether limited analyses are sufficient.

"Never a Dull Moment": The Influence of the Rapidly Evolving Social and Political Context on Resource Allocation for Genomics in the U.S. and Beyond

PRESENTER: **Dr. Kathryn A Phillips**, University of California San Francisco

A country's social context – its health care system, industrial structure, governmental institutions, and political context – greatly influence the allocation of resources. This presentation will focus on how the social context in the USA is influencing resource allocation for genomic tests, with a particular focus on differences and similarities across countries.

The social context is rapidly evolving in ways that will influence the allocation of resources to genomic tests, including the mergers of large insurers and creation of new health care delivery systems, changes to FDA regulations that both increase and decrease regulatory stringency, and the rapid growth of laboratory benefit management companies, which conduct utilization management of genomic tests. There are also several prominent "Big Data" initiatives in the USA such as the National Institutes of Health All of Us initiative and data generating companies such as Flatiron and Concert Genetics. These changes are occurring within an environment where controlling the costs of health care – particularly pharmaceuticals – has (re)gained prominence, but also within a political environment that is pro-business and anti-government intervention.

A particularly intriguing example of a shift in coverage policy that has widespread implications will be discussed: the new Medicare coverage of tumor sequencing tests for patients with advanced cancer. This decision represents a paradigm shift in the approach to coverage that is likely to have ripple effects with other payers and genomic tests for several reasons. The policy requires that the test be a companion diagnostic and that the test have FDA approval/clearance. It also provides for coverage for panels that include a large number of genes if at least one gene in the panel meets the requirements. This policy will shape how test developers seek coverage for future genomic tests and it threatens the viability of testing provided by small or non-profit/university based labs that do not meet the coverage requirements and cannot get FDA approval for their tests. Most importantly, because the Medicare program does not consider costs or cost-effectiveness in coverage decisions, there has not been an assessment of the benefits/costs of this policy.

This presentation will conclude with a discussion about how the social context may continue to evolve in the future and how the US experience is similar and different to other countries.

3:30 PM –5:00 PM MONDAY [Evaluation Of Policy, Programs And Health System Performance]

Universität Basel | Kollegienhaus – Seminarraum 103

Organized Session: Lessons from India's Intensified Mission Indradhanush, One of the World's Largest Immunization Drives

SESSION CHAIR: **Stephen C Resch**, Harvard University

Cost and Efficiency of the Intensified Mission Indradhanush Program

PRESENTER: **Susmita Chatterjee**

AUTHORS: Palash Das, Anita Pinheiro, Dr. Logan Brenzel, William Lodge II, Christian Suharlim, Nicolas Menzies, Mr. Stephen C Resch

Introduction: Intensified Mission Indradhanush (IMI) programme is a strategic endeavor launched by the Government of India in October 2017 aiming to achieve 90% full immunization coverage in the country by 2018. The basic strategy of IMI involved a process of microplanning to identify children with missing doses, and outreach to communities to deliver immunization during one week of each month for four consecutive months (October 2017 – January 2018) in lower-coverage districts across India. Special drive like IMI requires additional resources, however, there is no information on the incremental cost of conducting IMI.

The objective of this study was to estimate the actual additional government expenditure as well as economic cost of IMI and to examine the efficiency and sustainability of the programme.

Methods: We purposefully selected five states: Assam, Bihar, Maharashtra, Rajasthan and Uttar Pradesh which had a high concentration of IMI activity. IMI districts were grouped under different divisions which were selected at random using probability proportional to size. The final sample consists of randomly selected 35 districts, 94 blocks and 282 sub-centres.

Financial cost of IMI included vaccines and supplies, expenditure on communications, incentives for front line workers, mobility support, supervision, alternate vaccine delivery while economic cost included time spent for attending training, meeting, conducting head count survey, sessions, supervision etc. A five-six members team visited each levels of facilities for collecting data from administrative records, financial records, IMI reports and through interviews.

Results: Uttar Pradesh, Maharashtra and Rajasthan contain of 83 (44%) IMI districts and urban areas. In the districts sampled from these three states, financial cost per district varies from 4,205 to 376,874 USD. Financial cost per child in these districts varies from 1.17 to 4.68 USD per child, with the lowest in Uttar Pradesh (1.17 – 2.82) and highest in Maharashtra (2.29-4.68). The largest expenditure category were vaccines and supplies for Uttar Pradesh (62%) and Rajasthan (75%), and communications for Maharashtra (29%). On average, 0.89 to 1.45 child were

vaccinated per hour during IMI. Additional analyses looking into economic costs in all five states exploring the diversity of resource use between facilities, efficiency and sustainability of the programme will be presented in the conference.

Discussion: Given the lower baseline coverage for Uttar Pradesh and Rajasthan, the increasing financial cost per child from Uttar Pradesh, Rajasthan, to Maharashtra may reflect the increasing marginal cost of covering more children in a given population. The economic cost calculated in this analysis for Uttar Pradesh is about four times higher compared to the cost of routine immunization in the state, supporting the wealth of research demonstrating a higher cost for programmes aiming to improve immunization coverage. Given the varying degree of output in vaccination in the different states, increasing labour efficiency or investing in more communications effort may improve efficiency.

Quantifying the Additional Doses Delivered Due to the Intensified Mission Indradhanush Program in India: A Difference-in-Difference Analysis

PRESENTER: **Emma C Clarke**, Harvard University

AUTHORS: Christian Suharlim, Susmita Chatterjee, Dr. Logan Brenzel, Jessica Cohen, Margaret McConnell, Mr. Stephen C Resch, Nicolas Menzies

Introduction: Over the past decade, significant progress has been made in increasing access to new vaccines in low- and middle-income countries (LMICs). However, while new vaccine introductions have accelerated, vaccination coverage rates have remained largely stagnant. In India in 2017, an estimated 7 million children (approximately 27% of the birth cohort) did not receive the full immunization schedule.
In response to challenges in routine immunization delivery, in 2017 the Government of India launched the Intensified Mission Indrahanush (IMI). The goals of IMI were to increase full immunization coverage to 90% in low-performing districts by December 2018, and to sustain these gains after the end of the program. Implemented in selected districts and cities, IMI involved micro-planning to identify under-immunized populations, social mobilization to raise awareness of vaccination services, and four rounds of intensified outreach efforts.

Methods: We evaluated the impact of IMI on vaccine delivery using econometric techniques for causal inference from observational data. With data from India's Demographic and Health Survey (DHS) in 2015-16, we matched districts included in the IMI program to control districts excluded from the IMI program, using a nearest neighbor matching approach incorporating data on prior vaccine coverage, household wealth, and other socioeconomic variables. Then, with data from India's Health and Medical Information System (HMIS), we conducted a difference-in-differences analysis comparing trends in vaccine delivery in program districts to trends in control districts from six months before through six months after the start of IMI implementation. The effect of IMI was estimated as the difference in these trends. We used a Poisson regression model with lagged live births included as an offset, as a proxy measure of target population size, to estimate the effect of IMI on coverage of four vaccines: BCG, OPV, DPT3, and measles (first dose). This model include the district-level covariates used for matching.

Results: IMI was implemented in 187 districts and urban areas across 26 states and territories in India from October 2017 through January 2018. These areas make up approximately 36% of India's birth cohort. In 2015-16, mean district-level coverage of basic vaccines in the districts selected to participate in IMI was 50%, compared with 68% in the districts not selected to participate. After matching IMI districts to control districts, our sample included 171 districts in each group, with a coverage gap of five percentage points between groups. Using matched data, we estimated that IMI increased coverage by 4.8% to 9.1% across different antigens, equivalent to an additional 926,000 doses of these four vaccines delivered in districts previously identified as having low vaccine coverage.

Conclusions: In order to inform the allocation of scarce resources for immunization intervention, there is a need to identify the effectiveness of different interventions. India's IMI program represents one of the largest global immunization outreach efforts in history. We found that IMI had a significant effect on vaccine coverage, which varied across different antigens. Our findings suggest that periodic intensification of routine immunization (PIRI) activities such as IMI can be successful in increasing coverage.

Diverse Local Decision Making Capacities and Their Function in Supporting Immunization Drives in India: A Mixed-Methods Approach

PRESENTER: **Ms. Isabelle Feldhaus**

AUTHORS: Susmita Chatterjee, Dr. Logan Brenzel, Christian Suharlim, Thomas Bossert, Mr. Stephen C Resch

Background: Donors, researchers and international agencies have made significant investments in the collection of high-quality data on immunization costs and impacts, aiming to improve the efficiency and sustainability of services. However, these investments do not always translate to enhanced local performance. At the local level, managers play a key role in the implementation of immunization programs and may be making key decisions that affect program performance. Understanding how local managers of immunization programs make decisions and how their decision making ultimately relates to performance can highlight opportunities to improve the efficiency of these programs.

The Intensified Mission Indradhanush (IMI) is a program of periodic intensification of routine immunization (RI) implemented in low-coverage districts across India between October 2017 and January 2018. IMI involves a process of microplanning to identify children with missing doses and outreach to deliver immunizations at temporary vaccination sites, involving stakeholders at the district, block, and subcenter levels. Within this context, the objective of this study was to understand how decentralized decision making in IMI implementation relates to the program's performance.

Methods: To assess the decision space of local program authorities, structured questionnaires tailored to the different levels of IMI implementation (i.e., district, block, subcenter) were developed to examine their range of choice across five functional areas: (i) strategic and operational planning, (ii) financial management, (iii) human resources, (vi) service organization and delivery, and (v) governance and local

participation. Responses to questions were scored (0 – low/narrow, 1 – moderate, 2 – high/wide) and mapped to domains characterizing decision space, institutional capacities, and accountability structures operating within the program. Correlation analysis was conducted to examine the relationships between these domains and program performance. Additional qualitative information gathered regarding local managers' challenges, perspectives on IMI, and priorities were synthesized.

Results: Data was collected in 17 districts, 49 blocks, and 206 subcenters across three states in India between August and November 2018. Notable variation in decision space was found across all functional areas between states. The majority of respondents at each level reported making changes to IMI implementation based on experience and feedback over the course of implementation. Capacity at the subcenter level was the most variable with the widest range of education, training, and experience among managers. Strong accountability structures during IMI are reported with the majority of direct supervisors communicating with lower levels almost daily, especially at the subcenter level (93%). Furthermore, over 21% of subcenter managers (ANMs) reported making changes to IMI implementation based on community participation. Local managers across levels faced challenges, including shortages in human resources, resistant and/or hard-to-reach communities, limited support from other departments, lack of transport at lower levels, unmotivated workforce, and ineffective collaboration with international partners.

Conclusions: Findings highlight how organizational design, capacities, and processes for decision making can influence program performance. This analysis provides specific information into decision making at key points in the program's organization. Incorporating insights into future program design and planning can contribute to enhancing the efficiency of immunization in India and similarly decentralized contexts.

3:30 PM –5:00 PM MONDAY [Production Of Health, Health Behaviors & Policy Interventions]

Universität Basel | Kollegienhaus – Seminarraum 104

Obesity/Diet/Exercise/Nutrition #2

SESSION CHAIR: **Alexander L. P. Willen**, Norwegian School of Economics

Rebates As Commitments: The Effects of a Gym Membership Reimbursement Program

PRESENTER: **Alexander L. P. Willen**, Norwegian School of Economics

AUTHORS: Mr. Barton Jay Willage, Tatiana Homonoff

Can financial incentives induce health behaviors? We examine this question by evaluating a large-scale wellness program at a major university in the US. This program fully reimburses students' fitness membership fees ($75) if they attend the gym at least 50 times during the semester. Given the increasing prevalence of health insurers reimbursing fitness center dues to encourage healthy lifestyle choices, this is a particularly interesting wellness incentive program to examine. To perform our analysis, we obtained individual-level administrative data on daily gym attendance for the universe of students over a five-year period, covering the three years that the policy was in place, as well as one year before it was implemented and one year after it was terminated. This provides us with 100.000 student-year observations and more than 1.5 million gym check-ins. We provide four sets of empirical results. First, we show that the program had a significant effect on gym attendance, driven exclusively by a change in the attendance behavior of existing members. Using a difference-in-difference framework, we find that individuals exposed to the reimbursement program increased their gym visits by almost 5 visits per semester. Second, we provide clear evidence of a bunching effect at the 50-visit threshold, consistent with a rational response to a non-linear incentive set with a considerable kink. Third, we demonstrate that the program did not have a negative anchoring effect among high frequency gym visitors. Finally, we show that the effect did not completely disappear after the termination of the program, providing evidence of a habit formation effect. These results suggest that rebates as wellness commitment devices can be successful in inducing healthy behavior.

Low or High Tax Rate? The Potential Health and Revenue Effects of a Tax on Sugar Sweetened Beverages

PRESENTER: **Dr. Peter Hangoma**, University of Zambia

AUTHORS: Maio Bulawayo, Mwimba Chewe, Mr. Nicholas Stacey, Laura Downey, Kalipso Chalkidou, Karen Hofman, Mpuma Kamanga, Anita Kaluba, Gavin Surgey

BACKGROUND AND OBJECTIVE

Zambia is experiencing a rise in mortality and morbidity associated with obesity related non-communicable diseases (NCDs). Excessive consumption of sugar from non-alcoholic beverages such as sugar-sweetened beverages (SSB) is a major risk factor for obesity and related diseases such as CVDs and diabetes. One way to reverse this trend is through an SSB tax. In September 2018, the Finance Minister announced an equivalent 3% excise tax on 'non-alcoholic beverages". This rate is lower than one commonly adopted in other countries and the one proposed by stakeholder (25%). The potential health and revenue benefits of the tax depend on the level at which it is set. Our objective was to study the potential health and revenue impact of a 3% sugar tax proposed in the National budget compared to a 25 rate. To the best of our knowledge, no previous study assessing the effect of a sugar tax in a low-income sub-Saharan Africa country has been conducted before.

METHODS

We developed a mathematical model which simulated the effects of a 3% and 25% excise tax on SSB consumption, energy intake and the corresponding change in BMI, obesity prevalence, deaths averted, and life years gained. Baseline consumption values for SSBs and their

substitutes were derived from the 2015 Living Conditions Monitoring Survey (LCMS) data. Age and sex specific Body Mass Index (BMI) were computed from the 2017 Zambia NCD STEPS Survey. Own-price and cross price elasticities as well as other key parameters were obtained from the literature. We constructed 95% confidence bands and sensitivity analyses to account for uncertainties in key parameters.

RESULTS

Over a 40-year time horizon, a 25% SSB tax was found to avert 2,526 deaths, with effects particularly significant among women. The tax was found to potentially generate an additional US$ 5.46 million in revenue annually. This amount is almost 3 times higher than the tax paid by the sugar industry in 2017 (approx. US$1.7m). A 3% tax is projected to have no significant impact on health, and will only raise about US$33,314 per annum in revenues.

CONCLUSIONS

If set at an appropriately high rate (25%), the introduction of an SSB tax in Zambia has the potential to significantly avert deaths lost to lifestyle-related disease. In addition, the revenue generated could make a contribution in financing the Zambian health system, given the limited financing options presently available.

The Sweet Life: The Long-Term Effects of a Sugar-Rich Childhood

PRESENTER: **Tadeja Gracner**

AUTHOR: Paul Gertler

Background: It has only recently been found that nearly all American infants and toddlers consume added sugar daily, and exceed the *adult* limit of 7 tsp of added sugar per day by the time they are two years old. As liking for sweetness is shaped by exposure to sugar-rich diet during the first years of life, its excessive consumption then may persist into adulthood. This is concerning, because increasingly, excess intake of added sugars has been put forth as a key risk factor for unhealthy weight-gain, cardiovascular disease, diabetes, and cancer. Yet, evidence on robust link between excess intake of sugars and these diseases is scarce, and no study has estimated the impact of exposure to sugar-rich diet in childhood on diet and health later in life.

Objective: We estimate the impact of exposure to sugar-rich diet early in life on diet and health in later adulthood.

Methods and Data: We exploit the end of the rationing of processed sugary foods between January 1940 and September 1953 in the United Kingdom as a natural experiment inducing variation in adult diet and health. The de-rationing of sweets had a dramatic effect on the confectionery market – spending on sweets increased by more than 150% within one year. Using a regression discontinuity design, and by controlling for cohort trends, we assume that cohorts born before (1950-1953) and after the rationing ended (1954-1960) are similar, except in their exposure to rationing early in life. We use the Living Costs and Food Survey to observe national consumption of nutrients before and after the rationing, and the Dietary and Nutrition Survey to analyze daily diets of adults more than five decades later. We also use the English Longitudinal Study of Ageing to observe variation in health among today's older adults.

Results: We observe almost a 100 percent increase in consumption of sugar by the end of 1954 in the UK compared to a few years before. While we document a slight increase in consumption of fats, the change is much smaller. No large change was observed for other foods. We find that more than five decades later, cohorts born during the rationing consume less added sugars, more fiber, fruits and vegetables, compared to cohorts born soon after the rationing has ended. Yet, they do not consume more or less total calories, suggesting substitution across foods. We observe no difference in consumption of protein or fats. Finally, we find that cohorts born before 1954 are less likely to be severely obese, be diagnosed with diabetes, heart attack, arthritis, or have any diet-related chronic disease.

Conclusion: We find that exposure to sugar-rich diet early in life affects preference for sweetness that persist into adulthood, and that such dietary patterns over the life-course translate into adverse health outcomes. Such evidence points at the importance of obesity prevention efforts early in life. Our results also provide suggestive evidence on the long-term impact of dietary guidelines, as diets during rationing were in many ways similar to today's dietary guidelines.

Effects of Obesity on Wages of Men and Women in China

PRESENTER: **Charles R Link**, University of Delaware

AUTHOR: Simon Condliffe

Like the U.S., China has a problem related to obesity. Our objective is to estimate the causal effect of body weight on wages of Chinese males and females. We are not aware of any other studies dealing with this issue in China. Our data, including more than 9,000 males and 6,000 females, are from the China Health and Nutrition Survey (CHNS) that provides a wealth of information about each individual in the survey. The CHNS is an ongoing longitudinal household survey conducted in nine Chinese provinces: Guangxi, Guizhou, Henan, Hubei, Hunan, Jiangsu, Liaoning, Shandong, and Heilongjiang. We use the survey years 1989, 1991, 1993, 1997, 2000, 2004, 2006, 2009, and 2011.

We have followed the approach of Cawley (2004) looking at the effects of obesity on wages of men and women in the U.S. We employ four regression strategies (separately by gender), to estimate the effects of weight on wages: OLS with contemporaneous weight, OLS with lagged weight, fixed-effects (with and without time fixed effects), and an instrumental variable for weight.

For Chinese males, our preliminary results for the first three approaches just noted, indicate a positive and significant effect of BMI and weight in kilograms on wages of men. For Chinese women, our preliminary results provide very different effects of obesity on wages. The coefficient for BMI is statistically significant and negative for the OLS with current BMI and current weight. Even when not significant in the fixed effects models (with and without time fixed effects), the coefficients are negative. When the clinical dummies representing overweight and obese are used, the coefficients are statistically significant and negative compared to normal weight.

In order to avoid problems associated with OLS and fixed effect models, we estimated an instrumental variable wage model. Xie and Awokuse (2013) while using the CHNS data, employed "difficulty in running one kilometer" as an instrumental variable for health status to investigate the causal effect of health status on individual income. We use this instrument to explore the relationship between body weight and the worker's wage. We create a dummy variable indicating if the respondent has difficulty running one kilometer. The variable meets the characteristics of a valid and strong instrument for respondents' weight according to the Staiger and Stock (1994) rule. In our preliminary results for males, using the IV approach yields positive and significant effects of BMI and weight in kilograms on wages. For females, our preliminary results indicate a significant and negative effect of BMI (and weight in kilograms) on her wage.

Interestingly, for all cases, a Hausman test fails to reject the hypothesis that OLS and IV coefficients are equal for both males and females. This suggests that any endogeneity of weight does not appreciably affect the OLS estimates and OLS should be preferred to IV since OLS results in lower standard errors.

3:30 PM –5:00 PM MONDAY [New Developments In Methodology]

Universität Basel | Kollegienhaus – Seminarraum 105

Organized Session: Recent Attempts at Quantifying the Relationships between Economic Development and Malaria: Current Methods and Challenges

SESSION CHAIR: **Edith Patouillard**, WHO

DISCUSSANT: **Fabrizio Tediosi**, Swiss Tropical and Public Health Institute; **Michael Borowitz**, Global Fund for AIDS, TB and Malaria

Economic Growth and Malaria: Revisiting the Evidence

PRESENTER: **Nayantara Sarma**, IHEID

AUTHORS: Jean-Louis Arcand, Richard Cibulskis, Edith Patouillard

Despite a decline in recent years, there were 217 million cases of malaria world-wide in 2016. Approximately 80% of the global disease burden was borne by 15 Sub-Saharan countries and India alone. In their celebrated contribution on the impact of malaria on economic growth, Gallup and Sachs (2001) argued, using cross-sectional level and growth regressions, that malarial countries displayed, ceteris paribus, per capita income levels and annual per capita growth rates that were, respectively, 70 and 1.3 percent lower than non-malarial countries.

We revisit the evidence using both more recent and improved data, as well as empirical techniques that have become the norm in the intervening years. We apply the within-estimation which accounts for country and time specific effects to isolate the impact of malaria on GDP per capita from other factors correlated with malaria that may also affect income. Our compiled data include 180 countries over the period 2000-15. In order to identify the causal effect of malaria on GDP per capita, we attempt an instrumental variable (IV) approach using malarial drug resistance as our IVs: resistance to sulphadoxine-pyrimethamine, Chloroquine and Artemisinin-Based Combination Therapies.

Our preferred specification, which accounts for country-specific time-invariant unobservables, indicates that malaria eradication would be associated with a 5% increase in per capita GDP on average. A similar specification, but where the dependent variable is the growth rate of GDP per capita, indicates that malaria eradication would be associated with a 1% increase in the annual growth rate. Given the much higher levels of malaria incidence in poor than in rich countries, it is apparent that the distributional effects of malaria eradication would disproportionately benefit the world's poorest countries. Finally, we find that our causal specifications using the selected IVs provide estimates that are not stable.

Economic Return on Investment of Malaria Control in Sub-Saharan Africa Since 2000 Using a Panel Data Analysis of Prevalence Surveys

PRESENTER: **Ben Lambert**

AUTHORS: Pete Winskill, Samir Bhatt, Peter Gething

The association between malaria and poverty has previously been studied though, until recently, data were insufficient to determine the direction of causality. Whether economic growth leads to reductions in malaria transmission or alternatively transmission hampers development or both has important ramifications for public health policy. Similarly, the timescales involved for malaria to affect growth are currently unknown and hinder attempts to make economic arguments for disease elimination.

Here we apply the Arellano-Bond estimator to panel data consisting of a recently-published database of historical prevalence surveys in Sub-Saharan Africa and use it to investigate the effect of malaria transmission on economic growth from 1960-2015. Our main instrumental variable is the coverage of insecticide-treated bednets, which have been in use since approximately 2000 across the continent. By working with time series data, our approach also allows us, for the first time, to capture the dynamic effects of malaria transmission on growth. Using counterfactual prevalence estimates from the Malaria Atlas Project, we then use our estimates to determine the boost to economic growth due to recent upscaling of interventions and also to calculate the economic return on investments for each intervention.

We conclude that malaria transmission causes long-term suppression of GDP per capita growth and that this effect is stronger than that running in the opposite direction. We estimate that transmission perturbs growth across a range of timescales, with the impact greatest over longer periods (10 years+) of time. The economic boost delivered to some of the poorest nations on earth due to the upscaling of insecticide-treated bednets and indoor residual spraying is considerable and already amounts to a large positive return on investment, which is set to grow over time.

The effect of reductions of malaria transmission on growth from our estimates is smaller than those determined by previous analyses. This may be because our sample consists only of Sub-Saharan African countries which have experienced relatively modest growth over the period of investigation but likely also reflects differences in available data and methodology. The magnitude of the impact of economic growth on transmission is smaller than the effect in the opposite causal direction, which may pertain to qualities of our data sample, but could be because malaria transmission is tied to local vector ecology which is relatively insensitive to development. Our analysis indicates that there is a contemporaneous impact of changes in transmission on economic growth but that this is smaller than the longer-run effects. This is reasonable because many of the channels through which transmission affects growth are hypothesised to operate on longer time scales. Donor fatigue, alongside a myriad of other factors including the spread of insecticide and drug resistance threatens the gains that have been made against malaria transmission over recent years. Against this backdrop, our work indicates the continued importance of investment in malaria control to allow the world's poorest the chance to escape poverty.

Expanding Malaria Control Interventions: Insights on How Malaria Morbidity and Mortality Reductions May Affect Economic Outputs

PRESENTER: **Seoni Han**

AUTHORS: Jean-Louis Arcand, Jeremy A. Lauer, Edith Patouillard

It is well evidenced that malaria poses a burden on population well-being. However, most of the evidence available fails to provide insights on the mechanisms of how malaria morbidity and mortality affect economic outputs. This presentation aims to overcome this limitation by identifying two channels, namely labour supply and physical capital accumulation, through which changes in the coverage of malaria control interventions and associated burden reduction, may impact a country’s economic outcomes.

We investigate the impacts of increasing investments towards universal coverage of WHO-recommended malaria control interventions on economic outputs in high-burden malaria-endemic-countries for the period 2016-2030. We use the WHO Economic Projections of Illness and Cost of Treatment (EPIC) model based on the human capital augmented Solow model, which incorporates a yearly recursive production function accompanied by the evolution of the two production factors - physical capital accumulation and labor stock. The model computes economic outputs in terms of GDP and GDP per capita under economic and disease assumptions in two different scenarios. A counterfactual scenario assumes coverage of key malaria control interventions is sustained over the study period whilst a scale-up scenario considers increasing coverage to 90% by 2030. Synthesizing changes both in physical capital and labor force, we compare gain/loss of the economic outcomes between the two scenarios. We also take into consideration how the improved health status of children through malaria burden reduction is transferred to the productivity gains of their caregivers in working age groups. We conduct the study in twenty-nine malaria-endemic countries, which together accounted for 95% of global malaria cases in 2016.

We find that scaling-up malaria intervention coverage to 90% by 2030 could lead to a decline of 58% in malaria incidence rates and 71% in death rates over the study period in the selected countries. These burden reductions could contribute to an increase of 0.15% in the aggregated GDP and 10% in GDP per capita cumulatively over the study period. A larger proportion of the economic gains would come from averted malaria morbidity than related deaths. Low-income malaria-endemic countries are expected to benefit larger gains than countries with higher income.

3:30 PM –5:00 PM MONDAY [Production Of Health, Health Behaviors & Policy Interventions]

Universität Basel | Kollegienhaus – Seminarraum 106

Income and Inequality #2

SESSION CHAIR: **Indrani Saran**, Boston College

Changing Socioeconomic Inequalities in Child Nutrition in the Indian States: What the Last Two National Family Health Surveys Say

PRESENTER: **Dr. Simantini Mukhopadhyay**, Institute of Development Studies Kolkata
AUTHOR: Achin Chakraborty

Introduction

Though the fourth and latest round of India's National Family Health Survey (NFHS) shows a decline in child stunting, the figures are still quite high compared to other developing countries. Moreover, an overall decline in the average level often hides the fact that children in all socio-economic groups do not experience the same. This paper attempts to look into the dynamics of socioeconomic inequality in child undernutrition in India. We also probe into how such inequality has evolved in the decade following NFHS-3 in each of the major states.

Data and Methods

We use unit-level data from NFHS-3 and NFHS-4 conducted in 2005-06 and 2015-16 respectively. To look into the dynamics of socioeconomic inequalities in undernutrition, we use different indicators, ranging from the Rawlsian criterion (relative rate of decline in the bottom wealth quintile vis-à-vis the mean) to the more sophisticated measures such as the extended concentration index to measure socioeconomic inequalities. We also use linear and quantile regression to ask if the pattern of association of private wealth and access to a public nutrition programme differs across the quantiles (particularly comparing the bottom quintile and the median) of the nutritional distribution in each of the major states.

Results and Discussion

The backward states not only have retained the last ranks in terms of average stunting, but they have also faltered in the reduction of child stunting during the decade under study. These are the states which have also been the laggards according to the Rawlsian criterion. That is, children from the poorest quintile of households in these states have witnessed proportionately less improvement in stunting. Even when we use the health inequality measures based on the ranking of the households' wealth scores, such as the concentration index and the extended concentration index, we find that inequality in stunting has increased in these states. While mapping the performance of states in reducing stunting inequalities to the economic indicators, we find that there is no generalisable pattern. Gujarat, which has had the second highest growth rate in Per Capita Net State Domestic Product (PCNSDP), has witnessed a rise in inequality in child stunting by all measures. At the other extreme, Uttarakhand, which has had the highest growth rate in PCNSDP and the second highest rate of poverty reduction, has also been successful in reducing wealth inequality in stunting, irrespective of the measure chosen. The regression results show that in most of the backward states, the effect of receiving benefits from a public nutrition scheme was non-significant even at the bottom quintile.

Conclusion

The findings of this paper call for immediate policy attention since children from the poorest households in the backward states seem to suffer from the dual burden of the state effect and the class effect. The paper also reveals the limited effect of Integrated Child Development Services (ICDS) in improving nutritional scores of children in most of the backward states, even in the bottom quintile.

Identifying the Impact of Economic Crisis on Mental Illness in Italy: What Are the Socioeconomic Gradients?

PRESENTER: **Yuxi Wang**, Cergas Bocconi
AUTHOR: Giovanni Fattore

Background

The advent of the global economic crisis has prompted increasing research on the impact of economic and social shocks on mental health and suicidal behaviour. Conceptually, economic crisis can affect mental health through increased unemployment, indebtedness, insecurity and decreasing welfare support. As one of the countries that were hit most severely during the recent crisis, Italy presents an interesting case to investigate the mental health consequences of the recession. Although several studies analysed the issue in Greece, Spain, Portugal, the UK and the US, to our knowledge no Italian study has utilized patient- and small area- level hospital administrative data to identify the causal effect on a national scale.

Objectives

The primary objective of the study is to measure the impact of economic crisis on healthcare in Italy, specifically focusing on neighbourhood socioeconomic determinants of admissions with mental disorder and their length-of-stay. We are also interested in testing whether hospital service utilisation associated to mental disorders changes according to the level of deprivation in small areas.

Data and Method

We exploit an eleven-year (2006-2016) panel dataset of hospital discharge information, containing mental disorder patients' demographic characteristics, diagnosis, length-of-stay and information on the admitted hospital, as well as data on the local socio-economic and labour market condition at the level of clusters with common economic structure. Panel fixed-effect of unemployment rate on severe mental illness admission per 100,000 habitants and average length-of-stay is used to account for time-invariant heterogeneity. In order to address the issue of

potential endogeneity of unemployment rate, we control for the fiscal capacity and other economic factors of the small areas. Further, we create discrete deprivation groups and perform a geographical analysis for standardised utilisation ratio to observe potential deprivation gradients.

Preliminary Results and Discussion

Preliminary results showed that unemployment is associated with higher admission rate for severe mental illness hospitalization after controlling for population size, average age, gender composition and percentages of different civil status. We expect to find significant impact of change in unemployment rate on severe mental illness admission after controlling for additional economic factors, as well as persistent inequality of utilization across different deprivation groups. The results will contribute to the literature of spatio-temporal variation in the wider determinants of health and shed light on the groups that are most susceptible to the effects of the economic crisis.

Is It All Relative? The Health Impacts of Changes to Absolute and Relative Income

PRESENTER: **Boriana Miloucheva**

AUTHOR: Maripier Isabelle

Despite policies designed to foster redistribution, the concentration of income among top earners has increased in most developed economies, as has inequality within and across communities. Aside from the well-documented repercussions of these trends on social cohesion and productivity, evidence suggests that changes in the income distribution might have an impact on individuals' physical and mental well-being. Indeed, recent work has pointed to the feeling of *falling behind* as a potential driver for the rise in morbidity and in mortality among certain groups of the population, for whom absolute levels of income have not necessarily declined. However, identifying the health effects of changes to people's *relative* economic situation from changes to their *absolute* level of income is not straightforward. First, both absolute and relative income are likely endogenous inputs in the health production function. Second, changes in individuals' income levels often simultaneously affect their rank or position within the income distribution, making it difficult to separately assess the consequences of movements in relative income on health outcomes. In this paper, we propose an empirical strategy that draws on the importance and geographic concentration of the extractive industry in Canada to address these challenges. To deal with the potential reverse causality characterizing the relationship between health and income, we exploit exogenous movements in the price of oil, which predominantly affect the earnings of individuals employed in the extractive industry. Those variations in the price of oil also induce movements in local income distributions based on the makeup of local labour markets and on the share of individuals employed by the oil industry. An oil price shock therefore induces different combinations of changes to individuals' absolute and relative incomes, based on their own labour market activity and on the industrial composition of their neighbourhood. We capitalize on these combinations to shed light on the mechanisms through which changes in people's absolute and relative income trajectories may contribute to the development of severe health conditions and the use of inpatient care services. Using linked hospital records and census files, we find that while increases in individuals' absolute income levels have protective impacts on their health, changes to their relative income do not in and of themselves seem to affect the probability of hospitalization for most conditions. However, our results indicate that increases in relative income can contribute to the protective effects of positive absolute income shocks on health conditions related to drugs or alcohol abuse, and on mental health. For individuals whose absolute income is not affected by a change in the price of oil, we find positive health effects from being surrounded by oil workers when the price of oil surges. Positive externalities might therefore dominate the potential health impact of negative shocks to relative income for these people.

Racial/Ethnic Disparities in Rural-Urban Mortality Gap in the United States: A 24 Years Longitudinal Study

PRESENTER: **Mr. Soroosh Baghbanferdows**, Istanbul Technical University

AUTHORS: Nasim B. Ferdows, Amit Kumar

Research Objective: Although overall life expectancy in the US has improved rapidly over the course of the 20th century and the racial gap in all-cause mortality has declined in recent decades, geographical disparities in mortality have increased in the last three decades. This research aims to study racial and geographical disparities by comparing the trends in mortality rates in the US rural and urban populations within each race and gender group.

Design: Longitudinal county level analytic file of the US population 65 years and older, over the period of 1968 to 2015 obtained from Compressed Mortality Files (CMF) from CDC-WONDER and Area Health Resources Files (AHRF). First, we depict the overall trend in age-adjusted mortality rate within each race and gender group. Then we present the trends in mortality rates within and between different rural-urban categories for each race and gender. Finally, we decompose the trend in age-adjusted mortality rates in the rural and urban markets to the counties' per-capita income quartiles, to compare the trend in racial mortality gap in the rural and urban areas with different sociodemographic characteristics.

Population Studied: County-year level data from all US states. We defined rural and urban markets based on the 2013 Rural/Urban Continuum Codes: urban, rural county adjacent to an urban county and rural county not adjacent to an urban county.

Principle Findings: Overall mortality rate in the US older population has been declining over the last five decades. Although the gap in Blacks and Whites mortality rates increased during 1980s and 1970s for both genders, the racial gap started to decline since early 2000s, with a more considerable decline for females. However, decomposing the trends into the rural and urban areas, the racial gap in mortality rates has only declined in urban areas. Moreover, mortality rates of the whites in rural areas declined more rapidly than their Black counterparts, resulting in a gap that has been widening in the last three decades. The racial gap has increased considerably for the male population residing in rural counties not adjacent to an urban county. The results from the income quartiles show similar trends to the overall rural and urban trends in racial mortality rate differences.

Conclusion: Although the overall trend in racial mortality gap has declined over the last decade, the gap has only declined in the urban areas. Furthermore, racial disparity in mortality rate has increased in rural areas, with a considerable widening between white and black male population living in rural counties not adjacent to an urban county.

3:30 PM –5:00 PM MONDAY [Economic Evaluation Of Health And Care Interventions]

Universität Basel | Kollegienhaus – Regenzzimmer 111

Organized Session: Less Costly and Less Effective: Dilemmas of South-West Interventions

SESSION CHAIR: **Anna Vassall**, London School of Hygiene & Tropical Medicine

DISCUSSANT: **Gesine Meyer-Rath**, Boston University

Dichotomising Cost-Effectiveness Undermines Its Ethical Justification and Potential Contribution to Health

PRESENTER: **Jack Dowie**, LSHTM

AUTHOR: Mette Kjer Kaltoft

The ultimate justification for the use of cost-effectiveness as a criterion in a resource-constrained service is ethical, arising from the existence of opportunity costs. Whatever the threshold adopted, these opportunity costs rule out any restriction of the principle to those interventions that are 'incrementally' cost-effective at the chosen threshold, which leads to the rejection of those that are 'decrementally' cost-effective at the same threshold. 'Cost-effectiveness' cannot ethically be divided in this way. Interventions that fall under the linear ICER line in the south-west quadrant of the cost-effectiveness plane are cost-effective because they create net health benefits, exactly as do those in the north-east quadrant. If there is objection to the fact that they are cost-effective by reducing effectiveness as well as costs (foregone benefits), it is possible to reject them, but only on policy grounds other than their failure to be cost-effective.

The distorted use of cost-effectiveness discourages innovations that would increase overall health gain by being less individually effective, but generate more benefits, either in the condition concerned (by affecting more patients) or elsewhere. While it would be interesting to be able to establish whether, and where, specific south-west savings would generate more benefits, requiring this will distract attention from the fundamental lack of 'statistical compassion' that affects evaluation of interventions in the north-east as well as the south-west quadrant. Use of a generic willingness to pay per quality-adjusted life year to assess the foregone benefits is a practical and equitable solution that recognises the rights of anonymous health service users as well as (possibly) identifiable ones (although data protection regulations will make this an even more impossible task).

Cost-Effectiveness of Reactive Targeted Indoor Residual Spraying for Malaria Control in South Africa

PRESENTER: **David J Bath**, London School of Hygiene & Tropical Medicine

AUTHORS: Jackie Cook, Catherine Pitt, Immo Kleinschmidt

In very low (pre-elimination) transmission settings, malaria incidence becomes patchy and blanket control strategies may no longer be efficient. In such settings, a reactive, targeted indoor residual spraying (IRS) programme may focus resources more effectively than a less targeted approach. We conducted a cluster-randomised controlled non-inferiority trial to examine whether targeted IRS (TIRS) is as effective as, and more cost-effective than, the current practice of generalised IRS (GIRS), in two provinces of South Africa (Mpumalanga and Limpopo).

The trial was conducted over two malaria seasons: 2015/16 (very low incidence) and 2016/17 (higher incidence). In GIRS clusters, a three-month campaign was conducted, spraying houses in high risk areas based on past years' cases and available budget. In TIRS clusters, case investigation teams sprayed households of incident cases and their neighbours.

Although not sufficient to confirm non-inferiority, the absolute point difference in incidence between the two arms was very small (two extra cases per 10,000 population). However, GIRS involved the spraying of 35 times more structures compared with TIRS, requiring substantially more resources. In Mpumalanga province, TIRS cost ~60% less than TIRS, largely due to reductions in insecticide and contract spray teams. Compared with TIRS, GIRS cost an additional $1.90 (year 1) to $2.20 (year 2) per resident per year, which equates to an additional ~$5,000 (year 1) to ~$75,000 (year 2) per local malaria case averted.

Targeted reactive spraying appears to be a safe and more sustainable method of deploying IRS in this area of very low transmission. We suggest that resources could be redeployed more efficiently in alternative malaria control activities, such as improved surveillance, encouragement of prompt care seeking, and improved case management.

Cost-Effectiveness of Discontinuing Cotrimoxazole-Preventive Therapy in HIV-Positive Adults in Uganda

PRESENTER: **Sergio TorresRueda**, London School of Hygiene & Tropical Medicine

AUTHORS: Paula Munderi, Jonathan Levin, Joseph Lutaakome, Zacchaeus Anywaine, Andrew Abaasa, Ronnie Kasirye, Ms. Sedona Sweeney, Mr. Kenneth Roger Katumba, Stella Settumba, Anna Vassall

Cotrimoxazole preventive therapy (CPT), which reduces opportunistic infections and malaria, is part of the package of care for HIV-positive people in Africa. However, the added value of long-term CPT has been questioned given its cost, related haematological adverse events, and the

wide availability of effective antiretroviral therapy (ART). A placebo-controlled trial in Uganda investigated the safety of discontinuing CPT in ART-stable patients. We carried out an economic evaluation using trial data to determine the cost-effectiveness of CPT discontinuation.

Patient-specific data on resources used to diagnose and treat CPT-preventable events, malaria cases, and severe CPT-related haematological adverse events, as well as CPT use, were collected from patient files. Morbidity data (frequency and duration of individual events) and mortality data were collected from the trial dataset. An expert clinician panel determined illness severity, from which disability weights were derived. Disability-adjusted life years (DALYs) were calculated and an incremental cost-effectiveness ratio (ICER) estimated.

The trial found that discontinuing CPT led to statistically-significant increases in CPT-preventable events and malaria, and a decrease in severe CPT-related haematological adverse events. More deaths were observed in the placebo arm, but the difference was not statistically significant. Despite additional costs of diagnosing and treating more CPT-preventable events and malaria in the placebo arm, total costs were lower in the placebo arm than in the CPT arm ($21,013 v. $37,686) largely due to the cost of cotrimoxazole in the latter. Mean costs per person/year were $8.75 in the placebo arm and $15.23 in the CPT arm. Better health outcomes were observed in the CPT arm (with a mean of 0.06 DALYs averted per person during the trial), than in the placebo arm (0.03 DALYs averted), largely driven by improvements in mortality.

The ICER point estimate of CPT discontinuation was $631 per DALY averted, which is considered cost-effective by most commonly-used cost-effectiveness thresholds. As the intervention was both less costly and less effective, the ICER was found in the south-west quadrant of the cost-effectiveness plane. Probabilistic sensitivity analysis confirms that discontinuing CPT is very likely to be cost-effective.

The Ministry of Health of Uganda has subsequently used the findings from the trial and the economic evaluation as a justification to change national guidelines and discontinue CPT from ART-stable patients who meet certain clinical requirements.

Clarifying Health Gains and Losses When Communicating Cost-Effectiveness Analysis

PRESENTER: **Rita Faria**, Centre for Health Economics at the University of York

The communication of cost-effectiveness analysis can be influential in overcoming the challenges around south-west interventions. Presenting results in terms of quadrants and incremental cost-effectiveness ratios – the 'traditional way' – focusses on the impact of the new intervention on the health of the patients with the target health condition. However, it can mask that other patients may bear the health losses from any additional costs. Under the 'traditional way', it may be difficult to understand that the health impact of the new intervention depends not only on its health gains but also on its health opportunity cost.

The clearest way to show this is by presenting results in terms of net health benefit to the jurisdiction’s population. Thanks to recent work estimating the marginal productivity of many health care systems, it is possible to show the size of the health losses due to costs and, conversely, the health gains due to any savings. For some settings, it is also possible to have an idea of who are the patients who are most likely to bear the health losses if the new technology imposes additional costs.

In this presentation, I will discuss the challenges in recommending south-west interventions if the health gains due to the savings are not explicitly considered. I will illustrate the options for the communication of cost-effectiveness results using recent work on the new drugs for hepatitis C. Lastly, I will ask the audience’s feedback about how to explain opportunity costs and net health benefits to non-health economists.

3:30 PM –5:00 PM MONDAY [Demand & Utilization Of Health Services]

Universität Basel | Kollegienhaus – Fakultätenzimmer 112

Organized Session: Discrete Choice Experiments to Improve HIV Prevention and Treatment in Low- and Middle-Income Countries

SESSION CHAIR: **Fern Terris-Prestholt**, Faculty of Public Health and Policy, London School of Hygiene and Tropical Medicine

DISCUSSANT: **Sandra G. Sosa-Rubi**, National Institute of Public Health; **Matthew Quaife**, London School of Hygiene & Tropical Medicine

Preferences for Conditional Economic Incentives to Improve Adherence to Pre-Exposure Prophylaxis: A Discrete Choice Experiment in Mexico City

PRESENTER: **Sandra G. Sosa-Rubi**, National Institute of Public Health

Background: Pre-exposure prophylaxis (PrEP) is highly effective in preventing HIV transmission among high-risk patients who take the medication, but specific programs to improve PrEP adherence among high-risk population -male sex workers (MSWs)- have not been investigated. MSWs are at great risk of acquiring HIV, and having high adherence to PrEP is important to achieve adequate protection. Characterizing MSWs’ preferences for PrEP and adherence motivators is important to curb the epidemic in Mexico and other countries with concentrated HIV epidemics. Conditional economic incentives to improve adherence are generally effective, yet they have not been evaluated specifically for PrEP among MSWs.

Objective: To measure preferences for conditional economic incentives (CEIs) to motivate adherence to PrEP among MSWs.

Methods: We conducted a discrete choice experiment (DCE) in Mexico City, Mexico to collect stated preference data from n=200 self-reported HIV-negative MSWs. Participants were asked to choose between two unique, hypothetical CEI programs to improve PrEP adherence over 10 choice sets. Four important attributes emerged from previous qualitative research: (1) incentive amount (low, medium, high); (2) incentive format (electronic gift card v. physical food & grocery voucher); (3) incentive type (fixed incentive v. lottery); and (4) how the adherence should be objectively verified (blood test v. hair analysis). We used a partial factorial design to develop scenarios with incentive packages that combined plausible attribute levels. Respondents chose 'Option A or B or none' based on these scenarios. We estimated the marginal utilities and willingness-to-accept (WTA) attributes as well as the influence of socioeconomic status through interaction effects. We used conditional logit, rank-ordered logit, and latent-class finite mixture models for estimation. The study was approved by Ethics /IRB at INSP and at Brown University.

Results: MSWs recruited for this study had a median age was 26 years (range: 18-38). Respondents were mostly street-based (50%) but also engaged clients through the internet (39%). Over three-quarters of respondents (77%) did not have health insurance. Most (88%) would be willing to start PrEP if it was offered for free. All of them (100%) would be generally interested in a program to improve adherence to PrEP using incentives. The incentive amount was the most important attribute. Doubling the offer amount (i.e., increasing the incentive level by 100%), increased the average probability of accepting a specific hypothetical program by 34%. Respondents preferred an electronic gift card (over a physical food & grocery voucher); and they preferred fixed incentives over lotteries: they would be willing to forgo 120 pesos in incentives in order to keep a fixed incentive (instead of a lottery). There was not significant preference for a blood versus hair-based test for objective verification of adherence. Finally, we found that the partial utility of CEIs decreased with higher socioeconomic status.

Conclusions: MSWs are very interested in PrEP, especially if it is provided for free. New and innovative adherence-enhancement programs are needed, including use of incentives. These results from Mexico have clear implications for PrEP programs in Latin America and other settings with concentrated HIV epidemics.

Don't be Irrational: Age Differences in Consistency Tests in Discrete Choice Experiments

PRESENTER: **Ms. Harini Balakrishnan**, Brown University

Background: Internal validity tests are used to assess the rationality of respondents' preferences in discrete choice experiments (DCEs). One internal validity test is the consistency test, where the same question is asked twice in the questionnaire. If a respondent answers differently to the repeated question, they "fail" the test. Performance of adults and adolescents may vary due to differing stages in neurocognitive development and consequential differences in decision-making processes. While common wisdom finds adolescents to be more impulsive, psychological literature also find that adults rely on simpler decision strategies and have lower fluid intelligence. We are unsure of how these factors together may result in differential rates of failure of consistency tests, and differences are not accounted for in current practice in DCE analysis. Furthermore, current DCE literature has not reached a consensus on whether or not responses from those that fail consistency tests should be included in analysis. **Objective**: To compare performance on consistency tests between adolescents and adults and the factors associated with failing such tests. **Methods**: We collected DCE data containing a consistency test from 203 adult females (median age: 29) and 204 adolescent girls (aged 16-17) from Ekurhuleni Municipality, South Africa. Rates of failure of the consistency test were regressed against status as an adult using logistic regression. We also controlled for interviewer effects. Previous research has consistently suggested that characteristics of the interviewer, including age and gender, can influence respondent performance, for example due to acceptability bias. Additional sensitivity tests controlled for self-evaluation of DCE difficulty and evaluation of subjective well-being. Higher perceived DCE difficulty suggests greater cognitive load on the respondent, and therefore increased use of compensatory strategy mechanisms. Lower perceived subjective well-being may result in suboptimal decision-making due to less engagement with life activities like the DCE task. **Results**: Overall 18.7% of the sample failed the consistency test. Adults are 10.0% more likely to fail a consistency test than adolescents ($p < 0.01$) controlling for interviewer effects. Additional sensitivity tests all showed that adults were more likely to fail than adolescents, controlling for evaluation that the DCE was easy (10.2% more likely, $p < 0.01$), evaluation of life activities as "worthwhile" (10.6%, $p < 0.01$), or both (10.8%, $p < 0.01$). **Conclusion**: Contrary to common wisdom, we find that adults are more likely to fail consistency tests. Future DCEs should consider age differences in performance when implementing consistency tests by creating shorter or otherwise less cognitively burdensome DCE tasks for adults; in addition, this study provides further evidence that failure of the DCE task does not represent irrationality alone, and should not be a determinant for removing respondents' answers from a data set.

ISAY: Incentives for South African Youth -- A Discrete Choice Experiment for Economic-Incentive-Based Medication-Adherence Interventions for Adolescents Living with HIV

PRESENTER: **Dr. Omar Galarraga**, Brown University

BACKGROUND: Sufficiently-high adherence to antiretroviral treatment (ART) medication is essential for therapeutic effect in controlling HIV. Adherence to treatment, however, is suboptimal, particularly among adolescents in low-resource settings with food access and transportation constraints. In the HIV context, conditional economic incentives hold great promise to improve adherence to antiretroviral treatment, yet youth-centered preferences for programs to improve adherence to medications have not been fully investigated, and little is known about preferences of young people living with HIV. **OBJECTIVE**: To study factors influencing youth preferences for conditional economic incentives (CEI) to improve adherence to ART. **METHODS**: We conducted a discrete choice experiment in Cape Town, South Africa. A sample of n=200 adolescents (10-19 years old) living with HIV, who were taking ART, and who had at least one episode of low adherence in the past year, were asked to choose between two hypothetical programs over 8 choice sets. Each choice set presented attributes of ART-adherence-enhancement interventions using CEIs. The choice sets consisted of attributes identified in in-depth qualitative interviews with key stakeholders: adolescents, caregivers and health providers. A partial factorial design allowed creation of scenarios with plausible attribute levels. Respondents choose 'Option A or B or none' based on the scenarios. Conditional logit, rank-ordered logit, and latent-class finite mixture

models were used for estimation. Marginal utilities and willingness-to-accept (WTA) attributes were estimated through interaction effects. Two separate programs were proposed: one with monthly clinic visits and another with quarterly visits. **RESULTS**: Average age of respondents was 16.2 years, and they were 53% female, 100% Black African, with 8.5 years of education, and of lower socio-economic status (as measured by asset index), as well as high food insecurity (71%). Five important attributes emerged from previous qualitative research: incentive amount (low, medium, high), format (food voucher, fashion voucher, cash), who the recipients should be (youth only v. youth + parents/caregivers), participants (all ART initiators v. non-adherent patients), and incentive delivery mode (clinic pick-up v. virtual). In terms of willingness to accept for the quarterly visit program: Participants were willing to forgo up to R109 if the incentive was given in cash, and up to R85.7 if it was allocated to youth only (vs. youth + parents/caregivers). Similarly, they were willing to forgo up to R82.7 if the program was open to both previously adherent and non-adherent youth. Finally, youth were willing to forgo up to R28.8 if the incentive was distributed as a virtual/electronic incentive. **CONCLUSIONS**: Adolescent preferences for incentives including the optimal combination of amount, timing, delivery modality, etc., should be integrated in program planning and implementation to ensure incentives translate to high-adherence behaviors. Our findings have implications for implementation and scale-up of adherence-enhancing programs among youth living with HIV. The use of incentives over the short term in the critical age- and developmental-transition, when adolescents begin to take sole responsibility of their medication-taking behaviors, holds great promise for optimizing adherence. Discrete choice experiments are an important tool to ensure maximum impact of youth-centered programs to increase adherence to medications.

3:30 PM –5:00 PM MONDAY [Economic Evaluation Of Health And Care Interventions]

Universität Basel | Kollegienhaus – Hörsaal 114

Organized Session: Bringing Together Programme Evaluation and Economic Evaluation: Determining Value for Money of Health Care Policies

SESSION CHAIR: **Simon Walker**, Centre for Health Economics University of York

DISCUSSANT: **Mark Sculpher**, University of York; **Pieter van Baal**, Erasmus School of Health Policy & Management

From Impact Evaluation to Decision-Analysis: Assessing the Extent and Quality of Evidence on 'Value for Money' in Health Impact Evaluations in Low- and Middle-Income Countries

PRESENTER: **Noemi Kreif**

Background: There is a growing demand amongst development organisations to base policy upon evidence of "what works". In response, there has been a rapid recent growth of published impact evaluations in the area of development in general, including in global health. While many of these impact evaluation studies have used sophisticated statistical methods to maximise the internal validity of their effectiveness estimates, the question arises: to what extent can they reliably inform "value for money" assessments and decisions over the allocation of limited available resources?

Aim: In this work, we scrutinise the approaches taken in published impact evaluations, quantifying to what degree any type of economic evaluation studies have been conducted, and assessing the quality of those studies.

Methods: The review was conducted using the repository of published impact evaluations from the International Initiative for Impact Evaluations (3ie), and in the Ovid MEDLINE database, aiming to identify studies in low- and middle-income countries (LMICs) with experimental or quasi-experimental designs, but excluding drug efficacy trials. Upon locating studies that conducted economic evaluations, we assessed their quality, based on criteria derived from the International Decision Support Initiative (iDSI) Reference Case, which considered criteria that included, among others, analysis transparency, incorporation of heterogeneity and accounting for uncertainty.

Results: We have identified 70 studies that included both and impact evaluation and an economic evaluation component. We found quality to be a concern. For instance, half of the studies did not state the evaluation perspective, studies rarely used generic measures of health outcomes such as quality- (or disability-) adjusted life years (QALY or DALY), and many did not reflect uncertainty appropriately.

Conclusion: To provide more informative evidence for decision making, there is a need for methods guidance on including economic evaluation in the design and conduct of impact evaluations. This work highlights some important areas where impact evaluations in global health that incorporate economic evaluation may be improved.

Estimating the Cost-Effectiveness of the Quality and Outcomes Framework in Primary Care in the UK

PRESENTER: **Ankur Pandya**

Introduced in 2004, the United Kingdom's (UK) Quality and Outcomes Framework (QOF) is the world's largest primary-care pay-for-performance programme. Given some evidence of the benefits and the substantial costs associated with the QOF, it remains unclear whether the programme is cost-effective. Therefore, we assessed the cost-effectiveness of continuing versus stopping the QOF. We developed a lifetime simulation model to estimate quality-adjusted life years (QALYs) and costs for a UK population.The study links estimates of effect from a programme evaluation based on a cross-country comparison of population mortality to the cost-effectiveness of the policy using a decision analytic modelling approach.

In the base-case analysis, continuing the QOF increased population-level QALYs and health-care costs, resulting in an incremental cost-effectiveness ratio (ICER) of £49,362 per QALY. The ICER remained >£30,000/QALY in most scenarios. Continuing the QOF was cost-effective in 18%, 3% and 0% of probabilistic sensitivity analysis iterations using thresholds of £30,000/QALY, £20,000/QALY and £13,000/QALY, respectively.

Compared to stopping the QOF and returning all associated incentive payments to the National Health Service, continuing the QOF does not appear cost-effective. To improve population health efficiently, the UK should redesign the QOF or pursue alternative interventions.

Programme Evaluation and Decision-Analytical Modelling: Estimating the Cost-Effectiveness of the English Hip Fracture Pay- for-Performance Programme

PRESENTER: **Nils Gutacker**, Centre for Health Economics at the University of York

Background

Many healthcare systems experiment with pay-for-performance (P4P) programmes that award providers financial bonuses for delivering high quality care. Yet, despite their popularity, evidence that P4P improve healthcare provision and is a cost-effective use of resources is still limited. This paper seeks to fill this gap by combining methods from the fields of programme evaluation and economic evaluation. Since April 2010, hospitals in England receive bonus payments of 1,300 GBP per hip fracture patient who received guideline-conform care according to nine criteria (e.g. surgery within 36h of fracture). Compliance is assessed through a clinical audit of all NHS-funded hip fracture care in England and Wales, the National Hip Fracture Dataset (NHFD). Since 2011, the English part of the NHFD can be linked to the Hospital Episode Statistics and ONS mortality data.

Methods

We estimate difference-in-difference models of compliance for each P4P criterion separately and for overall compliance over the period 2006 to 2014, using the Welsh NHS, where care was not incentivised, as a control group. We then estimate regression models to relate criterion achievement to 7, 30, 90 and 365-day secondary care costs and mortality in the linked HES-ONS-NHFD dataset and use quality of life weights to calculate QALYs. Finally, we use these parameters to populate a cost-effectiveness model.

Results

We find that care standards improved in both countries after 2010 but improved faster in England. The estimated causal effect of the payment policy on the probability of achieving all criteria jointly is 47% ($p<0.001$). This is driven by improvements in five criteria. The improvement in care caused by the policy is associated with a 6% reduction in 1-year mortality and a 0.310 QALY gain over a patient's lifetime. The P4P increased costs to commissioners by approximately £1940, resulting in an incremental cost-effectiveness ratio of <£6,500 per QALY.

A Framework for Identifying and Measuring Spillover Effects of Changes to Healthcare Organisation and Delivery

PRESENTER: **Rachel Meacock**, The University of Manchester

Changes to the way in which healthcare services are organised and delivered have wider consequences beyond the patients or the services targeted. These types of wider changes are called spillovers. They may have positive effects, because more patients benefit than was originally intended, and/or they may have negative effects, because more attention is paid to some patients and activities at the expense of others.

A limited amount of research has shown that these spillover effects can be substantial. They may be substantial enough to affect whether a proposed change in service organisation is cost-effective. There is therefore a need for a systematic method of identifying and measuring spillover effects in health programme evaluation.

Our aim was to develop structured guidance for incorporating spillovers in the evaluation of changes to healthcare organisation and delivery. A framework was developed based upon a systematic review.

This framework is illustrated through application to the evaluation of the cost-effectiveness of increased availability of primary care services at weekends. Through this practical application we illustrate how incorporating spillover effects influences the overall costs and benefits of this policy change.

The suggested framework provides a consistent way of assessing the wider effects on all patients of changing the way that health and social care services are organised.

3:30 PM –5:00 PM MONDAY [Production Of Health, Health Behaviors & Policy Interventions]

Universität Basel | Kollegienhaus – Hörsaal 115

Education, Schooling and Work #1

SESSION CHAIR: **Fabrice Etile**, Paris School of Economics

Does Education Lead to More Physically Active Lifestyle? Evidence Based on Mendelian Randomization

PRESENTER: **Jaana T. Kari**, University of Jyväskylä

AUTHORS: Ms. Jutta Viinikainen, Prof. Petri Böckerman, Jaakko Pehkonen, Tuija H. Tammelin, Niina Pitkänen, Katja Pahkala, Terho Lehtimäki, Olli T Raitakari

Highly educated individuals make healthier lifestyle choices, are healthier, and live longer. Current literature has documented significant associations between educational attainment, health, and health behaviors, but it is not clear whether the observed correlations are causal or not. This study focuses on one form of health behavior, physical activity, which is closely linked to health status throughout the life course. We use Mendelian randomization (MR) to examine whether educational attainment is causally related to leisure-time physical activity in adulthood.

The study sample consisting of 1651 participants is drawn from three Finnish data sets: 1) the Cardiovascular Risk in Young Finns Study (YFS); 2) the Finnish Longitudinal Employer-Employee Data of Statistics Finland; and 3) the Longitudinal Population Census of Statistics Finland. The data sets are linked using unique personal identifiers.

Education is measured using register information on the highest completed level of education in 2007, which is converted to years of education, and self-reported physical activity in 2011 is described by overall leisure-time physical activity (ranging from 5 to 15) and hours of weekly intensive activity. The genetic risk score (GRS) is based on 74 single nucleotide polymorphisms (SNPs) that are shown to predict years of education in a genome-wide association study.

The statistical analysis uses two methods. To replicate standard observational studies, Ordinary Least Squares (OLS) models are first utilized. Because of potential confounders and reverse causality, OLS regression coefficients may be biased. To identify a causal effect, the analysis is extended using MR with the GRS as an instrument for years of education.

The validity of the instrument and the robustness of our conclusions are tested and supported in several ways. First, we use official registers on education to minimize measurement error and problems related to time-varying exposure. Second, we use a PhenoScanner to detect potential alternative pathways through which SNPs in the GRS may affect physical activity. Third, we run Sargan's test using individuals 74 SNPs as instruments to assess the validity of over-identifying restrictions. Fourth, we utilize a reduced-form model to diminish the potential biases stemming from time-varying exposure, gene-environment interactions, measurement error in the exposure variable, and reverse causation. Fifth, we conduct falsification tests to avoid false positives.

According to the OLS results, years of education is positively related to overall physical activity and hours of weekly intensive activity. The MR results show that education is causally linked to physical activity. On average, one additional year of education leads to a 0.7-point increase in overall leisure-time physical activity and 0.3 more hours of intensive activity each week.

Physical inactivity is one of the leading risk factors for global mortality. This reinforces the need for policy interventions that promote physical activity. The finding that education is causally related to physical activity may be an important link modifying the risk for chronic diseases during the life course, and it may serve as an explanation for higher rates of mortality and morbidity among less educated individuals.

Schooling and the Production of Mental Health

PRESENTER: **Ana Balsa**, Universidad de Montevideo

We use a randomized design to assess the impact of two models of middle school education on students' mental health dynamics in Uruguay. One of the models is similar to that of charter schools in the US, with teams aligned with school goals, extended instruction time, individualized learning, family involvement, and high expectations on students. The second model involves traditional public schools with single shift schedules, high rates of teacher absenteeism, lack of student follow-up, and low expectations on students. Many studies have analyzed the effectiveness of charter schools on students' academic trajectories, learning, and labor market outcomes. Much less focus has been placed on students' mental health status and well-being. While charter schools tend to offer socioemotional containment and support, they can also impose burdens on students by demanding high academic standards and breaking with prior cultural models. Stress and mental health struggles may be of particular concern during adolescence and could have long-lasting impacts on socio-emotional skills and academic trajectories.

We evaluate the impact of three charter schools in Uruguay by using an RCT design, exploiting the fact that schools define entry by lottery due to oversubscription. We follow up lottery winners and losers at 3-months, 1 year and 3 years after middle school initiation (N=411). Non-winners end up attending traditional public schools. In each wave, we measure depression symptoms, life satisfaction, and socioemotional health (self-reported by students) and in wave 3 we ask parents to complete a questionnaire about their children's externalizing and internalizing behaviors (the parent form of the Child Behavior Checklist or CBCL). We estimate panel data instrumental variables models of mental health outcomes on treatment assignment, using intention to treat indicators (lottery assignment) and intention to treat x wave interactions as instruments. Using time lags, we explore whether the effects in each wave reinforce or counteract the effects in prior waves.

We find that charter school initiation results in an increase in students' number of depression symptoms and in a higher fraction of students at risk of depression (3-month follow-up). This dip in mental health tends to persist at 1 year follow-up and is accompanied by a decrease in life satisfaction, a lower sense of class belonging, and perceptions of lower ability to comply with academic duties and to persevere over time (grit). These effects, however, revert by year 3. After the third year, self-reported depression symptoms decrease and life satisfaction increases to the levels of the control group. Furthermore, parents of treated subjects report that their children show less internalizing and externalizing behaviors than parents of control subjects. These improvements in mental health coincide with students' better sense of school and class belonging, better perceptions of the academic climate and improved academic behaviors. Those improving their mental health are the same subjects that suffered mental health deteriorations initially.

Parental Education and Offspring Outcomes: Evidence from a German Schooling Reform

PRESENTER: **Dr. Jinhu Li**, Deakin University

AUTHOR: Dr. Sarah C. Dahmann

In recent literature economists have pointed out the importance of cognitive and non-cognitive skills in determining individual achievements over the life course. The determinants of these new dimensions of human capital are still largely unknown. Parental education is believed to be an important determinant of these skills, because correlation between parental education and the outcomes of the next generation has been established by a large body of studies. Children brought up by higher-educated parents are consistently found to be more likely to have better health, education, and labour market outcomes.

The literature that addresses causality of parental education and outcomes of their offspring is rather scarce and inconclusive. Most of these studies have focused on the effect of parental education on children's education. Some recent studies examined the effect of parental education on children's health outcomes, in particular very early life outcomes such as birthweight. So far, there are only few studies examining the effect of parental education on other important offspring outcomes such as their cognitive and non-cognitive skills (Carneiro et al 2013, Lundborg et al 2014, Silles 2011).

Our study aims to identify the causal effect of parental education on cognitive and non-cognitive skills of the next generation. We identify causality by exploiting a compulsory schooling reform in Germany after World War II. The reform extended compulsory schooling from 8 to 9 years and was implemented in West German federal states between 1949 and 1969. We discriminate between the effect of mothers' education and the effect of fathers' education, and distinguish effects for sons and daughters.

Using data from the German Socio-Economic Panel (SOEP) study, we employ an instrumental variables (IV) approach to estimate the causal effect of parental education on their offsprings' outcomes. The long-span nature of the SOEP study allows us to trace the generation who were exposed to this schooling reform and the outcomes of the next generation through their adulthood. The richness of the data also allows us to study a wide range of outcome variables, including cognitive skills measured by fluid and crystallized intelligence, and non-cognitive skills such as personality traits and economic preferences.

Preliminary results from the IV and difference-in-differences estimates show that higher parental education improves the cognitive skills and some non-cognitive skills of the next generation. In particular, both maternal and paternal education increase the fluid intelligence of the next generation. This positive effect is purely driven by the daughters rather than the sons of those who were exposed to this reform. The effect of parental education on non-cognitive skills is less clear. There is some weak evidence that higher paternal education increases locus of control and patience of their sons. The effects of parental education on the other offspring outcomes are statistically insignificant.

Home Is Where the Head Is: The Spatial Relationship between Household Wealth and Early Childhood Cognitive Outcomes in the Context of a Maternal and Child Health Programme

PRESENTER: **Anja Smith**, Economics Department, Stellenbosch University

AUTHORS: Sarah Gordon, Ed Kerby, Christina Laurenzi, Sarah Skeen, Mary Jane Rotheram-Borus, Mark Tomlinson

The relationship between income and health is difficult to disentangle. It is also of increasing importance in the context of public health programmes and in making fiscal decisions, e.g. whether to increase expenditure on household income grants or increase expenditure on population health. The availability and use of precision data is becoming the norm in wealthy countries and offers opportunities to address public healthcare risks and opportunities more quickly and efficiently, while taking into account exiting wealth patterns. The Philani Mentor Mother Programme in Khayelitsha, South Africa allows us to study this process in a low-resource setting.

The aim of our study is to use geographically granular data to consider the relationship between household wealth and child cognitive outcomes, while controlling for the impact of a perinatal home visiting programme designed to improve maternal and child health and nutrition.

The Philani Mentor Mother model is a home-based maternal and child health intervention that has been operating in peri-urban Khayelitsha, a high-poverty, geographically diverse area outside of Cape Town, South Africa since 2000. Philani's Mentor Mothers are mothers themselves who have been identified as "positive deviants"—women who are able to raise healthy children in the face of multiple adversities—and are trained and selected from their own communities to deliver a comprehensive intervention to expectant mothers. A cluster randomised controlled trial evaluating this programme began in 2008, enrolling 1 238 mother-baby pairs, half of whom received the Philani Mentor Mother intervention and half of whom received the standard care. Following recruitment, mothers and children were followed up immediately following birth at 6 months, 18 months, 36 months, 60 months (5 years) and 8 years.

Using data from the first post-birth survey, we constructed a household socio-economic index (including access to services) using multiple correspondence analysis (MCA). Mother and baby pairs (by household) were assigned to wealth quintiles. Geo-locating each mother-baby pair at a fine spatial geographic level allows for the calculation of distance to markets (transport), healthcare infrastructure and state capacity (post offices and social services). We examine the relationship between household wealth and geographic access to services relative to variation in child cognitive outcomes achieved in the Philani Mentor Mothers programme through bivariate and multivariate analysis.

We hypothesise that household wealth as measured by a socio-economic index has a positive and significant effect on child cognitive outcomes independent of the package of maternal and child healthcare interventions received by intervention mothers and babies. Wealthier and poorer households are geographically clustered. We explore whether access to markets (transport), healthcare infrastructure and state capacity (post offices and social services) has a larger association with improved cognitive outcomes than the home-based maternal and child health intervention.

Measuring wealth, access to services (as implied by fine spatial mapping) and child cognitive outcomes allow us to observe how policy interventions can be more precisely targeted. Spatial modelling and precision implementation of maternal intervention programmes allows for more effective use of finite resources in a low-resource setting.

3:30 PM –5:00 PM MONDAY [Economic Evaluation Of Health And Care Interventions]

Universität Basel | Kollegienhaus – Hörsaal 116

Organized Session: Family Carer Spillovers in Economic Evaluation: Causes, Applications, Methods and More

SESSION CHAIR: **Werner Brouwer**, Erasmus School of Health Policy & Management

DISCUSSANT: **Lisa A. Prosser**, University of Michigan

Mechanisms behind Family Carer Spillovers

PRESENTER: **Hareth Al-Janabi**, University of Birmingham

Introduction: Health and care services for patients have the potential to affect the lives of family carers. Formal consideration of these 'spillovers' in economic evaluations and decision-making is advocated, but, to date, little is known about how spillovers occur. Psychological models of the stress process and the concept of the 'caring externality' offer a starting point. However, there has been limited empirical study of the causal mechanisms behind family carer spillovers. This study investigated the mechanisms by which health and care services can affect family carers' lives across three major disease areas (dementia, stroke, or mental health).

Methods: In-depth focus groups and interviews were conducted with 49 participants to investigate perceptions and experiences of spillover from health and social care services. Family carers and care professionals were purposefully sampled to get variation across caring role (relationship, co-residence) and health system experience (primary care, secondary care, social care). In the focus groups and interviews, participants mapped patient services and aspects of service delivery to aspects of carer quality of life; this was follow-up by a detailed discussion of the nature and scope of spillovers. Interviews and focus groups were recorded and transcribed in full. Transcripts were coded and analysed thematically, using descriptive accounts and an explanatory account, to generate over-arching causal mechanisms to explain carer spillovers across the sample.

Results: The analysis resulted in six mechanisms behind family carer spillovers:

- Information – degree to which service delivery informs and trains family carers;
- Management of care – shifts of responsibility for care between formal and informal sectors;
- Patient outcomes – impacts of services on patient outcomes;
- Alienation – feelings of alienation or inclusion created by service delivery;
- Compliance – barriers to patients complying and engaging with services;
- Timing / location – changes in timing and location of services;

Each mechanism was associated with sub-themes relating to both positive and negative spillovers on the family carers.

Conclusion: The mechanisms can be summarised with the mnemonic 'IMPACT'. The finding that 'patient condition' was a key mechanism is consistent with work showing carer outcomes are affected by patient outcomes. Three other mechanisms (management, compliance, and timing/location) highlight the practical ways in which services affect the scale and scope of family care. 'Information' and 'alienation' highlight less obvious channels by which patient services can affect family carers' quality of life. Systematic consideration of these mechanisms may be useful in the design of economic evaluations and could contribute to an improved evidence base for funding and delivering services to optimise the wellbeing of carers as well as patients.

Parental Health Spillover Effects of Rare Genetic Conditions

PRESENTER: **Ms. You (Eunice) Wu**, University of Melbourne

Objective : Rare genetic conditions are commonly severe multisystem disorders with considerable psychological, physical, and social implications to family members. The increased implementation of next-generation sequencing in clinical care provides opportunities for early diagnosis and tailored management of genetic conditions, which can substantially improve the quality of life, not only of the patient but also of those in the family network. Failing to consider quality of life spillovers in economic evaluations is likely to largely underestimate their value and bias the evidence used to inform decision making. This is the first study to examine the parental spillover effects across four rare genetic conditions supported by the Australian Genomics Health Alliance.

Methods:Two approaches were taken to measure the absolute and relative parental health spillover effect. Parents of recruited children across the Australian Genomics cohorts completed a health-related quality of life (HrQoL) measure (SF-12) and a parent proxy of children's quality of life measure (CHU-9D).

To estimate the absolute spillover effect, parents from each condition were matched to parents in the general population from the Household, Income and Labour Dynamic in Australia survey on parent characteristics. The absolute spillover effect was given by the difference in quality of life index scores between the two groups. To estimate the relative spillover effect, a multiple linear regression was used to model parents' quality of life as a function of children's quality of life, adjusting for parents and children's characteristics and other contextual factors. The relative spillover effect was given by the coefficient on the variable denoting children's health utility.

Results : Preliminary analysis of the renal cohort data showed that the mean quality of life of participating parents was 0.71 and the mean quality of life of the children was 0.65. Having a child with a genetic condition was associated with a statistically significant reduction in quality of life by 0.062 ($p<0.001$; 95% CI 0.036-0.088), which is the estimated absolute spillover effect.

Preliminary multivariable analysis of the renal cohort revealed that the relative parental spillover effect was 0.304 ($p=0.004$; 95% CI 0.110-0.498) adjusting for parent, children and contextual factors. This indicates that parents' quality of life changes approximately by 30% of the change in children's quality of life. A genetic condition in child significantly affects parental role limitation ($p=0.026$), social functioning ($p=0.004$), mental health ($p=0.017$) and vitality ($p=0.003$).

Conclusion: This study highlights the importance of capturing spillover effects in economic evaluation within paediatric rare genetic conditions. The absolute parental spillover effect estimated is significantly larger than what is considered in literature as clinically important difference in quality of life. The relative spillover effect also has twice the effect size of published parental spillovers in the context of non-genetic conditions. Following further analyses of the full dataset, these estimates will be incorporated into future cost-effectiveness analysis of genomic technologies.

Caregiver and Family Member Spillover Effects—a Systematic Review of the Literature

PRESENTER: **Eve Wittenberg**, Harvard University

Abstract: A growing body of research has identified health-related quality of life effects for caregivers and family members of ill patients (i.e., "spillover effects"), yet these are rarely considered in cost-effectiveness analyses (CEA). We systematically reviewed the medical and economic literatures (MEDLINE, EMBASE, and EconLit, from inception through 4/3/18) to identify articles that reported preference-based measures of these effects. Our goal was to create a catalog of values for use in CEA. From 77 articles culled from nearly 3,700 initially identified, we found only 5 that reported spillover utility *per se*. The vast majority reported utilities for caregivers or family members, sometimes alongside utilities for a comparison group of non-caregiving family members or others (sometimes population utilities, matched or not). Alzheimer's disease/dementia was the most-commonly-studied disease/condition, and the EQ-5D was the most-commonly used measurement instrument.

In general, utilities indicated a loss in quality of life associated with being a caregiver or family member of an ill relative. As most studies restricted their samples to caregivers, the range of family effects that can be included in CEA is constrained. Similarly, the lack of a comparison group in most of the studies restricts their usefulness in analyses, and imposes additional assumptions in order to incorporate their values into CEAs. Nevertheless, these values provide a starting point for considering spillover effects in the context of CEA, opening the door for more family-based analyses.

Quantifying Family Spillover Effects in Economic Evaluations: Measurement and Valuation of Informal Care Time

PRESENTER: **J. Mick Tilford**, University of Arkansas for Medical Sciences

AUTHOR: Scott D Grosse

Abstract: Spillover effects on the welfare of family members may refer to caregiver health effects, informal care time costs, or both. This review focuses on methods that have been used to measure and value informal care time and makes suggestions for their appropriate use in cost-of-illness and cost-effectiveness analyses. It highlights the importance of methods to value informal care time that are independent of caregiver health effects in order to minimize double-counting of spillover effects. Although the concept of including caregiver time costs in economic evaluations is not new, relatively few societal perspective cost-effectiveness analyses have included informal care, with the exception of dementia. This is due in part to challenges in measuring and valuing time costs. Analysts can collect information on time spent in informal care or can assess its impact in displacing other time use, notably time in paid employment. A key challenge is to ensure appropriate comparison groups that do not require informal care in order to be able to correctly estimate attributable hours of informal care time or foregone

market work. Use of hours of reported informal care time without subtracting hours of care for a matched comparison group can result in substantial overestimates of the economic burden of informal care, particularly for pediatric conditions. To value informal care time, analysts using either opportunity cost or replacement cost (proxy good) approaches can apply estimates of hourly earnings. Studies ideally would use data on care time that is differentiated either by displaced activities (opportunity cost) or type of informal care (replacement cost) and use estimates of the value of time that are appropriate for each time use category. The opportunity cost of informal care depends on which activities are displaced, and likewise the replacement cost of informal care services can vary greatly depending on the task. In particular, the replacement cost approach may not fully reflect the variety of care management services provided by informal caregivers and as a result may undervalue care. Applying a single wage rate to overall hours of informal care is at best a crude approximation of the economic cost of care. Alternatively, stated preference methods (i.e., contingent valuation, conjoint analysis) can be used to value the effect of informal care on both health utility and time costs. Although that can entail double-counting of time costs with health effects, it is possible to design choice experiments to avoid double-counting. In the meanwhile, lack of consensus and standardization of methods makes it difficult to compare published estimates of informal care costs.

3:30 PM –5:00 PM MONDAY [Economic Evaluation Of Health And Care Interventions]

Universität Basel | Kollegienhaus – Hörsaal 117

Organized Session: Revision of National Essential Health Services Package in Low- and Middle-Income Settings: Application of Economic Evaluation Evidence in Ethiopia

SESSION CHAIR: **Prof. Stephane Verguet**, Harvard T.H. Chan School of Public Health

DISCUSSANT: **Mizan kiros Mirutse**, Ethiopia Health Insurance Agency; **Prof. Jolene Skordis-Worrall**, Deputy Director, University College London Institute of Global Health; **Karl Blanchet**, Associate Professor, London School of Hygiene & Tropical Medicine

Revision of the 2005 Essential Health Services Package in Ethiopia: Processes and Core Principles

PRESENTER: **Dr. Solomon Tessema Memirie**, Addis Ababa University

Ethiopia's essential health services package was first prepared in 2005 and then addressed mainly communicable, maternal, neonatal, childhood and nutritional conditions. Due to socioeconomic development, demographic and epidemiologic changes, the disease landscape is changing very fast in Ethiopia. Non-communicable diseases (NCDs) and injuries accounted for more than 44% of the Ethiopia's total mortality in 2017 and NCDs are projected to rise to more than 65% of the total national burden of disease by 2040. Commensurate with these rapid changes, Ethiopia's Federal Ministry of Health (FMoH) has decided to revise its 2005 essential health service package (EHSP).

In this presentation, we describe the revision process of Ethiopia's EHSP and the core principles of prioritizing interventions for inclusion in the publicly financed EHSP. Core and technical working groups were established under the leadership of Ethiopia's FMoH that developed a road map for the EHSP revision that clearly outlined the objectives and scope of the revision process. The roadmap defined the methodologies and approaches for: data collection, priority-setting criteria, costing, and fiscal space analysis. It also defined the roles and responsibilities of different actors (e.g. government, civil society) participating in the revision process in a way that ensured transparent and participatory review processes.

The core principles that were used in the EHSP revision process were identified based on the World Health Organization recommendations and included: value for money, equity and financial risk protection. Other criteria considered were: disease burden, relevance, feasibility of implementation, and public and political concerns. A list of nearly 1700 initial interventions were identified and evidence on cost-effectiveness, financial risk protection and severity of disease were used from different sources including the Disease Control Priorities 3rdedition (DCP3, www.dcp-3.org) and the published literature.

In this presentation, key considerations and processes undertaken in the revision of Ethiopia's EHSP and the challenges and leasons learnt in the revision process that could potentially be applied to other low- and middle-income settings will be highlighted and discussed critically.

Conflicts of interest: none.

Funding: Bill & Melinda Gates Foundation.

Application of Economic Evaluation Evidence in Revising Ethiopia's Essential Health Services Package

PRESENTER: **Mieraf Taddesse Tolla**, Harvard T.H. Chan School of Public Health

Although Ethiopia has achieved remarkable improvements in a range of key health outcomes, much remains to be done to meet universal health coverage goals which Ethiopia aspires to. In particular, the country still lags behind with respect to high priority health services: for example, only 44% of under-5 children with diarrhea received treatment in 2016; and out-of-pocket (OOP) payments remained a major source of healthcare financing contributing to 33% of the US$30 total health expenditure per capita in 2014. As a result, households, especially the poor and the rural majority suffer poor access to healthcare and experience substantial financial risks while doing so. In addition to the problem of poor healthcare use, households tend to bypass lower level health facilities even for basic services that could be potentially obtained at the

lowest level; unavailability of drugs is cited among the main reason for bypassing nearest facilities. Moreover, the changing epidemiology and demographic trends exert additional pressure to the already constrained Ethiopian health system.

Therefore, the ongoing revision of Ethiopia's essential health services package (EHSP) needs to address the gaps in access to services addressing both communicable and non-communicable diseases while ensuring for financial risk protection (FRP) and equity. To this end, economic evaluation evidence on the performance of potential health interventions with respect to cost-effectiveness, FRP, and equity is key to guide the decision-making process. The Disease Control Priorities-Ethiopia (DCP-E) team has been working closely with policymakers in Ethiopia to generate such evidence covering a broad range of services addressing communicable diseases, non-communicable diseases, selected surgical interventions, policies addressing supply side gaps, and various service delivery platforms—a few examples of which are summarized below and will be presented at the session with emphasis on their application to inform Ethiopia's EHSP revision.

Using both facility-based and household-based surveys covering five of the largest Ethiopian regions, it was found that 7% and 6% of households with a member having severe pneumonia/diarrhea were impoverished due to OOP medical payments (at the poverty line of US$ 1.25 per day, 2011 purchasing power parity). Likewise, a hospital-based study reported that 27% of households in Addis Ababa who sought services for cardiovascular diseases (CVD) incurred catastrophic health expenditures - annual OOP spending on CVD care greater than 10% of household annual income. On the other hand, evidence from economic evaluations produced by the DCP-E project revealed that several of the interventions addressing child and maternal health conditions and primary prevention of CVD could be cost-effective in Ethiopia. Most of the interventions evaluated would cost less than 0.5 times Ethiopia's gross domestic product per capita, whereas some interventions like percutaneous coronary intervention for acute myocardial infarction and treatment of bipolar disorder combined with psychotherapy were deemed not cost-effective. Using extended cost-effectiveness analysis methods, public finance of a package of services addressing depression, bipolar disorder, and schizophrenia was found to generate substantial health gains; and public finance of medical primary prevention of CVD would procure large FRP gains, especially among the poorer households.

Conflicts of interest:none.

Funding: Bill & Melinda Gates Foundation.

Completing the Unfinished Agenda or Scaling up Essential Interventions for NCDs and Injuries in Low- and Lower-Middle-Income Countries? Estimated Impact on Life Expectancy, Deaths Averted, and Inequality in Life Expectancy

PRESENTER: **Ole F. Norheim**, Professor, Department of Global Public Health and Primary Care, University of Bergen

AUTHORS: Jan-Magnus Okland, Dr. David Watkins

Countries are in different phases of demographic transition, with substantial shifts in the age composition of populations, leading to epidemiological transitions from mortality predominately associated with communicable, maternal, neonatal, and nutritional diseases (CMNN) toward mortality associated with non-communicable disease (NCD) and injuries. These changes are reflected in the Sustainable Development Goal targets and the drive for Universal Health Coverage.

The aim of this paper is to estimate impact on life expectancy, deaths averted, and inequality in life expectancy from scaling up recommended cost-effective and equitable actions for promotion, prevention and treatment of CMNNs, NCDs and injuries in low and middle-income countries.

Framework, data and methods

We use recommendations from the Disease Control Priorities Project, 3rd Edition for scale up of predominantly primary health care through a Highest Priority Package (HPP) and an Essential UHC package for CMNNs, NCDs, and injuries, and estimate expected impact on key outcomes by 2030. Data on mortality by country, cause, age, and sex are from the WHO Global Health Estimates (GHE) 2015 update. Population data are from the UN Population Division, 2017 revision. We use DCP3's mortality model to estimate mortality change by 2030 and from these generate new life tables to estimate deaths averted, life expectancy, and inequality in life expectancy across countries and within countries. We measure impact on inequality by Gini applied to health and Concentration Index.

Results

For low-income countries,on average, the largest impact on life expectancy and deaths averted will be achieved by first implementing the Highest Priority Package for CMNN and then for NCDs and injuries. For one third of the countries deaths averted are highest from HPP for NCDs and injuries. Impact on inequality in life expectancy between countries is higher by targeting CMNN conditions.

For lower-middle-income countries,on average, the impact from the Highest Priority Package on life expectancy is almost similar when we compare CMNN with NCDs and injuries interventions, with slightly higher impact from all interventions for NCDs and injuries. More deaths can be averted from the Highest Priority Package by targeting NCDs and injuries than CMNN conditions. Impact on inequality in life expectancy between countries is higher by targeting CMNN conditions.

Interpretation and tentative conclusions

Countries can achieve high impacts by systematic priority setting that takes into account both the unfinished agenda and increasing needs for NCD and injuries services. Most LICs can achieve most value for money, broadly defined as increased life expectancy and reduced inequality, by further investments in high priority services for CMNN conditions, while starting to prepare for investments in NCD and injury services. The same holds for some LMICs that are less advanced in the epidemiological and demographic transition. For a majority of LMICS that have achieved large mortality reductions in CMNN conditions, investing in the Highest Priority Package for NCDs and Injuries will provide most value for money.

Conflicts of interest: none.

Funding: Norwegian Agency for Development Cooperation

3:30 PM –5:00 PM MONDAY [Evaluation Of Policy, Programs And Health System Performance]

Universität Basel | Kollegienhaus – Hörsaal 118

Insurance, Spending and Disease: Perspectives from the United States

SESSION CHAIR: **Michael Chernew**, Harvard Medical School / Dept of Health Care Policy

Paying Patients to Switch: Impact of a Rewards Program on Choice of Providers, Prices, and Utilization

PRESENTER: **Michael Chernew**, Harvard Medical School / Dept of Health Care Policy

One barrier to health care price shopping is the presence of insurance, which distorts patient incentives to shop. As a solution, employers and insurers are experimenting with changes to benefit design that encourage patients to switch to lower-priced providers. One increasingly popular strategy is to use financial incentives to reward patients who receive care from lower-priced providers. We evaluated the impact of a rewards program implemented in 2017 by 29 employers with 269,875 eligible employees and dependents. For 125 elective services, patients who receive care from a designated lower-priced provider receive a check ranging from $25 to $500 depending on the provider's price and service. Among these services, in the first 12 months of the program, we find a 2.1 percent reduction in prices. Total savings from reductions in prices were $2.3 million, or roughly $9 per person per year. These effects are primarily seen in MRIs and ultrasounds and with no price reduction among surgical services.

Changes in Prescription Drug Utilization Following Closure of the Medicare Part D Donut Hole

PRESENTER: **Dr. Ayesha Ali**, University of Tennessee Health Science Center

AUTHOR: Cameron Kaplan

Background: Medicare Part D, which provides prescription coverage for elderly individuals, was initially designed with a large coverage gap, or donut hole, where beneficiaries would lose prescription drug coverage once total annual drug spending reached $2,830; and then coverage would resume if total annual drug spending reached $6,440, called the catastrophic coverage phase. Beneficiaries qualifying for the Medicare low-income subsidy (LIS) have remained exempt from this gap in coverage. Beginning in 2011, the Affordable Care Act began to gradually eliminate the coverage gap. The first step, implemented that year, reduced the cost of brand-named drugs by 50% for purchases within the coverage gap.

Methods: We used the 5% sample of Medicare Claims data, selecting non-dual eligible beneficiaries, aged 65 and older, who maintained continuous coverage in both 2010 (the last year prior to the donut hole closure) and 2011 (the first year of the donut hole closure). We identified overall annual prescription drug fills and total out-of-pocket expenditures in each year as our outcome variables. We used a difference-in-differences model to compare beneficiaries not eligible for LIS, and therefore subject to the coverage gap and subsequent 50% discount on brand-named drugs in 2011, with beneficiaries receiving LIS who did not experience a gap in coverage or change in policy.

Results: We find that overall annual out-of-pocket spending among non-LIS beneficiaries decreased by $130 (95% CI: [-148.97, -112.03]) while overall prescription drug fills had no significant change. Among individuals who reached the donut hole, total number of prescriptions increased by about 1.8 (95% CI: [0.77, 2.90]) compared with 2010 fills per year and overall annual out-of-pocket spending decreased by $390 (95% CI: [-420.11, -359.92]). Among individuals whose expenditure put them above the upper limit of the donut hole and into the catastrophic coverage phase, the overall out-of-pocket expenditure decreased by $1,629 (95% CI: [-1681.76, -1576.48]) among the non-LIS beneficiaries and there was no change in the number of prescriptions filled.

Conclusions: The initial ACA policies to close the coverage gap likely contributed to reducing out-of-pocket spending on prescription drugs, however, some of the reduction may have been driven by increased usage of generic drugs. Overall, the coverage gap closure appears to have led to reduced financial burden for Medicare patients, but lower prices for medications do not appear to have affected overall number of prescriptions filled.

Comparing the Effects of Medicaid and Basic Health Insurance on the Equity of Enrollees' Economic Burden of Disease: Using the Method of Coarsened Exact Matching

PRESENTER: **Ms. Yangling Ren**, Xi'an Jiao tong University

AUTHORS: Zhongliang Zhou, Guanping Liu, Ms. Dan Cao

Abstract

Background:

In China, millions of low-income and disabled people receive health insurance and financial support from medicaid. However, there has been little systematic evidence focused on the economic burden of disease (EBD) and equity of this special group compared with Basic Health Insurance enrollees. Medicaid is divided into One-stop Medicaid and After Medicaid. This study aims to investigate the equity of Medicaid beneficiaries' EBD compared with Basic Health Insurance enrollees and then provide more targeted suggestions for future policy formulations in Medicaid.

Methods:

Data on Basic Health Insurance were derived from the fifth Health Service Survey and data on Medicaid were obtained from the Survey of Civil Affairs of Shaanxi province conducted in 2013. Using the coarsened exact matching method to control for confounding factors, we included a match sample of 33207 beneficiaries between One-stop Medicaid and Basic Health Insurance, and 34124 enrollees between After Medicaid and Basic Health Insurance. The index of personal medical expenses to household disposable income was used to measure EBD (EBD occurs if this index is greater than 0.4) and examine the equity of economic burden of disease in Medicaid and Basic Health Insurance in the recommendation of World Health Organization. Concentration index (This value ranges from minus 1 to 1, positive value indicates pro-rich inequality and negative value indicates pro-rich inequality) was adopted to assess inequality of EBD and was decomposed into its contributing factors to explain EBD inequality and explore equity of these two schemes.

Results:

After coarsened exact matching, without medical assistance, the enrollees' EBD of One-stop Medicaid and Basic Health Insurance were 10.8% and 6.2% ($p<0.001$), while the enrollees' EBD of After Medicaid and Basic Health Insurance were 24.2% and 4.6% ($p<0.001$); with medical assistance, the enrollees' EBD of One-stop Medicaid and Basic Health Insurance were 6.3% and 6.2% ($p=0.475$), while the enrollees' EBD of After Medicaid and Basic Health Insurance were 13.8% and 4.6% ($p<0.001$), indicating the effective of medicaid in One-stop Medicaid. The concentration index of the One-stop Medicaid was -0.4192 and -0.137 for Basic Health Insurance; the concentration index of the After Medicaid and Basic Health Insurance were -0.3313 and -0.3812, respectively. The majority of observed inequalities in EBD were explained by economic statuses, degree of education and inpatient. Moreover, the horizontal inequity indexes were -0.1078 and -0.3914 for One-stop Medicaid and Basic Health Insurance; -0.3457 and -0.3869 for After Medicaid and Basic Health Insurance, respectively.

Conclusion:

Our findings emphasize that Medicaid makes a difference in enrollees' EBD compared with Basic Health Insurance, and they indicate the disparities in Medicaid's procedures. Efforts should be made to strengthen policies and programmes in Medicaid to relieve enrollees' EBD, such as raising the standard for compensation in One-stop Medicaid and simplifying procedures in After Medicaid. This study will provide evidence-based strategies to guarantee the right to life and medicare of those who live in poverty both in China and other developing countries.

The Effect of a U.S. Alternative Payment Model on Expenditures and Utilization

PRESENTER: **Stephan Lindner**, OHSU

AUTHORS: Menolly Kaufman, Miguel Marino, Jean O'Malley, Heather Angier, Erika Cottrell, Jamal Furqan, John Heintzman

Background: Moving away from a fee-for service (FFS) reimbursement model to alternative payment models (APMs) that base payments on expected patient costs and quality are considered a central element in efforts to reduce costs and improve quality of care in the United States. However, APM reforms have so far mostly focused on large provider organizations or hospitals and not resulted in clear cost reductions. This study examines an Oregon Medicaid (the public health insurance for low-income people) APM program established in 2013 that provides prospective per-member-per-month (PMPM) payments to primary-care providers called community health centers (CHCs) that serve medically underserved patients. The APM program has several unique features: (i) payments are based on services provided within CHCs but not on services provided by external providers (i.e., hospitals, specialists); (ii) payments are not tied to performance; (iii) participating CHCs can engage in novel services aimed at addressing social determinants of health (e.g., helping members access community services), but they are not directly reimbursed for these; and (iv) payments for some services "carved out" from the program continue to be based on a per-unit payment rate (i.e., behavioral health, dental and obstetrical services). Between 2013 and 2018, 15 CHCs with approximately 150,000 Medicaid members have been added to the program in several phases.

Study Design: We use Oregon Medicaid claims data spanning 2010-2018 for our analysis. Patients attending participating CHCs form the treatment group, while patients attending non-participating CHCs form the control group. We examine overall expenditures of attributed patients as well as expenditures of services provided by CHCs (internal services) and expenditures of services provided by external providers (external services). For expenditures of services provided by CHCs, we further distinguish between those included in the APM and those carved out. We use a flexible event-study approach to account for staggered APM implementation and cluster standard errors at the CHC level using block bootstrapping.

Results: Overall expenditures as well as expenditures related to internal or external services do not change as a result of the APM. Expenditures related to internal services included in the APM decrease, while expenditures related to internal services carved out from the APM increase. We do not observe treatment heterogeneity across implementation waves.

Conclusions: This APM program in Oregon of CHCs provides important insights into how features of APM models influence delivery of care and expenditures. First, CHCs participating in the APM program have only indirect incentives to reduce costs of external providers, and we find no decrease in such expenditures during our study period. Second, CHCs participating in the APM reduce expenditures related to internal services included in the APM, but also increase expenditures related to internal services that are carved out from the APM. The latter result suggests that CHCs at least partially compensate for costs of novel services by increasing the use of carved-out services, for which they receive a fixed payment per unit of service. Overall, our findings highlight that incentives embedded in an APM model may have strong implications for utilization and expenditures.

3:30 PM –5:00 PM MONDAY [Supply Of Health Services]

Universität Basel | Kollegienhaus – Hörsaal 119

Digital Health Around the World

SESSION CHAIR: **Pinar Karaca-Mandic**, University of Minnesota

Demand for Primary Care, Teleheath, and Specialty Services

PRESENTER: **Todd Wagner**, Stanford University

AUTHORS: Elizabeth Gehlert, Howard Jiang, Steven Asch, Paul Heidenreich

Many people struggle to access needed services and consultations in a timely fashion. Policy makers in the US refer to “the tyranny of distance” in speaking of the millions who struggle to access health care because they live far away from a medical facility. The US Department of Veterans Affairs is particularly concerned about access. While it is the largest integrated health care provider in the US, it operates a limited number of hospitals (n=120) and outpatient facilities (n=1,500) and many Veterans have to travel long distances to get care, especially specialty care.

In this longitudinal cohort study, we examine patients’ utilization of primary and specialty care among patients with heart failure (HF). We pay particular attention to the role that distance plays in the demand for care. Using distance as a price, we then examine whether telemedicine substitutes for in-person care. Finally, we examine whether HF quality of care indicators decrease when patients rely more on their primary care providers than cardiologists, treating physician choice as endogenous.

We identified all patients with a diagnosis of HF in the US Department of Veterans Affairs Health Care System between 2007-2014. Beginning with their index date, we tracked each patient’s monthly utilization of primary care, HF specialty care, cardiac procedures, and telehealth (n=27,467,902 person-months). For the telehealth, we identified whether it was for primary care or specialty care and the modality (phone or video). For each month, we also tracked the patients’ residence, which we used to compute their travel distance to the VA medical center. We categorized travel time into ten 10-mile categories, with the top being 100 or more miles. We followed methods used by Steinman et al. to assess quality indicators for HF that do not require chart review. We tracked co-morbidities using the Charlson co-morbidity index. We identified the patient’s primary care providing during the month and calculated provider volume of HF patients and panel size. The analyses examining demand and substitution effects used a person-level fixed-effect regression with robust standard errors. The models examining quality of care used instrumental variables regression whereby travel distance was used to address the endogeneity of physician choice.

On average, patients with HF averaged .24 primary care visits per month, and .07 HF visits per month. Between 2007-2014, there was a large growth in telehealth, especially primary care telehealth. In 2007, 2.6% of the patients had a primary care telehealth visit in a month and by 2014, 14.5% had a one. Travel distance was negatively associated with face-to-face visits. In addition, travel distance positively associated with primary care telehealth, providing evidence of a net substitution effect, although telehealth specialty care was not a strong substitute for face to face specialty care. Ongoing analyses are examining whether HF quality indicators are higher for patients who see specialists, whereby we treat physician choice as endogenous.

Economic Evaluation of an Enhanced Intervention for Home-Based Maternal Record By mHealth to Improve Continuum of Care in Rural Bangladesh

PRESENTER: **Dr. Ruoyan Gai**, National Center for Child Health and Development

AUTHORS: Syed Emdad Haque, Kiyoko Ikegami, Rintaro Mori

To achieve maternal and neonatal health related SDGs, challenges remain on how to improve health care seeking and practices across the care continuum in Bangladesh. A cluster randomized controlled trial is implemented to evaluate the effectiveness of an enhanced maternal and child health handbook program by application of mobile platform (finished in October 2018). Alongside this community-based intervention, an economic evaluation is ongoing to assess population health impacts, cost-effectiveness and budget impacts, in order to provide full package of evidence to decision making and resource allocation for the introduction of the program in the country.

A decision tree model to project the natural history of pregnancy, childbirth and postpartum / neonatal periods and the expected effectiveness of the proposed intervention is developed based on epidemiological characteristics in rural Bangladesh and aggregates all evidence available at the population level. The model covers the life stage from pregnancy to six weeks after childbirth, and simulates health impacts of deaths and sequelae in later life of mothers and babies. The health states includes: good health, maternal complications during pregnancy, childbirth and

postpartum periods, neonatal complications, maternal sequelae, neonatal sequelae, and death. A hypothetical cohort of pregnant women at reproductive age of 15 to 49 years enter the model based on the annual fertility rate, and have a chance to remain healthy, or to develop complications during pregnancy, childbirth and postpartum periods, such as hypertensive disorders, hemorrhage, sepsis, and obstructed labor, based on base-case epidemiological parameters derived from systematic review and the potential effects of the improved utilization of the standard recommended care continuum and health-related practices by the proposed interventions. Depending on the probabilities to access specific services and to be referred to the facility with sufficient capabilities in case of complications, as well as the health-related practices, the maternal and / or neonatal outcomes would be different.

Then the expected health outcomes, majorly reduced maternal and neonatal mortality and morbidities caused by complications, and will be measured by Disability Adjusted Life Years (DALYs). Information for costs to implement the proposed interventions (except research) at the field will be generated and then that for the implementation at the national level will be estimated. Following WHO's guideline of economic evaluation, we will calculate incremental cost-effectiveness ratio (ICER) and incremental budget amounts of the two options compared to status quo. We consider the option with ICER less that the per capita gross domestic product (GDP) to be very cost-effective and three times of per capita GDP to be cost-effective, as suggested by the Commission on Macroeconomics and Health. Budget impact will be estimated based on the size of population, unit costs for the implementation, the amount of the improved utilization of case services and unit patient costs for the service. A time horizon for the estimates of costs and DALYs averted will be the remaining life span of the cohort of mother-baby pairs as described later. Sensitivity analyses will be performed to explore the effects of parameter uncertainty.

The Role of Electronic Health Record Vendor in Hospital Referral Decisions

PRESENTER: **Dr. Chad Meyerhoefer**, Lehigh Univeristy

AUTHORS: Yuriy Pylypchuk, Talisha Searcy, William Encinosa

Electronic Health Records (EHRs) are able to aggregate patient information into a single record which can be used by multiple providers to treat a patient. Sharing information across the care continuum through EHRs can sometimes produce multiple benefits. These include an increase in the quality of care and patient safety (Meyerhoefer et al., 2017; Meyerhoefer et al., 2016) and an improvement in the efficiency of care delivery (Miller et al., 2005; Agrawal, 2002).

Unfortunately, progress towards health information exchange (HIE; sharing patient information across providers with different EHR systems) in the United States has been relatively slow. Challenges such as patient matching, information blocking, lack of standards, and technical difficulties have impeded functional HIE (Vest and Gamm, 2010; Adler-Milstein and Pfeifer, 2017; Miller and Tucker, 2014). There is also evidence that EHR vendor dominance can affect the level of HIE activities. In particular, Everson and Adler-Milstein, (2016) find that hospitals engage in more HIE activities with hospitals that use other EHR systems only as vendor dominance increases.

We build on previous work by investigating whether the choice of EHR vendor affects hospital referral decisions when patients need to be treated outside the hospital system. We also determine whether cross vendor referrals depend on vendor market share and vary by individual vendor. The data for our analysis come from three different sources. Information on hospital referrals for 2011-2015 come from the U.S. Centers for Medicare and Medicaid Services, while information on EHR vendor is extracted from the HIMSS Analytics Database, and the American Hospital Association Annual Survey is used to obtain hospital system name, system ownership and hospital referral region (HRR). Our main sample consists of all non-federal acute care hospitals located in the 50 U.S. states and D.C.

We consider how both the EHR adoption and switching to a different EHR system affect hospital referral patterns. Our primary outcome variable is the percentage of referrals outside of the hospital system to other hospitals with the same vendor. We use a difference-in-differences specification to compare referral patterns in hospitals that either adopted or switched to a new EHR to referral patterns in hospitals that either did not have an EHR system (in the case of the adoption model) or did not switch EHR vendors (in the case of the EHR switching model). In both cases we interact the treatment effect of adoption or switching with the market share of the EHR vendor, and compare models with year and hospital system fixed effects to models that include HRR-specific linear and quadratic time trends. We also conduct an event study to assess the robustness of our results. Preliminary results suggest that both EHR adoption and vender switching increase the proportion of referrals to other hospitals with the same EHR vendor. These effects are more pronounced in areas where the newly adopted vendor has a higher market share. Overall, these findings suggest that EHR vendors and the hospital systems that adopt them may attempt to prevent information transmission to competing vendors and systems.

Cost-Effectiveness of a Mobile Technology Enabled Primary Care Intervention on Cardiovascular Disease Risk Management in Rural Indonesia

PRESENTER: **Blake Angell**, The George Institute for Gobal Health

AUTHORS: Dr. Thomas Lung, Devarsetty Praveen, Jarwo Sujarwoto, Delvac Oceandy, Gindo Tambpubolon, Asri Maharani, Anushka Patel

Background

Cardiovascular diseases (CVD) are the leading cause of disease burden in Indonesia. Effective interventions to reduce this burden are often limited by primary healthcare system coverage, particularly in rural areas where populations face numerous barriers to care. This study investigated the cost-effectiveness of a mobile technology-supported intervention to strengthen primary healthcare and improve care for CVD in a rural Indonesian setting.

Methods and findings

Cost and effectiveness data were collected through a quasi-experimental study, involving four control and four intervention villages in Malang district, Indonesia. The intervention was implemented between February 2017 and January 2018. A census of all residents aged ≥40 years was carried out to identify those at high risk of CVD in control (n=2,429) and intervention (n=1,894) villages who were re-assessed approximately 12 months post implementation to determine the effectiveness of the intervention. These data were used to inform a modelled cost-utility analysis using Markov methods to determine the cost-effectiveness of scaling-up the intervention across the district relative to usual care over a 5 year period. The analysis was conducted from the health-system funder perspective and the primary outcome measures for the analysis were cost per Disability Adjusted Life Years (DALYs) averted with a 3% discount rate. Disability weights for people with CVD were adopted from the Global Burden of Disease Study and death rates resulting from CVD events was estimated using results from the literature for middle-income nations. Cardiovascular events were modelled based on estimates from the literature of the risk of these events applied to the risk profiles found in the trial population. Costs of delivering the intervention were collected through the trial including the staff and consumables needed to deliver the intervention, the service use of high-risk individuals, and the medical and other equipment needed to deliver the intervention. Parameter uncertainty was explored using one-way and probabilistic sensitivity analyses. Compared with no intervention, the intervention resulted in significant improvements in systolic blood pressure (average reduction -8.7mmHg, 95%CI-7.4, -10.1). Scale-up of the intervention across the district through existing healthcare centres was found to result in an additional cost to the system of approximately $35M USD over five years (predominantly through the costs associated with greater pharmaceutical use) but resulted in a cost per DALY averted of $2,668 USD, well under the WHO threshold of Indonesia's GNI per capita to be considered very cost-effective in the Indonesian context. Sensitivity analyses demonstrated the results to be robust across a wide range of variations in key parameters though the results were most sensitive to variations in the disability weights used in the model.

Conclusion

By improving access to healthcare, a multi-faceted mobile technology supported primary healthcare intervention was found to be a highly cost-effective intervention to improve the care for CVD in a rural Indonesian setting. The intervention should be considered for further rollout across the district and potentially more broadly across the nation and other rural settings across the world.

Health-Related Internet Use of the Hard-to-Reach Population: Empirical Findings from a Survey in a Remote and Mountainous Province in China

PRESENTER: **Dr. Hongmin Li**, School of Health Care Management, Shandong University

Background Expanding use of the Internet contributes to more effective searches for health-related information and opens up opportunities for direct communication online with health care professionals online. However, less is known about how users' characteristics on the demand side influence health-related Internet use, especially in remote and rural areas within developing countries. The absence of accurate estimates of users' characteristics and their impacts on adaptations of health care services in developing countries constrains focused policy-centered discussions and the design of appropriate policies.

Objective Our aim in this study was to assess the prevalence of health-related Internet use and to identify its determinants in a remote province in China.

Methods We conducted a cross-sectional survey in June and July of 2018 in Ningxia, located in the northwestern China. Rural households were selected by multi-stage random sampling and households' key formants were interviewed face-to-face at the respondents' home. Dependent variables were whether the households' use of online health services or not. Independent variables were chosen based on the Andersen's Behavioral Model. Socio-demographic characteristics were compared between households used health-related online services with non-users. We applied logistic regression models to evaluate multivariate associations between respondents' characteristics and their usage of online health services, and obtained odds ratios (ORs) with 95% confidence intervals.

Results A total of 1,354 respondents from rural households were interviewed, of whom 707 (52.22%) were men. The mean age of the respondents was 44.54 years (SD = 10.22). Almost half of the surveyed households (640 out of 1,354 or 47.27%) reported using one or more online health care services, whereas 37.8%(502/1,354) reported using the Internet to obtain health-related information, 15.51%(210/1,354) used the Internet to communicate with professionals about health issues, and 7.24% (98/1,354) had engaged in online consultations in last year. After controlling for potential confounders, Households engaged in health-related Internet use were found to be richer, have higher health demands, and have less geographic access to high-quality health care compared with other households.

Conclusion Internet has become a major health information resource in rural Ningxia. Social structures, family enabling factors, health needs, and characteristics relating to health care access were significant predictors of households' health-related Internet use in rural and remote areas in China. Those who belong to older age groups, have low incomes, and whose education levels do not extend beyond primary school education are significantly less likely to use online health care services and to benefit from online health care programs. A need for continued collaborative efforts involving multiple stakeholders, including communities, online and offline health care providers, family members, and the government.

KEY WORDS: online healthcare, remote and rural areas, cross-sectional survey, China

3:30 PM –5:00 PM MONDAY [Supply Of Health Services]

Universität Basel | Kollegienhaus – Hörsaal 120

Organized Session: Physician Agency, Quality of Care and Over-Prescribing in Primary Care: Experimental Evidence from the Private and Public Sectors in South Africa

SESSION CHAIR: **Mylene Lagarde**, London School of Economics and Political Science

Is Quality of Care Better in the Public or Private Sector? Evidence from an Audit Study in South Africa

PRESENTER: **Duane Blaauw**, Centre for Health Policy, School of Public Health, University of the Witwatersrand

Because of the information asymmetries between patients and providers, it is difficult for patients to determine the quality of care they receive. Therefore, market-based delivery of health care is often likely to lead to socially inefficient outcomes. This is especially the case when optimal care requires denying patients of services that they value (such as antibiotics), as market-based health care may over-respond to demand. To avoid such issues and deliver health care services to all in a more cost-effective way, governments in many Low- and Middle-Income settings employ providers to deliver services for free (or at nominal costs).

To compare the quality of care provided in the private and public sectors, we conduct an audit study in a representative sample of private and public providers in Johannesburg. In South Africa, the poorer majority of the population relies on free public primary care delivered in clinics staffed mostly by nurses. Meanwhile, those who can afford it or have private health insurance can consult General Practitioners (GPs).

We use standardised (fake) patients (SPs), that is, healthy subjects trained to accurately and consistently portray a particular clinical case (following a detailed rehearsed script), and to subsequently record pre-specified aspects of the consultation. In this study, SPs portray a patient suffering from acute bronchitis, a common viral infection whose management should only consist of symptomatic relief treatment, to the exclusion of antibiotics. From the 227 interactions between patients and providers, we capture very rich information about the consultations, including duration of the consultation, whether the provider asked essential questions and undertook essential examinations necessarily to arrive to a correct diagnosis, and what treatment they recommended. Based on the drugs dispensed or prescribed, we also calculate the cost of the treatment given and compare it to the most cost-effective option recommended by experts.

We find that private providers exerted significantly more effort than public providers, conducting longer (10 minutes vs. 7.8 minutes) and more thorough consultations, completing more items on a checklist of essential history and examination items (45% vs. 34%). They were also less likely to prescribe unnecessary antibiotics (62% vs. 78% of public providers). This is consistent with higher levels of qualification and better clinical knowledge of private providers. However, the average cost of the drugs prescribed was 4.5 times more expensive in the private sector compared to the public sector. The results hold even after controlling for patient workload and waiting times, and after including market fixed effects.

Although the performance of private providers is higher, the results generally show low levels of quality of care and worrying levels of unnecessary prescribing of antibiotics in both sectors. Even though the study design does not allow us to fully isolate the effect of practicing in the private sector holding provider characteristics constant, it suggests that private delivery of healthcare leads to more over-treatment and socially inefficient outcomes.

Are Providers Responsive to Patients' Preferences? Evidence from Antibiotic Prescribing in South Africa

PRESENTER: **Ling Ting**, University of Witwatersrand

Antibiotic resistance (ABR) constitutes a significant threat to global public health. The problem is even more critical in low- and middle-income countries which have more infectious disease, higher rates of ABR, less access to diagnostic tools, and fewer financial resources to purchase effective antibiotics. In the medical literature on antibiotic prescribing, one of the most consistent reasons expressed by providers for prescribing antibiotics are patients' actual demands for antibiotics (or providers' *perceptions* that patients expect antibiotics). In other words, unnecessary prescribing is mainly a response to what patients value, a problem that might be particularly acute if healthcare delivery is market-based, and denying care that patients value may have future financial consequences. However, there is hardly evidence about the proportion of unnecessary prescribing that is due to patient demand, and whether public and private respond differently to patients' demand.

We study antibiotic prescribing of primary care providers in South Africa, and the extent to which patient demand drives unnecessary prescribing. Antibiotic resistance is particularly high in South Africa and the majority of antibiotics are prescribed by public and private primary care providers.

We create an exogenous variation in patient demand for antibiotics in a random sample of about 200 public and private primary care providers in Johannesburg. Specifically, each provider receives a pair of standardised patients (SPs), who visit them in a random order. In this study, SPs are fake patients trained to follow a detailed script to portray accurately and consistently a case of acute bronchitis, and to subsequently record the content of the consultation and treatment received. In one of the two visits, the SP mentions at the beginning of the consultation that they would only agree to take antibiotics if they are really necessary. According to national and international guidelines, the mild symptoms of acute bronchitis portrayed by the SP should be treated with symptomatic relief drugs, but no antibiotic should be prescribed.

We find that the rate of unnecessary prescribing of antibiotics is significantly lower when patients clearly mention their reluctance to antibiotics, although it remains very high (57% vs 73%). This change occurs while all measures of effort and quality of care (consultation duration, number of questions asked and examinations undertaken) is the same whatever the attitude of the patient. The only notable difference is that more providers volunteer a diagnosis to the 'reluctant' patient (67% vs. 58%). We find that private providers are slightly more responsive to patients' preferences, as they reduce their unnecessary prescribing by 22.5%, while public providers reduce it by 20.5%.

The results suggest that even though part of unnecessary prescribing of antibiotics may be due to *perceived* patient demand by providers, unnecessary prescribing remains largely due to providers' own decision. Hence, while a **successful** public awareness campaign would contribute to reduce unnecessary prescribing, most of it is driven by provider behaviour.

Physician Altruism and Clinical Decision-Making: Evidence from a Field Experiment with Standardised Patients in South Africa

PRESENTER: **Arthika Sripathy**, London School of Economics & Political Science

Most healthcare decisions and costs are determined at the level of physician-patient interactions; therefore, understanding what motivates physician behaviour in these interactions is a necessary pre-requisite to regulating healthcare provision effectively. Physicians' concern for patients' health and financial well-being (altruism) is commonly considered an important driver of quality and cost in healthcare. Nevertheless, convincing empirical evidence on the role of provider altruism in real-world clinical settings is scarce. Collecting rich, objective information on all relevant aspects of physician behaviour in the field is complex. Observational data typically suffer from various selection problems, as altruistic providers may decide to treat sicker patients, or needier patients may choose to consult more altruistic doctors. Common lab-experimental measures of altruism (from dictator games) are also rarely tested against actual behaviour in the field, to assess their ability in predicting provider behaviour in real clinical settings.

To address these challenges, we conduct an audit study utilising standardised (fake) patients (SPs), to investigate the role of altruism in predicting providers' effort in consultations and subsequent therapeutic decisions. SPs are healthy actors, trained to accurately and consistently portray a particular clinical case (following a detailed rehearsed script) and to subsequently record pre-specified aspects of the consultation. The clinical case portrayed by our SPs is an uncomplicated case of viral acute bronchitis, for which antibiotics are unnecessary and only symptomatic relief therapy is recommended. We exploit the insurance status of the SPs (their signalled financial well-being) to create exogenous variation in the pro-social incentives faced by the treating provider. Namely, our SPs either have high- or low-insurance cover. We then test whether an experimental measure of individual altruism – from a dictator game conducted in a follow-up survey of all participating providers – can predict providers' responses to patients' insurance cover.

The study sample includes 89 private primary healthcare providers from Johannesburg, South Africa. Each provider receives unannounced visits from two SPs (in a random order) – one from each insurance type – resulting in 178 SP visits in total. Detailed information on each clinical interaction is recorded by the SPs immediately after each visit in a de-briefing questionnaire, including the duration of the consultation and whether the provider asked essential questions and undertook essential examinations to arrive at a correct diagnosis. We use item response theory (IRT) methods to construct measures of providers' effort. We also capture what treatment was recommended, and based on the drugs prescribed, we calculate the treatment cost and compare it to the most cost-effective option recommended by experts.

Controlling for possible variations in providers' profit incentives from different patient insurance statuses (both types of SP insurance cover have the same consultation rate, and the providers do not gain financially from their prescribing choices), we investigate I) the impact of patient insurance status on care appropriateness (recommended diagnostic effort and treatment) and ii) the validity of our standard experimental measure of individual altruism in predicting provider behaviour. Data analysis is currently ongoing, and expected to conclude by February 2019.

3:30 PM –5:00 PM MONDAY [Specific Populations]

Universität Basel | Kollegienhaus – Seminarraum 208

Health Service Use of Specific Populations

SESSION CHAIR: **Claire de Oliveira**, Centre for Addiction and Mental Health

The Impact of Immigrant Concentration on Mental Health—Quasi-Experimental Evidence from a Public Social Housing Programme

PRESENTER: **Jane Greve**

AUTHORS: Cecilie Weatherall, Bence Boye-Kovacs

Previous studies have documented large and significant differences in mental health by immigrant status. While there are several reasons why we expect immigrants to differ in their initial health, immigrants' health investments may also differ from the majority while residing in the host country.

In this paper we utilize a quasi-random allocation of applicants into different neighborhoods through the public social housing office merged with administrative registry panel data to examine the impact of immigrant concentration in the neighborhood on mental health. The applicants entitled to public social housing are lower-income residents with both an urgent housing problem and social problems.

While there can be many reasons for the observed differences in health investments by immigrant status, in this paper, we focus on the impact of social networks as immigrants tend to interact with others from their language group. Our results suggest that being allocated to a neighborhood with a higher concentration of immigrants (in general) has a significant and negative impact on mental health for immigrants and the effect is larger among men than women. There is no significant impact of immigrant concentration in the neighborhood among ethnic Danes. Although we cannot distinguish whether it is due to changes in information or social norms, we find consistently that the impact is large and significant when we examine the concentration of immigrants from the resident's own language group on mental health. Furthermore, the impact of immigrant concentration is not significant among men and women changing general practitioner when moving indicating that the results are not driven by differences in the supply of health care services in the neighborhood.

What Explains the Inequalities in Healthcare Use between Immigrants and Natives in Switzerland?

PRESENTER: **Ms. Christina Tzogiou**, Zurich University of Applied Sciences and University of Lucerne
AUTHORS: Dr. Stefan Boes, Dr. Beatrice Brunner

Background

Even in a high income country, such as Switzerland, immigrants tend to suffer higher rates of mortality and morbidity compared to natives. Foreign nationals are an indispensable component of the Swiss demography and labor force. They comprise 25% of the permanent population, with the majority coming from EU/EFTA states. At the same time, the immigrant population in Switzerland is very heterogeneous. Unequal access to prevention, care and support can have considerable health and cost implications for the whole society. A better understanding of the inequalities in healthcare use is key for the design of cost-effective interventions towards the improvement of national health and a sustainable solidarity-based healthcare system.

Objective

The aim of this study is to explain the inequalities in healthcare use between different immigrant groups and natives in Switzerland. The inequality measures examined are the probability of visiting a doctor or an emergency department, as well as the number of doctor and emergency department visits in the past 12 months.

Data and methods

The data are drawn from the Swiss Health Survey 2012 and the Health Monitoring Survey on the immigrant population 2010 in Switzerland. The data contain information on the health status, healthcare utilization, and socioeconomic characteristics. We differentiate immigrants between first- and second generation and culturally similar and different to natives. To retrieve the relative contribution of each inequality factor we apply a non-linear decomposition method based on the Oaxaca-Blinder approach. We further extend the model by categorizing the factors into different groups, such as circumstances and effort.

Results

Swiss are more likely to visit the doctor compared to overall, to first generation and to culturally different immigrants. These differences could be reduced by 87%, 63% and 40%, respectively, if the corresponding immigrant groups had the same endowments as the Swiss. The contribution of effort accounts for most of the explained inequalities. Swiss also go more often to the doctor compared to the aforementioned immigrant groups. While these differences could be decreased significantly if overall and first generation immigrants had the same endowments as Swiss, the inequality between Swiss and culturally different is mainly attributed to the differences in their coefficients. Culturally similar immigrants are more likely to visit the emergency department and also exhibit a higher number of visits. Since they are fairly similar in their characteristics to the Swiss, these inequalities are mainly attributed to the differences in the coefficients. On the other hand, culturally different immigrants are less likely to visit the emergency department. The main contributing factor is the amount of the annual health insurance deductible chosen.

Conclusions

Healthcare utilization is lower in the immigrants most divergent from the Swiss and higher in the culturally similar. The contributions of these inequalities are heterogeneous across the four inequality measures and comparison groups. It is, therefore, important to develop customized strategies to reduce differences in endowments, but also further investigate the drivers of the differences in the coefficients.

Healthcare in a Pure Gatekeeping System: Utilization of Primary, Psychiatric and Emergency Care Services in the Prison Population over Time.

PRESENTER: **Karine Moschetti**
AUTHORS: Jacques Spycher, Mark Dusheiko, Bruno Gravier

Background: Prison healthcare systems are required to meet the healthcare needs of a complex prisoner population where somatic and psychiatric poly-morbidity is high. They are under increasing pressure with rising prisoner populations, constrained prison capacity, and limited

public resources in terms of funding and personnel with concerns over privatization. Evidence on the determinants and repartition of healthcare utilization (HCU) across care services behind bars remains scarce, hence knowledge on HCU is needed to improve the efficiency of prison healthcare.

Objectives: To examine the factors influencing routine primary care (nurse and GP), psychiatric and emergency service utilization of prisoners. In particular, how demand for care services is impacted by prisoner's health status, penal and socio-demographic circumstances, prison conditions and provision of care services over time. The dynamics of care utilization across the different care services and persistence of acute events and emergency care in a pure gatekeeping environment is of interest.

Data & Methods: This study analyses individual longitudinal panel data of all adult inmates (n=8,701) incarcerated between 2013 and 2017 in the four prisons of Canton of Vaud, Switzerland. Data are for diagnosed somatic and psychiatric chronic conditions from mandatory health screening, sociodemographic, prisoner carceral circumstances, prison attributes including occupancy rate and allocation levels of prison healthcare resources. Two-part regressions were used to estimate associations with the probability, frequency and overall HCU of nurse, GP, psychiatric and emergency care separately. Finally, dynamic models with lagged period HCU across different services, and past acute events were estimated.

Results: After conditioning on chronic somatic, psychic and co-morbidity which were highly predictive of demand for all care services; we find that HCU of routine primary and psychiatric care decreases with prison overcrowding, but emergency care increases significantly. An increase in health care staff resource allocations increases HCUs of planned services, while reducing utilization of emergency care. We found that past acute health events and emergency care significantly increases both planned and emergency health care utilization in subsequent periods. Increased frequency of past psychiatric care significantly reduces emergency care and the demand for of planned nurse as well as GP consultations. However, past GP consultations also reduces future psychiatric consultations. Length of stay in prison reduces all HCU, prisoners with multiple prison stays receive less planned care, but more emergency care, and preventive detention increase psychiatric care.

Conclusions: This study provides novel empirical evidence of the effects of overcrowding in prisons and the amount of staff resources allocated to ensure demand for primary and psychiatric care is satisfied. Our findings support the fact that timely access to planned care can reduce emergency admissions, which if avoided reduces future demand for care. Similarly, prevention of acute events reduces future need for HCU. This study highlights potential substitution effects between primary and psychiatric care and between emergency HCU, suggesting there may be value for both patients and prison healthcare services from increasing access to, and coordination between care providers in prisons especially when overcrowding occurs and emergency care is costly.

The Effect of Pharmacare Plan G Coverage Change in British Columbia on Opioid Agonist Treatment Initiation and Adherence.

PRESENTER: **Mr. Natt Hongdilokkul**, British Columbia Centre for Excellence in HIV/AIDS
AUTHORS: Emmanuel Krebs, Xiao Zang, Charlie Zhou, Fahmida Homayra, Jeong Min, Bohdan Nosyk

Background: Opioid agonist treatment (OAT) is the evidence-based standard of care for people with opioid use disorders (PWOUD). Until British Columbia's (BC) Pharmacare Plan G coverage expansion on February 1st, 2017, all individuals earning positive incomes were required to pay a portion of the costs of OAT out-of-pocket. These co-payments, amounting to an average of $102.78 per month, were eliminated with the policy change. We aimed to determine the effect of the Pharmacare Plan G coverage change on OAT initiation and retention.

Methods: We defined a cohort of all BC residents with an indication of an OUD using linked health databases. The study period was defined as the 10 months before and after the coverage expansion (04/01/2016–11/30/2017). We executed a difference-in-differences analysis in which we compared the pre/post mean difference in outcomes to that of a historical comparator cohort with identical follow-up intervals prior to the study period (08/01/2014-03/31/2016). We controlled for differences in individual demographic and clinical characteristics, OAT regimen types and prescriber characteristics. We conducted robustness checks on shorter 3- and 6-month pre/post follow-up intervals.

Results: Among the 56,836 PWOUD included in our analysis, during the post-intervention period 25,910 individuals received OAT and 4,721 enrolled in Plan G coverage. We found Plan G coverage expansion did not have a significant effect on OAT initiation but significantly increased OAT retention. Specifically, coverage expansion increased the probability of OAT adherence by 4.95% (95% Confidence Interval:3.02%-6.88%), decreased the number of days off OAT by 16.42%(13.46%-19.37%), and decreased the number of OAT episode discontinuations by 17.41%(10.10%-24.74%). Results were robust over shorter pre/post follow-up intervals.

Conclusions: Reducing out-of-pocket spending improves OAT retention. The limited effect on initiation may suggest further efforts towards full implementation of the policy change may be required.

3:30 PM –5:00 PM MONDAY [New Developments In Methodology]

Universität Basel | Kollegienhaus – Seminarraum 209

Simulation-Based Approaches and Extrapolation

SESSION CHAIR: **Richard Cookson**, University of York

Microsimulation for Lifecourse Economic Evaluation: A Framework and Application to Early Years Policy

PRESENTER: **Dr. Ieva Skarda**, University of York

AUTHORS: Miqdad Asaria, Richard Cookson

We present a new birth cohort microsimulation framework for lifecourse economic evaluation, which provides detailed information about long-term health and non-health benefits, public costs, and inequality impacts. Cost-benefit analysis typically estimates health and social benefits separately. Our framework is more insightful as it allows for individual-level clustering and causal interaction between various health and social outcomes over the lifecourse. It can also provide detailed information about distributional impacts on inequality in lifetime consumption, health and wellbeing.

We use life-stage-specific networks of equations to model the causal pathways linking early life circumstances and skills formation to diverse later life outcomes. Our equations from age 0 to 14 are primarily based on longitudinal survey data from the Millennium Cohort Study. Later life equations are parameterised using causal effect estimates from quasi-experimental studies combined with target data from surveys and administrative records, with outcomes to age 46 validated using the 1970 British Cohort Study.

We illustrate the framework by evaluating a training programme for parents of young children at risk of conduct disorder. We find that the programme becomes cost-saving within eleven years, delivers a mean gain of 0.41 good years per child recipient, allowing for both health-related and consumption-related quality of life, and 2 % of recipients gain more than 5 good years. In addition, it has larger benefits for children of parents who are poorer, less educated and with mental illness, and reduces inequality of opportunity for lifetime wellbeing between the best-off and worst-off children by 0.36 good life years.

Exploring Different Extrapolation Methods for Weight Trajectory Analyses after a Childhood Lifestyle Intervention

PRESENTER: **Marije Oosterhoff**, Maastricht University Medical Center

AUTHORS: Hans Bosma, Nina Bartelink, Onno C.P. van Schayck, Manuela Joore

Background: Decision-making on childhood lifestyle interventions is informed by cost-effectiveness evidence. Although interventions may not be able to demonstrate cost-effectiveness on the short-term, they may positively affect weight trajectories to young adulthood, and reduce future adverse consequences of obesity. Ignoring long-term cost-effectiveness information could run the risk of underestimating the interventions' value. Extrapolation beyond the trial data to young adulthood is often required when employing a long-term cost-effectiveness perspective on childhood lifestyle interventions.
Objective: Explore different methods for modelling weight trajectories up to young adulthood for children receiving lifestyle interventions.
Methods: The differences, advantages, and disadvantages of three methods were compared: 1) extrapolation based on trial data, 2) linear extrapolation of the intervention effect, and 3) extrapolation based on informed priors obtained from expert elicitation. We used data of 1676 children between 4 and 12 years of age who participated in the quasi-experimental study examining the effects of the Healthy Primary School of the Future' (HPSF) and the 'Physical Activity School' (PAS). Body mass index scores were determined from objective measures of weight and height; these were measured at baseline, and at one, and two-year follow-up. Firstly, the two-year effects on BMI were extrapolated to 20 years of age with linear mixed effects models. For the second approach, effects were linearly extrapolated based on national cross-sectional data on BMI of children aged 0-21 years. Thirdly, expert opinions on the parameters of weight trajectories were collected from interviews.
Results: BMI had significantly decreased in children of HPSF and PAS compared to children of control schools (unstandardized effect size: -0.21 and -0.17, respectively) (1). The lack of multiple data points limited the possibilities for modelling the non-linear trend in BMI, which resulted in a BMI difference of almost 5 points between the extrapolated curves and Dutch averages at 20 years of age. The availability of national data facilitated the modelling of the non-linear trend in BMI, resulting in a population BMI trajectory. The effects of HPSF and PAS were modelled by adjusting the average BMI score at 4-years of age, after which the general BMI trajectory was followed. This resulted in a BMI reduction of -0.15 (HPSF) and -0.12 (PAS) at 20 years of age. The maintenance of intervention effects was varied across a range of decay rates and time intervals. The use of informed priors allowed for incorporating additional information, including experts opinion on secular trends, the potential decay of intervention effects, and the uncertainty around parameter estimates.
Conclusion: Compared to extrapolation of trial data and linear extrapolation of intervention effects, the use of informed priors may enhance the validity of predicting future outcomes and may support the uptake of cost-effectiveness evidence in decision-making on childhood lifestyle interventions.

References

1. Bartelink NHM, van Assema P, Kremers SJP, Savelberg HHCM, Oosterhoff M, Willeboordse M, et al. *Can the Healthy Primary School of the Future offer perspective in the on-going obesity epidemic in young children? – a quasi-experimental study*. [submitted]

Multi-State Simulation Modelling with Short-Term Single Arm Clinical Trial Data: The Case of CAR T-Cell Therapy

PRESENTER: **Ms. Jill Furzer**, University of Toronto

AUTHORS: Sumit Gupta, Jason Pole, Petros Pechlivanoglou

Rationale: Novel therapies in oncology bring a promise for disrupting current medical practice and potential for cure. They also bring an eagerness for timely integration into clinical practice. Evaluation of the clinical and economic value of these therapies is however hindered by limited access to individual-level data, or evidence on comparative and long-term effectiveness, as well as potential reporting bias in available data sources. Novel methods in economic evaluation and decision analysis are necessary to assess the clinical and economic value of such strategies.

Objective: To inform decision making on novel therapies with evidence from short-term, single-arm clinical trials using simulation modelling and matched control groups from registry data.

Methods: We illustrate the use of the proposed methods through the estimation of long-term comparative effectiveness and cost-effectiveness of chimeric antigen receptor T-cell (CAR T-cell) therapy for pediatric acute lymphoblastic leukemia. To address limited access to individualized data, we pooled digitized survival data from published single-arm clinical trial results. In the absence of a clinical trial control arm, we constructed a broad standard of care arm using individual-level data from a pediatric cancer registry, matched to clinical trial inclusion/exclusion criteria and baseline patient characteristics. We built a combined multi-state and individual-level simulation model (MSM), to assess the comparative cost and efficacy of the novel therapy against the standard of care. Both treatment strategy arms predict movement to sequential health or treatment states and death using transition probabilities. We assumed a range of cure rates in the treatment arm given limited information on long-term effectiveness. The simulation model includes 100,000 individuals. Uncertainty around published clinical trial results and other parameters is tested through one-way and probabilistic sensitivity analysis. Scenario analysis on novel therapy costing schemes is also considered.

Results: Through digitization and evidence synthesis across trials, we were able to accurately construct an intention-to-treat sample from the observed trial data. Our matched control group with a broad, data-driven comparator effectiveness performed well in comparison to other published, model-based evaluations. The MSM precisely estimated short-term comparative effectiveness and cost. Long-term predictions based on assumed cure rates provided an understanding as to the responsiveness of overall lifetime cost-effectiveness to projected improvements in therapeutic efficacy.

Conclusions: The combined use of survival curve digitization, comparator cohort matching and MSM provides improved precision in assessing cost-effectiveness for novel therapies.

A Microsimulation Model for Population and Health System Projection in Colombia

PRESENTER: **Mr. William Garcia**, PROESA/ Universidad ICESI

AUTHORS: Dr. Norman Maldonado, Sandra Marcela Camacho MD, Enriqueta Cueto, Carlos H. Arango, Sergio Hernández, Verny Mendoza

Background: Projections of health system insurance are essential for planning and financing population health care needs. In Colombia, the health system is known as the General System of Social Security (SGSSS) and is composed of a private component and a large social security sector financed with public resources.

Purpose: To develop a microsimulation model for population and health system insurance projections in Colombia. Projections include demographic and socio-economic characteristics such as education, occupation and income, known as social determinants of health (Solar and Irwin 2010).

Methods: The model starts with an artificial population and then simulates every individual's life course to project future population. We use statistical matching and imputation algorithms for generating an artificial population from multiple data sources; and stochastic projections of demographic components based on behavioral models and discrete-event simulation for simulating life courses.

The demographic module produces population forecasts using the UN Bayesian family of methods for population forecast (Raftery, Alkema, and Gerland2014). The labor force module models individual's labor trajectories following the methodology proposed by Lopez and Lasso2012. This model classifies working age population into wage earners, unemployed, economically inactive and non-wage earners; category for informal labor workers predominant in LMIC countries.

Affiliation to the health system is mandatory. For this, there are two health insurance regimes: 1) the Contributive Regime (CR), for those individuals with payment capacity and their families and 2) Subsidized Regime (SR), for the poorest population. In the CR, the individuals are affiliated to SGSSS through the payment of an individual contribution from the worker that covers the family. In the SR, affiliation is done by family groups, after targeting the poor population. We use detailed rules that determine the eligibility to health insurance regimes based on modeled household structure, individual's labor status and income level. These rules are established in concordance with the Colombian health system norms [Ministry of Health Law 2353, 2015].

Results: The model is part of a computational laboratory that simulates Colombia's health system based on expected health status of individuals represented in an artificial society in Colombia with pioneer implementation in the Department of Risaralda.

Results for Risaralda observed for the period 2010-2015 indicate that 86.4% of the population was affiliated, and the coverage progressively increased to reach 96.6% in 2015. Simulated number of affiliates differ in 2.2% (UI: 2.0%; 2.4%) from the mean expected.

The breakdown by insurance regime reflects the growing trend for each regime. Model error differs by regime: CR model simulates 6.6% (UI: 6.5%; 6.8%) more affiliates that the expected, while the SR model underestimates the affiliates by -3.7% (UI:-3.9%-3.4%).

Contribution: Projections of population using a bottom-up approach that provides population estimates by health insurance regime, in addition to social determinants of health and traditional demographic dis-aggregations such as age, sex and region. The model accounts for prediction uncertainty and Colombian health system particularities. This is useful for planning social security resources in Colombia and simulating health system changes or policy interventions. The model can be extended to other health system schemes.

Increasing the Transparency and Accessibility of Survival Analysis for Decision Analytic Models: A Proposed Standard Template for Selecting Parametric Survival Models

PRESENTER: **Bram Ramaekers**, Maastricht University Medical Center
AUTHORS: Xavier Pouwels, Sabine Elisabeth Grimm, Manuela Joore

Introduction:

Survival analysis is a commonly adopted technique and often highly influential in decision analytic models (DAM). Although general guidance is available, there remains variation in the choice and reporting of survival analysis methods, which can lead to opacity in DAMs. In particular, the following decisions are often not well supported: a) whether stratified models should be used; b) whether standard parametric survival models are appropriate or there is a need for more flexible models; c) model selection based on statistical fit and; d) model selection based on expert opinion and / or external data validation. The objective of this work was therefore to develop a standardised survival analysis template, with the aims of, making methods accessible to all analysts, making the application less vulnerable for technical errors, and increasing transparency for analysts and decision makers.

Methods:

The template was built using R Markdown (mainly using the 'flexsurv' package), using established methods and features to support survival analysis decisions. The template will be provided online and will only require the definition of input data (i.e. time, event and grouping parameters). Moreover, the template will produce output files (.csv) that can easily be copied into an accompanying Excel file to produce the required survival functions in Excel (both probabilistic and deterministic). The use of the template is illustrated with publicly available breast cancer overall survival data (bc) derived from the 'flexsurv' package (N=686).

Results:

Our template supports choices and decisions of survival analysis methods by providing: a) plots of log cumulative hazard and the scaled Schoenfeld residuals over (log) time, to support decisions for or against stratified models; b) diagnostic plots for seven standard parametric survival models (e.g. the log cumulative hazard and -log survival odds over log time for the Weibull and loglogistic distributions respectively) to decide whether standard parametric survival models are appropriate; c) goodness of fit statistics (e.g. Akaike Information Criterion) to support model selection and; d) tabulated and plotted extrapolated survival and annual transition probabilities to support model selection based on expert opinion and external data. Additionally, the template in combination with the accompanying Excel files facilitated the implementation of parametric survival models (including spline based models) in DAM.

The breast cancer case study illustrates the usefulness of this template in all steps of the survival analysis decision making process, and highlights potential discrepancies between statistical fit and external data.

Conclusions:

The template for survival analysis in DAMs will be made widely accessible. This will potentially increase the transparency of the survival model selection process, and is foreseen to make survival analysis less prone to technical errors. This could result in a more consistent use of appropriate survival analysis methods, and facilitate external reviewing of DAMs. Ultimately, this will result in better informed (reimbursement) decisions.

3:30 PM –5:00 PM MONDAY [New Developments In Methodology]

Universität Basel | Kollegienhaus – Seminarraum 212

Organized Session: Pushing the Boundaries of Existing Methods for Cost and Outcome Analysis of Medical Technologies: First Results from H2020 EU Project COMED

SESSION CHAIR: **Aleksandra Torbica**, Bocconi University

Real-World Evidence for Economic Evaluation of Medical Devices

PRESENTER: **Benedetta Pongiglione**, UNIVERSITA BOCCONI ACQUISTISAP
AUTHOR: Aleksandra Torbica

Introduction

Randomized controlled trials (RCTs) are considered the gold standard in the hierarchy of research designs for evaluating the efficacy and safety of a treatment intervention. However, the highly selective populations examined within the RCTs setting are often not comparable with general populations. The low external validity of RCTs and the general shortage of clinical evidence available to support the use of many medical devices have emphasized the necessity for exploring the use of real-world data (RWD) as a complementary source to RCTs data for establishing a more robust evidence base on the effectiveness of medical devices.

The aim of the present project is to assess in a comprehensive way the existing sources of RWD on medical devices in Europe. This work is part of the H2020 EU funded project COMED, which involves six universities and research centres across Europe.

Methods

A research protocol has been developed to guide the mapping exercise, and it describes:

1. Type of sources of RWD selected for this research. These include: Administrative Data, Registries and Observational Studies
2. Case studies to implement the mapping exercise. We select 3 case studies:
    1. Orthopaedics focusing on arthrosis of the knee/hip as disease; knee/hip replacement or revision as procedure, and knee/hip endoprosthesis as a device;
    2. Robot-assisted surgery;
    3. Cardiovascular disease focusing on Trans-Catheter Valve Treatment Trans-catheter Aortic Valve Implantation (TAVI) Trans-catheter Mitral Valve Repair (TMVR)
3. Search strategy: 3 complementary approaches. 1) screening of relevant national sources of information (e.g. Ministry of Health website); 2) systematic search on PubMed 3) Advice from experts in the field of the device and clinical conditions.

Results

Information on existing sources of RWD for each case studies are provided in a template including details on the key features of the source (e.g. data collection period, sample size) and the main content of the dataset, distinguishing socio-demographic information, clinical and epidemiological data, resource use and health outcomes.

The data mapping includes all countries of the project participants, i.e. Italy, UK, Netherlands, Switzerland, Germany, Hungary, and we enlarge the scope of our mapping including Spain, France, Denmark, Finland, Sweden, Poland and Hungary as well as international databases at pan-European level.

The number of available sources of RWD and their quality vary depending on case study and country. For example, for orthopaedics, most countries have a national registry and administrative data (e.g. hospital discharge) contain useful information, although not as detailed. When a registry does not exist, often more observational studies are available; this occurs for example in France.

Conclusions

In this work, we highlight the importance of RWE, map the sources of RWD currently available, and show whether they are known and used in medical, epidemiological and economic research. The findings of this work will be propaedeutic to a subsequent working package of the COMED project, which aims at developing methodological guidelines to inform data collection on the costs and outcome of medical devices in real world settings, particularly when no experimental and randomised evidence is available.

Surrogate Outcomes in Health Technology Assessment: Are They As Established As They Seem?

PRESENTER: **Oriana Ciani**, Bocconi University

AUTHORS: Bogdan Grigore, Rod S Taylor

Aim

To map the range of methodological approaches adopted in practice regarding the use of surrogate outcomes based on a detailed analysis of health technology assessment (HTA) reports from selected international agencies.

Introduction

In order to ensure timely access to innovative therapies, HTA agencies often need to conduct their evaluations with limited evidence. This often relies on the use of surrogate outcomes rather than final, patient-relevant outcomes, such as death, morbidity, and health-related quality of life.

Methods

We included HTA agencies from the United Kingdom (NICE, HIS), Germany (G-BA, IQWiG), Netherlands (ZiN), France (HAS), Canada (CADTH) and Australia (MSAC, PBAC). We identified all evaluation reports of both pharmaceuticals and medical devices undertaken by NICE within the last five years that explicitly identified the use of surrogate outcomes. We then checked the other agencies for evaluation reports on the same technologies.

Reports were screened and we extracted data on how surrogate outcomes were considered and validated. In particular, we focused on the consideration of their acceptability, justification, validation and method of incorporation in the cost-effectiveness model.

Results

We identified 26 NICE reports that explicitly mentioned the use of surrogate outcomes, mainly in oncology, cardiovascular, infectious diseases and endocrine areas. We were able to identify equivalent reports on most of these technologies across the HTA agencies. Our data analysis is

ongoing; however, our initial findings show that, in most cases, the reliability of surrogate outcomes, although used, is not formally discussed and there was often expectation of the evidence demonstrating the validation of surrogate outcomes.

Conclusions

Although many agencies have incorporated guidance on the use of surrogates in their methods, the initial results of our study indicate that, the implementation of this guidance is limited. Evidence for the use of acceptable surrogate outcomes is typically not required and often the reliability of surrogate outcomes was implicitly accepted, even when there was limited evidence to support this. The full results of this project will be presented.

Geographic Variation in the Utilization of Medical Devices: A Multilevel Analysis

PRESENTER: **Ms. Meilin Möllenkamp**, Hamburg Center for Health Economics, University of Hamburg
AUTHORS: Stefan Rabbe, Jonas Schreyögg

Introduction

The existing international literature shows, that there is great variation in the utilization of health care services within and between countries. Researchers have shown for several medical procedures that a large part of the variation is driven by the demand side. However, some studies also find indications of supply-related differences in utilization. The latter is often referred to as “unwarranted variation”, meaning that the variation cannot be explained by differences in the burden of disease, scientific evidence or patient preferences.

This study aims at identifying and explaining variation in the utilization of medical devices within and between Germany and Italy. Medical devices may be breakthroughs from a technological perspective and may show superior cost-effectiveness compared to existing alternatives. However, the utilization of these devices may vary considerably, which could also have an impact on outcomes.

Methods

We develop a scientific model analyzing and explaining variation of the utilization of five selected medical devices. The analysis is based on patient-level data, containing each inpatient treatment for the years 2012–2015. We apply multilevel logistic regression models to assess the determinants of patients receiving a defined treatment based on a medical device or not.

We estimate two separate models, one for each country. For the within-country comparison, the effects of the presumed influencing variables at the patient-, hospital- and NUTS 3-level on the odds of receiving a certain treatment are interpreted. Differences between the countries are assessed by comparing the significance of the effects of the presumed influencing variables and the amount of the total variation attributable to each level.

Results

We conducted a literature search to select eligible medical devices and corresponding conditions and procedures. We selected five devices (e.g. stents, laparoscope) used for the treatment of major conditions (such as AMI or prostate cancer) with a presumably high variation and a sufficiently large sample size. Further, we identified relevant explanatory variables to capture demand- and supply-side factors.

First results indicate that a large part of the total variation in the use of the selected medical devices (80%-84%) is due to characteristics at the patient level (e.g. age, gender), while characteristics at the hospital level (e.g. number of beds, number of physicians) and at the NUTS3 level (e.g. median income, education) play a subordinate role. Nevertheless, since 12-15% of the total variation are attributable to the hospital level and 4-5% to the NUTS3 level, this may indicate the presence of potentially unwarranted variation.

Conclusion

This study contributes to the identification of the determinants of regional variation in the utilization of medical devices within and between Germany and Italy. The identification and understanding of regional variation in medical practice is essential as unwarranted variation can imply structural deficits and inefficiencies in the health care system, such as planning and coordination deficits, misplaced incentives or poor patient involvement. In the further course of the project further countries such as Switzerland, Hungary and the Netherlands will be included in the analysis.

How Early Dialogues in Medical Devices Contribute to Faster Reimbursement Decisions: A Stakeholder Analysis

PRESENTER: **Mr. Florian Dams**, University of Bern
AUTHORS: Carlo Federici, Dr. Carl Rudolf Blankart

Introduction

Medical devices (MD) licensed in Europe often lack HTA-relevant evidence at market launch. Manufacturers have to provide evidence on product safety and technical performance to obtain a CE-marking; not on (cost-) effectiveness. The new Medical Device Regulation (MDR) emphasizes post-market clinical follow-up, wherefore HTA-relevant evidence is generated once the device is used in clinical practice. HTA evidence base may be improved by promoting an early dialogue (ED) between manufacturers, HTA-bodies and regulatory authorities in an early stage of the development process.

Objective

We want to assess stakeholder's knowledge, opinion and expectations about EDs in MDs and aim to assess how bi- and tri-partite EDs can lead to timelier HTA-evidence.

Methodology

We sent paper-based questionnaires to informed persons of HTA-bodies, notified bodies (NBs), and competent authorities (CA) in 8 European countries. Questionnaires were supplemented by telephone-based semi-structured interviews. Manufacturers were surveyed online. Data was transcribed and analyzed using qualitative and quantitative methods. Based on the consolidated information, potential pathways for bi- and tri-partite EDs where derived.

Results

Manufacturers' knowledge of EDs appeared to be low. Most of the manufacturers have not been affected by HTA requirements as HTA of MDs is in its infancy. CA were knowledgeable about HTA and ED, whereas NBs knowledge seemed to be limited. HTA-bodies provided insights about drivers and barriers of HTA of MDs and ED. HTA-bodies and manufacturers seemed to favor an alignment of CE and HTA evidence requirements, CA and NBs tended to oppose.

Discussion

In general, stakeholders' knowledge of HTA might be considered to be low. Therefore, HTA-bodies should actively promote the possibility of EDs to manufacturers of HTA-relevant MDs. Initiatives for tripartite EDs and an alignment of CE and HTA-evidence requirements should be postponed after the end of the transition period of the new MDR.

3:30 PM –5:00 PM MONDAY [Demand & Utilization Of Health Services]

Universität Basel | Vesalianum – Grosser Hörsaal EO.16

Organized Session: Randomized Interventions to Increase Health Insurance Takeup

SESSION CHAIR: **Stephen Coussens**, Columbia University

Nudging Take-up of Subsidized Insurance: Evidence from Massachusetts

PRESENTER: **Dr. Stephen Coussens**, Columbia University

AUTHOR: Dr. Timothy J Layton

Incomplete take-up of free and low-cost health insurance remains a puzzle. Failure to enroll in coverage has consequences for the uninsured as well as the health care providers and state budgets that bear the costs of uncompensated care. Moreover, if the marginal enrollee is healthier on average, increasing enrollment may improve competition and reduce premiums in the market by improving the risk pool. Research from other contexts suggests that behavioral frictions or mistakes may play an important role in determining whether households complete the enrollment process.

We conducted a randomized trial to test "nudges" (letters sent by postal mail) that could increase enrollment in the Massachusetts Health Connector, the state marketplace through which eligible residents can obtain subsidized private coverage. Nudges were targeted to households that were determined eligible for financial assistance but—for unknown reasons—failed to enroll in an insurance plan. Our study design employs three treatment arms: a generic reminder letter, a personalized reminder letter, and a personalized reminder letter with a simplified (check-the-box) enrollment option.

Enrollment in the Connector involves typically involves a complicated process including calling a number to retrieve a password and then filling out a series of forms on a website. Our intervention tests whether the onerous process acts as a barrier to enrollment, and, if so, who is screened out of insurance. We focus our attention on two characteristics of the marginal enrollees: (1) health status and (2) valuation of insurance. For health status, we use health information from the Massachusetts All-Payer Claims Database, and we use this information to characterize the extent to which there is adverse selection into the market on this margin. For valuation of insurance, we use exogenous variation in the price of insurance in the Connector caused by discontinuous changes in subsidy amounts at particular income thresholds to estimate willingness-to-pay for insurance for different populations. We then assess whether the marginal consumers have higher or lower WTP for insurance relative to consumers who don't enroll with or without the nudge and consumers who enroll with or without the nudge, allowing us to assess the targeting value of the nudge.

Woodwork Effects of Medicaid Expansions: Evidence from the Oregon Health Insurance Experiment

PRESENTER: **Dr. Adam Sacarny**, Columbia University

Although the literature on health insurance takeup has identified the possibility for woodwork effects, or enrollment spillovers onto the already-eligible, the magnitude of these effects is not well established. Large woodwork effects could compound the direct effects of health insurance expansions, leading to bigger coverage gains with additional (though uncertain) health benefits, financial risk reductions, and fiscal costs. We

identify woodwork effects in the context of the Oregon Health Insurance Experiment, which randomized Medicaid eligibility to low-income adults in Oregon. Like other recent expansions of public health insurance, children of the newly eligible adults already qualified for free or low-cost health insurance. Our preliminary results point to large, economically meaningful woodwork effects: for example, for every 3.4 adults who ever enroll in Medicaid due to the expansion, 1 child enrolls in the program. Future analyses will explore the mechanism behind these findings and, relatedly, shed light on the relative importance of different theories of incomplete takeup, including incomplete information about eligibility, time costs of take-up, and familial learning about the value of Medicaid.

Fight the [Statistical] Power: Imperfect Compliance and Treatment Effect Estimation

PRESENTER: **Dr. Stephen Coussens**, Columbia University

Experimental research designs must often allow for participants' imperfect compliance with their randomized treatment assignment. That is, some in the control group might obtain the treatment of interest, while some in the treatment group might not obtain the treatment. Instrumental variables estimation in this context sidesteps this problem, and yields an unbiased estimate of the average treatment effect on "compliers," the group of individuals whose treatment take-up is determined by their randomized treatment assignment. Although non-compliance does not bias this treatment effect estimate, it nonetheless comes at a cost in the form of a reduction in precision. Low compliance rates therefore result in many studies being underpowered, weakening the conclusions that can be drawn from them. While individual compliers cannot be directly identified, in this paper I propose a framework for assessing individuals' likelihood of compliance utilizing their baseline (i.e. pre-randomization) characteristics, and harnessing this information to improve the precision of treatment effect estimates. Using publicly available data from the Oregon Health Insurance Experiment, I empirically demonstrate the feasibility of these methods and go on to discuss the contexts in which they are most likely to be effective.

5:15 PM –6:30 PM MONDAY [Pre-Congress And Sponsored Sessions]

Universität Basel | Kollegienhaus – Regenzzimmer 111

Sponsored Session: How can we Bring Health Economics, Health Services Research and Health Policy Together? Let's Discuss the Case Example of Switzerland (Sponsored by Helsana)

SESSION CHAIR: **Eva Blozik**, Helsana Health Insurance Group

PANELISTS: **Stefan Otto**, Swiss Federal Office of Public Health; **Pius Gyger**, Health Economist; **Thomas Rosemann**, Institute of Primary Care

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5:15 PM –6:30 PM MONDAY [Special Sessions]

Universität Basel | Kollegienhaus – Hörsaal 118

Memorial Session: Remembering Alan Maynard and Uwe Reinhardt

SESSION CHAIR: **David Bishai**, Johns Hopkins Bloomberg School of Public Health

Tuesday

8:30 AM –10:00 AM TUESDAY [Health Care Financing & Expenditures]

Universitätsspital Basel | ZLF – Gross

Financing and Expenditure: Empirical Evidence from Asia

SESSION CHAIR: **Jui-fen Rachel Lu**, Chang Gung University

Primary Health Care Financing Interventions: A Systematic Review and Development of a Stakeholder-Driven Research Agenda for the Asia-Pacific Region

PRESENTER: **Blake Angell**, The George Institute for Gobal Health

AUTHORS: Rebecca Dodd, Anna Palagyi, Thomas Gadsden, Seye Abimbola, Dr. Shankar Prinja, Stephen Jan, David Peiris

Introduction: Interventions targeting the financing of primary health care (PHC) systems could accelerate progress towards universal health coverage, however, there is limited evidence to guide best-practice implementation of these interventions. This study aimed to generate a stakeholder-led research agenda in the area of PHC financing interventions in the Asia-Pacific region.

Methods: We adopted a two-stage process: (1) a systematic review of financing interventions targeting PHC service delivery in the Asia-Pacific region was conducted to develop an evidence gap map; and (2) an e-Delphi exercise with key national PHC stakeholders was

undertaken to prioritise these evidence needs.

Results: Twenty-one peer-reviewed articles and ten grey literature reports were included in the review. There was limited consistency in results across studies but there was evidence that some interventions (removal of user fees, ownership models of providers and contracting arrangements) could impact PHC service access, efficiency and out-of-pocket cost outcomes. The e-Delphi highlighted the importance of contextual factors and prioritised research in the areas of: (1) interventions to limit out of pocket costs; (2) financing models to enhance health system performance and maintain PHC budgets; (3) the design of incentives to promote optimal care without unintended consequences; and (4) the comparative effectiveness of different PHC service delivery strategies using local data.

Conclusion: Through an iterative process of stakeholder engagement, we developed a priority-driven research agenda to guide the use of financing interventions in advancing universal health coverage in the Asia-Pacific region. Although policy-makers and other key stakeholders see an important role for financing interventions, the current evidence does not address their needs. There is a need for more pragmatic research that balances academic rigour with practical considerations of how financing interventions can be implemented at scale.

Analysis on the Influencing Factors of Medical Debt Among Middle and Low Income Families in China-Based on Chinese Family Financial Survey

PRESENTER: **Dr. Jiajing Li**, Shandong university

AUTHORS: Chen Jiao, Mengjie Wu, Dr. Jian Wang

Background:

Medical debts are the greatest cause of bankruptcies in the United States. And it is also one of a number of factors leading to the financial exigency and reduction in the utilization of medical services, especially for Middle and Low Income Families. Most people with medical debts have medical insurance, and whether they have medical insurance seems to have little impact on the effect of medical debts on families. However, there is a lack of research on the causes of medical debt in China, including medical insurance and utilization of medical services.

Objective:

To evaluate the influencing factors of family medical debt at low and middle income levels.

Methods:

Hierarchical Tobit regression was used to estimate the impact of medical insurance, non-communicated diseases(NCD), hospitalization, per capital income, catastrophic health expenditure(CHE), unemployment of middle-aged people (25-65 years old) on family medical debt (logarithm). The data was from the Chinese Family Financial Survey in 2015 covering 37,289 households in 28 provinces. Low- and middle-income families are defined as families whose per capita income ranks last 1/3 and middle 1/3 respectively. Family medical debt were defined as the borrowing money for family members' medical treatment. CHE was defined as out-of-pocket medical expenses accounting for more than 40% of household non-food expenditure.

Results:

The medical debt incidence of middle-income and low-income families were 2.5% and 4.1% respectively. And the average medical debts of families with medical liabilities were $9479.4 and $7243.1, respectively. The larger the payments exceeding CHE incidence threshold and CHE incidence were, the higher the medical debt was. CHE would increase household medical debt by 21.7% - 25.5%. low and middle-income family with middle-aged people suffering from NCD, unemployment or hospitalization would increase the medical debt. In particular, low-income families were much more affected because hospitalization of middle-aged people would lead to 34.2% promotion in household medical debt. On the meanwhile, the medical debt of low-income families was also significantly affected by the hospitalization of students and children under 5 years old. However, families with children under 5 years of age can significantly reduce the medical debt of low- and middle-income families. For medical insurance, only middle-aged people with Urban Residents' Basic Medical Insurance could reduce household medical debt by 10.0% efficiently.

Conclusion:

This study fills in the blank of research on medical liability in China. For low- and middle-income families, household medical debt was usually accompanied by CHE. And the worse the impact of CHE, the higher the household medical debt. The NCD and the utilization of medical services of middle-aged people have a significant impact on family medical debt. The impact of China's medical insurance on household medical debt still needs further study.

When Inequality Is Not Inequity: Intersecting Sex-Related Inequalities in Public Funded Health Insurance Scheme Coverage in Five Southern Indian States.

PRESENTER: **Jyotsna Negi**, George Institute for Global Health

AUTHOR: Devaki Nambiar

Sustainable Development goal 3.8 aims to achieve Universal Health Coverage (UHC), including financial risk protection for all. It is argued that health insurance coverage plays a crucial role in achieving UHC, despite low penetrance in countries like India. According to India's

National Family Health Survey (NFHS), the proportion of households having at least one usual member covered under health insurance or scheme increased to 29% in 2015-16 from 5% in 2005-06. But this increase has been uneven. While earlier government schemes covered public servants and certain employers, recently, pro-poor insurance schemes have been introduced at state and centre. Research shows that gender inequality marks health coverage and outcome indicators – gender inequities in relation to financial risk protection are understudied. Thus, it is less clear how accessible these schemes are by gender, as well as its intersections with other axes of inequality:wealth,education, age etc. Given the emphasis being placed on achieving UHC for all in India currently, this paper examines gender inequalities in publicly funded health insurance/schemes coverage in southern states, where its penetrance is greater and of longer duration.

Study draws on data from NFHS 2015-16 disaggregated by six dimensions of inequality for five southern Indian states (Andhra Pradesh (AP), Karnataka, Kerala, Tamil Nadu (TN) and Telengana). World Health Organisation's Health Equity Assessment Toolkit (HEAT) Plus and Stata were used to analyse the results. Various summary measures of inequality were computed: ratios for place of residence; relative concentration index (RCI) for ordered dimensions like education and wealth, and between group variances (BGV) for unordered dimensions of inequality like caste and religion.

Median coverage was lower in women as compared to men in all states except for Kerala and TN. Overall, inequalities were most pronounced in Telengana, followed by AP. Education-related inequality was significantly greater among women (-10.56 (95%CI: -12.43 - -8.68) in Telengana as compared to men (-4.13 (95%CI: -7.01 - -1.26) whereas in TN, the margin of inequality was lower and not significant (men: -1.8 (95%CI: -5.04 – 1.44) vs women: -3.92 (95%CI: -5.57 - -2.27)). Caste related inequalities were most pronounced in Telangana and Kerala; in the latter, the level of inequality among women (BGV: 39.26 (95%CI: 22.08 – 56.43)) was three times that seen among men (BGV: 13.36 (95%CI: -10.59-37.31)). Religion related inequalities were most pronounced in Kerala (women BGV: 55.86 (95%CI: 31.01 – 80.71; men BGV: 23.17 (95%CI: -9.77 – 56.11) followed by Telangana.

We found inequalities in self-reported male and female enrolment in five southern states with robust public insurance schemes. Inequalities favour the poor, uneducated and elderly. Religion and caste-based inequalities exist across genders, at times greater among women. Results should be interpreted with caution as pro-poor inequality may intended and do not reflect inequity. If health insurance schemes are to truly offer financial risk protection, they must variably address the intersecting marginalization faced by women and men.

Is Indonesia's Single Payer National Health Insurance Scheme Associated with Greater Hospital Efficiency? A Data Envelopment Analysis

PRESENTER: **Ms. Rebecca Ross**, Palladium -Health Policy Plus

AUTHORS: Dr. Arin Dutta, Dr. Prastuti Soewondo

Background: Starting in 2014, Indonesia's national single-payer insurance scheme, Jaminan Kesehatan Nasional or JKN, originally planned to reach universal insurance coverage by 2019. However, there is concern that JKN payment mechanisms incentivize overtreatment and hence inefficiencies for the scheme, which runs a significant deficit. The scheme administrator (BPJS-K) pays hospitals for outpatient and inpatient care via the Indonesia Case-Based Groups, with payment rates differentiated by type of diagnosis, severity of the condition, geography, and hospital classification type. With few national treatment guidelines, providers have flexibility in optimizing facility resources for treatment procedures, interventions, and drug administration. Given that (a) hospital expenditures account for 80% of JKN spending, and (b) private hospitals (60% of all BPJS-K-contracted hospitals) must fund most expenditures from their revenue, this analysis aims to discern whether private hospitals' use of resources has become more efficient since JKN, and what implications this has for quality.

Methods: Few studies have assessed technical efficiency in Indonesian hospitals since JKN; existing studies are limited to public hospitals and do not analyze links to JKN. We collected primary data from 73 private hospitals across 11 provinces and used two methods. First, Data Envelopment Analysis (DEA) to assess the change in technical efficiency of private sector hospitals' inpatient and outpatient departments pre- (2013) and post- (2016) JKN. Second, difference-in-difference (DiD) regression to understand whether efficiency scores were associated with being contracted by BPJS-K (i.e., JKN). Models were constructed separately for outpatient and inpatient departments and included covariates to address variation in case-mix and local context: island group, urban or rural location, population density, hospital type, and type of private ownership.

Results: Descriptive statistics indicate inputs and outputs used in the DEA models increased in both types of private hospitals. Overall, average efficiency scores increased in both inpatient and outpatient departments between 2013 and 2016. However, when stratified by BPJS-K contract status, the efficiency score trends differed. Difference-in-difference analysis suggests that contracting with BPJS-K was significantly associated with increased efficiency in inpatient departments. The impact of BPJS-K contracting on mean change in efficiency (DiD) was 3.46%, which was higher than other significant effects found. However, BPJS-K contracting was not significantly associated with efficiency change in outpatient departments. Greater hospital specialization was also associated with increased efficiency—i.e., private hospitals with more specialists (type B) were more efficient than general hospitals (type D).

Conclusions: Improved technical efficiency in the hospital sector in single-payer systems can add to the longevity of current reimbursement rates, which can help schemes achieve future financial balance. Then schemes can maintain their benefits and coverage. However, international experience indicates that payment systems that force increasing technical efficiency may also create incentives for cost-cutting and weaken incentives for delivering quality care. In our study we include key recommendations for the Government of Indonesia and BPJS-K for sustaining hospital efficiency while adding payment model modifications which incentivize greater quality of care, such as outcome-driven case-based payments.

Investing in TB: The Case for Increased Public Spending in Cambodia to Improve Health and Household Economic Outcomes

PRESENTER: **Shreeshant Prabhakaran**, Palladium, Washington

AUTHORS: Mrs. Catherine Cantelmo, Matt Hamilton, Carel Pretorius, Mony Srey

Background: While Cambodia has made significant strides in scaling up TB case detection and treatment, leading to a 55% reduction in TB-related mortality in the last 16 years, the country still has one of the highest burdens of TB in the world and the TB program faced a US$19 million funding gap in 2017. Additional public investment is essential to fill this gap and protect households from catastrophic OOP spending on TB. Like in other countries, TB disproportionately affects the poor in Cambodia and the majority of TB patients (60%) spend at least 10% of their household income on direct and indirect costs associated with treatment.

Methods: In order to understand how additional investment in the TB program could reduce OOP spending on TB in Cambodia, the USAID-funded Health Policy Plus (HP+) project developed and applied a methodology in partnership with the National Center for TB and Leprosy Control (CENAT) to project the economic impact of TB on households, taking into consideration two programmatic achievement scenarios and underlying demographic and epidemiological changes. HP+ applied TIME Impact, a dynamic TB epidemiological transmission model that estimates TB prevalence, incidence, and mortality, and developed Excel-based models to project household economic impacts of seeking care for TB and premature death using TIME Impact outputs and existing secondary data on TB costs, household spending on TB (based on a 2014 cross-sectional study), and lost productivity due to TB.

Results: If TB detection and treatment trends remain unchanged, OOP spending on direct medical costs, direct non-medical costs (e.g., transportation), and indirect costs (e.g., lost wages, sold property) for TB remain high each year. Under this scenario, TB patients spend over US$6 million annually on direct TB costs. Indirect costs for testing and treatment and due to premature death exceed US$47 million annually (0.2% of GDP in 2018). In 2025, an estimated 6,486 households will spend at least 40% of their household income on TB. However, if Cambodia increased its screening and case detections rates, contact investigation coverage, and IPT coverage and improved the sensitivity and specificity of diagnostics, the resulting decline in TB and MDR-TB incidence and mortality reduces the costs borne by TB patients. Total OOP direct spending by TB patients is estimated to decrease from US$6.2 million in 2018 to US$4.0 million in 2025 under this scenario. Indirect costs decline by 44% to US$26 million in 2025.

Discussion: Despite TB services being provided free of charge in Cambodia, TB patients face significant costs, particularly indirect costs in terms of lost wages. Very few patients receive reimbursement for direct costs through social protection schemes such as HEF, as the costs are either not covered by the scheme or patients are unaware that they can be reimbursed. The findings from our study suggest that upfront investment in improving TB case detection and treatment can reduce the economic burden to households. CENAT is using these results to budget for transportation, meal, and other patient subsidies by type of TB and advocate for increased government investment in TB.

Service Utilization and Associated Factors: Strategic Purchasing Pilot Experience from Myanmar

PRESENTER: **Dr. Phyo Myat Aung**, Population Services International Myanmar

Title: Service Utilization and Associated Factors: Strategic Purchasing Pilot experience from Myanmar

Speaker: Phyo Myat Aung, Sr. National Program Manager (UHC), Population Services International Myanmar (PSI)

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Special Invited Session: Strategic Purchasing of Health Services in Low and Middle Income Countries

Co-authors: Phyo Myat Aung, Tin Aung, Si Thu Thein, Han Win Htat, May Me Thet,

Myat Noe Thiri Khaing and Wint Cho; PSI Myanmar

Background: PSI Myanmar implemented a strategic purchasing pilot in two peri-urban townships of Yangon (Shwepyitha and Hlegu) to demonstrate the capacity of private general practitioners (GPs) in its Sun Quality Health (SQH) social franchise network to offer a basic package of primary care services to the poor while reducing financial barriers. 7,259 individuals from 2,003 households were registered at 5 SQH clinics where they could access package of services that included under 5 child health, maternal and women health, communicable diseases, non-communicable diseases and general illnesses. The research aimed to examine the relationship between demographic factors and service utilization visits at the assigned clinics.

Method: During beneficiary registration, PSI/Myanmar recorded demographic characteristics such as age and gender of the beneficiaries, age, gender, education of the household head, socio economic status (SES) and distance (in kilometer) between clusters of household and assigned clinics. PSI also recorded service utilization visits reported by the providers. We used the pilot's first six months' service utilization data as outcome variable and analyzed the association with above demographic characteristics using Stata 13.

Results: 1,192 (16.4%) of total beneficiaries visited the clinics during the first six months, and they visited mostly for general illnesses which contributed 77.5% of total visits. Among them, beneficiaries from Hlegu used the clinics more than that of Shwepyitha (25.9% vs 6.8%). In multivariate analysis, we found that elderly person (50+ age group), female individuals, beneficiaries resided within 1 km of the clinics, and those fall in lowest SES quintile were more likely to use the clinics in both townships ($p<0.05$). The number of visits reached its peak at 4th and

5th month from the start of registration. In addition to that, age and gender of the beneficiaries, proximity to the clinics, and their SES status also had association with the frequency of clinic visits ($p<0.05$). It was higher in reproductive and elderly age groups compared with under 5 age group while it was lower in male individuals compared to female. Beneficiaries living more than 1 km far from their assigned clinics had less visits than those within 1 km to the clinics. Members of the households that belonged to the poorest quintile 1 had more visits to the clinics than those belonged to quintile 4 and 5.

Conclusion: We concluded that poor people can access the clinics for primary health care by strategic purchasing from private general practitioners. Elderly people and female individuals are more likely to visit the clinics and general illnesses is the most common type of service. Beneficiaries located in close proximity to the clinics are also more likely to use the services.

Are Attendees of Strategic Purchasing Clinics Paying Less for Family Planning Services?: Findings from the First Strategic Purchasing Pilot in Myanmar

PRESENTER: **Dr. May Me Thet**, Population Services International Myanmar
AUTHORS: Cho Myat Nwe, Yin Yin Mon

Background

Myanmar has lower contraceptive prevalence rates(CPR) than other Asian countries through achieving 51%(Myanmar DHS 15-16) and socio-economic status was associated with family planning(FP) use for Myanmar women(Sudhinaraset, M., et al. 2016). To support the Government of Myanmar to achieve Universal Health Coverage by 2030, Population Services International Myanmar(PSI/Myanmar) has launched a strategic purchasing(SP) pilot where selected 5 general practitioners(GP) clinics are contracted to provide a basic primary care services package including family planning services to poor households in 2 peri-urban townships of Yangon, Dar-Pein and Shwe-Pyithar in 2017. A new financing mechanism was introduced with a capitation payment system to the GPs and a reasonable co-payment system to the beneficiaries. Beneficiaries enrolled at contracted GPs were issued health cards. The pilot aims to improve access to quality healthcare with an affordable cost in poor communities.

Objectives

The study aims to i) examine whether the strategic purchasing pilot can reduce the end user cost for FP and ii) identify the associated factors for attending SP clinic for FP use.

Methods

This study is part of a larger health seeking behavior survey with 1650 pilot households done at base line and mid line after 6 months. 2322 women participated in FP section and the questionnaire covered demographic information, health card ownership, enrolled GP characteristics, different types of FP services use, FP provider type and cost for FP. For first objective, the analysis was conducted to compare the cost paid by women at SP and non-SP GP clinics as they were comparable in terms of provider qualifications and available services and t-test was used. Cost was expressed in Myanmar Kyats(exchange rate 1 US$=1570 Myanmar Kyats). For second objective, descriptive analysis was done for generating percentages. Chi-square tests and multivariate logistic regression analyses were conducted to identify the factors associated with FP use at SP clinics. Stata Statistical Software, version 14.1 was used for analyses and statistical significance was determined at $p=0.05$. We obtained approval from PSI Research Ethics Board and Department of Medical Research Myanmar.

Key Findings

Of 2322 women, 772(33.2%) reported that they received a FP service. Among 722 FP users, the sources were 15.3% from SP clinics,40.3% from non-SP clinics,35.6% from Pharmacy,0.9% from Hospital Out-patient Department,0.5% from Health Centre,4.3% from informal providers and 2.9% from Charity clinics. When comparing the end user cost between and SP and non-SP clinics, mean cost was 43.8% less for those attending SP clinics(620.3 MMKyats) than non-SP clinics(1415.1 MMkyats) with the p-value<0.001. In multivariate analysis, attending SP clinics for FP was associated with being health card owner(AOR=4.7, p-value<0.001), Dar-pein resident(AOR=13.0; p-value=0.001), injection user(AOR=14.3, p-value<0.001), IUD/Implant user(AOR=108.3, p-value<0.001), and enrolled with female GP provider(AOR=10.7, p-value<0.001).

Knowledge contribution

The study shows that by contracting GPs in a strategic purchasing scheme, the end user cost is reduced for FP and hence it can improve access to quality family planning services by the poor. It also highlighted that women characteristics, clinic provider gender and type of FP services are important for use of FP services at Strategic Purchasing clinics.

8:30 AM –10:00 AM TUESDAY [Production Of Health, Health Behaviors & Policy Interventions]

Universitätsspital Basel | ZLF – Klein

Ageing #3

SESSION CHAIR: **Puneet Kaur Chehal**, Emory University

Food Stamp Timing: An Evaluation of Emergency Department Utilization Among Medicaid Recipients

PRESENTER: **Chad Cotti**, University of Wisconsin - Oshkosh

AUTHORS: Dr. Orgul Ozturk, John Gordanier

The impact of poor nutrition has been established as an important determinant of health. It has also been demonstrated that the single monthly treatment of food stamps leaves meaningful nutritional deficiencies in recipient households during the final weeks of the benefits cycle. Further, health related behaviors have been documented to be altered on the date of food stamp receipt.

This project exploits highly detailed and linked administrative data on health care utilization of food stamp recipients (and non-recipients) and *randomized* food stamp receipt dates to allow us to measure the impact of food stamp treatment days and the low nutritional periods created by the SNAP benefits cycle on the likelihood of emergency department utilization among the Medicaid population.

Overall, we find strong empirical evidence linking food stamp receipt days to a notable reduction in the likelihood of accessing emergency care, which suggest a time-use relationship for this population. On the other hand, we find evidence that as recipients enter the “late phase” of their respective food stamp benefits cycle, their utilization of emergency department services increases. The size of the late cycle effect is greatest among older adults, which is consistent with increased food insecurity as a possible mechanism linking the food stamp benefits cycle to emergency care utilization.

The Paradox of Decreasing Rates of Cost-Related Medication Non-Adherence Among Old and Older-Old Americans

PRESENTER: **Dr. James Zhang**, The University of Chicago

AUTHORS: Deepon Bhaumik, David Meltzer

OBJECTIVES: Cost-related medication non-adherence (CRN) is a persistent and serious challenge among the elderly population in the US despite the institution of the Medicare Part D prescription drug program. This research aims to assess the hypothesis that as the elderly reach older age, rates of CRN paradoxically decreases, controlling for a wide range of factors influencing CRN behaviors.

METHODS: Elderly patients (age>=66) were identified using the 2004 Health and Retirement Study (HRS) and separated into two cohorts, the old (66-79 years of age) and the older-old (80 or older), and then followed longitudinally up to 2014. HRS is a nationally representative sample of older adults with survey questions on health, behavior, and socio-economic status. CRN was self-reported. A wide range of predictors were extracted, including socio-economic status (age, gender, race/ethnicity, and educational attainment), ratio of Social Security (SS) income to the total income, Medicaid eligibility in addition to Medicare enrollment, comorbidities (including diabetes, heart disease, stroke, depression, and cancer, and Activities of Daily Living (ADLs), Instrumental Activities of Daily Living (IADLs)). Standardized CRN rates between 2004 and 2014 were calculated using a logit model, adjusted for the aforementioned socio-economic, comorbidity, and functional status variables. Individual income was also calculated based on various sources of self-reported income, including pensions, social security income, income from financial assets split between the spouses, and labor income, and adjusted to 2014 dollars using the consumer price index. The ratio of SS to total income was also calculated for each survey year between 2004 and 2014.

RESULTS: 6,154 elderly aged between 66-79 (old) and 2,628 elderly aged 80 or older (older) were followed from 2004 to 2014, with 3,860 and 518 elderly respondents remaining in 2014, with standardized CRN rates of 11.8% and 6.4% in 2004, respectively. The prevalence rates of all four comorbidities, including cancer, diabetes, heart disease and stroke increased markedly over time for both groups, and the price-index adjusted individual income decreased steadily for the old age group from 2004 to 2014, but remained fairly stable for the older age group. Accompanying the decreasing income, the SS income to total income ratio increased steadily from 60% to 70% for the old age group, and increased modestly from 71% to 76% for the older age group from 2004 to 2014. Adjusted for the socio-economic, comorbidity, insurance status, functional status, and SS income to total income ratio variables, the population standardized CRN rates decreased from 11.8% to 6.0% for the old age group, and from 6.4% to 3.7% for the older age group from 2004 to 2014.

CONCLUSIONS, DISCUSSION AND POLICY IMPLICATION: As the elderly age, there is a decrease in monetary resources available to them, increasing reliance on the SS income, as well as higher prevalence rates of major chronic conditions. However, their population standardized self-reported CRN rates steadily decreased as they aged, in both the old and older age groups.

Costs of Dementia and Alzheimer’s Disease in 188 Countries

PRESENTER: **Mr. Joseph Dieleman**, University of Washington

AUTHORS: Suman Chakrabarti, Paola Pedroza, Ms. Abigail Chapin, Angela Liu, Taylor Matyasz

Background

The financial burden of Alzheimer's disease and Dementia has been secularly increasing since 2000 and the worldwide costs of dementia were estimated at $818 billion in 2015. Due to methodological challenges and data scarcity on country level costs, estimates on dementia spending have been constrained to large global regions. Although spending on dementia tends to increase with economic development, we expect that large variation exists across countries. Country level estimates of current costs of dementia can be beneficial for policy makers and planners and can identify financing gaps. In this study, we estimate complete and comparable country-specific dementia costs and disaggregate these as direct, indirect and social care costs.

Methods

We conducted a systematic review of the global literature on the costs of dementia (2000–2016). We searched PubMed and Google Scholar for disease expenditure and cost of illness studies related to Alzheimer's disease and/or dementia. 275 studies which included published peer-reviewed articles and reports were identified for final extraction after appraisal for methodological quality. Country level data on total and per-capita direct costs were extracted along with data on informal care for basic and instrumental activities of daily living (ADL). We supplemented extracted published estimates with primary cost data obtained from the World Mental Health Surveys. Dementia prevalence estimates, GDP and country level wage data were obtained from the Global Burden of Disease. Spatiotemporal Gaussian process regression models were used to generate direct, indirect and social care costs of dementia for 188 countries. All estimates are adjusted for the effects of inflation and are in 2018 purchasing-power parity-adjusted dollars.

Findings

We estimated that global costs of dementia will exceed one trillion US PPP dollars in 2018. Per-capita dementia costs were highest in high-income countries which make up 85% of total worldwide costs. The bulk of dementia costs are informal with indirect and social care accounting for three-fourths of the total dementia costs. Informal costs are largely attributable to high ADL and IADL caregiver time and opportunity costs for young caregivers. We expect per capita dementia spending to increase fastest in upper-middle-income countries which will likely be driven by continued growth in GDP and aging populations. Dementia spending per capita in low-income countries is quite low and expected to remain so due to age distributions, low costs of formal care and opportunity costs.

Interpretation

Worldwide costs of dementia are substantial and vary greatly by country. As populations age, costs of dementia are expected to increase substantially.

Quantifying the Impact of Huntington's Disease on Quality Adjusted Life Years and Overall Survival

PRESENTER: **Michelle Tew**, University of Melbourne

AUTHORS: Philip Clarke, Jay A Stiles, Ilias Goranitis, Anita Goh, An Duy Tran

Quantifying the Impact of Huntington's Disease on Quality Adjusted Life Years and Overall Survival

Mr Jay A. Stiles, Dr Ilias Goranitis, Dr Anita Goh, Ms Michelle Tew, Professor Philip Clarke

Huntington's disease (HD) is a rare, genetic, neurodegenerative disease involving motor, cognitive, and behavioural decline. There is no cure and it is associated with reductions in health-related quality of life (HrQoL) and overall survival. The disease leads to premature disability with subsequent carer burden on HD families. Symptoms typically arise during the fourth and fifth decade of life resulting in reduced productivity for HD patients and their carers.

Quality-adjusted life years (QALYs) are a useful metric for quantifying health outcomes, combining both life expectancy and HRQoL. This research aims to estimate the impact of HD on overall survival and QALYs.

The study utilises data from Enroll-HD, an international observational study of people with HD and their families as controls. Enroll-HD aims to contribute to the development of new therapeutics and improve clinical care and ultimately improve the quality of life of HD families. It involves 170 study sites located across North America, Latin America, Australasia, and Europe. The analysis includes data from the third release of Enroll-HD data with information on a total of 8,714 people. Health-related quality of life of participants was assessed annually using the SF-12 questionnaire. Survey responses are transformed into utility scores using a published SF-6D algorithm, which are then used to calculate QALYs.

Our study is the first to examine whether HRQoL, in terms of SF-6D scores, are an independent predictor or morbidity and mortality in the HD population. A two-way fixed effects regression model is used to assess the relationship between HrQoL and morbidity and mortality. The following baseline covariates will be controlled for: age, gender, education, disease progression, onset of symptoms, total functional score (TFC), mini-mental state exam (MMSE), presence of chronic disease, CAG allele repeats and severity of mental illness. We also assess the relationship between HrQoL and overall survival in HD patients compared to non-HD controls using multivariate cox proportional hazard regression. Patients with HD are compared with non-HD individuals to estimate the overall lifetime QALY loss. Where data is available, non-HD individuals from the Enroll-HD dataset are used as a counterfactual, otherwise life table methods are employed.

Early findings suggest QALY loss and overall survival is significantly different between people with HD and non-HD individuals.

Exploring Factors Associated with Self-Treatment Among the Elderly in Rural China: A Cross-Sectional Study in Different Elder Subgroups

PRESENTER: **Ms. Wanchun Xu**, School of Medicine and Health Management, Huazhong University of Science and Tenchnology
AUTHOR: Liang Zhang

Objective: Self-treatment is a common and widespread behavior, of which the risks are multiplied in old age, particularly in the rural and remote areas in which the elders may lack access to health care and resort to self-treatment as an alternative. This study aims to explore the prominent factors associated with the self-treatment behaviors among the elders in rural China. Both the determinants of the individuals and the health care delivery system, as well as some characteristic factors in the China's specific context, are examined in different subgroups of the rural elders to identify the high risk population.

Method: Based on a multi-stage stratified random sampling method, a cross sectional household survey was conducted among 30 villages in Sinan County, Guizhou Province in western China. Data was collected through a household-individual combined questionnaires including individual demographic background, health condition, health habits, the access to health care, utilization of the family practice, etc. 3983 individuals in 1355 households were investigated, while the analysis was restricted to the population of the elderly who had been experiencing illness in the previous two weeks. The final sample size was 338 (individuals). Pearson's chi-squared test and binary logistic regression analysis were performed for data analysis in the whole sample group and four subgroups: elders with chronic diseases, elders without chronic diseases, empty-nest elders and non-empty-nest elders.

Results: Approximately 25.94% of the 1303 elders reported morbidity in the past two weeks before the investigation, of whom 34.4% indicated the self-treatment behaviors. The variables independently associated with a greater probability of self-treatment in the whole sample group were: better health status, no recent alcohol consumption, and fewer utilization of family practice, which is the same in the subgroup of the elders with chronic diseases. No significant predictors were found in the subgroup of the elders without chronic diseases. Empty-nest elders with higher affinity to traditional Chinese Medicine and drinking alcohol recently were less likely to self-treat. The non-empty-nest elders who were no less than 75 years old and at better health status were more likely to self-treat.

Conclusion: In general, the variables of the socio-demographic status can hardly enter the models. The common significant predictors include better health condition, recent alcohol consumption, and the utilization of family practice, and advanced age as well as self-care in TCM also play the roles in some subgroups. The findings suggested the potential of family practice in facilitating the timely and convenient care for the rural elders.

Innovation and deficiency: Taking the factors from both the demand-side and the supplier-side into consideration, this study attempts to explore the determinants of the rural elders' self-treatment behavior in the specific context of rural China, trying to detect the potential inequity of access to medical care through the analysis in different subgroups. However, the mechanism of the decision-making on self-treatment as well as the health seeking pattern among the rural elder are not clear yet. Further studies are needed to elucidate the mechanism and develop the improvement strategies of health equity in rural area.

8:30 AM –10:00 AM TUESDAY [Demand & Utilization Of Health Services]

Universitätsspital Basel | Klinikum 1 – Hörsaal 1

Demand and Utilization of Heath Services by Age Group

SESSION CHAIR: **Robin Yabroff**, American Cancer Society

Impact of Health System Characteristics on Health Care Utilization Among the Mid-Aged and Elderly in China

PRESENTER: **Dr. Haipeng Wang**, Shandong University
AUTHORS: Ms. Lizheng Xu, Chaofan LI

Objective Access to health care is a primary goal of health systems in both developed and developing countries. To achieve universal health care coverage by 2020, China's government had implemented a new round of health system reform since 2009. A number of policies and interventions were taken to improve availability, affordability and accessibility to health care for the total population. This study aims to examine the association between health system characteristics and health care utilization in China.

Method The data was obtained from the third wave of China Health and Retirement Longitudinal Study (CHARLS) in 2015. After excluding missing data, there 17,374 respondents aged 45 and above were included to analyze. The outcome variables are whether respondents had outpatient care visits at least once in the last month and whether they received inpatient care in the last year. At the macro level, key health system characteristics are measured by density of doctor (number of health professionals per 1000 population), density of bed (number of beds per 1000 population), price of health care (outpatient or inpatient expenditure per visit) and share of out-of-pocket expenditure in total health expenditure. At the individual level, control variables include gender, age, education level, occupation status, economic status, self-reported health status, presence of chronic disease, dummy of urban and rural residence and coverage of health insurance schemes. Two-level logistic regression model was used to examine the impact of health system characteristics on health care utilization.

Results About 18.3% of the mid-aged and elderly utilized outpatient visits in the last month and 13.7% of them received inpatient health service in 2015. The share of out-of-pocket payments was negatively associated with probability of outpatient care utilization (OR=0.96, 95%CI: 0.93–0.98, $P<0.01$). However, other health system characteristics had no significant impacts on probability of outpatient care visits. The share of out-of-pocket payments had significantly negative impacts on probability of inpatient care utilization (OR=0.98, 95%CI: 0.97–1.00, $P<0.05$). Similarly, inpatient expenditure per visit was also negatively associated with inpatient care utilization (OR=0.24, 95%CI: 0.05–1.11, $P<0.1$). In contrast, the number of beds per 1000 population was positively associated with probability of inpatient care utilization (OR=1.26, 95%CI: 1.10–1.43, $P<0.01$). The number of health professionals per 1000 population had no significant association with either outpatient or inpatient care utilization. As regards individual level variables, economic status, self-reported health status, presence of chronic disease and coverage of health insurance schemes were positively associated with health care utilization.

Conclusion The study suggests that share of out-of-pocket payments in total health expenditure and price of health care play important roles in both outpatient and inpatient care visits, while the availability of health professionals does not seem to play a significant role. More health financing policies and provider payment reform measures are needed to reduce share of out-of-pocket payments and control increment of health care price.

Key words: Health care utilization, Health system, Multi-level model, Mid-aged and elderly

Health Care Utilization at Retirement: Evidence from Urban China

PRESENTER: **Qin Zhou**

AUTHORS: Karen Eggleston, Gordon G. Liu

Rapid population aging in China, for such a large population at relatively low per capita income, brings a series of challenges for social and economic development, including sustainability of current health insurance programs. Extending working lives beyond the current low retirement ages—50 years for women and 60 for men—has been a key issue discussed for alleviating pressure on public and private budgets, but is controversial. As input to this policy debate, there is limited evidence about the impact of retirement on healthcare expenditures. Theoretically there are at least four mechanisms, with mixed effects. Retirees face a lower price for health services after retirement (because retiree coverage has a lower coinsurance rate) as well as a lower opportunity cost of time, both of which may increase utilization. Retirement may also directly impact health, although most studies show only weak effects in the short-term. Income effects may also shape utilization, since income typically falls at retirement; yet China's urban retirees also enjoy free premiums and free funds in their personal insurance accounts, and residents of developed cities such as our study site, Hangzhou, enjoy relatively generous pensions. Thus the overall impact of retirement on utilization is an empirical question.

We employ a fuzzy regression discontinuity (RD) design combined with instrumental variables based on the normal retirement ages among urban formal sector workers to study the change in health care utilization associated with retirement. We randomly selected 15% of the insured population in Hangzhou, China in 2012, and tracked their medical claims during 2012-2014. Restricting to enrollees within 10 years of retirement age (between 40 and 60 for women and between 50 and 70 for men), our analytic sample includes 232,427 people with over 4.2 million medical claims.

Our results show that retirement significantly increase outpatient care utilization, but has no significant impact on the use of inpatient care. We give evidence that the increase of outpatient care utilization at retirement is attributed by the increase in number of outpatient visits. Ceteris paribus, retirement increases number of outpatient visits by 16.1 percent for females and 14.6 percent for males. The impact could be related to the lower patient cost sharing and reduced opportunity cost of time at retirement. Our findings contribute to better understanding the effect of retirement on health care utilization among population with generous health insurance in developing countries.

Inpatient Treatment Expenditure of Cancers in China, 2013–2017: Evidence from Shandong Province

PRESENTER: **Junfang Xu**

AUTHORS: Yuxia Yang, Dr. Jian Wang

Background: As the leading cause of death, cancer has become a major public health problem in China. To inform the on-going health care reform, empirical evidences on the economic costs of common cancers are urgently needed to contribute to the potential benefits to society and individuals from allocating more resources to screen and prevent cancers in China. However, the hospitalization cost and particularly the composition of hospitalization expenditure caused by common cancers in recent years remains largely unknown.

Method: Our study sample included 20,138 cancer patients (i.e., stomach cancer, lung cancer, colorectal cancer, esophageal cancer and breast cancer), who were hospitalized during 2013-2017. All the data (e.g., social demographic data, admission diagnoses, hospital length of stay, type of health insurances and cost items) were collected from the Health Information System (HIS) in the Second Hospital of Shandong University located in Shandong province, China. All statistical analyses were based on a pooled dataset, including data from 2013 to 2017 to allow for trend analysis of hospitalization expenditures. The basic demographics, length of stay, and hospitalization costs including drug costs, insurance costs, bed care cost, examination cost, laboratory cost and other costs were described using median values and interquartile ranges (IQR).

Results: The hospitalization costs of five common cancers remained almost stable from 2013 to 2017. Patients with esophageal cancer had the highest hospitalization costs in the past five years, which was 34137.96 RMB in 2017 followed by lung (23094.54RMB), stomach (22607.23 RMB), colorectal (20761.45RMB) and breast cancer (10855.05 RMB). The highest cost item was drug costs followed by material costs. However, the proportion of drug costs to total hospitalization costs showed a decreasing trend during 2013-2017, which was 61.77%, 57.87%,

54.69%, 49.71% and 47.55% for colorectal, stomach, lung, esophageal and breast cancer respectively in 2017. The compensation proportions of three types of health insurances increased slightly, but they were quite different (about 45%, 65%, 80% for Basic Medical Insurance for Urban Residents, Basic Medical Insurance for Urban Employees and Provincial Health Insurance respectively).

Conclusion: The hospitalization cost of cancer patients is high. It is important to control the inpatient treatment cost through patients and diseases- based adjustment on the compensation proportion of health insurance and drug costs reasonably. Moreover, considering the heavy economic burden, early screening and treatment of common cancers would also benefit a lot to the society and individuals.

End-of-Life Cost and Its Determinants for Cancer Patients in Urban China: A Population-Based Retrospective Study

PRESENTER: **Mr. Zijing Pan**, Huazhong University of Science and Technology
AUTHORS: Zhong Li, Liang Zhang, Dr. Ruibo He, Shan Jiang, Chengzhong Xu, Fangfang Lu, Pei Zhang, Boyang Li

Abstract

Objective This study aimed to define the end-of-life (EOL) healthcare utilisation and its cost and determinants for cancer patients and to proactively inform related strategies in mainland China.

Design A population-based retrospective study.

Setting and participants Data from 894 cancer patients were collected in urban Yichang, China from 01 July 2015 to 30 June 2017.

Outcome measures Emergency department (ED) visits, outpatient and inpatient hospitalisation services, intensive care unit (ICU) admission and total costs were used as the main outcomes.

Results In this study, 66.8% of the 894 patients were male, and the average age was 60.4 years. Among these patients, 37.6% died at home, and patients had an average of 4.86 outpatient services, 2.23 inpatient hospitalisation services and 1.44 ED visits. Additionally, 5.9% of these patients visited the ICU at least once. During the EOL periods, the costs in the last 6 months, 3 months, 1 month and 1 week were US$18 234, US$13 043, US$6349 and US$2085, respectively. The cost increased dramatically as death approached. The estimation results of generalised linear regression models showed that aggressive care substantially affected expenditure. Patients with Urban Employee Basic Medical Insurance spent more than those with Urban Resident-based Basic Medical Insurance or the New Rural Cooperative Medical Scheme. The place of death and the survival time are also risk factors for increased EOL cost.

Conclusion The findings suggested that the EOL cost for cancer patients is associated with aggressive care, insurance type and survival time. Timing palliative care is urgently needed to address ineffective and irrational healthcare utilisation and to reduce costs.

Ethics and dissemination This study was approved by the Ethics Committee of the Tongji Medical College, Huazhong University of Science and Technology (IORG No.: IORG0003571). All the data used in this study were de-identified.

Strengths and limitations

This population-based study was the first to systematically estimate the end-of-life (EOL) health expenditure for cancer patients in mainland China. It is important to estimate the palliative care demand and guide its system building.

This study introduced EOL healthcare utilisation and cost in China and quantified the relationship between them.

This study will guide health policy regarding the delivery of high-quality, cost-effective cancer care systems.

Given the anonymity of the data, we cannot obtain the health records from primary care facilities and healthcare utilisation outside Yichang. Thus, the EOL healthcare cost might have been underestimated.

The unique socioeconomic status of the selected population may reduce the generalisability of our findings. Further studies on the provincial or national levels are essential to provide systematic evidence.

Health Insurance and Medical Services Utilization of Migrated Children in China

PRESENTER: **Ms. Hongli Jiang**, school of publich health ,Fudan University
AUTHOR: Dr. Mengcen Qian

Background

In China, each child could entitle to the specific social health insurance program according to their household registration (agriculture *hukou* or urban *hukou*) in the places of their registration. Nowadays so-called coordination of urban-rural health insurance is that two programs respectively for agriculture *hukou*-holders and urban *hukou*-holders merged into one in the coordinated insurance area. However, under a segmented system, children might become ineligible for basic health insurance of the inflow cities, especially for those rural-to-urban trans-provincial migrants. As previous studies shown, participation in the health insurance would increase people’s medical service utilizations.

Methods

Our study focused on whether rural-to-urban migrated children uninsured by the health insurance in the inflow city had less utilizations than non-migrants there, which was due to no insurance or different benefit packages between inflow and outflow areas. We carried out the questionnaire survey in Shanghai, Hefei urban area and central districts of Chongqing. Differences of utilizations between children groups were hypothesized varied among three cities. Significant differences of utilizations in Shanghai, the most developed megalopolis, resulted from both regional disparity and urban-rural disparity of benefit packages. Differences in Hefei, the capital of undeveloped Anhui province, only reflected the urban-rural gap. Theoretically, there would be no difference to be observed in central districts of Chongqing for coordination of urban-rural health insurance.

0 to 12-year-old children were sampled at communities, kindergartens and primary schools and their parents were required to answer the questions raised by trained investigators from December 2017 to January 2018. With 10,837 respondents, we established the Logit model and the negative binomial model respectively to compare between two groups whether to visit physician within two weeks and the number of hospitalization in the last year. The two-part model was applied to compare their expenses of two groups. By the means of propensity score matching, we then created a highly comparable control groups in each sampled city to test effects of the models. We further added interactions between city and insured by the insurance in this city to capture the differences among cities.

Findings

Generally，the probability of physician visits within two weeks of non-migrated children was 19.06% higher, and 18.51% higher after matching than those of the migrated ones uninsured by the health insurance in the inflow city. The number of hospitalization in the last year had no difference. The migrated children were prone to be charged 32.78% more and to have 55.61% more out-of-pocket expenses per time, due probably to their insufficient early treatment and more severe conditions when getting medical services. However, claiming expenses per time had no difference after matching. It occurred probably because insurance reimbursed less for outpatient services and migrated children's returned to household register for reimbursement of inpatient services afterwards. This happened in Shanghai, but it was not true for Hefei and Chongqing

Our study demonstrated barrier to insurance in the inflow city mainly decreased children's outpatient services utilization and increased their expenses, while there were little regional and urban-rural disparities for insurance of inpatient services.

Household Cost-of-Illness for Management of Severe Childhood Pneumonia in Bangladesh

PRESENTER: **Marufa Sultana**, Deakin University

AUTHORS: Nur Haque Alam, A.S.G. Faruque, George J Fuchs, Niklaus Gyr, Abdur Razzaque Sarker, Nausad Ali, Md. Jobayer Chisti, Tahmeed Ahmed, Lisa Gold

Background: Severe pneumonia is a leading cause of childhood mortality, especially in developing countries. World Health Organization guidelines recommended hospitalization for its management. Seeking care from any facility involves expenses from households through direct or indirect (income/productivity loss) spending. Reliable cost estimates from the household perspective are necessary to understand the economic costs associated with severe pneumonia. The objective of this study was to estimate the household cost-of-illness of severe pneumonia in Bangladesh and to assess socioeconomic and rural-urban variations.

Methods: An incidence-based cost-of-illness study was performed for one complete episode of severe pneumonia from a household perspective. Costs are presented in 2018 US dollars (USD). This study was nested within a cluster-randomized trial investigating different management approaches of severe childhood pneumonia in Bangladesh. Face-to-face interviews collected socioeconomic, demographic, resource use and cost data who received usual care management. Direct medical cost, direct non-medical cost and time costs were calculated to estimate total cost per household per episode. Multiple regression analysis was applied to explore the factors associated with variations of treatment costs. Sensitivity analysis explored robustness of direct and indirect costs.

Results: 1,247 children with severe pneumonia were enrolled from November 2015 to September 2018. Mean age of the children was 14 months (SD ±10.04); 798 (63%) were less than one year of age and 802 (64%) were male. Mean household cost per episode was USD 124 ±107 (median USD 96, IQR 88). Caregiver income/productivity loss was the main cost driver (60% of mean cost). Direct medical cost constituted 32% (USD 50) of the total mean costs per household, of which medicines cost was the largest contributor (38%). Poorest quintile of households spent a higher proportion (27%) of monthly income (USD 90) compared to richest households (income USD 644, proportion of cost 12%). Costs were significantly higher for urban households (Urban mean USD 151, Rural mean USD 72; $p<0.001$). Regression analysis showed significant association of costs with predictor variables such as assets quintile, length of hospital stay (LoS), child age, geographical region, and parental education. Sensitivity analysis showed results were most sensitive to LoS and productivity loss.

Conclusions: Severe pneumonia in young children is associated with high economic burden for households. The cost-of-illness varies significantly across socio-economic, demographic and geographic parameters. Findings highlight the potential efficiency and equity gains from improved access to pneumonia preventative and management strategies to reduce childhood mortality and morbidity.

Parents' Preferences for Follow-up Visits for Children Living with Type 1 Diabetes

PRESENTER: **Maude Laberge**, Universite Laval

AUTHORS: Monia Rekik, Malek Badreddine

Context

It is accepted that although patients may initiate a visit to a health care provider, follow-up visits are often based on recommendations from providers. This suggests that follow-up care, since not initiated by patients, may not reflect patients' perception of a need for care. However, few studies have examined the burden of regular follow-up care and the patients' perceived value of such care.

For parents of children with type 1 diabetes (T1D), after initial phases of diagnosis, education on diabetes management, and adaptation of a family's routine, children have scheduled visits every three months, typically with an endocrinologist, but sometimes also with other health professionals, to support appropriate management and control of the diabetes. The frequency of these visits is higher than with adults in large part because of how growth in children may affect diabetes. However, regular follow-up care is also a disruptor for both parents and children in terms of absenteeism from work for parents and from school for children. These visits are scheduled regardless of how well controlled the diabetes is. The value of follow-up care may differ depending on the child's condition, and the usefulness of information received but also on the burden that it imposes on parents. Our study examines how benefits and burden from the parents' perspective could affect their preferences in regards to the frequency of regular follow-up care.

Methods

We developed an online patient survey, which was distributed to parents of children living with type 1 diabetes in the province of Quebec, Canada. The survey was available in French and English, and distributed through diabetes clinics, on social media groups and forums for parents of children with T1D. The survey was developed in collaboration with a parent of a child with T1D to ensure that it was appropriately reflecting the services in regular follow-up care and that the language was understandable and clear. We conducted a Poisson regression on parents' preference on the number of months that should separate two follow-up visits.

Results

A total of 188 parents answered the survey throughout the province of Quebec. The mean child age was 7.3 (sd 5.0) and the mean number of years with the diagnosis was 6.6 (sd 4.0). The majority (59%) had an insulin pump; 15% of children had other health conditions. The average preferred interval reported was 4 months.

The number of years that the child had lived with the diagnosis, being in a higher income group, and being a single parent were associated with a preference for spacing out follow-up visits. Reporting receiving helpful information and a child having co-morbidities were associated with preferring shorter time between visits.

Conclusion

Preferences of parents in the frequency of follow-up visits vary and are sensitive to the benefits perceived from the visits and the associated burden. Health services could be adapted to reflect children's needs and patients' preferences.

Inequalities in the Utilization of Maternal and Child Health Care Services in Low- and Middle- Income Countries

PRESENTER: **Mr. Md. Mehedi Hasan**, The University of Queensland

AUTHORS: Ricardo J. Soares Magalhaes, Abdullah Al Mamun

Background: While the utilization of essential maternal and child health (MCH) care services is improving, the gaps in MCH services utilization is continuing that must need to be addressed for achieving health related Sustainable Development Goals. This study investigated the current gaps in the utilization of MCH care services to the extent of sociodemographic characteristics in low- and middle- income countries (LMICs).

Methods: We analysed nationally representative cross-sectional Demographic and Health Survey (DHS) data to estimate the utilization coverage of demand for family planning satisfied with modern contraceptive methods (mDFPS); at least 4 antenatal care visits (4+ANC); skilled attendant at birth (SBA); institutional delivery (ID); delivery by caesarean section (CS); measles, BCG and three doses of DPT immunizations of children; oral rehydration therapy (ORT) for diarrhoea treatment and care seeking for the symptoms of acute respiratory infections (ARI) for children. We measured absolute gaps in the utilization coverage of indicators in terms of wealth (rich, Q5 – poor, Q1), residence (urban – rural), women's/mother's education (secondary or higher education – no education) and age (adult, 20-49 years – adolescent, 15-19 years of age). We also estimated the Concentration Index (C) to measure the degree of wealth-based inequality in the utilization coverage.

Results: Among the most recent surveys conducted between 2006 and 2016, the coverage of MCH service utilization were <80% in 56 of 63 countries for mDFPS, 44 of 63 countries for 4+ANC, 44 of 63 countries for SBA, 34 of 62 countries for measles immunization, 28 of 62 countries for DPT immunization, 6 of 63 countries for BCG immunization, 59 of 62 countries for ORT, 61 of 62 countries for ARI care, and 37 of 63 countries for ID. On the other hand, 10 of 63 countries had CS ≥20%. The rich-poor gaps in MCH services utilization was greater by at least 20 percentage points in 25 of 63 countries for mDFPS, 41 of 63 countries for 4+ANC, 45 of 63 countries for SBA, 20 of 62 countries for measles immunization, 20 of 62 countries for DPT immunization, 16 of 62 countries for BCG immunization, 11 of 62 countries for ORT, 27 of 62 countries for ARI care, 47 of 63 countries for ID, and 13 of 63 countries for CS. Similar to the gaps between rich and poor, the urban vs rural, at least secondary education vs no education, and adult vs adolescent women/mother were also apparent largely, particularly among countries with lower coverage of MCH utilization services. Most of the countries with lower MCH service coverage and higher gaps were

belonged to the Sub-Saharan African, and South and Southeast Asian regions. The value of C showed that the MCH services were disproportionately utilized by the wealth-based better-off groups in almost all the countries.

Conclusions: High pro-rich, pro-urban and pro-secondary+ education and pro-adult inequalities were observed in MCH services utilization. Attention need to be given to the poorest, rural, lower education and adolescent women/mother to accelerate the progress and achieve the universal coverage of MCH in LMICs.

8:30 AM –10:00 AM TUESDAY [Evaluation Of Policy, Programs And Health System Performance]

Universitätsspital Basel | Klinikum 1 – Hörsaal 2

Extending the Reach of Economics: Political Economy, Immunization, Vaccination, and Teaching Health Systems

SESSION CHAIR: **Sally Clark Stearns**, The University of North Carolina at Chapel Hill

Bringing Health Economics Knowledge to Non-Economists: A Multi-Modal Knowledge Transfer Approach to Decision Makers, Researchers, Patients, and the General Public

PRESENTER: **Maude Laberge**, Universite Laval

AUTHORS: Prof. Thomas G Poder, Simon Berthelot, Roxane Borgès Da Silva, Christian Chabot, Jason R Guertin, Pascale Laveault-Allard, Annie Poirier, Dr. Erin Strumpf, Hervé Zoumahoun

In a 2015 consultation on the Strategy for patient-oriented research (SPOR) in Quebec, Canada, researchers, patients, and health system decision makers expressed a need for training in health economics and in economic evaluation.

The Quebec SPOR –SUPPORT Unit created a team researchers in health economics from across the province. This team began with conducting an environmental scan of the training needs. Based on the findings of the scan, the team developed a three-pronged approach to enhancing knowledge in health economics among non-economists.

First, the team created a knowledge transfer tool that consists of a series of educational videos to be distributed via a web-based platform accessible by computer, tablet and smartphones. These were designed specifically for clinicians, researchers, patients, and health system decision makers, who do not have prior knowledge of health economics.

Second, the team developed a workshop with short presentations on selected topics.

Third, team members are available to review research protocols of research teams to provide constructive feedback. They are also available for one-on-one consultations to review the protocols. In the first year, the consultations were provided on the same day as the workshop with research teams who had submitted research protocols.

One year after the project started, 15 videos with each a duration of five to seven minutes were finalized and made publicly available on a YouTube channel. A workshop on selected topics in economic evaluation in health care was delivered in Quebec City with a very positive evaluation from participants. Team members have also reviewed nine protocols and contributed to the integration of an economic dimension into the research protocols.

In addition, a mapping of all available resources in health economics and economic evaluation in health care in Quebec was created. This mapping includes names and contact information of people and organizations who have relevant expertise.

Future plans include the organization of workshops to be delivered in different cities, with potentially additional material and new topics. Revisions of protocols continues to be offered but on an ad-hoc basis, in that researchers can ask the Support Unit, who will transfer the request to the project team. In addition, the team will be developing a tool to measure patients' costs associated with their utilization of services and conditions. The objective is that the tool will support standardization in the collection of patient cost data to be integrated in economic evaluation studies.

Using e-Activities to Enhance on-Line Learning in Health Economics

PRESENTER: **Shelley Farrar**, University of Aberdeen

AUTHOR: Lynsey Christie

Background. The Health Economics Research Unit has a remit to build and sustain capacity in the economics of health. We have provided a distance learning post graduate certificate in health economics for many years and have recently developed the programme into an on-line MSc in Health Economics for Health Professionals. This is aimed at health professionals working in any part of the world. One of courses we offer is on health care systems and policy.

Challenge. Our students want a broad knowledge of health care systems and also to develop bespoke understanding of their own health care system and how to evaluate it and our intended learning outcomes reflect this. We have students from all around the world studying on our

programme. We cannot include detailed descriptions and analysis of every health care system in the teaching material and still meet the analytical depth required in the intended learning outcomes of an MSc.

Approach. The approach needs to facilitate individualised learning through supporting the application of principles and/or frameworks. Gilly Salmon advocates the use of 'e-tivities' to ‘enable active and participative online learning’. These are activities (online for our programme, though not necessarily so) which use a task-based approach to learning. We are utilising e-tivities on our health care systems course to support the students’ bespoke learning requirements. For example, one e-tivity guides the students to data sources to build a picture of their chosen health care financing system, categorise it and evaluate their results against a given set of criteria.

Evaluation. In the first year of trialling these activities as part of our online programme, we assessed their impact by examining student participation and the university generic student course evaluation form. In the second year of utilisation, January to March 2019, we are issuing an e-activity-specific evaluation and using a reflective student exercise to assess their impact on the intended learning outcomes.

Conclusion. We have achieved good levels of student participation and positive feedback in the first year of using the e-tivities. We anticipate that these conclusions will be supported by our more formal and targeted evaluation which we will be able to report at the iHEA 2019 Congress.

Teaching Health Economics in the Unified Health System in Brazil: A Real World Experience in Oncology

PRESENTER: **Tania Maria Costa da Silva Beume**, Brazilian National Cancer Institute

Introduction: Health Economics (HE) is on discussion in Brazil since 1990 with the introduction of the universal health system, serving 300 million citizens and maintained through taxes. Since 2013 HE integrates the discipline Management in Health Care (MHC) in the Multi Professional Post-Graduation Program on Oncology of the Brazilian National Cancer Institute (INCA). HE is not mandatory as a discipline in the educational program and can be disclosed by the students through yearly evaluation. In Brazil teaching HE is still not an issue for Health Economists.

Objective: In this presentation we will discuss the introduction of the teaching HE to health professionals in Oncology at a research institute of the Brazilian public health system. We will also discuss the need for educational training for Health Economists for teaching HE to health professionals and the acceptance by health professionals in receiving HE education by health economist.

Methods: An observational study was conducted for 6 years. The Health Economist associated her experience as a Health Care Manager and strategies of active learning to create discussions based on the routine of the health professionals and to introduce health economics concepts and methodologies.

Results: Evaluation through exercises showed greater acceptance of the theme through health professionals and change of behavior in the short time. All students confirmed that: learning the theme with Health Economist introduced other perspective on economics concepts; learning HE brought a new impression concerning their role in the health system; and, professionals were able to utilize economics evaluation for decision making in health care setting. HE should be taught also to undergraduate students. Active learning strategies facilitated learning aimed at behavior change.

Conclusion: The experience by INCA involves the health professional in their environment and integrated the health economist to the health care team. The familiarity of the Health Economist in MHC was decisive to capture the attention and to involve the students with economics questions which were not perceived in their professional routine. Health Economist working in the health care setting or teaching health economics is not the reality in the Brazilian Health System. This role is usually played by health professionals. Teaching HE should be associated to practical experience in MHC. Partnership between health institutions and the colleges of economics should be stablished to favor the approach of economist to the clinical environment and engaging students of economics in health economics.

Reaching Mid-Career Immunization Professionals with Vaccine Economics Training in Four Countries

PRESENTER: **David Bishai**, Johns Hopkins Bloomberg School of Public Health
AUTHORS: Dagna Constenla, Ijeoma Edoka, Karen Hofman, Dr. Maryam Huda, Anthony W A Kinghorn, Ms. Shreena Malaviya, Chrispus Mayora, William Padula, Dr. George Pariyo, Omrana Pasha, PR Sodani, Susmita Chatterjee, Patrick Wedlock

Introduction

The Teaching Vaccine Economics Everywhere (TVEE) program is a partnership of faculty from 5 academic institutions in LMICs. The goal of TVEE was to build sustainable teaching platforms and a curriculum to help mid-career vaccine policymakers apply economics to their decision making in vaccine delivery. The project had to overcomes the challenges of delivering applicable skills to busy professionals with a variety of professional backgrounds and to build financial sustainability of the program.

Objective

Dr. David Bishai will share his experiences on developing and delivering health economics content to audiences that mix learners with a variety of economics backgrounds and differing levels of familiarity with health systems and health policy. His presentation will focus on the option of reaching mid-career policy makers with short courses in health economics that are designed to be relevant to the trainee.

Methods

The TVEE project was built upon the landscape analysis assembled by the BMGF in 2016, that observed a significant need for capacity building in immunization economics and related topics. Faculty met to produce a wish-list of learning objectives and then to narrow it, focus it, and package it into 6 course modules. Each module was built around a focal case-study to show learners how the content of each course module would apply to a real-life problem they would face professionally. Teams of content writers worked to build a combination of readings, lectures, and practical exercises and then to deliver the course modules at a series of 2-4-day workshops in each of the partner countries. Course review data were used to iteratively improve each course module. Learners for each workshop were recruited in consultation with national leaders in vaccine delivery and are now entering into a program for sustained coaching and mentoring to apply what they learned.

Results

The faculty met to assemble a final list of 89 learning objectives that could be classified into the following 6 course modules: 1) Principles of Vaccine Economics; 2) Economic Evaluation; 3) Costing; 4) Finance and Resource-Tracking; 5) Systems and logistics; and 6) Program Evaluation. Several defining case studies illustrated how a decision-maker would face problems related to this material.

Since its pilot in July 2017, twenty workshops have been conducted in the last 18 months in four countries and training has reached 302 participants from 21 different GAVI eligible countries.

In almost every workshop the course reviews show a demand for practical exercises. Trainees prefer a ratio of 1/3 to 1/2 of the time devoted to group work on in-class exercises. Mid-career learners greatly appreciate seeing problems that look like those they face each day in their work, especially exercises that draw on data from their own region. Currently each workshop includes the opportunity for participants to apply to receive on-going coaching and mentoring in applying vaccine economics to an active issue in policy in their unit. Because our faculty have posted all exercises and lectures on Open Courseware under a Creative Commons License, other academic units can use and adapt the workshop materials.

Political Economy on Financing of Traditional Vaccines and Vitamin A Supplements

PRESENTER: **Justice Nonvignon**, University of Ghana

AUTHORS: Alex Adjagba, Genevieve Aryeetey, Jennifer Asman, Alyssa Sharkey, Erin McLean, Sarah Wood Pallas, Ulla Kou Griffiths

Background

Vaccines and vitamin A supplements are essential health commodities, which ideally should be included in the Government health budget. However, for several decades, external donors have funded health commodities in countries with constrained Government health budgets. While Gavi has successfully ensured that Governments co-finance ‘new’ vaccines, ‘traditional’ vaccines (such as relatively inexpensive measles and polio vaccines) are still fully funded by donors in some countries. Other essential health commodities commonly funded by external sources include HIV antiretrovirals, malaria prophylaxis and tuberculosis drugs. The shift from donor to Government financing is currently debated in several fora in line with increased GNI per capita in recipient countries and the inherent goal of ensuring long-term financial sustainability. Financing of health commodities is an important issue within this debate, as it can be argued that donors should shift to primarily fund interventions that need substantial technical support, such as health systems strengthening and global public goods, such as R&D. Moreover, many donors have found that transition to government financing for health commodities is extremely challenging to realize, even for relatively cheap commodities. Factors hindering transition could be related to power, incentives and interest groups. Hence, a political economy framework can enhance our understanding on how best to guide transitions towards Government financing.

Aim

The aim is to determine how political economy factors affect financing of vaccines and vitamin A supplements in nine Eastern and Southern African countries. Political economy factors were defined as the interplay of power between and across donors and governments, including influences related to incentives, interest groups, and institutions.

Methods

A survey was undertaken to determine financing sources for traditional vaccines in Sub-Saharan African countries. The political economy of financing was analyzed through qualitative methods. A study framework, which includes seven dimensions of power that are classified as visible, hidden and invisible power, was developed. interview guides were created. .

Interviews with Government officials and external donors were conducted in seven countries were the commodities are externally funded (Burundi, Comoros, Eritrea, Ethiopia, Madagascar, Malawi and Zimbabwe) and in two countries that have transitioned to Government funding (Kenya and Rwanda). The latter two countries were included to understand the processes that allowed these countries to successfully start paying for traditional vaccines and vitamin A supplements from the Government budget. Interviews were also conducted with global stakeholders, including UNICEF Supply Division and headquarter staff in donor agencies. Interview topics were concerned with the relationship between actors and how the institution in question made financing decisions. Interviews were transcribed and coded according to the framework.

Preliminary results

The survey found that 16 out of 45 countries in sub-Saharan Africa do not pay for traditional vaccines from their national government budget. These are instead financed by UNICEF, JICA, KOICA, China Cooperation and pooled multi-donor funds. Vitamin A supplements have for the last two decades been provided through a global donation programme funded by the Government of Canada. . Findings from analysis of the interviews will be completed by the time of the conference.

Scope and Magnitude of Private Sector Financing and Provision of Immunization in Benin, Malawi and Georgia

PRESENTER: **Dr. Ann Levin**, Levin and Morgan LLC

AUTHORS: Spy Munthali, Venance Vodungbo, Natia Rukhadze, Kuhu Maitra, Tesfaye Ashengari, Dr. Logan Brenzel

Background: Little is known about the role of the private sector (for-profit and not-for-profit) in financing vaccination and the incentives for collaboration between the public and private sectors.

To fill this gap, we conducted a three-country study on the engagement of private sector providers in immunization in three low and middle-income countries – Benin, Malawi, and Georgia. We investigated the extent to which private providers are financing vaccination services and what the incentives are for public support for vaccination in the private sector.

Aim

The aim was to determine how political economy factors affect the financing of vaccines in the private sector in two African and one Eastern European country.

Methods: In each country, we surveyed a stratified random sample of 50 private providers (private for-profit and not-for-profit) using a standardized, pre-tested questionnaire administered by trained enumerators. In addition, we conducted at least 300 client exit interviews in each country. Data were collected on patient and provider characteristics, availability of cold storage, fee schedules, payments made, and vaccine doses administered as well as sources of financing. Interviews were also conducted with key stakeholders to learn about incentives for public-private collaboration.

Data were analyzed on characteristics of private sector immunization services, incentives for public-private collaboration in provision of immunization services, and financing of private sector vaccination.

Results: The three countries had different models of private service delivery for the provision of vaccination. In Malawi, 44% of private facilities, predominantly faith-based organizations, were providing vaccination and administered 27% of total vaccinations. In Benin, 18%of private facilities provided vaccinations, accounting for 7% of total vaccinations. In Georgia, all of the sample facilities were privately managed and 100% of private vaccinations were conducted at these facilities. In all three countries, the Ministries of Health (MoHs) supplied vaccines and provided other support to private facilities. In all three countries, the government had different incentives to engage with the private sector.

Discussion/Conclusion: Governments have varying incentives to support the private sector to improve access to vaccination and to move towards universal health coverage. However, governments' ability to regulate immunization services and promote quality and affordable services in the private sector remains a significant challenge.

The Political Economy of Private Sector Vaccination in the MENA Region

PRESENTER: **Dr. Ann Levin**, Levin and Morgan LLC

AUTHORS: Nahad Sadr-Azodi, Miloud Kaddar, Dr. Helen Saxenian

Background: The Middle East and North African region is diverse with countries of different income levels, institutional settings and many displaced populations. It also has a thriving private health sector. However, little is known about the incentives for private providers to provide immunization services and the extent of public-private collaboration related to vaccine procurement, administration and reporting. UNICEF sponsored a landscape analysis of the role and contributions of private/nongovernment (henceforth, private) health providers to immunization coverage and equitable access.

Aim

The aim was to determine how political economy factors affect financing of vaccines in the private sector in twenty Middle Eastern and North African countries.

Methods: The team conducted three activities: 1) literature review on private sector immunization in the region; 2) data collection on the role and incentives for private sector immunization in twenty countries through an online survey for key informants and private providers; and 3) country visits to carry out face-to-face interviews with key stakeholders and private providers in Jordan, Sudan and Tunisia.

Results: The study revealed a lot of variation in the role of the private sector. This role ranges from a limited engagement in countries such as Sudan where mostly national programme vaccines are administered in urban areas and NGOs perform the majority of services in conflict areas to Jordan where providers offer many vaccines outside of the national program and for-profit private providers are prominent. Governments were motivated by the need to increase access to vaccination to hard-to-reach populations and urban populations. They sometimes also want options for populations that can afford to pay for vaccination services and want access to vaccines outside of the national programmes.

Governments provide incentives to accredited private providers by offering vaccines and other injection materials and equipment at no charge in many countries. The government's ability to regulate and supervise private provider vaccination varies within countries.

Conclusion: Public-private collaboration in provision of vaccination services is taking place in most of the studied countries. Governments have a variety of motivations to support private sector vaccination, including provision of services for displaced persons. They have some of the same challenges as found in other studies on private health provision, i.e. the need to improve their regulation and supervision of private provider vaccination to ensure that quality services are being offered and reported by this sector.

Strengthening Health System Performance through Efficient Use of Existing Health Resources in Ethiopia

PRESENTER: **Tizta Tilahun**, Harvard T.H. Chan School of Public Health - Department of Global Health and Population

AUTHORS: Carlyn Mann, Dr. Girmaye Dinsa, Mirkuzie Woldie, Peter Berman

Introduction

Improving the efficiency of government health spending frees-up resources to further health outcome improvements and contribute to achieving universal health coverage (UHC). This is increasingly important for Ethiopia as it is faced with a decrease in some external funding and the government's ability to increase domestic resource mobilization through taxes is limited due to its low income, small formal sector, and pro-growth policies.

Methods

Previous efficiency analyses in Ethiopia were limited in geographic scope and sample size. A more robust efficiency analysis using descriptive statistics and Data Envelopment Analysis was conducted for 798 public health facilities, analyzing data from Ethiopia's Service Provision Assessment Plus (SPA+) and Health Information Management System (HMIS). Possible determinants of efficiency of health resources was also explored by analyzing supply and demand-side factors.

Findings

Most of the studied public health facilities were operating below optimal efficiency with more than 50% of them with some level of technical inefficiency. The productivity of clinical staff in producing outputs was very low - 4 outpatient equivalent visits per clinical staff per day, equating to 1 skilled professional per 10000 people in our sample. The International Labour Organization estimated that 34.5 skilled professionals per 10000 people are needed to achieve UHC.

Inefficiencies result from an imbalance between inputs, service delivery processes, and service utilization - the interaction between supply and demand factors. Supply-side constraints include the right mix of inputs for adequate service provision, staff competencies, staff motivation, or structural organization of the facility. Furthermore, staffing is more likely determined by government norms and administration rather than patient loads. Demand-side factors that influence utilization of public health services is a concern. Ethiopia's previous health plans focused on expanding the geographic coverage of public health facilities but to the detriment of providing quality health care services. Only 62% of health facilities provided all basic child health services (outpatient curative care, child vaccinations, and child growth monitoring) and limited provision of quality maternal health services. Additionally, a recent study assessing factors affecting utilization found that low quality of care given long waiting times to see a provider and lack of medicines as major reasons to not seek care.

Conclusion

This analysis suggest that the value lost through inefficiency is substantial. Ethiopia can and should do more to gain the benefits of improving efficiency to provide quality health care services and contribute to sustainably financing the health system. Providers may need to pay more attention to individual preferences to care, perceptions of quality, and accessibility to increase utilization or demand for services. This might imply some shifts in effort by health providers towards outreach services and health promotion activities.

Ethiopia's HMIS contained some, but not all, of the data needed to monitor efficiency at health facility level and thus the need to include the SPA+ survey in this analysis. Since the benefits of improving efficiency may be large, much more could be done to improve the use of evidence for diagnosis and intervention.

No potential conflicts of interest

Funding source: Bill & Melinda Gates Foundation

8:30 AM –10:00 AM TUESDAY [Health Care Financing & Expenditures]

Universitätsspital Basel | Klinikum 1 – Hörsaal 3

Financing and Expenditure: Empirical Evidence From Developing Economies

SESSION CHAIR: **Susan Sparkes**, World Health Organization

An Operationalizing Theoretical Framework for the Analysis of Universal Health Coverage Reforms: First Test on an Archetype Developing Economy

PRESENTER: **Sameera Awawda**, Aix Marseille University

AUTHOR: Mohammad Abu-zaineh

Achieving universal health coverage (UHC) including financial risk protection has been integrated into the 2015-2030 Sustainable Development Goals (Target 3.8). The paper presents an operationalizing theoretical framework for thinking about and analyzing the potential effects of recent reforms seeking to achieve UHC in the low-coverage and low-resource settings. Akin to other public programs, the implementation of UHC-oriented reforms is resource-demanding and is likely to have varying effects at both the micro- and macro-level. Therefore, we propose to assess UHC within a broader context of dynamic stochastic general equilibrium (DSGE) model. The DSGE encapsulates a set of heterogeneous households that are differentiated based on socio-economic and health characteristics and are assumed to optimize their intertemporal utility of consumption, health capital, and leisure. The model is calibrated in a way to capture the salient features of a representative economy of a developing country using data from multiple sources (including the World Development Indicators and representative household surveys). The estimated model is, then, used to simulate alternative financing policies that may be designated to help achieve a sustainable UHC. The theoretical framework we propose can be easily adapted and contextualized to assess the implementation of UHC in a particular developing country settings. When applied to a hypothetical country, results show that the implementation of UHC can indeed improve the population health while offering households financial protection against future uncertainty. However, the degree of financial risk protection appears to vary across heterogeneous households and alternative UHC-financing policies, depending mainly on the associated benefits and the additional burden borne by each group.

Health Insurance and Labor Force Migration: Evidence from China

PRESENTER: **Ms. Julie Shi**, Peking University

The relationship between health insurance and labor market outcomes is of interest to researchers for decades. There exists substantial evidence showing that the provision of health insurance could result in market distortions. For example, many studies find that the Medicaid program in the United States discourages labor supply, when measured by probability of working and working hours. Yet, the existing literature is limited in understanding the impact of health insurance provision on migration decisions. In specific, if the health insurance policy design incorporates variations dependent on geographic locations, in terms of enrollment eligibility and reimbursement generosity, people's migration decisions could be affected.

In this paper, we examine the impact of health insurance program on the migration decisions for the labor force, using a nationwide representative data in rural China. In 2003, China initiated a rural health insurance program, i.e., the New Rural Cooperative Medical Scheme (NRCMS), and it now covers almost 500 million rural residents. The program was first implemented in some counties as a pilot program, and then it was extended to the whole nation within a few years. During the same period, a large portion of rural residents migrated to other provinces, cities or counties to work. The overall size of migrant workers in China reached 225 million in 2008. The provision of NRCMS is likely to be related to people's migration decisions through two mechanisms. First, getting access to NRCMS may improve participates' health status, therefore more healthy workers would be able to migrate for higher labor income. Second, the design of NRCMS also includes restrictions that would discourage migration. In specific, the reimbursement rate is lower for medical expenditures occurred outside of the area of residency. Workers may be locked in local areas even though they could work in other regions more productively. Therefore, it remains an empirical question to investigate the impact of health insurance on worker's migration decision.

In the empirical analysis, we use four-year panel data with instrumental variable strategy to explore the impact of health insurance on the choice of location to work for the labor force. The results suggest that the provision of NRCMS discourage migration in general. Specifically, it decrease the probability of working outside of one's area of residency by 1.78%, and it reduce the days working outside of one's area of residency by 2.9 days. We then sort the migrate workers by their destination working places into "inside of the county of residency", "outside of the county of residency while inside of the same province", and "outside of the province of residency", and we examine the detailed impacts accordingly. We find that the effects are concentrated from two sources, namely discouraging people who is working inside of his county of residency from migrating outside, and drawing those who is working outside of his province of residency to come back. The finding indicates that the design of health insurance benefits affects people's migration decision.

The Hidden Adverse Selection in Social Health Insurance -- Relationship between Premium Non-Payment and Health Status of People Covered By China's Urban Employee Basic Medical Insurance

PRESENTER: **Ms. Yushan WU**, JC School of Public Health and Primary Care, The Chinese University of Hong Kong

AUTHORS: Mr. Wen He, Shuguang Shen, Benjamin Hon-kei Yip, Eng-kiong Yeoh, Shanquan Chen, Hong Fung

Introduction:

Social health insurance (SHI) is strongly suggested as a financing method to achieve universal health coverage. One of the main advantages of SHI is the mandatory enrolment, which improves the equity in medical access and financing and enhances the risk pooling effect among the whole population. However, there is possibility that people join SHI but not pay the full contribution, which will affect the balance of the insurance funding and equity in financing. Previous research showed that contribution evasion in SHI system was serious in developing world. China made great progress in establishing SHI system and accomplished nearly universal insurance coverage in recent years. However, there is scant research on contribution evasion problem in China context. This research uses empirical data from China's SHI system, to explore the premium non-payment issue and factors related to it, especially the health status of individuals.

Methods:

Our research is based on urban employee basic medical insurance system(UEBMI), one fundamental scheme of China SHI system. We exacted insurance data of people covered by UEBMI in one big city of southern China from 2012 to 2016. The data includes individual demographic information, yearly premium payment record, and health expenditure reimbursement record. We first reviewed the insureds' premium payment continuity over years. We calculated years of premium non-payment between the first year of payment 2016, to exclude years before joining UEBMI. Then we conducted Poisson regression on factors related to years of premium non-payment, especially the individual health status proxied by types of diseases diagnosed.

Results:

Our research showed that around 37% of our sample has premium non-payment in one or more years. Regression analysis showed that the number of years with premium non-payment decreased significantly with number of the diseases diagnosed and increase of age. The likelihood of non-payment is higher among liberal workers than company worker and manager. Furthermore, people who are retired or unemployed are more likely to have premium non-payment than those who are employed.

Discussions:

Our research showed that contribution evasion problem does exist in China SHI system. In the case of UEBMI, the issue is most serious among liberal workers. Because of flexible income, their payroll contribution is hard to be controlled by government. Some traditional SHI countries, such as France and Germany, are all in the process of reducing their reliance on payroll contributions and resorting to other financing channel. Furthermore, people with more types of diseases are less likely to drop-out from the contribution, which is in line with the adverse selection theory. More regulation could be conducted by the government, like extending the suspension period of insurance coverage after restarting the payment. Our research also has some limitations at this stage, like not distinguishing the common diseases and chronic diseases. Further research will be done to remedy the limitations and to explore the research question through time series analysis.

Monitoring Progress Towards Attainment of Financial Risk Protection in Uganda: An Assessment of Catastrophic Payments and Impoverishment 2005 to 2017

PRESENTER: **Brendan Kwesiga**, Independent Researcher

AUTHORS: Grace Kabaniha, Tom Aliti, Pamela Nabukhonzo, Justine Hsu

Background: Monitoring progress towards attainment of Universal Health Coverage (UHC) is focused assessing attainment of the goals on coverage of health services and protection of households from the impact of direct out-of-pocket payments. Although Uganda has expressed aspirations for attaining UHC, out-of-pocket payments remain a major contributor to total health expenditure. The aim of this study is to monitor progress on the financial risk protection for Ugandan households.

Methods: This study uses data from the Uganda National Household Surveys for 2005/06. 2009/10, 2012/13 and 2016/17. Financial risk protection is measured using catastrophic health payments and impoverishment indicators. Financial risk indicators are defined using the standard UHC indicators within the SDGs. These are: catastrophic payments if they exceed a set threshold of the budget share of total household consumption expenditure based on thresholds of 10%. Health payments are impoverishing if they push the households below the US$1.91/day poverty line. Logistic regression model is used to assess factors associated with household financial risk.

Results: The results show that although progress has been made in reducing financial risk protection, this progress remains minimal and there is a risk of reversal of this trend. We find that although catastrophic health payments decreased from 22.4% in 2005/06 to 13.78% in 2012/13, we observe an increase to 14.22%. The percentage of Ugandans pushed below the poverty line (US$1.91/day) has also decreased from 5.2% in 2005/06 to 2.71% in 2016/17. We show that the distribution of this risk varies across socio-economic status, location and residence and there are household characteristics associated with an increased likelihood of incurring financial risk.

Conclusion: To address the burden of financial risk protection, there is need for interventions aimed at reducing out-of-pocket payments especially among those most affected. In short term, ensuring that the population accesses publically financed services through insuring availability of key inputs required at these facilities is critical. In the medium term, introducing prepayment through health insurance will further reduce the burden due to household expenditure

Socio-Economic Inequalities in the Performance of Primary Care Practices Under Brazil's National Pay-for-Performance Scheme

PRESENTER: **Roxanne J. Kovacs**, LSHTM (London School of Hygiene and Tropical Medicine)

AUTHORS: Timothy Powell-Jackson, Everton Silva, Jorge Barreto, Søren Rud Kristensen, Luciano Gomes, Garibaldi Gurgel, Josephine Borghi

Introduction:

The National Programme for Improving Primary Care Access and Quality (PMAQ) in Brazil is one of the largest pay-for-performance schemes in the world. PMAQ offers financial bonuses to municipalities based on the performance of primary care practices in their remit. A unique feature of PMAQ is that municipalities have autonomy to determine how to structure incentives and allocate bonus payments across providers – which creates the opportunity to study the effect of incentive design on outcomes.

Inequality in the performance of health providers under financial incentive schemes is a crucial issue that has received only limited attention in the literature. If providers working in affluent areas are better able to meet performance targets than those working in more deprived areas, financial incentives could plausibly exacerbate socio-economic inequalities in the health system. We examine the relationship between socio-economic inequalities and practice-level performance in PMAQ and investigate how these inequalities are mediated by differences in the design of financial incentives.

Methods:

We use administrative data on performance in PMAQ for 17,500 primary care practices located in 4,000 municipalities. These data are available for three points in time, corresponding to the programme cycles in 2011, 2013, and 2018 respectively. Performance in PMAQ is measured using approximately 650 indicators contained in the national guidelines to generate a continuous score, bound between 0 and 100.

To capture the socio-economic status of the neighbourhood in which facilities are located, we develop a multidimensional measure of deprivation at the census tract level based on the Brazilian social vulnerability index. We link geocoordinates of practice location with tract-level data on deprivation derived from the latest census and group practices into quintiles, based on the level of deprivation of the local area.

We are primarily interested in whether inequalities in PMAQ performance between primary care practitioners are related to local area deprivation and how these inequalities change over time. We also explore whether the design of financial incentives mediates the association between socio-economic status and performance in PMAQ.

Results:

We provide novel evidence on socio-economic inequalities in performance in a national pay-for-performance scheme. Findings will show whether socio-economic status of the local area is a determinant of performance in PMAQ. Results will also highlight whether the way in which financial incentives are designed mediates this relationship. The evidence generated here will inform the design of PMAQ going forward as well as other pay-for-performance schemes in low and middle-income countries.

Towards Universal Health Coverage: Strengthening Financial Incentives to Improve Quality of Care in Cote D'ivoire

PRESENTER: **Denizhan Duran**

Universal health coverage (UHC), defined as ensuring a population has access to effective health services without financial hardship, has emerged as a powerful guiding target for health systems worldwide. In order to reach UHC, countries need to concurrently invest in their health financing systems and strengthen their quality of care. Currently, there is limited evidence on how financial incentives influence high quality care, especially in low- and middle-income settings, and at the health system level. This paper develops an analytical framework reviewing the literature on the intersection between financing and quality of care, documents pathways through which financial incentives can be leveraged to improve quality of care, and implements this framework in a country setting. Earmarking, conditioning, community involvement, provider pay and institutional reform are identified as the main pathways through which financing can influence the structure, process and outcomes of quality of care. This framework is then implemented to assess the links between financing and quality of care in Cote d'Ivoire, a lower-middle income country with a weak health system following a prolonged period of instability. Using a mixed methods, implementation science approach, this paper assesses the impact of a recent performance-based financing pilot covering over 5 million beneficiaries and 320 primary care facilities. Through analysis of baseline and quarterly indicator data, as well as interviews with policymakers and health providers, it studies the impact of this program through the identified pathways, looking at the evolution of indicators over time and providers' perception on the program, as well as identifying institutional enablers and barriers.

The Role of Efficiency Gains in Expanding Fiscal Space for Health in Nigeria

PRESENTER: **Yewande Ogundeji**, Health Strategy and Delivery Foundation

AUTHORS: Babatunde Akomolafe, Kelechi Ohiri, Yusuf Auta

Background

A major component of achieving universal health coverage in many developing countries is reducing out-of-pocket (OOP) expenditure which is a critical demand side barrier to accessing care. Nigeria has the highest OOP expenditure in Africa and government health spending is below par compared to recommended benchmarks. Given the correlation between government spending and improvement in health outcomes, its importance cannot be overemphasized. This study sought to explore and identify viable options to increase health spending in Kaduna state, Nigeria.

Methods

Our study involved qualitative and quantitative approaches. First, we developed a conceptual framework to explore fiscal space for health. This included a comprehensive review of literature and theoretical frameworks. Our framework consisted of 6 thematic areas: macroeconomic growth, reprioritization of health, health sector specific sources, developmental assistance/grants, public private partnerships and efficiency gains. Second, we conducted key informant interviews with 13 participants including public expenditure experts and senior program managers and policy makers. Third, we conducted a quantitative desk review to inform our revenue projections and the feasibility of the identified fiscal space options. Data sources included audited reports, government budget and expenditure data, household surveys, health account surveys, annual expenditure reports, and economic growth data.

Findings and Discussion

Building on previous analysis of the health needs in the state, in addition to the current health spending, ₦16bn (43Mn USD) is required to fund the health system. We found that the health sector can obtain a ₦5.2bn (14Mn USD) if 80% of budget performance is achieved; premium payments from a planned social health insurance scheme could generate an additional ₦2bn (5.5Mn USD); and earmarked taxes could potentially generate ₦1.5bn (4Mn USD). However, health budget performance has been poor (an average of about 50% over the past 5 years) and implementing health insurance or earmarking taxes require legal frameworks and careful design that are time and resource consuming. Efficiency gains in terms of improving health budget performance appears to be the most feasible, sustainable, and cost effective fiscal space option for the State. To obtain potential revenue from this option, the state ministry of health and other health agencies would need to liaise and frequently engage with the ministry of budget and planning and finance to effectively communicate the need to prioritize health in terms of budget release for the sector, which can be achieved by providing measurable evidence of impact, value for money, and accountability for previously disbursed funds.

8:30 AM –10:00 AM TUESDAY [Health Care Financing & Expenditures]

Universitätsspital Basel | Klinikum 1 – Hörsaal 4

Financing and Expenditure: Empirical Evidence from High-Income Economies

SESSION CHAIR: **Matthew Jowett**, World Health Organization

Assessing the Role of Capabilities in Equity Impact Evaluation of Chronic Disease Management Programmes

PRESENTER: **Ina Tapager**

AUTHORS: Kristian Schultz Hansen, Karsten Vrangbæk

Chronic diseases are highly important for the future level and distribution of health and well-being in Western societies. Thus, it seems pertinent to assess not only efficiency of chronic care but also its impact on health equity. However, operationalization of health equity has proven a challenging task. The optimal choice of methods to assess equity will depend on the nature of equity concerns: what should be distributed, how, and to what end? As part of an ongoing research project on the socioeconomic impact of Disease Management Programmes (DMPs) in Denmark, we will investigate the potential fit of Amartya Sen's capabilities framework for assessing equity impacts of DMPs. In addition, we aim to explore new ways of conceptualizing and measuring capabilities. This paper presents an attempt to achieve this aim.

We present a three-step strategy and discuss the challenges and concerns related to each of the steps. The first step is to introduce a conceptual background for equity studies in health economics and develop an equity inquiry framework including the capabilities approach. Secondly, we use this framework to guide a directed content analysis of national DMP guidelines and diabetes action plan (centrally decided principles of allocation of care resources) to extract the equity related aims as revealed from these. We discuss how such considerations may inform an evaluative framework. Thirdly, the findings of the previous two steps will constitute the conceptual basis for a large-scale survey- and register-based study of the implementation and effects of disease management programmes in Denmark (to be implemented in 2019).

Our preliminary findings suggest that a capabilities framework may provide a good fit for analysing equity impacts of DMPs as it encompasses several of the aims presented in official policy documents. These aims include an emphasis on response to differential vulnerability in patients and a focus on rehabilitation and education efforts to enable people to choose according to own values and goals to support independent and meaningful lives. We suggest that a fruitful way forward in developing a capabilities-based evaluation measure for DMPs may be to combine theories of capabilities developed in the field of economics with theories of capabilities and self-efficacy developed in psychology.

Much of the conceptual work on health equity deals with health and health policy in very general terms. We argue that studying a specific health issue (diabetes) and the associated policies (DMPs) may help bridging the gap between theoretical deliberations and practical applications in health equity studies.

Key words: equity, capabilities, evaluation, Disease Management Programmes, diabetes

Do the Strongest Shoulders Carry the Heaviest Burden? The Distribution of Health Care Costs in the Netherlands

PRESENTER: **Dr. Jelena Arsenijevic**, Utrecht University

AUTHOR: Wim Groot

Introduction: Solidarity in health care is usually perceived as income solidarity and is related to the redistribution of healthcare costs among income groups. One of the goals of the health reforms in the Netherlands in 2006 was to enhance the income solidarity. The aim of this study is to examine the distribution of health care costs over households in the Netherlands and their changes during the period 2000-2012, i.e. before and after the reform of the curative health care system

Method: We use Household Budget Survey Data (Budgetonderzoek) collected by Statistics Netherlands in 2000, 6 years before the major health care reforms and in 2012, 6 years after the reforms. We look at the distribution of total insurance premiums (basic community rated premiums, income related premiums and general taxes) and out-of-pocket payments (including deductibles).

Results: The distribution of all income-related premiums and out-of-pocket patient payments was regressive in 2000. This means that lower income groups paid relatively more for health care. The distribution of income-related premiums in 2012, 6 years after health care reforms was also regressive. However, the distribution of out-of-pocket patient payments was progressive. Also, the level of out-of-pocket patient payments decreased in 2012 compared with 2000.

Conclusion: Our results show that is difficult to achieve the income solidarity in time of growing health care costs. Out-of-pocket patient payments in the Netherlands are among the lowest in Europe. However, the income-related premiums are still regressive. A challenge for formal solidarity in health care will be to manage the interaction between income solidarity (regressive payments) and risk solidarity (willingness of younger people to pay for the increasing costs for elderly).

Health Care Use and Medical Expenditure from 2000 to 2015 for Children with Special Health Care Needs: Contributions to Increasing Expenditure

PRESENTER: **Kim Dalziel**, The University of Melbourne

AUTHORS: Li Huang, Ekaterina Woods, Gary Freed

Objective: To provide estimates of long-term trend of health service use and expenditure along with characteristics of children with special health care needs (CSHCN) for the first time in more than a decade. To explore contributions to total expenditure growth according to health care categories.

Methods: The national Medical Expenditure Panel Survey (MEPS) quantifies health care use and expenditure providing US population estimates. Data from 2000 through 2014 (n=511,239) were used for children with and without SHCN. CSHCN were identified using the standard five question screener. Health care use and expenditure were analyzed using multivariable linear regression and generalized linear modelling respectively, controlling for a range of covariates. Contributions to total expenditure growth were estimated using decomposition. Costs were standardized to 2014 and data adjusted for MEPS complex survey design. Results will be updated to include recently available 2015 data. Medical expenditures were grouped as hospital visits, physician office-based visits, non-physician office-based visits and pharmaceuticals.

Results: The prevalence of children classified as CSHCN in the population remained relatively constant over time and was 19.1% in 2014. The types of conditions have changed over the last 15 years with sharp rises in anxiety and depression and attention deficit hyperactivity disorder (ADHD). Medical care expenditure for CSHCN grew by $3192 per child from $3320 in 2000 to $6512 in 2014, with an annual average increase of 4.1% which is 30 times the increase for other children. This increase was almost thirty times the increase for non-CSHCN. The largest contributors to growth in total expenditure were hospital costs (34%), pharmaceuticals (30%) and non-physician office-based visits (22%). The growth in expenditure is driven largely by a rise in price of pharmaceuticals (contributing 38% to growth), price of hospital services (contributing 27%) and volume of non-physician office-based visits (contributing 14%). In terms of contribution to total expenditure, 7 out of the top 10 pharmaceuticals were for ADHD.

Conclusion: The proportion of CSHCN has remained stable over time but total health expenditure has risen dramatically and at a higher rate than for other children. The increases appear to be driven by increases in cost of pharmaceuticals, particularly ADHD pharmaceutical, the cost of hospital services and the volume of non-physician office-based visits. The increased in non-physician office-based visits may reflect the changing needs of children with mental health and developmental disorders. Efforts to understand whether the increase in cost and volume of services is associated with better-quality care and improved outcomes are critical to ensure a sustainable health system for the highest needs groups of children.

Gap in Funding for Specialist Hospitals Treating Patients with TSCI Under an Activity-Based Funding Model in New South Wales, Australia

PRESENTER: **Bharat Phani Vaikuntam**, The University of Sydney

AUTHORS: James Middleton, Patrick McElduff, John Walsh, Jim Pearse, Luke Connelly, Lisa Sharwood

Introduction

The competing demands of rising healthcare costs alongside the importance of optimising patient outcomes after injury, render efficient and cost-effective health care fundamentally important. Patients sustaining severe traumatic injuries have resource intensive complex needs, which are often underestimated by the Diagnosis-Related Group (DRG) based funding methods used in the health service models of many countries. However, if the DRG-based hospital funding insufficiently covers treatment costs, services may be limited to compensate for the gap in funding with reduced quality of care. This is particularly true in patients with acute Traumatic Spinal Cord Injuries (TSCI), timely appropriate care can prevent secondary complications and significantly improve long-term patient outcomes with reduced burden on health system. This study aims to quantify the gap in funding between actual treatment costs in acute care settings and the reimbursement received by hospitals under the current payment system.

Methods

Patients included in the study were aged 16 years or older with incident TSCI between June 2013 and June 2016 in New South Wales, Australia. Patients were identified from record-linked health data based on the TSCI-related ICD-10 AM codes within their hospital diagnosis. The acute care treatment costs were estimated at both the patient level and separation level; most index episodes comprising contiguous separations at different hospitals. The per separation costs enabled estimation of payment discrepancies at the hospital level. All costs were

estimated using two approaches; first using the hospital administrative cost data to estimate the costs incurred by the health service providers in a bottom-up costing approach. The second approach was based on the National Weighted Activity Units (NWAU) assigned to each Activity-Based Funding (ABF) activity. The scale of the funding gap was examined across the Australian hospital peer groups; and Specialist Spinal Cord Injury Units (SCIU) relative to or co-located with trauma centres, and general hospitals.

Results

534 patients with an acute incident TSCI from the record-linked data, accounting for 811 acute care treatment separations within their index episodes. For the 534 patients with TSCI, the total acute care treatment cost was estimated at $40.5 million (2016 $AUD); the median (IQR) per patient cost was $45,473 ($15,535–$94,612) using the DNR costing method. Using the NWAU costing method the total cost was $29.9 million; median (IQR) $37,999 ($15,502-$64,462). The mean and median gap in cost per patient estimated using the two approaches were $19,834 and $9,474 respectively. Comparing the actual costs with the funding provided to the public hospitals under an ABF model indicated a deficit between $9,756 - $21,000 per separation at the specialist and principal referral hospitals.

Conclusion

The findings of this study suggest a substantial gap in funding for resource intensive patients with TSCI in specialist hospitals under current DRG-based funding methods. Specifically, depending to the classification system, the principal referral hospitals, the SCIU co-located with a major trauma centre and stand-alone SCIU were under-funded by around 5.3 million dollars over the study period, whilst the other non-specialist hospitals were over-funded for the acute care treatment of patients with TSCI.

Changes in the Private Vs. Public Payment for Hospital Care in the U.S., 1996-2016

PRESENTER: **Thomas Selden**, US Agency for Healthcare Research and Quality

Hospital revenues in the United States totaled $1.1 trillion in 2017, comprising nearly one-third of total spending on health care. Given the magnitude of hospital spending, it is critical that U.S. policymakers understand the causes and the consequences of payment variation across payers, across hospitals, and over time. Following Paul Ginsburg (2010), several recent studies have shown evidence of large private-public payment differences that vary substantially both between and within markets. It is also now clear that private-public payment differences have changed substantially over time; Selden et al. (2015) showed that the average private-Medicare payment gap for standardized inpatient hospital stays grew from approximately 10 percent in 2000 to over 70 percent in 2012.

This paper uses data from the Medical Expenditure Panel Survey (MEPS) to extend the analysis of hospital payments in three directions. First, I present updated estimates, extending the Selden et al. analysis to 2016. Second, I apply the same methodology to examine standardized payment rates for emergency room visits and for outpatient visits. Third, nationally-representative evidence is also presented showing that hospital charges have grown even more rapidly than private payment rates.

Private-public payment rate differences widened substantial during the first decade after 2000, not just for inpatient care, but also for emergency room visits and for outpatient visits. More recently, however, some moderation or even reversal of these widening differences has occurred – especially when measured in percentage terms. A natural question is whether the private-public payment divergence since 2000 was due more to private insurance overpayment relative to cost or to underpayment on the part of Medicare and Medicaid. Evidence on hospital costs is examined to try to help answer this question.

Finally, the ratio of standardized charges to standardized Medicare payments rose steadily throughout the study period until 2012, when charges exceeded four times Medicare payment rates for inpatient stays, emergency room visits, and outpatient visits. After 2012 this ratio leveled off or modestly declined. While few insured patients pay charges, they can be highly relevant for patients who are uninsured or out of network and for some third-party payers who, for a variety of historical reasons, continue to reimburse providers on the basis of un-negotiated billed amounts.

The Incidence of Health Care Financing in the United States, 2005-2015

PRESENTER: **Thomas Selden**, US Agency for Healthcare Research and Quality

AUTHOR: Paul Jacobs

In 2016 the United States spent $3.5 trillion on health care. The many sources of this health spending include multiple public insurance programs, private employer-sponsored insurance, private individual coverage, and out-of-pocket payments, including those from the 10 percent (approximately) of the population under age 65 remaining uninsured as of that year. Compounding this complexity is the fact that each coverage type is generally financed in multiple ways. For instance, Medicare (for seniors and persons with disabilities) is financed through federal general revenues, a dedicated payroll tax, means-tested enrollee premiums, and patient cost sharing. Employer-sponsored insurance is financed with worker and employer premium contributions and with out-of-pocket payments – all of which are subsidized through the federal and state tax systems. Understanding the incidence of health care finance is important for sound policymaking in any country. This is all the more true in the U.S., given the intricacy of its financing system and given that it spends such a large share of GDP on health care. Nevertheless, the U.S. lacks a system for systematically tracking health care finance equity, and the two most recent U.S. finance equity analyses examined 1987 (Wagstaff et al. (1999)) and 2004 (Ketsche et al. (2011)).

We develop a system for tracking health care finance equity for the U.S. over time. Household data from the Medical Expenditure Panel Survey were supplemented with benchmarks from the National Health Expenditure Accounts, state and local government spending, tax simulations from National Bureau of Economic Research's TAXSIM model, and taxation benchmarks produced by the Congressional Budget Office using

Internal Revenue Service data on tax returns. We present incidence estimates for each year from 2005 through 2015. Employing a consistent methodology over time, we are better able to show how policy shifts have altered incidence.

As has been shown in all previous U.S. studies, health care finance was regressive as of 2005. The U.S. has long differed from most other OECD nations in this respect, reflecting its greater reliance on private health insurance and its lack of universal coverage. By 2015, however, incidence had shifted toward a proportional (flat) distribution of burdens, with some progressivity at the top of the income distribution. This shift was less about low-income or middle-income households paying a smaller share of income, and more about high-income households paying more, as health spending increased on average. The shift appears to have stemmed from a number of factors. Medicare coverage increased on both the intensive and extensive margins, with enrollment rising as the population aged and with cost-sharing declining due to the introduction of Medicare Part D drug coverage and the on-going expansion of Medicare Advantage managed care plans. On-going increases in Medicaid eligibility, including Affordable Care Act expansions in 2014 and 2015, also played a role, as did 2013 revisions to the federal tax code that increased taxes on high-income households. One large, but ultimately transient, contribution was the Great Recession, with its multi-year impacts on employment, household income, and employment-related insurance.

8:30 AM –10:00 AM TUESDAY [New Developments In Methodology]

Universität Basel | Kollegienhaus – Hörsaal 001

Developments in Research Methodology

SESSION CHAIR: **Manuel Gomes**, UCL

The Use of Data Combination for Small, Unrepresentative Survey Data: Simulation and Application of Misspecified Moment Condition Models

PRESENTER: **Mr. Adrian Rohit Dass**, University of Toronto

AUTHORS: Whitney Berta, Tyrone Perreira, Prof. Audrey Laporte

Survey data provides a rich source of information to test hypotheses in applied health economics research. These surveys are typically designed to be representative of the population, which implies that any observed economic relationships in the data can be extended to the population of interest. This is an extremely important feature as it is ultimately the population we are interested in and not the survey sample itself. Unfortunately, in applied research settings, surveys can be subject to low response rates which may limit their representativeness of the target population. Some survey datasets are supplied with weights that are designed to make them representative of the underlying population. These weights, however, may not adequately adjust for non-random missing patterns in the data. An active field of research in the econometrics literature is on the topic of data combination, which can involve the combination of marginal moments from a representative dataset, such as census or administrative data, with the biased survey data. This type of data combination can be used to reduce bias from mis-measured variables as well as for inference in small sample sizes. An important issue related to the data combination literature is the choice of estimator to combine the moments. Although the Generalized Method of Moments (GMM) estimator has traditionally been used to combine moment conditions, the two-stage GMM estimator requires the estimation of a first stage weighting matrix, which can be poorly estimated with a large number of moments. Generalized Empirical Likelihood (GEL) estimators bypass the need to estimate a first-stage weighting matrix and have smaller asymptotical bias than GMM. Despite this theoretical advantage, different GEL estimators may perform poorly when the survey population is not representative of the population. This paper performs Monte Carlo simulations to investigate the performance of GMM and various GEL estimators under different sampling schemes and combinations of population moments. We find that the Exponential Tilting (ET) estimator of the GEL family of estimators generally has better performance compared to GMM and other GEL (Empirical Likelihood & Exponentially Tilted Empirical Likelihood) estimators under all sampling schemes examined. An application investigating the determinants of wages of Health Support Workers (HSWs) using survey data collected in Ontario, Canada is presented. The results from ET suggest that the Mincer earnings function (wages as a function of schooling and experience) holds for HSWs in Ontario; unweighted results using Ordinary Least Squares do not. The econometric techniques presented in this paper may have useful applications for health economists working with survey data that is small and unrepresentative of the population.

Estimating Treatment Effects with Machine Learning: A Comparison of Approaches

PRESENTER: **Stephan Lindner**, OHSU

AUTHOR: John McConnell

Background: Machine Learning (ML) applications have a growing impact on the field of health economics. Until recently, most ML applications have focused on problems of prediction. However, recent developments in ML have put forth methodologies that expand the application of ML beyond predictive models into the realm of statistical inference, particularly in estimating treatment effects in cross-sectional data. The goal of this paper is to demonstrate the performance of methodologies that include ML algorithms to estimate average treatment effects in cross-sectional setting.

Study Design: We performed Monte Carlo simulations to assess the performance of several ML-based estimators, including Targeted Maximum Likelihood Estimation, Bayesian Additive Regression Trees, Causal Random Forests, Double Machine Learning (DML), and Bayesian Causal Forests. We constructed a flexible data generating process that allowed for systematically varying the amount of confounding between covariates, outcome, and treatment; the number of covariates; and the number of observations. We also tested the relative importance

of parameters specific to the DML method. In all tests, we assessed estimator bias, root mean squared error, mean absolute deviation, and 95% CI coverage rates. We also illustrate the performance of alternative methods using data on the effects of right heart catheterization.

Results: In models with significant confounding, ML-based algorithms generated estimates with smaller bias than the standard linear regression method. In some scenarios, the improvement from ML approaches was substantial (40-98%). With a smaller number of covariates, Bayesian Causal Forests was often the top perfomer, while Double Machine Learning fared better with large (>500) sets of covariates.

Conclusions: ML-based methods are promising methods for estimating treatment effects, allowing for the inclusion of many covariates and automating the search for non-linearities and interactions among variables. Our analyses provide guidance for researchers interested in implementing these tools in their own empirical work. Overall, the ability to expand the tools of ML into the area of treatment effects and statistical inference should be relevant to a large range of health economics research.

A Decision Theoretic Approach to Panel-Based, Pre-Emptive Genotyping

PRESENTER: **Dr. Jonathan Schildcrout**, Vanderbilt University

AUTHORS: Yaping Shi, Shawn Garbett, Zilu Zhou, John Graves, Dr. Josh Peterson

We discuss a decision-theoretic approach to building a panel-based, pre-emptive genotyping program. The method is based on findings that a large percentage of patients are prescribed medications that are known to have pharmacogenetic associations, and over time, a substantial proportion are prescribed additional such medication. Pre-emptive genotyping facilitates genotype guided therapy at the time medications are prescribed; panel-based testing allows providers to reuse previously collected genetic data when a new indication arises. Because it is cost-prohibitive to conduct panel-based genotyping on all patients, we describe a three-step approach to identify patients with the highest anticipated benefit. First, we construct prediction models to estimate the risk of being prescribed one of the target medications using readily available clinical data. Second, we use literature-based estimates of adverse event rates, variant allele frequencies, secular death rates, and costs to construct a discrete event simulation that estimates the expected benefit of having an individuals' genetic data in the electronic health record after an indication has occurred. Finally, we combine medication prescription risk with expected benefit of genotyping once a medication is indicated to calculate the expected benefit of pre-emptive genotyping. For each patient-clinic visit, we calculate this expected benefit across a range of medications and select patients with the highest expected benefit overall. We build a proof of concept implementation using a cohort of patients from a single academic medical center observed from July 2010 through December 2012. We then apply the results of our modeling strategy to show the extent to which we can improve clinical and economic outcomes in a cohort observed from January 2013 through December 2015.

Predicting Fixed Effects in Panel Probit Models, with an Application to the Determinants of Doctor Visits

PRESENTER: **Rainer Winkelmann**

AUTHORS: Dr. Johannes Sebastian Kunz, Kevin Staub

This paper presents a method to estimate and predict fixed effects in panel probit models when the individual dimension N is large and the time dimension T is small. One purpose of estimating the fixed effects is that they can be used to predict outcome probabilities. Fixed effects can also serve to rank individuals, or to group them into "high", "middle", "low" prevalence categories, or to use them in further correlation analyses.

Existing methods for estimating binary response models with fixed effects have a number of shortcomings. OLS estimates from linear probability models do not guarantee that outcome probabilities lie in the unit interval. If these probabilities represent a propensity score, for instance, propensity score weighting and other procedures require that probabilities lie strictly within the unit interval, which makes the use of OLS estimates problematic. Predictions based on maximum likelihood estimates of nonlinear models can likewise be problematic. In short panels, there are typically many units with identical responses in all time periods. For those units, maximum likelihood predictions are exactly zero or one, and thus not strictly in the unit interval. As we show analytically, the proposed method, based on bias-reduced maximum likelihood estimation, does not suffer from this problem. By exploiting cross-sectional information, it always delivers predictions that are strictly bounded away from zero and one. We further show in a variety of simulation settings that the proposed estimator turns out to perform surprisingly well also on other dimensions, such as the estimation of slope parameters and marginal effects.

We apply the estimator to predict period-specific fixed effects for the extensive margin of health care utilisation (any visit to a doctor during the previous three months), using German data for 2000-2014. We split the observation period into three five-year intervals, and obtain three separate predictions of fixed effects for each individual. One goal of the analysis is to use these predictions to assess their stability over time and their predictive ability in other health care utilisation dimensions, e.g., the probability of hospitalization in later years. Individuals without variation in the outcome - who complicate the analysis with the existing methods - represent from 29 to 46 per cent of the estimation sample, depending on the specification. Our findings document the markedly different shape of the distribution of fixed effects for males vs. females, while also indicating that these distributions are remarkably stable over time. We show that the percentile rank of the fixed effects is strongly predictive of future hospitalization, especially for women.

Using Nominal Group Technique to Better Inform Discrete Choice Experiments for Complex Population Health Intervention Design: A Case Study in Cycling

PRESENTER: **Camilla Somers**, Health Economics and Health Technology Assessment (HEHTA), University of Glasgow

AUTHORS: Cindy M Gray, Greig Logan, Hayley Connell, Graham Baker, Paul Kelly, Chloë Williamson, Sarah Broadfield, Allison Cole, Jason Gill, Emma McIntosh

Background: Discrete choice experiments allow researchers to elicit preferences for market goods or services that currently do not exist or when revealed preference data is unavailable. The methodology moves away from the assumption of goods or services being objects of utility, instead assuming that utility is derived from their attributes (features). Therefore, discrete choice experiments offer a unique opportunity to understand, through careful design, the value of potential intervention (as a good/service) attributes and their relative importance to one another prior to investment in their development and roll-out. However, key to their success is the identification of appropriate attributes. Nominal group technique is a consensus building focus group methodology that has gained popularity for attribute identification due to its speed and because participants must distil and prioritised information helping create a less cognitively burdensome discrete choice experiment. This study demonstrates the potential of nominal group technique to inform the initial stages of a project seeking to design interventions to increase cycling participation in adults. The project is in collaboration with a major UK bank and in partnership with British Cycling UK.

Methodology: Nominal group technique has five stages: idea generating (participants list all important attributes that would encourage them to cycle), round robin (attributes revealed to the group), attribute clarification (group agrees a definition for each attribute), silent ranking (participants rank the attributes silently) and group voting (participants publicly vote their top six attributes). The silent ranking and group voting scores are each cumulatively summed to identify those top ranked attributes across both tasks. Iterative thematic analysis of the transcripts was conducted to highlight common attribute themes across the groups. A discrete choice experiment will then be conducted online with HSBC employees in February 2019 to identify the optimal intervention scenarios and designs to be taken forward.

Results: Six nominal group technique focus groups were conducted in September/October 2018 with bank employees (n=32). Across the focus groups, five highly ranked attribute themes for consideration in future interventions were identified: provision of suitable workplace facilities for changing and bike storage; importance of social elements (such as cycling buddy schemes); need for education and training to inform new cyclists, build confidence and improve practical ability; provision of health awareness and performance tracking solutions; and need to overcome financial barriers which could occur with incentives or discounting.

Conclusion: This study demonstrates the use of nominal group technique for discrete choice experiments as a means for informing the design of future interventions. Through identification of prioritised attributes, nominal group technique provides clear guidance for the discrete choice experiment design. Importantly, it has validated the inclusion of a financial payment vehicle which will enable trade-offs for attribute levels to be calculated. Furthermore, through the application of mixed logit and interaction models, the discrete choice experiment will provide intervention development team with clear indication of how socio-demographic characteristics could impact the effectiveness of the intervention, thus creating more nuanced intervention designs.

An Approach to Improve the Validity of the AUI Assumption of the QALY Model

PRESENTER: **Afschin Gandjour**

Background/aim: When quality-adjusted life years (QALYs) are used to assess health profiles with varying health states, the condition of additive utility independence (AUI) must be satisfied. AUI stipulates that the utility of a health status in one period is independent of the health status in all other periods. Yet, uncertainty with respect to future health consequences as well as sequence effects can cause a violation of this assumption. The purpose of this study is to present a novel approach of eliciting preferences for health that potentially satisfies AUI.

Methods: A conceptual framework for eliciting health state preferences obeying the AUI assumption is developed. It is inspired by insights from the field of psychology and exploits the fact that uncertainty with respect to future health consequences can lead to anxiety whereas consideration of past health can lead to depression. Hence, states of anxiety and depression can lead to violation of AUI. A systematic literature was conducted in PubMed and Google Scholar to examine whether and to what degree states of anxiety and depression have been incorporated in empirical studies testing AUI.

Results: The literature search suggests that AUI has not been tested so far considering anxiety and depression . The suggested approach acknowledges heterogeneity in individual preferences for health. Four types of individuals are identified: The first type lives in the present moment and is not concerned about the future or the past. Hence, this individual does not violate AUI by definition. The second type anticipates the future health profile and its associated risk, whereas the third ruminates about the past, and the forth does both. Therefore, anxiety, depression, or both are displayed by the second, third, and forth type, respectively. Given this distinction, a two-step procedure is suggested where preferences for health states are elicited separately for each type of individual via health state descriptions. By including anxiety/depression along with the underlying health problem, combined health states are assessed. In a second step preferences are aggregated using population shares.

Conclusions: In order to satisfy the AUI condition of the QALY model, this paper suggests to accommodate heterogeneity of preferences and elicit them in a two-step procedure, based on combined health states including anxiety, depression, or both. While the approach does not rule out anticipatory feelings/rumination in individuals not suffering from a discernable anxiety/depression, cases of severe violation are accounted for. Noteworthy, the procedure is implicitly considered in indirect methods of utility elicitation that have an anxiety/depression dimension such as the EuroQol five-dimensional questionnaire.

8:30 AM –10:00 AM TUESDAY [Specific Populations]

Universität Basel | Kollegienhaus – Hörsaal 102

Costs and Outcomes in Specific Populations

SESSION CHAIR: **Nancy Breen**, National Institutes of Health

Socioeconomic Inequality in Relation to Systolic Hypertension, Its Depth and Severity in South Africa

PRESENTER: **Tryphine Zulu**, Government Employees Medical Scheme

AUTHOR: John Ataguba

Background

High blood pressure is a major risk factor for non-communicable diseases notably coronary heart disease and ischemic as well as haemorrhagic stroke and remains the leading cause of mortality associated with NCDs. Therefore, treating blood pressure to less than 140/90 mmHg is associated with a reduction in cardiovascular complications. Further, studies have confirmed a J-shaped relationship between blood pressure and mortality with increased risk at low blood pressures and greater mortality risk beginning at “normal” blood pressure of 140/90mm Hg. The risk of cardiovascular disease doubles with each increment of 20/10 mmHg of blood pressure, starting from as low as 115/75 mmHg. Consequently, treating hypertension as a binary outcome by focusing only on status ignores the differential impact of a blood pressure of 20/10 mmHg vs 10/5mmHg above the threshold. Therefore, this paper borrows from the poverty literature to assess inequality with respect to status, depth and severity of systolic hypertension.

Methods

We used data from the fourth wave of the South African National Income Dynamics Study (NIDS) to examine socioeconomic inequality in respect to systolic hypertension status, depth and severity with a threshold of systolic blood pressure of 140mmHg. We combine the concentration index and the Foster-Greer-Thorbecke metric to gain further insights into the relationship between these variables and socioeconomic status using the equivalised household expenditure as the ranking variable for socioeconomic status. We also employ decomposition analysis to explain the factors that drive the inequalities in these variables.

Results

The average systolic blood pressure for the NIDS population is 120.25 mmHg with a range of 67-233 mmHg. While the prevalence of hypertension is pro-rich, its depth and severity are significantly pro-poor. The concentration index for hypertension status is 0.103 whilst the CI for severity and depth is -0.023 and -0.048 respectively. With respect to hypertension status, BMI is the single biggest contributor (98%) to the observed pro-rich inequality. The socioeconomic inequalities in relation to severity and depth of hypertension are driven mostly by racial inequalities. African males and African females are concentrated amongst the poor (CI= -0.061 and CI=-0.281 respectively),and they are more likely to have more severe hypertension than the richer non-Africans with an elasticity of 0.302 for African males and 0.291 for females.

Conclusion

The poor are less likely to be hypertensive in comparison to the rich, however, when they are, they are likely to suffer more severe hypertension than the hypertensive rich. This means the hypertensive poor are uncontrolled- an interplay of late diagnosis, poor access to treatment and non-adherence to care. The findings also show that the magnitude of income-related inequalities in hypertension and their determinants differ between status and its severity and depth. This variation should be taken into consideration in population interventions aiming to prevent inequalities in hypertension. The main drivers of the inequality are obesity and race. Therefore, without addressing the root causes of socioeconomic inequalities such as the structural disadvantage for Africans compared to non-Africans in relation to access to optimal and effective hypertension care, the health inequalities will endure.

Socio-Economic Inequality and Horizontal Inequity in the Uptake of Screening Tests for Non-Communicable Diseases in South Africa

PRESENTER: **Tryphine Zulu**, Government Employees Medical Scheme

AUTHOR: John Ataguba

Introduction: Despite the known economic and patho-physiological impact of NCDs, levels of undiagnosed disease remain very high globally. It is estimated that 50% of people with diabetes are not aware of their status and about 20-30% present with complications at diagnosis. In South Africa, 50-85% of people with diabetes, particularly in rural areas, remain undiagnosed. Delays in diagnosis result in patients presenting at an advanced stage of disease, incurring costly and sometimes debilitating complications. This is further exacerbated by the lack of coherent screening programmes for NCDs in many developing countries including South Africa. This study aims to assess and decompose inequality in relation to the use of screening tests using age-based eligibility criteria for hypertension, diabetes and cholesterol using data collected during the first South African National Health and Nutrition Examination Survey.

Results: On average, uptake of screening tests is highest for diabetes (45% of the eligible population) compared to hypertension and hypercholesterolemia (42% and 19% respectively). There is pro-rich inequality for all screening services with a concentration index of use

ranging from 0.07 to 0.32. This is most pronounced for cholesterol screening with a horizontal equity index of 0.118 followed by hypertension and diabetes (HI=0.035 and 0.037 respectively). Non-need factors drive most of the observed inequality. Education, wealth, health, insurance and province of residence are the most prominent. Racial disparities are also evident and significant particularly for cholesterol testing where white respondents are 101% more likely to undergo the test compared to Africans. As expected, health insurance has a strong positive association with uptake of screening tests- this is most prominent for cholesterol -102% higher than those without medical insurance.

Conclusion: The uptake of the screening is highest for diabetes compared to either hypertension or cholesterol because the eligible population is older on average. Therefore, it is expected that as uptake of any screening tests increases with age, this is more likely to be in favour of diabetes compared to the other two tests. However, coverage of screening services is suboptimal (<50%) for all screening services including hypertension which should be done routinely and be easily available at low cost or free of charge. Therefore the policy focus should be on both the demand and supply side interventions. On the demand side, education and awareness programs are likely to improve access by sensitising people to the need for screening. Therefore, inter-sectoral collaboration is required to reduce the socioeconomic inequality in screening for NCDs. On the supply side, health insurance is a major determinant of screening however, it is only available to about 16% of the population. Therefore, screening services should be intensified in the public sector primary health care clinics where service are available free of charge and where the majority of South Africans access health care. Focusing efforts in the public sector would improve coverage for the rural folk, the uninsured and the unemployed because the face of the unscreened is mainly black, poor, rural, male, unemployed and uninsured.

Choice of Statistical Model for Estimating Health State Utility for Economic Models: A Case Study Using Quality of Life Data from Individuals at High Risk for Diabetes

PRESENTER: **Frauke Becker**, University of Oxford

AUTHORS: Talitha Feenstra, Eva Pagano, Jose Leal

Background

The preferred outcome measure in economic evaluations is the quality-adjusted life year (QALY) which is obtained by multiplying the quality weight of a health state by the time spent in that state. Utility data from preference-based health-related quality of life (HRQoL) instruments, such as the EQ-5D, are typically non-normal, left-skewed, multi-modal, truncated at 1 (full health), with 0 representing dead, and negative values representing states worse than death. Hence, ordinary least squares (OLS) regression may not be appropriate for analysing HRQoL data. Alternative analytical methods have been proposed, including generalized linear models (GLM), Tobit models, two-part models, and finite mixture models.

We explore the impact of the choice of the statistical model, using as a case study the estimation of the utility of three health states: normal glucose tolerance (NGT), prediabetes and diabetes. We use cross-sectional EQ-5D data from a cohort of individuals at high risk of diabetes or with diabetes. We assess the impact of the estimators using different goodness of fit measures. The rationale for the work is the need to inform a decision model evaluating the cost-effectiveness of interventions in prediabetes populations.

Data

ADDITION-PRO is a population-based, longitudinal data cohort study of individuals at high risk of diabetes recruited in Danish general practice between 2001 and 2006. Between 2009-2011 all individuals with impaired glucose at screening, those who developed diabetes following screening, and a random sub-sample of those at lower levels of diabetes risk were invited to attend a follow-up health assessment. 2,098 individuals attended the assessment. We estimated EQ-5D-3L utility scores using the English tariff. Individuals were classified as NGT, prediabetes and diabetes using the 2015 classification of the American Diabetes Association, complemented with diabetes diagnosis as identified at the health assessment.

Methods

Different types of regression models, accounting for individual characteristics (age, gender), estimated the association between HRQoL utility and the three glucose health states for mean EQ-5D (OLS, tobit, and GLM with family(gamma) and link(log)) or considering two classes within the EQ-5D distribution (two-part logit and GLM, and finite mixture model). Goodness of fit was assessed using mean square error, root-mean square error, Hosmer and Lemeshow test, and the Pearson correlation.

Results

The mean EQ-5D score in the sample population was 0.857 (SD: 0.174), the median 0.848 (IQR: 0.760, 1). Almost half of the sample (47%) reported perfect health with an EQ-5D score of 1. Results were similar for the two-part and finite mixture models where women with NGT had an EQ-5D score that was 0.040-0.042 higher compared to prediabetes women, while women with diabetes had an EQ-5D score that was 0.049-0.050 lower. Differences estimated by means of OLS, Tobit, and GLM ranged between +0.033 (Tobit) to +0.051 (GLM) for women with NGT and -0.034 (Tobit) to -0.058 (GLM) for women with diabetes. Estimates for men were smaller in all models.

Conclusions

The choice of the statistical model had an impact on the derived health states utilities. Models considering different classes within the EQ-5D distribution were found to be more consistent with each other.

Development of a User-Friendly Multi STI Modelling Software: Working with Decision Makers.

PRESENTER: **Fabian Sailer**

AUTHORS: Greta Rait, John Saunders, Rachael Hunter

Introduction Sexually transmitted infections (STIs) are often asymptomatic, but can have serious long term consequences, which may result in a significant burden to health care systems. Many disease models exist which examine the cost-effectiveness of screening and treatment interventions for single STIs.

Problem 1 Co-infection with more than one STI is possible. Considering this within disease models may have an impact on the cost-effectiveness of interventions. For example, an intervention which increases condom use, may be too expensive to be cost-effective when looking at only one STI. But the same intervention, without additional costs, will also decrease the incidence of other STIs and therefore have a greater impact in a multi STI model and may be cost-effective.

Problem 2 Most STI models have complicated user interfaces and therefore need modelling experts to input and use them. This makes them inaccessible to people who make policy and planning decision (decision makers). Involving decision makers in the development of the models could increase their use in policy and planning decisions.

Methods We developed an easy-to-use multi-STI modelling software for a United Kingdom (UK) setting. The software was developed in Java. Future users, specifically decision makers, decided which STIs to include in the model. Disease models were developed based on literature reviews, which were subsequently refined by consulting STI experts.

Future users developed the user interfaces for the software, using paper prototypes, wire-framing and “think aloud” techniques. These user interfaces were then connected to the disease models.

Results The software simultaneously simulates individual-based *Chlamydia*, *Gonnorhoea, Syphilis* and *HIV* infections with a discrete event simulation approach. All STIs and sequelae considered in the modelling software are represented by separate sub-models, which interact with each other.

All sub-models are flexibly designed. This enables users of the modelling software to adapt parameters, formulas, interactions, and the structure of sub-models if changes in medical knowledge occur.

Each sub-model is connected to a treatment pathway, which reflects the current standard of care for this specific STI. Some of these pathways are interlinked, e.g., a positive test for one STI will yield testing for other STIs. These pathways describe the overall care process, which may include, depending on the STI, opportunistic screening, testing, prophylaxis, treatment, and partner notification. Users are able to assign costs and utilities to health states and events, such as treatments, to perform health economic analyses.

Future users identified the most relevant parameters in the model, which can be changed easily by a user friendly graphical user interface.

Internal and external validation methods have been used to successfully validate the diseases models and the software.

Discussion We developed a multi-STI modelling software that is specifically designed to support decision makers and allows them to examine interactions between different STIs. The agile development process, which included future users of the tool, ensured that the modelling software is fit for purpose.

This modelling software does not replace more sophisticated and detailed disease models, which are still necessary for further examinations.

HIV and the Growing Health Burden from Noncommunicable Diseases in Botswana: Modelling Study

PRESENTER: **Dr. Markus Haacker**, Harvard T.H. Chan School of Public Health

AUTHORS: Rifat Atun, Till Bärnighausen

The “greying of AIDS” – the aging of the population living with HIV owing to antiretroviral treatment, and the emergence of age-related non-communicable diseases (NCDs) – has been well documented. The emerging health systems challenges – including the implications of HIV on the disease burden from NCDs on the population level, and the evolving role of HIV as a co-morbidity or co-existing disease of various NCDs – are less well understood. The paper addresses these challenges through a quantitative analysis of HIV-NCD interactions for Botswana.

We project the prevalence of HIV and of a broad range of NCDs in Botswana, by sex and 5-year age bracket, blending HIV-specific and demographic projections obtained from Spectrum software and workfiles, and estimates of the prevalence of NCDs from the GBD 2017 estimates. (The demographic projections embodied in Spectrum in turn draw on the UN World Population Profile 2017.) As a default, it is assumed that prevalence of HIV, and of the various NCDs, are uncorrelated (controlling for sex and age), and that sex- and age-specific prevalence of NCDs remain constant. Our results are robust to alternate specifications, e.g., extrapolating on trends in sex- and age-specific prevalence of NCDs, or considering direct effects of HIV on the prevalence of selected NCDs.

We find that HIV has slowed down population aging and growth in the burden of most NCDs (those which become more common in old age) because cohorts reaching old age have been decimated by AIDS-related mortality. This factor will be reversed from about 2030, as cohorts reaching old age then increasingly benefit from the scaling-up of treatment from the early 2000s, and the growth in the burden of NCDs consequently accelerates.

While headline HIV prevalence declines, the health needs of people living with HIV will become more complex, with increasing prevalence of NCDs and multi-morbidities – in this regard our findings mirror the literature on the "greying of AIDS." In addition, we find that – because of the aging of the population living with HIV – HIV prevalence among populations affected by NCDs is largely disconnected from overall population trends. E.g., HIV prevalence among the population at ages 15+ declines by 40 percent between 2015 and 2040 (from 15.9 percent to 10.2 percent), it increases by 50 percent among populations affected by cardiovascular diseases (from 19.9 percent to 29.9 percent), and remains nearly constant among the population affected by diabetes mellitus (declining from 25.6 percent to 24.0 percent). I.e., while headline HIV prevalence declines, HIV will play a persistent and, for some NCDs, increasing role in the growing burden from NCDs over the next decades.

We conclude that health systems challenges posed by the aging HIV population transcend and are more complex than described in the literature on the "greying of AIDS." Past AIDS-related mortality slows down increases in the burden of NCDs at present, but accelerates it over the coming decades. And even where headline HIV prevalence declines, HIV will be a persistent or even increasing aspect of the growing NCD burden.

The Excess Costs of Depression: A Systematic Review and Meta-Analysis

PRESENTER: **Hannah König**

AUTHORS: Dr. Hans-Helmut Koenig, Dr. Alexander Konnopka

Objective: Depressive disorders show a high prevalence in the population worldwide and are among the leading causes for the global disease burden. This systematic review and meta-analysis aimed to provide a global overview of cost-of-illness studies of depression and to assess the excess costs of depression quantitatively.

Methods: We conducted an unlimited literature search of English or German full-text peer-reviewed articles in PubMed, PsycINFO, NHS Economic Evaluation Database and EconLit until 27/04/2018. Additional relevant studies were identified in reviews and references of selected articles. Inclusion criteria were fulfilled by bottom-up studies that compared mean excess costs of depressed and non-depressed in adolescents, adults or elderly, and participants with primary diagnosis of a somatic disease. Participants with other mental diseases were excluded since we focused on major depressive disorders. Data extraction was double checked and authors contacted in case of missing data. Ratio of means (RoM), interpretable as the percentage change of mean costs of depressed compared to non-depressed, was chosen as effect measure for meta-analysis. We used the I^2 statistic as measure of heterogeneity.

Results: We screened 393 of 12,760 identified articles in full-text, of which 48 were included in the systematic review and meta-analysis. Of these, excess depression costs in adolescence were assessed in two articles, excess depression costs in adulthood in 20 articles, excess depression costs in elderly in 12 articles and excess depression costs among participants with primary diagnosis of somatic disease in 16 articles. Pooled total direct excess costs of depressed versus non-depressed were 179% higher in adolescents (RoM=2.79 [95% CI 1.69–4.59], $p<0.0001$, $I^2=87\%$), 158% higher in adults (RoM=2.58 [95% CI 2.01–3.31], $p<0.0001$, $I^2=99\%$), 73% higher in elderly (RoM=1.73 [95% CI 1.47–2.03], $p<0.0001$, $I^2=73\%$) and 39% higher in participants with depression as comorbidity (RoM=1.39 [95% CI 1.24–1.55], $p<0.0001$, $I^2=42\%$). Pooled total indirect excess costs of depressed versus non-depressed were 128% higher in adults (RoM=2.28 [95% CI 1.75–2.98], $p<0.0001$, $I^2=74\%$).

Discussion: This work is the first global systematic review of cost-of-illness studies for depression with a meta-analytic approach. The pooled results showed that total direct and indirect costs were significantly higher in depressed versus non-depressed in all age groups and participants with depression as comorbidity of a primary somatic disease. The difference in excess costs between depressed and non-depressed was highest in adolescents and did then decrease with age. As compared to all age groups, pooled RoM of participants with depression as comorbidity of a primary somatic disease was much lower. One limitation of our work was that many cost-of-illness studies were ineligible, because we focused only on bottom-up studies with a comparison group. Moreover, the I^2 statistic indicated high heterogeneity in direct excess costs. Future research of cost-of-illness studies for depression should focus on generating more evidence in adolescence and for indirect costs.

8:30 AM –10:00 AM TUESDAY [Economic Evaluation Of Health And Care Interventions]

Universität Basel | Kollegienhaus – Seminarraum 103

Economic analyses: Cost Effectiveness Applications

SESSION CHAIR: **Elisabeth Fenwick**, Pharmerit International

Potential Impact and Cost-Effectiveness of Bi-Valent Human Papillomavirus (HPV) Vaccination for Girls Aged 9 Years in Afghanistan

PRESENTER: **Palwasha Anwari**, Self-employee

AUTHORS: Mr. Frederic Debellut, Najibullah Safi, Clint Pecenka, Andrew Clark, Elisabeth Vodicka

Introduction: Primary prevention through HPV vaccination is available but has not been introduced in many South-Central Asian countries, including Afghanistan, despite the sub-region having the highest incidence rate of cervical cancer. This study estimates the potential impact and cost-effectiveness of HPV vaccination in Afghanistan to inform decision making for introduction. Method: The UNIVAC model was used to estimate the lifetime costs and health outcomes of vaccinating with the bivalent HPV vaccine a single cohort of girls (2009 birth cohort) aged 9

years in 2018. We ran scenarios with and without a catch-up campaign for girls aged 10 to 14 years. Input parameters were based on local sources, published literature or assumptions when no data was available. The analysis did not include screening or treatment for pre-cancerous cervical lesions. The primary outcome measure was the discounted cost per disability adjusted life year (DALY) averted, explored from the government and societal perspectives over the lifetime horizon. The comparator was the current status quo, assuming no change in cervical cancer screening and treatment over time. Results: We projected that vaccinating a single cohort of 9-year-olds against HPV in Afghanistan would avert nearly 2,000 cervical cancer cases, 1,000 hospitalizations and more than 1,500 deaths over the lifetime of the cohort. Vaccinating the same cohort and adding catch-up vaccination of 10 to 14-year-old girls would avert approximately 8,000 cervical cancer cases, 4,000 hospitalizations and 7,000 deaths. The HPV vaccine would avert millions in health care costs, entirely supported by Afghan households. From the government perspective, HPV vaccination in Afghanistan is anticipated to yield an ICER below the per capita GDP. The annual cost to implement a HPV vaccination program would represent a small percentage of the country's total immunization budget for 2018 and the total health expenditures. Conclusion: In Afghanistan, HPV vaccine introduction is likely to be cost-effective from the government perspective, with additional health benefits generated by a catch-up campaign.

Cost-Effectiveness of Initiating Pharmacological Treatment in Stage One Hypertension Based on 10 Year Cardiovascular Risk

PRESENTER: **Margaret Constanti**

Objectives: To evaluate at what 10-year cardiovascular risk threshold it is cost-effective to initiate antihypertensive drug treatment in people with stage one hypertension (140-159 mmHg systolic blood pressure), who do not have target organ damage, established cardiovascular disease, renal disease or diabetes mellitus.

Methods: Antihypertensive drug treatment for individuals at high cardiovascular risk has been shown to be highly cost-effective due to the reduction in cardiovascular events and relatively low cost of treatment. However, there remains debate as to its effectiveness and cost effectiveness in people with stage one hypertension, and also at different cardiovascular risk levels within this population. A lifetime Markov model was undertaken from a UK NHS perspective comparing antihypertensive drug treatment versus no antihypertensive drug treatment in a population with stage 1 hypertension. Treatment was defined as a medication from one of the 'A, C, D classes'. The base case age was 60, and the model was run separately for men and women. The comparators were compared in the following 10-year QRISK2 cardiovascular risk subgroups of: 5%, 10%, 15% and 20%. Minimum plausible QRISK2 risk levels were calculated for each age and gender group using a systolic blood pressure of 140 mmHg and a low total to HDL cholesterol. Health states included six non-fatal cardiovascular states: stable angina, unstable angina, myocardial infarction, transient ischaemic attack, stroke and heart failure. The interventions were compared in terms of lifetime costs (costs of the cardiovascular events, drug treatment, monitoring, and adverse events), quality adjusted life years, and cost-effectiveness. The model was also run for age groups of 40, 50, 70, and 75 years.

Results: In the base case age group, treatment was cost effective in the 10% risk subgroup, with ICERs between £9,500-£11,000, depending on sex. This result was found to be robust in the probabilistic and deterministic sensitivity analyses tested. The results were very sensitive to treatment effect. In younger age groups, treatment was cost-effective at the lowest risk subgroup but only cost-effective for higher risk subgroups in older age groups. The minimum plausible risks were compared to threshold risk levels identified in the model for each age group and gender, based on the NICE willingness to pay threshold of £20,000 per QALY, and treatment was found to be cost-effective for all men regardless of age, and for all women >60 years, as in these groups the risk thresholds from the model were lower than the minimum QRISK2 risk score possible for the respective ages and genders.

Conclusions: Initiating treatment in stage one hypertension for people aged 60, was found to be cost-effective regardless of 10 year cardiovascular risk. For other age groups, it was also cost-effective to treat regardless of risk with the exception of younger women.

Clinical and Cost-Effectiveness of the Managing Agitation and Raising Quality of Life in Dementia (MARQUE) Intervention for Agitation Symptoms in People with Dementia in Care Homes: A Single-Blind Cluster Randomised Controlled Trial

PRESENTER: **Monica Panca**

AUTHORS: Gill Livingston, Julie Barber, Louise Marston, Aisling Stringer, Claudia Cooper, Anne Laybourne, Francesca LaFrenais, Suzanne Reeves, Monica Manela, Kate Lambe, Sube Banerjee, Penny Rapaport, Rachael Hunter

OBJECTIVES:

To evaluate the cost-effectiveness of delivering the MARQUE (**M**anaging **A**gitation and **R**aising **QU**ality of Lif**E**) intervention in an eight-month parallel-group, superiority, cluster-randomised controlled trial, compared to treatment as usual (TAU).

METHODS:

The cost of the MARQUE intervention included the cost of training the therapists, and the cost of delivery of the intervention.

Data regarding healthcare service use and prescriptions were collected at baseline and 8 months asking about the previous 4 months. Unit costs from published sources were attached to each resource item. The economic analysis was from the healthcare cost perspective.

Quality adjusted life years (QALYs) using the EQ-5D-5L were calculated as the area under the curve adjusting for baseline differences over 8 months in the intervention compared to the TAU group.

We used multivariate imputation by chained equation for missing data, generating 20 imputed data sets. For each data set we ran 1,000 bootstrap replications using non-parametric bootstrapping; results were combined to calculate the mean values for costs and utilities and the standard errors around the imputed values, used to calculate 95% CI around point estimates.

We calculated the incremental cost per QALY and the probability of cost-effectiveness of MARQUE intervention versus TAU for a range of values of willingness to pay (WTP) for a QALY gained.

We conducted a sensitivity analysis including the cost of intervention for all residents living in intervention homes as the intervention was delivered to staff and therefore affected the whole care home.

RESULTS:

Mean total cost per resident in the intervention group, including the cost of the MARQUE intervention, was £1,379 (95%CI £1,041 to £1,718), compared with £1,175 (95% CI £917 to £1,433) in the control group, generating a mean difference of £204 (95% -£215 to £623; p-value= 0.320)

Non-parametric bootstrapping after multiple imputation produced 0.346 (95%CI 0.330 to 0.362) QALYs in the intervention group and 0.332 (95%CI 0.322 to 0.342) QALYs in the control group, generating a mean difference of 0.015 QALYs (95%CI -0.004 to 0.034; p-value= 0.127).

Combining the difference in costs and difference in QALYs, the mean incremental cost per QALY gained of the MARQUE intervention compared to TAU is £14,064.

Including all residents living in care homes allocated to intervention (N=282), the cost of MARQUE intervention per resident become £147 (£41,510/282). The mean total cost per resident in the intervention group would decrease to £ 1,307 (95%CI £968 to £ 1,646); still higher than in control group (£1,175). The mean difference in cost between groups was £132 (95%CI -£287 to £ 551; p-value=0.518). Combining difference in costs and QALYs gives an ICER of £9,078.

DISCUSSION:

Our economic analyses showed that although the mean incremental cost per QALY gained of £14,064 is below the NICE threshold, it has a low probability (62%) of being cost-effective at a WTP of £20,000 per QALY due to the wide confidence intervals for costs and QALYs. The results are heavily driven by assumptions about the cost of the intervention, as shown by the sensitivity analysis of a lower cost for the intervention.

Cost Effectiveness of a Fully Self-Guided Internet-Based Intervention for Sub-Clinical Social Anxiety Symptoms in the UK

PRESENTER: **Dr. Yaling Yang**, Nuffield Department of Primary Care Health Sciences

AUTHORS: John Powell, Helen Atherton

Background: Social anxiety disorder is one of the most common mental disorders with a 1-year prevalence of 4%-6% and a lifetime prevalence of up to 12%. Social anxiety is characterised by an intense and persistent fear of being negatively evaluated in social or performance situation and are often not recognized and treated. E-Couch is an online tool-kit of self-directed modules covering common mental health problems including social anxiety and generalised anxiety developed by researchers at the Australian National University. A large scale pragmatic randomised controlled l trial of a fully self-guided internet based intervention versus a waiting list control for sub-clinical social anxiety symptoms was conducted in the UK. This study aims to report economic evaluation of the intervention on the basis of this trial.

Methods: Eligible participants were recruited from the UK general population using direct-to-consumer advertisement placed on national webpages. Participants were asked to report key health service and social care utilisation data at baseline, 6 weeks, 3 months, 6 months and 12 months. Productivity loss data due to social anxiety symptoms have also been collected. Unit costs for service utilisation were derived from standard national sources. The cost of developing, delivering and maintaining the online intervention was estimated. Health status was measured at all time points using the SF-36, converted into SF-6D health utilities using established UK-based utility algorithms. Quality-adjusted life years (QALYs) were calculated by combining both the health utility and the time duration using the under the curve approach. The results of the economic evaluation will primarily be expressed in terms of incremental cost per QALY gained between the intervention and control. Non-parametric bootstrap estimation will be used to calculate 95% confidence intervals for mean difference of cost and QALYs between the trial groups, and incremental cost-effectiveness ratios. Sensitivity analyses will explore the implications of uncertainty on the incremental cost-effectiveness ratios and will consider the broader issue of the generalisability of the results.

Preliminary results: A total of 2122 eligible participants were randomized into the intervention and control group. SF-6D data were available at baseline, 6 weeks, 3 months, 6 months, and 12 months for 1061, 753, 402, 592 and 675 participants in the control group whereas the figures were 1061, 377, 167,251, and 324 for the intervention group. The low follow up at 3 and 6 months was partly due to a software problem failing to remind the participants to provide data. In 6 weeks using the completed sample analysis, the mean QALYs were 0.0717 (SD 0.0118) for the intervention group and 0.0703 (SD 0.0113) for the control group, and mean social costs were £463.75 for the intervention group and £331.29 for the control group. Further analyses are ongoing to explore uncertainty of the results, using clinical measures as main outcome, and long term impact of the intervention on cost effectiveness. Methodological issues on conducting economic evaluation for trials with internet-based intervention and data collection will be discussed including high drop out and missing data as well as influence of participants with high costs.

Economic Evaluation of Hypertension Management Under the EPHS Program in China

PRESENTER: **Ms. Yanchun Zhang**, China National Health Development Research Centre

AUTHORS: Ms. Jiangmei Qin Dr., Kim Sweeny, Lifang Zhang, Chunmei Lin

Background: Cardiovascular diseases (CVD) have become the main cause of mortality in China, accounting for 40% of deaths. To combat the challenge, Chinese government launched a program in 2009 called Essential Public Health Service program (EPHS), providing disease management to hypertensive patients through community health facilities. From 2009 to 2013 it is estimated that the program invested 25.2 billion Chinese Yuan (CNY) in hypertension management, making it the largest program of its kind ever in China to address hypertension. However, little is known about the benefit of such a large investment. This research estimates the effectiveness of the program in terms of controlling hypertension and assesses the long-term benefit of the program, including reduced health treatment costs, increased productivity and financial benefit.

Methodology: The predicted control rate of hypertension in 2013 was estimated using a trend analysis model based on data prior to 2009. The incremental effectiveness of the EPHS program during 2009-2013 was calculated by comparing the observed and predicted numbers of patients with hypertension control in 2013.

A model predicting 10-year integrated cardiovascular risk in the Chinese population based on age, gender, systolic blood pressure (SBP), BMI (body mass index), cholesterol, smoking and diabetes, was used to estimate the risk of CVD of the hypertension-controlled population versus the hypertension-uncontrolled group. Data were from the China Health and Nutrition Survey 2009.

This risk was used in a MARKOV model to predict the 30-year process of the hypertension-controlled and uncontrolled cohorts, for which simple hypertension, coronary heart disease (CHD), stroke and death were considered as the four states.

Economic and social benefit was estimated from averted CHD, stroke and death calculating increased workforce participation and productivity and cost saved. Net present values (NPV) of economic benefits and cost were used to calculate benefit-cost ratios at different discount rates.

Results: It was estimated that between 15.60 million and 19.46 million more patients had their hypertension controlled during 2009 to 2013 due to the EPHS, with an average of 20-mmHg lower SBP among the controlled. Over a period of 30 years, the numbers of deaths averted from coronary heart disease CHD, stroke and other causes because of increased hypertension control are estimated to be 11.45 thousand, 1.17 million and 1.21 million. At a 3% discount rate, the NPV of economic and social benefit from death averted would be 670,058 million CNY and 729,006 million CNY, respectively. The cost of the EHPS program for hypertension was estimated to be 252 million CNY. Benefit cost ratios of the investment of the EPHS of 2009-2013 ranged from 26.6:1 to 55.5:1.

Conclusions: (1) The EPHS program has played a significant role in the management of hypertension, and improved hypertension awareness, treatment and control. (2) Between 15.60 million and 19.46 million more hypertensive patients had their blood pressure controlled during 2009-2013 because of the EPHS. (3) The investment through the EPHS for management of hypertension has generated large socioeconomic benefit, in terms of averting deaths, increasing productivity and saving cost.

Cost-Effective Health Interventions in Global Health: A Comprehensive Analysis of the Cost-per-DALY Averted Literature

PRESENTER: **Mr. David Daeho Kim**, Tufts Medical Center

AUTHORS: Ritam Chowdhury, Peter J Neumann

Background:

As low- and middle- income countries (LMICs) aim to achieve universal health coverage, the need to prioritize limited resources becomes more important. Formal economic evaluations, such as cost-effectiveness analysis (CEA), can provide key information about the relative value of health interventions to inform the resource allocation decisions. Despite rapid growth in CEAs employing disability-adjusted life-years (DALYs), no comprehensive analysis has been conducted to understand potential cost-effective interventions in global health settings.

Methods:

We analyzed the Tufts Medical Center Global Health CEA Registry (www.ghcearegistry.org), a continually-updated, comprehensive database of English-language cost-per-DALY averted studies published since 1995. We first described variation in reported incremental cost-effectiveness ratios (ICERs) by study features (publication year and study sponsorship) and intervention characteristics (disease category and intervention type). In a subsequent analysis, following the WHO's approach, we labeled the intervention "best-buy" when the intervention's ICER is either cost-saving or less than US$100 per DALY averted. Then, we examined factors associated with an intervention being considered "best-buy" using random-effect logistic regression models to account for the correlation between multiple ICERs reported by a single study. To ensure comparability, we restricted the analysis of ratios to studies published in the last decade (2008-2017), applying a 3% discount rate for both costs and health outcomes, and conducted from a healthcare sector perspective. Finally, we provided a list of "best-buy" interventions in selected disease areas.

Results:

We identified 618 cost-per-DALY averted studies, reporting 4,933 cost-effectiveness ratios (in 2017 US$) for 2,107 interventions across 190 countries. Of the 4,933 reported cost-per-DALY ratios, 325 ratios (6.6%) were cost-saving and 144 ratios (2.9%) were dominated (i.e., more

expensive and less effective), while 1,426 (28.9%) ratios met “best-buy” criteria. The median ICER was $500/ DALY (the interquartile range, IQR: 110–3200). After excluding extreme values (i.e., including only ICERs between the 2.5 and 97.5 percentiles), the reported average ICER decreased each year by $95-per-DALY averted (95% CI: -146, -12). The reported industry-sponsored study ratios were more favorable than non-industry-sponsored study ratios (median: 66 vs. 500, IQR: 11–670 vs. 97–3400). Reported ICERs for interventions targeting communicable diseases were more cost-effective than those for non-communicable diseases (median: 190 vs. 1700, IQR: 51–970 vs. 320–6200). Among interventions with at least 1,000 reported ratios, immunization had the lowest median ICER of $360/DALY while pharmaceutical had the highest ($1,300/DALY). Our multivariate regression model did not show significant associations between other study characteristics and “best-buys”.

Conclusion

The number of available cost-per-DALY studies has increased substantially with many reporting ratios that can be deemed “best-buys”. In particular, many interventions targeting infectious diseases and primary prevention (e.g., immunization) are considered good investments. While the comprehensive league table can provide useful information for resource allocation choices in LMICs, final decisions should carefully consider the context and setting of local health systems.

8:30 AM –10:00 AM TUESDAY [Demand & Utilization Of Health Services]

Universität Basel | Kollegienhaus – Regenzzimmer 111

Health Status and the Demand and Utilization of Health Services

SESSION CHAIR: **Laura Anselmi**, The University of Manchester

Health Shock and Preference Instability: Assessing Health-State Dependency of Willingness-to-Pay

PRESENTER: **Mr. Muhammed Nazmul Islam**, James P. Grant School of Public Health, BRAC University

AUTHORS: Dr. Atonu Rabbani, Malabika Sarker

Hypothetical nature of contingent valuation (CV) estimates can depend on salience and perceived relevance for a health good or service. Negative health shocks can alter preferences over common health goods and services, as measured by willingness-to-pay (WTP). In this paper, we aim to understand how negative health shocks, namely being diagnosed with refractive errors, are associated with higher WTP for corrective eyeglasses, an otherwise familiar healthcare product. We use triple-bounded dichotomous choice (TBDC) experiments to elicit WTP for individuals diagnosed with refractive errors. We compare elicited WTP of this group with a carefully constructed cohort without the same health shocks. We control for the possible self-selection using a number of matching techniques based on the individual socio-demographic characteristics. We find that the observationally identical consumers diagnosed with vision problems are willing to pay 15-30% more for corrective eyeglasses and can accrue 23% higher consumer surplus at the prevailing market price. Further multivariable analyses suggest women are willing to pay BDT 84.7 less for eyeglasses, so are older respondents (8.5 BDT less for each additional year of age) and married respondents (BDT 64.5 less). On the other hand, more educated respondents are willing to pay more for corrective eyeglasses (BDT 191.4 more for respondents with above primary education), and so are higher income earners (each additional SD of household income is associated with additional WTP of BDT 84.7). Findings suggest that the preferences for healthcare products, such as eyeglasses, can significantly depend on the health state of the study population in addition to other socio-demographic characteristics of the respondents.

Prevalence and Direct Costs of Major Complications of Type 2 Diabetes in Finland 2002 - 2011

PRESENTER: **Mr. Olli Kurkela**, University of Tampere

AUTHORS: Jani Raitanen, Pirjo Ilanne-Parikka, Pekka Rissanen

Objectives

Diabetic complications have a notable impact on the direct costs of persons with type 2 diabetes. However, just few studies have analyzed the impact of individual complications in more depth. This study describes prevalence of most common type 2 diabetes complications in Finland utilizing national health care registries. Moreover, study adapts health care perspective and estimates the cost burden of aforementioned complications with emphasis on cardiovascular complications.

Methods

Data consists of all persons with type 2 diabetes that could be detected from the Finnish national registries between 2002 and 2011 (n = 482 171). In addition to demographic information, individual level registry data on inpatient and outpatient service use and reimbursed medication purchases were collected for the study cohort. Inpatient and outpatient service use was valued using national unit costs from year 2011. Person with type 2 diabetes was considered to have a certain complication, if an event coded under complication ICD-10 code was found from any of the care registers not more than three years before approximated diagnosis date. Cost are described by cost component, hospital district, gender and age-category. In order to estimate the incremental cost related to each complication category an individual-level regression model with costs as outcome variable and age group, gender and region as controlling variables is applied. The prediction on progression of costs until 2025 will be carried out utilizing a hospital district-level OLS regression model with total health care costs as outcome variable and average age, proportional amount of women, hospital district and population in hospital district as controlling variables.

Results

According to preliminary analysis, the proportion of persons with one or more complications had increased from 22% in 2002 to 48% in 2011. Concurrently, the total costs have increased from 449 million € in 2002 to 925 in 2011, however the average costs have decreased from 10709 € in 2002 to 5738 € in 2011. Cardiovascular diseases were most prevalent complication category among type 2 diabetics with 39% of persons suffering from them. Further analysis will be performed on prevalence and direct costs of each complication category with emphasis on cardiovascular category.

Discussion

Total costs of persons with diabetes and most common complications have increased during the time period, probably due to increased prevalence of type 2 diabetes. However, the average costs have been decreasing during the time period. Furthermore, study provides insights into diabetes costly diabetes complications. Furthermore, study provides regional insights into the economics of type 2 diabetes that could be beneficial when benchmarking the prevention and care practices. More efficient diabetes prevention and care could result in less individual suffering and benefits also for the wider economy in terms of improved productivity.

Health and Household Expenditures

PRESENTER: **Dr. Raun Van Ooijen**, University of Groningen

AUTHORS: Marike Knoef, Jochem de Bresser

This paper examines the effect of health on household expenditures in the Netherlands over the period 2009 and 2017; a period that is characterized by significant increases in out-of-pocket medical expenditures on long-term care. How health affects household's spending is an empirical question: on the one hand, health could affect the budget set through necessary out-of-pocket medical expenditures or, for the working population, through reduced income. On the other hand, health could affect household's consumption preferences; help with cleaning, gardening, and home maintenance will likely become more valuable in poor health, while leisure activities could be constrained by poor health.

Using expenditure data from the Longitudinal Internet Studies for the Social Sciences (LISS), we estimate how total non-medical and medical expenditures change when health deteriorates, and how shares on different expenditure categories vary with health. We estimate an expenditure-share demand system which includes health status, measured by general health, mental health, functional disabilities and chronic diseases. We exploit between household variation in health, but also within household variation over time to allow for possible correlation between unobserved household specific effects and health (such as personality traits that influence both health and spending categories).

The results show that non-medical expenditures slightly decline after a health shock, between 3 percent (for general health) and 7 percent (for severe chronic illnesses). Medical expenditures increase, but do not seem to drive the decline in non-medical expenditures. Instead, preferences seem to change after the onset of an adverse health shock, with more spending on housekeeping and less spending on leisure activities. After the 2015 long-term care reform, which increased out-of-pocket medical expenditures, unhealthy households spend less on leisure activities – a luxury good. A further increase in out-of-pocket medical expenditures may raise the concern that unhealthy households have to cut back on necessities as well.

"It Is Written in Our Genes! What We Would like to Know?" Understanding the Demand for Genetic Testing Using a Discrete Choice Experiment to Assess the French Populations' Preferences.

PRESENTER: **Aurore Pelissier**, université Bourgogne Franche-Comté

AUTHORS: Christine Peyron, Nicolas Krucien

With the rapid spread of genome sequencing in medicine, the number of patients who can access genetic testing **is already increasing and a more widespread access may be soon possible.** Tests conducted with these new sequencing techniques can produce, temporary, uncertain results that can be challenged quickly (or reinterpreted) as knowledge evolves. They may also provide information on predispositions or on diagnoses for diseases others than the one that justified them (called secondary findings).

Even if the technology exists, it is important to know its acceptability for potential users, i.e. the general population. What results would we accept if we were ill and confronted with these genetic tests? And under what conditions? To assess societal preferences for such tests in the current French context, we implemented a discrete choice experiment (DCE).

Following a four-step validation process, four characteristics came to light: 1. the identity of the person who decide the results disclosed to the patient: the patient himself, his physician, the law or an ethics committee. 2. The nature of the results communicated: only the disease-related results or with in addition i) the predisposition to diseases that can be treated or prevented, ii) the predisposition to diseases that can be treated and prevented but for which the list is fixed at a national level by geneticists, iii) the predisposition to diseases that can be treated and prevented and also to diseases without treatment available at this time. 3. The out-of-pocket fees the patient should pay for the test: 1€, 40€, 90€, 160€. 4. The use of the patient's blood sample after the test: no reuse as the sample will be not retained, reuse strictly to the benefit of the patient or anonymously for research or for both. We have defined an orthogonal optimal design of 16 choice sets with two unlabelled alternatives. The survey also asked about socio-economic characteristics, knowledge on genetics and relationships to health, science and technology of the respondents.

The data collection (online survey) took place between 09/28/17-10/13/17 on a sample of 2501 respondents, representative of the entire French population. Preliminary results confirm the importance and the interest of the French for this topic. 77% of our sample claimed it is better to

know its predispositions and 59% they want to be informed about all the possible results. The econometrics highlights the plurality of dimension to understand the demand for genetic testing (conditional logit) and the heterogeneity of preferences within the French population.

In the context of "Plan Médecine France Génomique 2025", our results show the importance to estimate the preferences of potential users to favour the diffusion of the technology.

Rethinking the Economic Costs of Malaria: Accounting for the Co-Morbidities of Malaria Patients in Western Kenya

PRESENTER: **Caroline G Watts**, UNSW Sydney

AUTHORS: Jason Alacapa, Harrysone Atieli, Alex (Ming-Chieh) Lee, Guiyun Yan, Virginia Wiseman

Despite a declining trend in the number of cases and deaths over the last decade, malaria still causes significant mortality and morbidity worldwide, especially in sub Saharan Africa. While the economic burden of malaria has been widely reported, few studies have considered the comorbidities commonly associated with malaria that cause an even higher economic burden on families and health systems.

Patient level inpatient data, including hospital charges to patients, were collected from patients who had been admitted with a diagnosis of malaria between June 2016 and July 2017 to a county level hospital in a malaria endemic area in Western Kenya, and used to estimate the economic costs of malaria from a health system and societal perspective taking into account treatment for conditions associated with malaria such as anaemia and other co-morbidities.

We analysed 458 patient records of which 60% were female inpatients and 40 % male inpatients. The mean age was 12 years (median 5 years). The mean length of hospital stay was three days. Over 50% of patients admitted with malaria were under 5 years of age. The mean health system cost for an inpatient with malaria was KSH 2,490 (USD 25) (KSH 95% confidence interval (CI) 1,401- KSH 3,579), direct out of pocket (OOP) payments were KSH 158 (USD 1.6) (95%CI KSH 65-KSH 223), indirect costs KSH 637 (USD 6) (95% CI KSH 194- KSH 1,080). When additional treatment was included, the mean health system cost was KSH 2,686 (USD 27) (KSH 95% CI 1,221- KSH 4,151). Direct OOP payments were KSH 705 (USD 7) (95% CI KSH 224-1,080).

The diagnosis and treatment of malaria continues to represent a significant cost to the Kenyan health care system. Including the costs of associated treatments such as anaemia and dehydration increased total costs to the health system by 8% and led to a quadrupling of OOP payments. The steep rise in OOP payments was largely due to the cost of medications and represents approximately 9.5% of the average Kenyan's rural household monthly income. While recognizing recent achievements in global malaria reduction, the disease remains a challenge to malaria endemic countries such as Kenya. Policymakers need to be better informed about the continued and significant economic burden this diseases places on patients and their families.

Effects of Changes in Short-Term Human Cognition on Reported Healthcare Utilisation.

PRESENTER: **Richard A Iles**, Washington State University

AUTHORS: Thomas L Marsh, Thumbi Mwangi, Guy H Palmer

Background

The *scarcity thesis* argues that being in a state of perceived scarcity affects individuals' cognitive ability to process information. The implications of this thesis to healthcare utilization has not been tested. Moreover, relevant literature provides limited justification for the use of different conceptions of cognition. Related work from the same study indicates that fluid intelligence provides a good fit when considering the effect of cognition on economic decision-making, particularly when returns are associated with uncertain returns. There exists a gap in the literature establishing a relationship between changes in short-run cognitive capacity, health service utilization decision-making and recall. This study tests whether fluid intelligence or working memory capacity is a better candidate for assessing the relationship between cognition and health reporting and service utilisation.

Methods

Three rounds of cognition and survey data was collect in Samburu County, Kenya between November 2017 and September 2018. The proceeding severe drought between 2015 and 2017 provides an exogenous economic shock for the pastoralist communities. Measures of fluid intelligence and working memory capacity were collected from respondents during each round. Short-form Ravens Progressive Matrices are used to measure fluid intelligence. Counting Span task is used to measure working memory capacity. The panel data allows estimation of the effects of changes in cognition on self-reported fever, duration of fever symptoms, and choice of curative healthcare service.

Results

Reductions in cognition are associated with high predicted reporting of fever episodes and longer durations of fever. The working memory capacity provides a better theoretical and empirical fit for reporting of fever, across various recall periods, and duration of fever symptoms. Furthermore, decomposition (Oaxaca-Blinder) analysis, according to the binary illiterate - literate groupings, indicates that differences in coefficients of working memory capacity statistically differentiate between these groups. The reliability of the cognition data is verified by equivalent correlation measure compared to results from US studies among literate populations using the same cognition tools.

Conclusions

Changes in human cognition are important explanatory variables in both healthcare expenditure and recall of health events. Measuring changes in cognition as opposed to absolute levels of cognition has theoretical and empirical support. The role of fluid intelligence and working memory capacity have distinct explanatory power in explaining household-level economic decision-making and recall of personal health events. These differences are evident despite sharing common features.

8:30 AM –10:00 AM TUESDAY [Economic Evaluation Of Health And Care Interventions]

Universität Basel | Kollegienhaus – Fakultätenzimmer 112

Methodological Advances and Applications in Economic Evaluation

SESSION CHAIR: **Simon Eckermann**, University of Wollongong

ALTERNATE CHAIR: **Thomas Lung**, The George Institute for Global Health

Valuation Methods in Costing for International, Multi-Sectoral Health Economic Evaluations: A Structured Scoping Review

PRESENTER: **Dr. Susanne Mayer**, Department of Health Economics, Center for Public Health, Medical University of Austria

AUTHORS: Claudia Fischer, Natasa Peric, Judit Simon

OBJECTIVE AND BACKGROUND: A prerequisite for the validity and usability of health economics evidence is sound costing methodology. Next to the identification, definition and measurement of costs, a critical part of the costing process is the valuation method. To achieve comparability and harmonization in methods across studies, sectors (i.e. the healthcare sector, education and criminal justice sector, employment sector and patient and family domain) and countries, an overview of the areas of controversy in cost valuation is a prerequisite. Therefore, a structured scoping review was conducted to map the concepts underpinning costing methods and to provide an overview of issues of concern when aiming for harmonization of the valuation process. Mental health was selected as exemplary disease area and issues particularly relevant for this field were synthesised.

METHODS: Firstly, economic evaluation guidelines and unit cost(ing) manuals, costing guidelines and unit cost programmes from the six European PECUNIA (ProgrammE in Costing, resource use measurement and outcome valuation for Use in multi-sectoral National and International health economic evaluAtions) partner countries (DE, NL, UK, AT, ES, HU) were searched and relevant health economics and HTA websites were screened. Secondly, we conducted a targeted search in the electronic databases PubMed and Embase to identify reviews of costing methods published in the past ten years.

RESULTS: Recommendations in terms of costing methods for the different economic sectors were found to vary and may in practice largely be driven by e.g. data availability. Country-specific heterogeneity with a major impact on cost valuation may stem from the general lack in guidance in terms of specific costing methods, double-counting between sectors, the impact of the analytical study perspective, recommended costing sources and hierarchies, variations in terminology, discounting, handling of overhead costs as well as the availability of established, standardized unit costing estimates in some countries.

DISCUSSION: This scoping review draws attention to several methodological factors that influence cost valuation methods across different sectors and countries. Highlighting, addressing and incorporating sector-specific issues that may have an impact on cross-sectorial comparisons is a crucial first step towards more comparability in health economic evaluations. For instance, the introduction of harmonised, sector specific units of analysis for the valuation of unit costs should be considered across countries, so that societal costs can be built up without double-counting and allowing better acceptance of cost estimations by decision makers.

Cost-Utility Analysis of Service Delivery Interventions Using Simulation Modelling of the Acute Medical Pathway

PRESENTER: **David Wonderling**

AUTHORS: Peter Rouse, Alex Haines, Dalia Dawoud, Jennifer Hill, Vicki Pollit, Jeremy Henning, Daniel Lasserson, Philip Dyer, Marcus Hughes, Michael Jones, Clare Jones, Paul Schmidt, Jason Kendall, Michael Gill

Background

The 2018 National Institute of Health and Care Excellence (NICE) guideline on ‘Emergency and acute medical care in over 16s: service delivery and organisation’ looked at 39 review questions covering the full acute medical pathway. It revealed a lack of health economic analyses of service delivery interventions. Health economic modelling was undertaken to establish the cost-effectiveness from a UK National Health Service (NHS) perspective and inform the guideline, for five interventions where clinical effectiveness evidence was available. To capture the benefits of improved patient flow across the whole hospital, discrete event simulation was chosen.

Methods

A cost-utility analysis was developed for patients entering a large district general hospital (DGH) through the emergency department (ED), or as a medical admission, over 12 months. The analysis used Simul8 Professional to model the pathway of the patients until discharge, accounting

for patient movements and blockages. Individual patients were characterised by Clinical Frailty Score (CFS), National Early Warning Score (NEWS) and age.

Detailed data from a large DGH were analysed to estimate the baseline movement of patients between different parts of the hospital, by NEWS, age, season, day of week and time of day. Data were also sourced from Hospital Episode Statistics, a national audit, NHS reference costs and the literature. Lifetime quality-adjusted life-years (QALYs) were attributed to each surviving patient based on their age and CFS.

A systematic review of treatment effects (including mortality and length of stay) was conducted, supplemented by expert clinical opinion. In addition to the direct effects, the indirect impact of the interventions was modelled with respect to reducing the number of 'medical outliers,' that is medical inpatients who are admitted to non-medical wards because medical wards are full. This was modelled by fixing the number of beds in each hospital location and incorporating a hierarchy of rules on patient movements during bottlenecks.

Results

We conducted 4800 runs for each intervention, each with an average of 107,912 patients, which even when using parallel processing, took several weeks of computing time.

For the intervention with the biggest treatment effect, 'Extended access to occupational/physiotherapy on medical wards' the model runs were sufficient to determine that it would be considered cost effective by NICE, using a cost-effectiveness threshold of £20,000 per QALY gained.

For three interventions, the impacts on medical outliers and QALYs were very imprecise but still the number of runs was sufficient to determine that these interventions were not cost effective at that threshold: 'Rapid assessment in the ED', 'Extended access to occupational/physiotherapy in the ED' and 'Daily consultant review on medical wards'.

For 'Extended consultant hours in the Acute Medical Unit' the number of runs was insufficient to assess cost effectiveness.

Conclusions

DES modelling was successful in replicating the flow of acutely ill patients through a DGH and in estimating the impact of service delivery interventions. However, to model precisely the impact on medical outliers and QALYs would require a considerable amount of processing power/time as well as detailed data analysis to determine inputs.

Human African Trypanosomiasis Modelling and Economic Predictions for Policy: A Data-Driven Initiative to Inform the Elimination of HAT

PRESENTER: **Xia Wang-Steverding**, University of Warwick
AUTHORS: Kat Rock, Marina Antillon, Jason Madan, Fabrizio Tediosi

Background

HATMEPP (Human African Trypanosomiasis Modelling and Economic Predictions for Policy) was designed to support local sleeping sickness (human African trypanosomiasis, HAT) elimination efforts by providing a data-driven approach to aid intervention planning and decision-making. In resource-limited settings, such as those countries afflicted with endemic HAT, it is of the utmost importance to be able to efficiently deploy a range of practical tools (including diagnostics, medical treatment, vector control) within monetary and logistical constraints whilst providing a robust assessment of disease levels and ensuring the success of intervention programmes. The initiative brings together epidemiologic and economic modelers with field experts in order to provide decision support that is informed by state-of-the-art modelling methods as well as expertise from the ground borne by years of local knowledge.

Methods

In the year since the project's inception, we have made progress on a number of fronts, which will be the focus of our presentation at iHEA:

- We have designed and pilot-tested a questionnaire to systematically assess the operational differences in interventions across where HAT activities are well underway: Ivory Coast, Guinea, Chad, and Uganda.
- We are updating the previous cost-effectiveness analysis of in order to a) use updated data from the field, b) assess the impact of a novel drug, fexinidazole, on elimination efforts c) assess the value-for-money of country-level decisions on goals set by the global community.
- Using preliminary results of the updated cost-effectiveness analyses, we have developed a prototype for a website to aid in local decision-making, which has helped interphase with country stakeholders. We will be showcase the website in our presentation.

Results and discussion

We found that country-level program officers were enthusiastic to share details of their operational capacity in a structured format, aided by the questionnaire. This, in combination with preliminary results of the updated CEA and the prototype of the website allowed them to understand the end-goal of our data-collection and analyses such that our pilot group provided us with constructive feedback on the structure of the questions. Our extensions of the standard cost-effectiveness analysis are formalizing the priorities of multiple national and international funders within the established principles of allocative efficiency (which will be further discussed in a separate presentation at iHEA).

In conclusion, we have found that the current frameworks of economic evaluations present numerous opportunities for collaboration with national HAT elimination programs as well as global stakeholders, and we here present how our work can reflect the fruits of those conversations.

"One Size Fits All": Does the Cost-Effectiveness of Screening for Colorectal Cancer Depend on Your Health Status Prior to Screening?

PRESENTER: **Eline Aas**, University of Oslo

AUTHORS: Matyn Vervaart, Mette Kallager, Michael Bretthauer, Geir Hoff, Magnus Løberg, Øyvind Holme, Tor Iversen

Background

Colorectal cancer (CRC) is the 4th most prevalent cause of cancer mortality in the world, and an increasing number of Western countries has implemented (or is considering implementing) organized population-based screening programs for CRC. Evaluations of the health and economic trade-offs of screening typically uses a population-based approach, yielding health policy recommendations and reimbursement decisions based on outcomes for the average population. These recommendations can mask important sources of patient heterogeneity such as age, sex and health status. Providing the same screening program to the entire population could therefore be inefficient use of resources. The objective of our study was to estimate the cost-effectiveness of screening for CRC in the general population, and to explore whether the cost-effectiveness depend on the individuals health status prior to screening. To our knowledge, this is the first study simultaneously evaluating long-term costs and health outcomes of screening based on individual-level data.

Data

The analysis is based on unique individual level data from a randomized controlled screening experiment, NORCCAP (NORwegian Colorectal Cancer Prevention), which took place from 1999 to 2001. The dataset consists of approximately 100 000 individuals born between 1935 and 1950, of whom 21 000 were invited to participate in a once-only screening with sigmoidoscopy. Information on screening participation status and screening outcome (positive and negative test and cancer diagnosis) was provided by the Cancer Registry of Norway. Information on outpatient consultations and inpatient stays were collected from the Norwegian Patient Register for the years 1997 to 2015. We use utilization of treatment, identified by ICD-10 codes as either main or secondary diagnosis, to define comorbidity-based subgroups in the analysis. In addition, we have information on time and cause of death, gender, age, level of education, working status and income from Statistics Norway.

Methods

Health outcome was measured by life expectancy, while for costs we apply several perspectives: Related health care costs including cost of screening, follow-up examinations and treatment costs, related and unrelated costs including also health care treatment not related to treatment and follow-up of colorectal cancer, and a societal perspective including production loss. Regression models are used to estimate the effect of patient characteristics on life expectancy and health care utilization. We calculate the incremental cost-effectiveness ratio (ICER), defined as the cost per life year gained, to present results. The bootstrap method is used to characterize uncertainty and to construct cost-effectiveness acceptability curves (CEACs).

Results

Preliminary results indicate that screening for colorectal cancer is cost-effective. Both costs and health outcomes vary with health status prior to screening. The health effect declines with more severe comorbidities, indicating that individuals with severe comorbidities should not be recommended to participate in screening. For comorbidities related to colorectal cancer, such as diabetes, the health gain of screening increases. When including unrelated health care costs, the costs also vary across patient subgroups.

Policy implications

The results indicate potential value for adopting a subgroup-based screening policy, implying that "one size fit all", is not an optimal strategy. Future research should include comorbidity when evaluating the cost-effectiveness of screening.

Economic Analysis of Quality Improvement Practices

PRESENTER: **Todd Wagner**, Stanford University

AUTHORS: Jean Yoon, Dr. Josephine Christina Jacobs, Angela So, Amy Kilbourne, Wei Yu

Health care organizations strive to improve the delivery of safe, high-quality care in a rapidly changing landscape where innovative technologies and processes are frequently touted as the next panacea. This has led to a growing international field focused on Dissemination and Implementation Research. Currently policy makers struggle to decide which innovations to implement because they must consider the budgetary impact, which is often unknown.

In 2015, Department of Veterans Affairs (VA) Quality Enhancement Research Initiative (QUERI) funded us to provide economic analysis to 15 existing QUERI projects. We structured our analysis plans around the International Society for Pharmacoeconomics and Outcomes Research (ISPOR) budget impact analysis (BIA) framework, which considers the net financial impact of adopting a new drug or device. Over time, however, it was increasingly clear that the ISPOR framework does not extend seamlessly to quality improvement (QI) practices, which focus on

re-organizing processes of care. QI practices tend to be highly complex interventions that adapt and change over the life course of the implementation study.

The ISPOR framework often assumes that the cost of a drug or a device is known (or easily knowable). However, the cost of QI practices is not known and four challenges make it difficult to estimate. First, a QI practice might be implemented seamlessly at one hospital, while the same program is implemented poorly at another facility. Unfortunately, quality is often not easily observed, even though it affects the cost of the intervention. Second, QI projects, which often rely on labor, do not scale as easily and as smoothly as drugs. This makes it difficult to extrapolate from one situation to another, especially across different labor markets. Third, drugs and devices are distributed using existing networks while QI projects often being designed to disrupt the existing distribution pathways, with ambiguous economic effects. Finally, QI projects are dynamic and the "intervention" changes over time; they often will start with one implementation strategy and then change to another strategy as the implementation of the QI practice progresses.

These challenges have led many to question our ability to understand causality from QI studies. An emerging group of researchers is trying to address these challenges and derive causal estimates by linking changing implementation strategies to process outcomes and production costs. In this paper, we discuss in further detail these challenges mentioned above, supported by empirical evidence, and highlight opportunities for further research.

Extensions to the Net Benefits Framework of Cost-Effectiveness Analysis to Cope with Divergent Objectives at the Global and Country-Level: The Case of Human African Trypanosomiasis End-Game Programs.

PRESENTER: **Marina Antillon**, Swiss Tropical and Public Health Institute

AUTHORS: Xia Wang-Steverding, Fabrizio Tediosi

Background: The net benefits framework has become a mainstay of the cost-effectiveness literature. The framework guides decision-makers to select among interventions that maximize the disease burden averted in the presence of budget constraints and imperfect information. The global health community is now working towards many goals of disease elimination or eradication, and therefore, the framework must be extended to consider resource allocation in order to maximize the chances of reaching a collective goal rather than only maximizing the disease burden averted. In other words, the framework must estimate the additional external resources that would be necessary to maintain an efficient use of resources at the country-level while staying on course to reach global targets. Here, we propose an extension to the net benefits framework that accounts for uncertainty, the country-level decision-maker perspective, and the perspective of the stakeholders that have set global targets. We illustrate our methods by considering the economic case for gambiense human African trypanosomiasis (gHAT) elimination by 2030.

Methods: We propose a modification of the cost-effectiveness acceptability frontier of the net benefits framework to consider the efficiency of the intervention from the perspective of the country-level decision manager and to estimate the additional cost of switching from an optimal intervention (in terms of cost per burden averted) to an intervention with a higher likelihood of meeting the global target (elimination by a prescribed year). The effectiveness and efficiency of four interventions were evaluated bycoupling an SIR-style transmission model with a probability tree of treatment outcomes in two typical African settings with low- and high-prevalence of gHAT. The baseline intervention featured active and passive surveillance, while alternatives additionally featured vector control, expanded passive surveillance, or both. Outcomes were denominated in disability-adjusted life-years and the probability of interrupting local transmission by 2030. Costs were denominated in 2014 US$ with time-horizons of 2030, the year designated for elimination, and 2040, to assess the impact dividends once elimination is reached. We incorporated the potential impact of non-linear increases in the incremental costs of case-finding at low disease prevalence in the later years of elimination campaigns and we calculated external resources needed to cope with these expenses.

Results: We found that interventions that included vector control provide a good-value-for-money (at less than $1000/DALY averted) due to the speed at which cases decline and the speed at which active surveillance activities could be safely scaled back with minimal risk for re-emergence. However, in later years, when few cases remain, sustaining gHAT elimination activities will require more external resources to alleviate economic pressures on constrained country budgets. Uncertainty regarding surveillance costs and the timing of surveillance scale-back will drive uncertainty around the necessary external aid.

Conclusion: We have presented a method to determine the share of funding necessary from global stakeholders to enable country partners to use their constrained budgets efficiently. While interventions for HAT that include vector control are cost-effective for countries, the increasing incremental costs of end-game activities to reach global targets may require increasing aid from global stakeholders.

Decision Support to Address the Tragi-Comedy of the Health Service Commons

PRESENTER: **Jack Dowie**, LSHTM

AUTHORS: Vije Rajput, Mette Kjer Kaltoft

In Hardin's original formulation, the tragedy of the commons - shared, public access lands - are over-grazed because individual farmers can send their livestock onto the land without restriction at zero price. The tragedy occurs because overgrazing eventually reduces the ability of the land to provide fodder. To avoid this, 'commons' of all sorts - shared, public access facilities and resources – require management. Ostrom showed community management was workable under conditions of good communication, trust and reciprocity, but, in the likely absence of this ideal, the approach most likely to succeed was a mix of government regulation, market forces and community-based management. Cole suggested the institutional structure is more complex, the tragedy arising from interacting resources and institutions. If the grass on the pasture had not been subject to appropriation, if the cattle had not been privately owned, or if property- and contract-enforcement institutions

supporting market exchange had been absent, the tragedy of the commons would not have arisen, regardless of the open-access pasture. Public health services such as the NHS are an archetypal example of the commons tragedy, currently advancing relentlessly towards its final act in the absence of good communication, trust, reciprocity, transparency and organisational coherence, all driven by the attempt to sustain the mantra of 'care based on need and free at the point of delivery '(or more recently "free at the point of use, based on clinical need and not an individual's ability to pay"). Maintaining these as an aspirational value, in the face of its operational impossibility, is taking the tragedy to tragi-comic levels. Along with undercover moves to increase charges, the tragedy is being fast-forwarded by the application of financial fertiliser, at the expense of other public services (social care, education, transport, utilities, community services) that are being progressively stripped of resources in real terms. All this paper does is suggest a way in which the individual citizens who, as identified patients, benefit from the services provided – but also, as anonymous patients, suffer the opportunity harms - might be freed from the structural-symbolic violence they are subjected to by the maintenance of the NHS narrative. It involves alerting them at the point of care as to how the 'tragedy' is leading to a denouement most would regard as a profound loss. In a multi-criteria preference-sensitive tool (Generic Rapid Evaluation Support Tool – GREST), designed to provide decision support for both clinicians and clinical commissioning groups, an equity criterion is introduced as one of six. The Ratings for the Equity criterion are based on Claxton's WTP for a QALY and its Weighting for the specific case provided on a 0 - 100% scale; 0 indicates no concern for equity implications and 100 concern only with the equity implications. Providing an equity weighting is mandatory, but if it is assigned zero, GREST becomes a standard, equity-insensitive but otherwise preference-sensitive, tool, for use within the time and resources of clinical decision practice. A demonstration version is available online. The main predictable objections are discussed.

8:30 AM –10:00 AM TUESDAY [Specific Populations]

Universität Basel | Kollegienhaus – Hörsaal 114

Determinants of Health in Specific Populations

SESSION CHAIR: **Lisa Gold**, Deakin University

Disparities in Mortality and Morbidity and Its Consequences for Intergenerational Transfers in the U.S.

PRESENTER: **HwaJung Choi**, University of Michigan

AUTHORS: V.Joseph Hotz, Robert F Schoeni, Judith A Seltzer, Emily E. Wiemers

In this paper, we pursue and expand the literature on mortality and morbidity disparities, kin availability, and intergenerational transfers by considering two substantive questions:1) How do disparities in mortality and morbidity affect the distribution of "kin availability" across demographic and socioeconomic groups in the United States? In particular, how does the absence of one's parents due to death and health problems affect the availability of kin – where the latter is traditionally measured by the spatial proximity of kin – by race/ethnicity, educational attainment and geography? 2) How does the absence or reduction in the availability of one's parents due to death and morbidity of a parent affect the types, incidence and magnitudes of financial and time transfers to and from one's parents?

We use the 2013 Panel Study of Income Dynamics (PSID) main interview and the Rosters and Transfers Module data that provide for a national sample of household heads and spouses, the residential locations of each living biological or adoptive parent.

In our preliminary analysis, we find that substantial disparities in mortality and morbidity across education groups. For example, at ages 25-39, the rate of mother in fair/poor health is 35% for individuals with less than 12 years of education while that rate is 16% for individuals with at least 16 years of education. At same ages, the rate of having no mother for those with education 12 years or less is more than triple the rate for those education with 16 or higher (15% vs. 4%). At ages 40-54, almost half of those with less than 12 years of education do not have a mother while about 22% of those with at least 16 years of education do not.

The mortality of parents has a decided effect on the distributions of a broader notion of proximity that includes lack of parents living nearby due to deaths by race/ethnicity and educational attainment. For example, restricting analysis to having at least living one parent, those with less than 12 years of education are more likely to live with or close to a parent or parent-in-law compared to those with at least 16 years of education (52% versus 44%). However, it does not mean that those with lower education have greater availability of parents once we take into account higher mortality among lower educated persons. If we estimate the proximity outcome (i.e., % living in the same household or close-by) after including in the sample those who do not have any living parent, the disparities by education are reversed: we have a lower share of adults who have a parent living nearby for those with less than 12 years of education compared to those with at least 16 years of education (26% versus 32%).

We will extend the analyses by examining how absence of parents and morbidity of parents affects the types, incidence, and magnitudes of financial and time transfers.

Children's Education and Parental Health: Intergenerational Transmission of Human Capital in the Ageing China

PRESENTER: **Dr. Yuanyuan Ma**, Zhongnan University of Economics and Law

AUTHORS: Yafei Liu, Dr. James Smith

Numerous studies have shown that education is associated with longevity, physical health and mental health across vastly different socioeconomic contexts. Recent evidence suggests that the effects of education on health even transcend across generations. However, previous

studies normally focus on the intergenerational transmission from parents to children. In the context of population ageing, the intergenerational transmission might work the other way around (i.e. from adult children to older parents). If well-educated adult children indeed provide better old-age support and improve their parents' health, investment in education could be a cost-effective means to promote population health and alleviate the fiscal challenges to governments induced by rising medical expenditure. China is one of the largest developing economies with relatively less generous social welfare. It has the largest elderly population and is one of the most rapidly ageing societies in the world. There are increasing concerns over the health status of the elderly and the sustainability of health expenditure.

Using data from the China Health and Retirement Longitudinal Study (CHARLS), we attempt to contribute to the literature with the first set of empirical evidence on the causal impact of adult children's education on older parents' health in China. CHARLS is a biennial, nationally representative panel survey of people aged 45 years or older and their spouses of any age. It is part of an international network of longitudinal studies of ageing and is closely harmonised with the Health and Retirement Study (HRS) in the US and the Survey of Health, Ageing and Retirement in Europe (SHARE). Exploiting the compulsory schooling law implemented in the 1980s and the instrumental variable (IV) method, we examine the effects of adult children's education on older parents' health (both physical and mental) and explore potential mechanisms.

Estimation results indicate that more children's education lead to better parental health, measured by a rich set of both self-reported health indicators and biomarkers. An additional year of schooling, induced by the compulsory schooling law, increases the probability of parents reporting good health by approximately 5 percentage points, decreases the probability of parental health deterioration since last wave and feeling body pain by about 7 and 5 percentage points respectively, decreases the probability of having hypertension by approximately 6 percentage points, and decreases the CES-D scores by approximately 0.7. The results hold for a series of robustness checks. Analysis on potential mechanisms show that children's education lead to higher earnings for children themselves and higher cash transfer to parents and lower probability of parental undiagnosed hypertension. Further heterogeneous analyses show that the effects are different for fathers and mothers.

Despite the policy significance and a large literature on the relationship between education and health, and intergenerational transmission of human capital, credible evidence on the causal effects of adult children's education on older parents' health are scarce. The findings in this paper have direct implications for current policies on education and health facing population ageing in the developing world.

Nutritional Assistance Program Impacts on Dietary Quality & Nutrient Intake of the Elderly

PRESENTER: **Dr. Susan Chen**, Virginia Tech
AUTHOR: Dr. Wen You

The main aim of this research project is to study the effects of the Supplemental Nutrition Assistance Program (SNAP) on nutrient intake and dietary quality of low income elderly adults in the United States. The elderly is a population that is more vulnerable to poor diet since the unintentional weight loss caused by diet-related diseases has been associated with increased mortality, disability, and nursing home admissions (Launer et al., 1994; Payette et al., 2000; Seidell et al., 2000). The SNAP program, which is the largest food safety net in US, should ideally help the needy elderly to afford nutritious food. However, it has been shown that lack of affordability, accessibility and acceptability to healthy food are barriers to food security for this population (Wolfe 2003). This complex set of economic, social, psychosocial, and health factors motivate the need to examine how food assistance programs like SNAP affect dietary and nutrient intake in the elderly in order to better serve this needy population and save on public healthcare costs.

SNAP benefits are transfers given to recipients to purchase food items. The well-known identification difficulty in SNAP program evaluation is to properly handle the fact that SNAP participation and the nutrient intake decisions are individual choices influenced by common unobserved factors (such as preference). This endogeneity problem results in inconsistent treatment effects. Specifically, the SNAP program endogeneity problem is not typically addressed in the literature where diet quality and nutrient intakes are outcomes of interests. The only study that has examined a topic similar to ours, while carefully addressing endogeneity, is Akin et al (1985). These authors found that nutrition assistance programs (interacted with Social Security and Supplemental Security Income Programs) do improve nutrient intake of the elderly. In our study we build on Akin's work by using more recent data and an additional diet quality index to re-examine this question.

To update this literature, we will use a battery of estimation methods to assess the sensitivity of the estimates to the econometric method used and the assumptions imposed. The methods used include an instrumental variable method with external instruments (e.g., cross-state SNAP eligibility for the elderly; SNAP outreach spending per capita), nonparametric bound estimates taking into account SNAP participation reporting errors (following recent work by Kreider et al. 2012 and Almada et al. (2015)), and a regression discontinuity approach that utilizes aspects of *The American Recovery and Reinvestment Act* that resulted in a change in SNAP eligibility thresholds. We utilize the National Health and Nutrition Examination Survey (2003-2014) to form pooled cross-sections of data.

Our outcomes of interests are Health Eating Index 2005 (a measure of dietary quality) and dietary component scores such as calories, calcium, iron, protein, Vitamin A and Vitamin 6. A naive (OLS) regression shows a positive association of SNAP when interacted with social support programs on the measure of diet quality. Our findings will update the quantification of food assistance program impact on elderly dietary outcomes and provide policy insights on elderly health promotion.

Better Salary, Healthier Babies? Effects of an Increase in Midwives' Remuneration

PRESENTER: **Joaquim Vidiella-Martin**, Erasmus University Rotterdam
AUTHORS: Tom Van Ourti, Loes Bertens

Early childhood health, including in utero exposure, has an enormous influence on adult health and economics outcomes. This widely accepted fact has motivated policy-makers to devote remarkable resources to understanding and improving early health outcomes. This is particularly true in the Netherlands, a country that has had amongst the highest perinatal mortality and morbidity rates in Europe (Buitendijk et al., 2003; 2004) since the 2000s. The Netherlands not only compares unfavourably to other European countries with similar levels of development on average, but also has large regional inequalities, even within the same city (De Graaf *et al.*, 2012; Poeran *et al.*, 2013). Several nationwide policies aimed at improving perinatal health have been implemented, but little is known about their impact on perinatal outcomes.

In this paper, we exploit one of these policies – a change in the remuneration received by midwives working in deprived areas. Midwives working with mothers who live in neighbourhoods over a given level of deprivation were entitled to an increased fee obtained per woman cared for, while the same midwives would only receive the standard fee for mothers living in non-deprived areas. We use a difference-in-discontinuity approach, in which we exploit a discontinuity along deprivation scores before and after the policy was introduced, to isolate the causal effect of additional remuneration on birth outcomes (mortality, low birthweight rates, and preterm births). Additionally, we also evaluate potential channels, including the effects of the additional fee on midwives' performance (number of referrals, home deliveries, etc.).

We observe modest health improvements in perinatal mortality as a result of the additional remuneration. Our findings contribute to the vast literature assessing the effects of healthcare workers' wage on health outcomes (Propper and Van Reenen, 2010). Additionally, we contribute to the growing literature on the determinants of early childhood health (Marmot, 2005), in particular on the role of healthcare in preventing adverse outcomes.

The Costs and Benefits Associated with Water Fluoridation for 5 Year-Old Children in Ireland

PRESENTER: **Jodi Cronin**, University College Cork

AUTHORS: Stephen Moore, Noel Woods, Mairead Harding, Helen Whelton

The aim of this study is to determine the costs and savings associated with Community Water Fluoridation (CWF) for 5-year-old children living in Ireland, the only country in Europe with a legislative mandate for water fluoridation. CWF is the most widely implemented public health preventive intervention to reduce the incidence and severity of tooth decay, the most common chronic disease in developed countries. However, despite the recognition of CWF as one of the top public health achievements of the 20th century, there has been an increase in public uncertainty around its relevance and effect in the current environment of multiple fluoride sources. This has resulted in a review of the continued efficacy of CWF (FACCT) and this cost-benefit analysis to ensure that CWF is an efficient investment of resources in oral health disease prevention for children living in Ireland.

Methods

To determine whether CWF is a cost-effective intervention we compared the benefits of CWF in terms of direct and indirect annual treatment costs averted to the annual cost of supplying water fluoridation.

The benefits of CWF were calculated as the costs averted to maintain a decayed deciduous tooth owing to the CWF intervention. Using caries outcome information (d_{3vc}mft) collected from a stratified cluster random sample of 5-year-old children classified according to whether they had lifetime exposure to CWF (n= 1,422) or not (n=929), the number of carious teeth attributable to forgoing one year of exposure to water fluoridation was calculated. Costs averted were considered from the health-payer, the state and the societal perspectives. The distribution of treatments in terms of restorations was the same across the three viewpoints, i.e. a composite restoration in accordance with Minimata EU Regulations, however the type of extraction (routine/surgical) differed across the three perspectives. State and health insurance data were used to inform treatment costs which were discounted and inflated to reflect the present value. The analysis did not consider follow-up treatments due to the exfoliation of deciduous teeth. Probabilistic sensitivity analysis was conducted using Monte Carlo simulations to incorporate uncertainty into the parameters of the base case analysis. Optimization analysis was also conducted to identify the threshold points for CWF to remain cost effective.

The cost of supplying CWF was estimated using information provided by Irish Water and the Health Service Executive (HSE) for 250 water treatment plants, currently fluoridating water supplies. Plants were categorized according to the average annual daily throughput for each plant (<1,000 to < 20,000 m^3/day). The cost of CWF included capital, operating & maintenance costs along with acid costs. In the base case, capital costs were depreciated over 25 years. The cost of CWF was annuitized in accordance with the HSE's standard accounting procedures.

Preliminary results

Net savings associated with dental treatment costs averted in 2017 were estimated at €5.76 per 5-year-old child in the base case analysis, representing a total saving to the health payer of €417,047 based on the number of 5 year- old children living in Ireland. The estimated return on investment at just under 3:1.

Do Childhood Infections Affect Labor Market Outcomes in Adulthood and, If so, How?

PRESENTER: **Ms. Jutta Viinikainen**, University of Jyväskylä

AUTHORS: Alex Bryson, Prof. Petri Böckerman, Marko Elovainio, Nina Hutri-Kähönen, Markus Juonala, Katja Pahkala, Suvi Rovio, Laura Pulkki-Råback, Olli T Raitakari, Jaakko Pehkonen

Introduction: A large literature indicates that poor childhood health leads to adverse health outcomes, poor cognitive performance, lower educational attainment, and weaker labour market outcomes in adulthood. We focus on an under-researched area, namely the role played by childhood infections and their links to labor market outcomes in adulthood. Using rich, longitudinal population-based data we examine to what extent links between childhood infections and adult labour market outcomes are likely to reflect initial health conditions and consider potential mechanisms.

Methods: The participants aged 35-50 in 2012 (N= 3,199) were drawn from the Young Finns Study which includes comprehensive register data on diagnosed infections at ages 0-18. Information on childhood infections originates from the Finnish Hospital Discharge Register which are nationwide data containing information on patients discharged from hospitals. A hospitalization, which included at least one overnight stay, was defined as infection-related if either a primary or a secondary International Classification of Diseases code indicated infection diagnosis. These data are linked to longitudinal register information on labour market outcomes (2001-2012) and parental background (1980). The estimations were performed using Ordinary Least Squares (OLS).

Results: Having an additional infection in childhood is associated with lower wages (b = -0.112, 95% confidence interval (CI): -0.212; -0.013), fewer years employed (b = -0.016, 95% CI: -0.029; -0.003), a higher probability of receiving any social income transfers (b = 0.012, 95 % CI: 0.002; 0.021) and larger social income transfers conditional on receiving any (b = 0.070, 95 % CI: 0.010; 0.129). We find no evidence that initial health endowments, parental background or poorer adult health would explain these connections. Instead, childhood infections seem to affect human capital accumulation, which explains a significant part of these correlations. Children who experienced severe infections were more likely to participate in remedial education, they had lower grade point averages at ninth grade and lower educational attainment in adulthood. When the aforementioned models are augmented with years of education, the point estimates for childhood infections are significantly closer to zero (wage equation: b = -0.073, 95% CI: -0.167; -0.020; employment years: b = -0.011, 95% CI: -0.024; -0.001; probability of receiving social income transfers: b = 0.009, 95 % CI: 0.001; 0.018; and the amount of social income transfers conditional on receiving any: b = 0.056, 95 % CI: 0.003; 0.114).

Conclusions: Higher incidence of childhood infections leads to lower long-term earnings, fewer years employed and higher amount of social income transfers received, an association that is partly explained by the association between infections and lower educational attainment. The data of this study originates from Finland where the health care system is based on public health care services to which everyone residing in the country is entitled. Despite universal access to health care we find surprisingly large and robust effects between childhood health and adult socioeconomic status. It is likely that in countries, where such a health care system does not exist these effects can be even larger.

Are There Any Differences between People with HIV and the General Population with Respect to Their Labour Participation Rates? An in-Depth Analysis during Economic Uncertainty

PRESENTER: **Beatriz Rodriguez**, University of Castilla-La Mancha

AUTHORS: Luz Maria Peña-Longobardo, Juan Oliva

Background

The existing literature has supported the negative impact that HIV/AIDS (Human Immunodeficiency Virus/Acquired Immune Deficiency Syndrome) has not only on individual´s health status and impairments, but also on the labour outcomes. However, few studies have compared the burden of HIV on the labour market participation with respect to the general population. Hence, the purpose of this analysis is to compare labour force participation patterns between people with HIV and the general population in Spain, adding a closer look to the last economic crisis (before, during and after).

Data and Methods

Two different surveys were used: the Hospital Survey on HIV-AIDS and the Labour Force Survey, both covering the time period from 2001 until 2016. The former dataset contains data on 9,517 people living with HIV (PlwHIV) aged 16 to 65 years old, whereas the latter has information on 4,035,016 individuals in the same working age regarded as the general population. Propensity score matching was applied to assess any difference in the labour participation patterns between the group of PlwHIV and the general population during the last economic crisis: pre-crisis period (years 2001 and 2002 and years 2006 and 2007), during the crisis (years 2010 and 2011) and the post-crisis (years 2015 and 2016). Several subgroup analyses were performed by gender, educational level, source of infection and level of defences.

Results

Results showed that PlwHIV were less likely to be employed than the general population along the analysis, although bigger differences were reported before and during the crisis. In fact, PlwHIV, compared to the general population, were less likely to have a job by 23 percentage points before the crisis and by 14 percentage points during the crisis years. No significant differences were found for the post-crisis period. Additionally, the differences between PlwHIV and the general population were larger in those infected through drugs, with low defences and low-educated individuals.

Conclusions

HIV individuals have lower labour market participation rates, compared to the general population. Such differences seem to be enlarged during economic uncertainty periods as the last economic crisis. Moreover, source of infection, level of defences and education play a key role in explaining the differences between PlwHIV and the general population. Despite the non-significant gap during the most recent years in the

labour participation rates between Plw HIV and the general population, our results support the need for the development of labour force initiatives to reduce the existing differences between HIV people and the general population.

8:30 AM –10:00 AM TUESDAY [New Developments In Methodology]

Universität Basel | Kollegienhaus – Hörsaal 115

New Insights Into Health Economic Questions Using Innovative Methodology

SESSION CHAIR: **Joanna Coast**, University of Bristol

Development of a Preference-Based Measure of Mobility-Related Quality of Life

PRESENTER: **Nathan Bray**, Bangor University

AUTHORS: Prof. Rhiannon Edwards, Llinos Haf Spencer

Mobility impairment is one of the leading causes of disability; in the United Kingdom approximately 11% of adults have some form of mobility impairment. NHS posture and mobility services support over 1.2 million people with long-term mobility needs. However, there is limited robust economic evidence to inform the design of these services and to guide the provision of assistive mobility technology and other mobility-enhancing interventions. Generic preference-based measures of health-related quality of life exhibit only limited applicability in common conditions associated with long-term mobility impairment, such as cerebral palsy and multiple sclerosis. A mobility-specific approach to preference-based quality of life outcome measurement could improve sensitivity and validity in this context.

Our aim is to develop a novel preference-based mobility-related quality of life outcome measure, known as MobQoL. Once completed, the MobQoL outcome measure will offer a standardised approach to measuring and comparing the effectiveness and cost-effectiveness of mobility-enhancing interventions, and have clinical relevance as a patient-reported outcome measure.

The MobQoL development project was funded as part of an ongoing Health and Care Research Wales fellowship. In order to understand how mobility and mobility impairments influence quality of life, an exploratory descriptive study was undertaken, using a qualitative framework analysis approach. Qualitative data were collected through semi-structured interviews. A total of 37 participants with a wide array of different mobility impairments were interviewed. Analysis of the qualitative data is expected to be completed in early 2019. Through framework analysis of the interview transcripts, we will develop a thematic framework to define mobility-related quality of life, and subsequently utilise this framework to disaggregate the concept of mobility into the key dimensions of mobility-related quality of life. These dimensions will form the basis of the MobQoL descriptive system.

Over the remaining two years of the project we will test the validity, reliability and acceptability of the MobQoL descriptive system, and develop a preference-based scoring system to allow quality-adjusted life year calculation using the MobQoL tool. This planned session will cover only the development of the MobQoL descriptive system.

How Do Patients with Fluctuating Health States Complete EQ-5D, SF-12 and EORTC-QLQ-C30? a Think-Aloud Study

PRESENTER: **Sabina Sanghera**, Health Economics at Bristol, Population Health Sciences, Bristol Medical School, University of Bristol

AUTHORS: Axel Walther, Tim Peters, Joanna Coast

Background: Recurrent fluctuations in health states occur due to long-term conditions with episodic symptoms (e.g. multiple sclerosis) or through side effects of cycles of treatment (e.g. chemotherapy for cancer). These fluctuations in health states can have an important impact on a patient's quality of life. For example, chemotherapy administered in cycles causes cyclical side effects as each cycle has a treatment and rest period to allow the body to recover. One cycle typically lasts between 2 to 4 weeks and 4-8 cycles of chemotherapy are given. It is not clear how patients with fluctuating health states complete health-related quality of life questionnaires. Important information on quality of life may be missed or over/underestimated due both to measure recall periods ('health today', 'past four weeks') and the timing of data collection. Therefore, data used in economic evaluations to inform decision-making could be inappropriate. Aim: Using chemotherapy treatment as a case study, we aim to explore whether patients adhere to recall periods, construct an average or recall the worst point of the chemotherapy cycle when completing EQ-5D-5L, SF-12 and EORTC-QLQ-C30. Methods: Adult patients attending the Bristol Cancer Institute for chemotherapy for urological, gynaecological or bowel cancers each took part in a think-aloud interview. Each patient: verbalised their thoughts while completing EQ-5D, SF-12 and EORTC-QLQ-C30; completed a pictorial task illustrating how quality of life changed over one chemotherapy cycle; and took part in a semi-structured interview. Interviews for different individuals were held at different points in the cycle. Common themes were identified and a coding framework developed. Transcripts were analysed using thematic analysis. Results: 24 patients treated with curative or non-curative chemotherapy were interviewed between July and September 2018. This work is being analysed and the findings will be presented at the conference. Preliminary results suggest that patients were more likely to adhere to the recall period of EQ-5D ('health today'), but emphasised it did not reflect their quality of life during chemotherapy. Patients seemed to have most difficulty completing SF-12 ('past four weeks') and could more easily complete EORTC ('past week'), provided they did not experience a change in quality of life during the past week. However, across all questionnaires, patients appeared to provide inconsistent responses by attempting to provide averages, focusing on the worst or most recent experience, or the best part of their cycle. It was common to see patients using all or some of the approaches when completing even one questionnaire. Discussion: The final results and the implications for using current approaches to

calculate quality-adjusted life years when health fluctuates will be discussed. An appropriate recall period is required to ensure recommendations provided to decision-makers are based on reliable data. Since patients appear to provide inconsistent responses to questionnaires when health fluctuates, alternative ways of asking these questions need to be explored to ensure meaningful evidence on quality of life is used to inform cost-effectiveness decisions.

The Complexity of the Health System: An Agent-Based Approach

PRESENTER: **Ms. Lucy Goeddel Hackett**, CIDE

AUTHORS: Florian Chávez-Juárez, Alejandro Blasco, Georgina Trujillo

Healthcare, as a whole, can be conceived as a complex system, where more or less direct interactions take place between different agents such as providers, insurance companies, regulators and patients. The complex nature of healthcare systems implies significant challenges to policy makers aiming to design far-reaching policy proposals, as happens in many countries that nowadays face rising costs and inequalities in care.

In order to better inform healthcare debates, we have developed a multi-purpose agent-based model of the health system. One of the objectives of the model is to allow *ex-ante* analyses of public policy proposals, and to study their impact on a wide range of outcome variables. In its current version, the model can simulate several policy proposals inspired by ongoing policy debates, such as mandatory insurance (US), increases in minimum deductible rates (CH), free provider selection by insurance company versus mandatory contracts (CH), universal free health care (MEX), among others.

Though our model incorporates a wide array of health literature in the determination of different processes, this is the first agent-based model of an entire health system that we are aware of. The model is easily adaptable to real-world scenarios and is flexible with respect to the legal and economic environment. It allows for calibration with real-world data, and is value-neutral in the sense that we acknowledge that many political discussions depend on crucial hypotheses on certain behaviours. Our model is designed to achieve maximal flexibility, allowing the user to run simulations under different hypotheses. For example, the user can choose whether providers will care more about the health outcome of their patients (altruistic view) or their financial situation (economic view). Finally, the model is multi-purpose as it is able to simulate various public policies and contexts fairly easily. This model will allow researchers to focus on a wide range of outcomes of potential interest.

The model is built around three key agents in the healthcare sector: providers, health insurance companies and patients, all of whom can interact and adapt to their context and to other agents' decisions. The most noteworthy elements included in this first version are (1) endogenous learning of all agents to best adapt to the system's current state, (2) the possibility of importing data on medical conditions, such as incidence and severity, and (3) heterogeneity between agents, both in terms of characteristics and behaviour.

In order to allow for analysing the effect of policy measures on diverse outcomes, the model provides indicators and data on different variables of interest. For instance, the model provides detailed information on healthcare expenditures, the financial burden on families, the health status of each individual, as well as on access and quality of care.

In this study, we mainly focus on the presentation of this multi-purpose model, but we also include some illustrative examples on how public policies can be analysed with the model. These examples have not yet been simulated because we are currently validating the model. We expect to have the full results by late February 2019.

Communicating Big Data to Patients and Their Families: Challenges and Solutions within the Context of Hereditary Cancer

PRESENTER: **Dr. Samantha Pollard**, BC Cancer

AUTHORS: Steve Kalloger, Ms. Deirdre Weymann, Sophie Sun, Jennifer Nuk, Intan Schrader, Dean Regier

Background: The initiation of multi-gene panel testing for patients with a suspected hereditary cancer syndrome has resulted in the return of large amounts of highly complex information. Tested individuals (probands) are tasked with the challenge of integrating complex risk information into their cancer prevention and treatment decisions. Under current health information privacy legislation, probands are the vehicle by which test results are relayed to genetic family members to facilitate the appropriate uptake of cascade genetic testing. In light of this enhanced proband burden, there is an unmet need to better understand and mitigate the challenges that probands face throughout this process. Doing so will help to promote patient understanding of their test results, reduce genetic counselor burden, and enhance the efficiency of cascade testing. The purpose of this study was to identify and respond to patient-reported challenges through the development of a patient decision support technique in the form of an e-health application (app).

Methods: We conducted 25 semi-structured qualitative interviews with individuals having received genetic testing through British Columbia's Hereditary Cancer Program between 2017 and 2018. Recruitment continued until two independent reviewers determined that theoretical saturation had been reached. A grounded theory approach to the qualitative analysis informed the identification of prioirity e-health app components. Research team members met frequently to discuss emergent interview themes. Through an iterative process of team discussion and communication with the app developer, we integrated solutions to participant-reported concerns, challenges and barriers into the app platform.

Results: Interview participants identified informational and inter-familial challenges throughout the process of genetic testing, the return of results, and the communication of their test results with family. To address these challenges, participants recommended a single informational resource provided in advance of the pre-test genetic counselling appointments, individualized diagnosis and testing educational material, and ongoing support throughout the process of communicating genetic risk information with family members resistant to engaging in such

discussions. Personal and family history of disease, expectations about the testing process, as well as family relationships informed individual recommendations.

Discussion: Within a publicly funded healthcare system, the appropriate use of finite resources is a necessary prerequisite to program sustainability. Within the context of cascade genetic testing, there is an established need to encourage appropriate uptake to facilitate the receipt of downstream benefits. Our participants report a strong desire for a resource to improve cancer-related and genomic literacy, and to enhance more constructive communication with family. The results of this study have directly informed the development of an e-health app to provide tailored educational information and guidance to communicate genetic information with family members.

What Is the Impact of Loneliness on Unemployment in European Organisation for Economic Co-Operation and Development (OECD) Member Countries?

PRESENTER: **Nia Morrish**, University of Exeter

AUTHOR: Antonieta Medina-Lara

Background: Loneliness is experienced where a desired quantity and quality of social interaction is not achieved. Current research trends mostly associate loneliness to the elderly, however new research from the 'BBC Loneliness Experiment' shows young people experience the highest levels of loneliness (40%). Therefore, as this generation enters work the prevalence of loneliness in the workforce could be set to rise requiring investigation into growth trends and the cost of loneliness, to the working age population.

Objective: To examine the relationship between loneliness and unemployment in the working age population by reviewing the existing literature and assessing the degree of loneliness in this population using available data.

Methods: First, a systematic search of the literature and narrative synthesis determined an association between loneliness and unemployment, and provided evidence of a suitable instrumental variable for loneliness. Second, the 2006 and 2014 waves of the European Social Survey (ESS) dataset were used to analyse the impact of loneliness on unemployment in people aged 16 to 65. Analysis was conducted on data from 18 European OECD countries, at both individual and cumulative levels. Logistic regression analyses tested the association between loneliness and unemployment. To develop a causal link the marginal effect of loneliness on unemployment was determined using an instrumental variable for loneliness (legal marital status) within bivariate probit regression models. Causality was further assessed using probit propensity score matching, by age and gender, to reveal the Average Treatment Effect (ATE) of loneliness on unemployment.

Results: 3,552 studies were identified and 13 included in the narrative synthesis. Despite variations in study design, datasets, sample sizes and countries a positive association between loneliness and unemployment was determined, being that loneliness negatively impacted employment and ability to cope with stress. ESS data provided 27,213 observations in wave 2006 and 25,371 in wave 2014 for analysis. Logistic regression analysis found loneliness positively associated with unemployment in both waves. Marital status proved a strong instrument in all but one (Portugal unemployment) 2006 wave regression, but was weak in 7 wave 2014 country level regressions. Where the instrument was strong in 2006, country level causal bivariate probit analysis found loneliness to trigger unemployment with statistically significant positive average marginal effect between 0.04 and 3.6 percentage points, while the likelihood of being in paid employment reduced by between 3.4 and 17.3 percentage points. Propensity score matching reinforced directionality found in wave 2006 instrumental variable analysis. Statistically significant ATE of loneliness on unemployment ranged between 0.022 and 0.074, such that those feeling lonely were between 2.2 and 7.4 percentage points more likely unemployed. Furthermore, the lonely were between 5.6 and 21.8 percentage points less likely to be in any type of paid work.

Discussion: Lonely European individuals are likely to also be unemployed. Multiple methods are used and evaluated in this paper to determine a causal inference to this finding. Regression and propensity score analyses exposed weaker employment prospects in lonely individuals; suggesting the economic impact of loneliness could be larger than previously calculated, given its effect through increased unemployment.

Waiting Times in Emergency Departments: Exploring the Factors Associated with Longer Patient Waits for Emergency Care in England Using Routinely Collected Daily Data

PRESENTER: **Steven Paling**, NHS England & NHS Improvement

AUTHORS: Jennifer Lambert, Jasper Clouting

Background

In England, performance against the four-hour standard for accident and emergency (A&E) waiting times has been deteriorating since 2010/11. Since longer waiting times are associated with worse patient outcomes, this standard - which aims to reduce waiting times - is of interest to the public and policymakers. However, existing academic research is limited by either using annual data, very short time periods or a small number of trusts. Routinely collected daily data for all trusts recently became available through a national data collection (SITREP), which captures key information on emergency departments (EDs). The daily data displays greater variability than monthly data, so is more pertinent to address questions of operational responsiveness.

Methods

Our study used daily data on 138 type 1 EDs in England over 90 days between December 2016 and February 2017 sourced from SITREP and the Hospital Episode Statistics. We used multivariate ordinary least squares (OLS) analysis to model A&E performance.

Findings

We found a statistically significant, non-linear relationship between bed occupancy and A&E performance against the four-hour standard. A full hospital, with 100% bed occupancy, had 8% lower A&E performance than a hospital at 85% occupancy. A higher proportion of patients with hospital stays over 21 days had a significant negative association with A&E performance, suggesting hospitals' bed flexibility may have an additional effect. We also found a significant negative association between the volume and volatility of admissions and A&E performance. Our findings are robust to a series of estimation techniques, including fixed effects and fractional response models.

Interpretation

This research highlighted that the relationship between A&E performance and bed occupancy is non-linear, and that patient mix has an effect additional to that of the amount of beds occupied. These findings can help (and have already helped) to inform policymaking to improve A&E performance.

8:30 AM –10:00 AM TUESDAY [Production Of Health, Health Behaviors & Policy Interventions]

Universität Basel | Kollegienhaus – Hörsaal 116

Health Enhancing and Impairing Behaviors: Consequences and Policies

SESSION CHAIR: **Terence C Cheng**, University of Adelaide

Graphic Images in Addition to Text Information As a Means of Discouraging Unhealthy Behaviour: Evidence from the Introduction of Visual Warnings on Cigarette Packaging in the UK.

PRESENTER: **Lazaros Andronis**, University of Warwick

AUTHOR: Daryn Park

Motivation and aims

Initiatives that seek to discourage unhealthy behaviours are seen as an effective and inexpensive way of improving people's health and wellbeing. Often, central to such initiatives is the provision of information on health risks posed by the targeted behaviour or product. Various means of communicating those risks are available, including written warnings and pictorial images. In some cases, such as in public health interventions aiming to curb cigarette smoking, written warnings are reinforced and supplemented by graphic images. While intervening through text warnings is seen as effective means of discouraging an unhealthy behaviour, the value of 'stepping up' the intervention by supplementing text with images is less clear. Using cigarette smoking as a case study, this paper aims to explore whether, and to what extent, the introduction of warning labels, as an addition to text warnings, appears to be an effective means of discouraging unhealthy behaviours.

Data and methods

Data on demographic, socioeconomic and smoking-related variables were obtained from Health Survey for England, a large cross sectional survey carried out annually in England and aiming to monitor changes in the population's health and lifestyle choices. A repeated cross-sectional dataset was created by appending annual surveys covering the period from 1995 to 2016. Interrupted time series analysis was used to evaluate the number of cigarettes smoked per day before and after the introduction of text and image warnings.

Findings and discussion

We found that both the introduction of text messages and image warnings were followed by a decrease in the level and trend of cigarettes smoked per day. Furthermore, as the salience of warnings increased from text to graphics, the decrease in the number of cigarettes smoked per day became more pronounced. We present the findings, compare them against other courses of action (e.g. excise taxation), interpret their significance for policy-making and discuss their potential applicability to other areas and interventions, such as efforts to tackle obesity.

Soda Taxes: Price and Quantity Effects on Soda and Other Drinks

PRESENTER: **Judite Gonçalves**, Nova School of Business and Economics

AUTHOR: João Pereira dos Santos

Portugal introduced a soda tax in February 2017. The amount of the tax is 0.08€ (+VAT) per liter for drinks with less than 80-grams of sugar per liter, and 0.16€ (+VAT) per liter for drinks with more than 80-grams of sugar per liter. The tax affects drinks with added sugar, excluding alcoholic drinks, flavored milk, and fruit nectars.

One of the arguments to introduce soda taxes, in Portugal and elsewhere, is to improve consumer diets through the reduction of sugar intake. Determining the impact of the soda tax on consumption can only be done empirically, as in theory there are several mechanisms that may entail both positive and negative effects. Those mechanisms include the elasticity of consumption with respect to prices, changes in recipes, and amplified consumer awareness of the detrimental health effects of sugar.

To study the effects of the tax introduction, we use extremely detailed data from one of the largest retailers in Portugal. We observe monthly sales of each product (e.g. 33-centiliter Coca-Cola cans, 1.5-liter bottles of Fanta Orange, and so on) in each of the more than 400 stores distributed nationwide from February 2015 to January 2018.

We take advantage of the tax breakdown to separate between soda drinks with much less than 80-grams of sugar per liter, drinks with just less than 80-grams of sugar per liter, and drinks with more than 80-grams of sugar per liter. We also consider diet drinks, nectars, and beer. We investigate the impact of the soda tax on price per liter and quantity sold in liters, by applying a difference-in-differences approach, comparing each group of products to water. We control for product, store, time, and brand fixed effects in a range of alternative specifications. In addition to the full sample, we look at a balanced panel that includes only products that are always available in all stores.

For drinks with more than 80-grams of sugar per liter, results indicate almost full price pass-through to the consumer. For drinks with less than 80-grams of sugar per liter, price pass-through surpassed 100%. Untaxed drinks also saw (modest) price increases. Findings from the difference-in-differences models indicate no significant changes in the consumption of either taxed or untaxed drinks *vis-à-vis* water, with the exception of sugary drinks with little sugar. Adopting an event study approach to look closer at the dynamics, for the most sugary drinks, we find a drop in consumption immediately after the tax introduction, followed by an adjustment back to the initial level. For some drinks there is evidence suggestive of stocking up prior to the tax introduction. This suggests that any benefits of the soda tax in terms of reducing sugar intake is mainly due to the reformulation of recipes, as producers reduced the sugar content of several drinks to fall below the 80-grams per liter threshold.

Does Healthy Behaviour Make People Happy – As Well As Healthy?

PRESENTER: **Jan Abel Olsen**, University of Tromsø

By definition, healthy behaviour is health enhancing. The four most commonly used indicators for healthy behaviour have overwhelming evidence on how people should live to improve their health: do not smoke; avoid high alcohol consumption; stay physically active, and; strive for normal weight. Furthermore, there is increasing evidence that healthy people are happier than unhealthy people. Thus, there is a positive *indirect effect* of healthy behaviour on happiness *via* improved health. However, the sign of the *direct effect* of healthy behaviour on happiness is less clear, because people who lead a healthy life might do so for instrumental reasons. Still, we would expect the total (net) effect of a healthy behaviour on happiness to be positive, otherwise people would not choose it. The aim of the current paper is to identify the absolute and relative importance of these two separate effects of healthy behaviour on happiness: the indirect effects (i.e. instrumental value) *vs* the direct effects (i.e. intrinsic value).

Our empirical analyses is based on: i) the Multi-Instrument Comparison (MIC) project with a total of 8,000 respondents in six countries including a group of non-diagnosed people as well as a chronic disease group, and; ii) two waves from a Norwegian population based health survey (The Tromsø Study) with 13,000 and 21,000 participants respectively. These comprehensive data sets allow both cross-sectional analyses and longitudinal analyses of how healthy behaviour at baseline affect health and wellbeing later in life.

The paper develops a composite measure of healthy behaviour in order to study the subgroup who adhere to *all four* public health recommendations, i.e. they do *not* smoke; their weekly alcohol consumption is *not* above 14 units; they are physically active more than 150 minutes per week, *and*; their weight fall into the category of a 'normal BMI'. Structural equation modelling is applied to investigate the direct and indirect (via health) effects of healthy behaviour. Health related quality of life is measured by EQ-5D. Happiness or subjective wellbeing (SWB) is measured by the satisfaction with life scale (SWLS) and converted to a [0 – 1] scale. In the regression analysis, adjustments are made for age, sex, marital status and level of education.

In the MIC study, the direct effect of healthy behaviour on SWB is similar in both the non-diagnosed group and the diagnosed group (0.05 on the SWB scale). The indirect effect is of similar magnitude in the diagnosed group but much smaller (0.01) in the non-diagnosed group. In the Tromsø study, the direct effects were smaller (0.01 and 0.02 in the two waves), and the indirect effects were of the same magnitude as the direct effects. The longitudinal analyses showed effects of similar magnitude. In conclusion, we find consistent positive direct effects of healthy behaviour on happiness.

The Relationship between Nonstandard Work Schedules and Substance Use. New Evidence from the NLSY97

PRESENTER: **Dr. Mona Khadem Sameni**, James Madison University

This paper analyzes the relationship between the use of four different substances and nonstandard work schedules. Using the NLSY97 and applying standard panel techniques as well as survival analyses, I find that contrary to most previous evidence, nonstandard work schedules are not necessarily associated with an increase in substance use, and in the case of drinking and binge drinking such correlation is actually negative. Accounting for permanent individual heterogeneity also suggests that people more prone to substance use are more likely to engage in jobs with nonstandard schedules. Results are robust to the specification at the intensive margin and accounting for long-term exposure to work with nonstandard schedules.

8:30 AM –10:00 AM TUESDAY [Production Of Health, Health Behaviors & Policy Interventions]

Universität Basel | Kollegienhaus – Hörsaal 117

Socioeconomic Status and Other Drivers of Health

SESSION CHAIR: **Gabriella Conti**, University College London

Demographic Dividend Projection Based on Age-Specific Targeting of Family Planning in Nigeria

PRESENTER: **Marita Zimmermann**, Institute for Disease Modeling, Intellectual Ventures

AUTHOR: Elisabeth Vodicka

Background. Reducing unintended pregnancy rates through increased access to family planning has been identified as a key strategy for improving economic growth and reducing poverty worldwide. The economic impact of family planning can be evaluated using the 'demographic dividend,' an indicator reflecting the population change in age structure that can occur as fertility and mortality rates decrease. The age structure shifts to a larger ratio of working age people compared to dependents, which can lead to an increase in GDP and GDP per capita. While some strategies propose deliberately targeting young women for family planning initiatives, it is unknown if doing so would improve the demographic dividend relative to targeting other age groups. To address this question, we aimed to evaluate the ratio of working aged people to dependents following a decrease in fertility rate by age group in Nigeria.

Methods. We used Demographic and Health Survey (DHS) data from 2013 for Nigeria to evaluate total fertility rate (TFR) and age-specific fertility rate (ASFR). We stratified these rates by unmet need for family planning, defined as fecund, no reported use of any modern or traditional contraception, and not wanting a child within 2 years. We projected changes in the TFR and ASFR when all pregnancies among 15-19-year-old women with unmet need were prevented, as well as the distribution of ASFR if the same number of pregnancies were reduced in any other 5-year reproductive age group. We projected changes in the population age structure using the Spectrum DemProj model – an established model based on current population, fertility, mortality, and migration. We compared results for a scenario with no change in fertility rate over 50 years to a scenario with fewer pregnancies in each age group. We assumed a linear reduction in fertility over the first 10 years, at which point rates were assumed to remain constant.

Results. We found that among 108,460 women surveyed in Nigeria, the TFR was 5.55 per woman. The ASFR among women age 15-19 was 121/1,000, of which 20% was among women with reported unmet need. If all pregnancies were prevented among 15-19-year-olds reporting unmet need, the TFR would be 5.42. After 50 years, no fertility change would lead to a ratio of 1.257 working people to each dependent compared to 1.281 when pregnancies were prevented among 15-19-year-olds with unmet need. Preventing the same number of pregnancies among women in other reproductive age groups would lead to ratios ranging from 1.275 (for women age 20-24) to 1.260 (for women age 40-45).

Conclusion. Decreasing pregnancies among 15-19-year-old women with unmet need for family planning would, more than other age groups, change the population age structure by increasing the ratio of working people to dependents. Our findings suggest that preventing unintended pregnancies in young women would result in the largest increase in demographic dividend and potential opportunities for economic growth. Strategically targeting family planning efforts toward adolescents with unmet need could positively affect the GDP and GDP per capita to increase total economic wellbeing in Nigeria.

Economic Development and Changing Socioeconomic Differences in Health: Evidence from South Korea, 1946-1977

PRESENTER: **Dr. Chulhee Lee**, Department of Economics, Seoul National University

This paper examines how socioeconomic differences in health change with improvements in economic and environmental conditions in South Korea. The birth cohorts born immediately after the Second World War spent their childhood and adolescence during periods of upheavals, including chaotic political and social circumstances that followed the liberation from the Japanese occupation, the Korean War that devastated the entire country, and the long and slow recovery from the destruction. By contrast, the birth cohorts born toward the end of the 1950s were the first generation to benefit from spending childhood during periods of prolonged peace and rapid economic growth in the 1960s and 1970s. Thus, a comparison of health disparities of these birth cohorts can offer a unique opportunity for studying the subject.

For this study, I collected a 0.5% random sample of military records for all males (including those exempted from service) born from 1946 to 1957. Korean military records provide a rare opportunity to connect a person's adult health outcomes to parental characteristics. Using the data, I investigated how the relationship between parental SES and adult health outcomes changed across birth cohorts.

The results suggest that the sons of individuals employed in prestigious occupations were significantly taller at conscription than the children of lower-class fathers. For example, conscripts whose fathers were employed in a professional job are approximately 2 cm taller than manual laborers' sons. It turns out that the socioeconomic disparity in health increased across birth cohorts. No advantages of having high-class fathers were observed for the cohorts born prior to the Korean War. The differences in height according to father's occupation emerged for the conscripts who were conceived or born during the Korean War; and the disparity became larger in magnitude for the post-war birth cohorts.

A possible explanation for the result is that socioeconomic differences in parental investments in children diminished over time. As a test, I conducted similar regressions including the years of schooling at age 20 as the dependent variable. The results show that father's occupation

was a strong determinant of years of schooling. Conscripts whose fathers had professional or clerical jobs were educated more than manual laborers' sons by approximately 2.5 years. Unlike the results from height regressions, however, the socioeconomic gradient in schooling remained little changed across birth cohorts, which tends to reject the aforementioned hypothesis.

Another possible hypothesis is that idiosyncratic shocks (such as exposure to war-caused disruptions, natural disasters, and infectious diseases) could weaken the effects of different parental investments, and that such shocks were more prevalent prior the end of the Korean War. In support of this hypothesis, I found that the socioeconomic disparity in adult height among the cohorts born prior to 1955 was more weakly revealed for conscripts from the central region that was hit harder by the Korean War than those from the southern region.

Education, Health, and the Quality of Life: Evidence from Administrative Healthcare Data

PRESENTER: **Dr. Ye Yuan**, National University of Singapore

AUTHORS: Junjian Yi, Kamhon Kan

We study the effect of education on health and the quality of life. We obtain unique full-population data by linking Taiwan's administrative healthcare records from 1996 to 2011 with the 2000 population census. We hypothesize that higher education reduces the hazard rate of chronic diseases and increases the restricted mean survival time (RMST) of disease-free state. We use the discontinuity in middle school enrollment introduced by the 1968 Taiwan compulsory education reform to identify the effect of education on individual's health. We find that one more year of schooling leads to significantly lower hazard rate of major chronic diseases, for example, malignant neoplasms, diabetes, and hypertension. Moreover, the effect is stronger for female than male. Overall, the 1968 Taiwan education reform increased average schooling by 0.2 years, and increased the disability adjusted life years by 0.28 years and 0.35 years for male and female, respectively. Our finding substantiate that education promotes population health and the quality of life.

Defining and Measuring Health Poverty

PRESENTER: **Philip Clarke**, Health Economics Research Centre, University of Oxford and Centre for Health Policy, University of M

AUTHOR: Guido Erreygers

The aim of the paper is twofold: first we elaborate how the concept of 'health poverty' can be defined and measured, and second we apply the methodology to study health poverty in a variety of cases. Although not entirely new, the notion of health poverty is seldom used – in contrast to the notion of income poverty. In our view a particular poverty concept focusing on health is useful and relevant, especially for public health policy. The measurement of health poverty allows us to gain insights into different sorts of health deprivation in society as a whole, and in specific subgroups.

Perhaps the main reason why there exist relatively few studies on health poverty is that in comparison to income, health is multifaceted and therefore much harder to measure accurately. The first choice to be made is that of the health variable which will be taken into consideration. We will look at three different variables, all of which are assumed to have ratio-scale properties. This means that we can calculate the distance of everyone's health achievement from a given threshold level and compare the differences between individuals. We are then in a position to measure health poverty by means of the now widely adopted Foster-Greer-Thorbecke (FGT) class of poverty indicators. In our application we look at poverty with respect to cardiovascular risk, general health status, and life expectancy.

The FGT class of poverty measures includes a poverty aversion parameter. Different values of the parameter will be assumed in order to assess three aspects of poverty (incidence, intensity and inequality, known as the three I's of poverty measurement). Moreover, the FGT class is additively decomposable, which makes it possible to gauge the contribution of poverty within specific subgroups to overall poverty.

Drivers of Health in Sub-Saharan Africa: A Dynamic Panel Analysis for the Period 1995--2014

PRESENTER: **Mwimba Chewe**

AUTHOR: Dr. Peter Hangoma

Sub Saharan Africa has the greatest share of the global communicable disease burden and a growing burden of non-communicable disease. Post the 2015 Millennium Development goals, the continent has seen remarkable improvements in indicators of overall population health. Although there is a relatively mature literature on this subject, the analytical approaches commonly applied do not account of a number of possible drivers of health, such as quality of health services, which are important in themselves, but also lead to endogeneity if omitted.

This study investigates the impact of different social, economic, environmental, health care and lifestyle factors on population health status for a sample of 30 sub-Saharan African countries, focusing on the period between 1995 and 2014. To do this, a dynamic panel data model using a difference Generalized Method of Moments estimator (GMM) was employed. For a more robust analysis two measures of population health were chosen; life expectancy and infant mortality.

The empirical results revealed that increases in health expenditure, educational attainment and health care quality were associated with significant increases in life expectancy and reductions in infant mortality. In addition, alcohol consumption had a negative and significant impact on infant mortality. Higher HIV prevalence rates was further associated with reductions in life expectancy whereas urbanization, per capita income growth and access to clean water positively influenced life expectancy levels.

We conclude that increasing health expenditure, reducing alcohol consumption, raising the levels of education and improving the quality of health care in the region would significantly improve health outcomes in the region.

Do Childhood Non-Cognitive Skills Determine Health in Later Life: Going Beyond the Mean

PRESENTER: **Rose Atkins**

AUTHORS: Alex Turner, Matt Sutton

In recent years, non-cognitive skills have been shown to predict health and health behaviours. A topic that has not yet been explored is how this relationship varies along the health distribution. Studies that go beyond the mean are especially relevant, as public policy is concerned with the extremes of the health distribution. We use the unconditional quantile regression approach to analyse the effects of early life non-cognitive skills across the entire distribution of health, measured at age 50. We use data from the National Child Development study and create measures of conscientiousness, agreeableness and neuroticism recorded at age 16. We apply an Oaxaca-Blinder decomposition at various quantiles of the health distributions to analyse gender differentials in health and to measure the contribution of non-cognitive skills to these differentials. We find all non-cognitive skills significantly impact health, and that these effects are most prominent at the lowest quantiles of the health distribution. We find that there is heterogeneity in the association of health to non-cognitive skills across gender, which accounts for a substantial proportion of the gender differential in observed health.

Solid Fuel Use and Cognitive Function Among Middle-Aged and Older Chinese Adults: Evidence from a Chinese Longitudinal Study

PRESENTER: **Huan He**, Center for Health Policy and Governance, School of Public Administration, Southwestern University of

AUTHOR: Liming Fang

Solid fuel use (e.g., burning of dung, charcoal, wood, or crop residues) in household cooking and heating is one of the major sources for indoor air pollution. Solid fuel use remains one of the key threats to health in many developing countries. Chinese government has launched multiple programs to speed up the transition towards more cleaner household energy use in the past decade, but a considerable number of families are still using solid fuels as their major energy sources, especially in rural areas. The adverse effects of solid fuel use and all-cause mortality, respiratory diseases and other cardiovascular and ophthalmic disorders were widely reported. The relationship between air pollution and cognitive function remains unclear. Specifically, few studies have investigated how transition of household energy usage relates to changes of cognitive function among the middle-aged and older population.

This study uses a national panel study to examine if continued solid fuel use for cooking is associated with worse cognitive function, comparing to transition to cleaner fuel use, is associated with improved cognitive function. Three waves (2011, 2013, 2015) of data are included from the China Health and Retirement Longitudinal Survey (CHARLS), a national large-scale sample of rural and urban residents of 45-years age and older. The effect is estimated using both the random-effects GLS regression, and the general 2SLS random-effects IV regression (local community level solid fuel use rate of the last wave as an instrumental variable), after adjusting for smoking, sociodemographic and geographical variables.

Preliminary results show that about 52% rural sample and 19% urban sample are using solid fuels for cooking in 2015, decreased by 18% and 9% comparing to 2011, respectively. Compared to clean fuel users, middle-aged and older adults using solid fuels for cooking have significantly worse performance on total cognitive function score and all cognitive tests measured in CHARLS, including orientation tasks, two wordlist recalls tasks (immediate and delayed), a serial sevens subtraction test for working memory, and a picture drawing test. Stratified analyses indicate that the adverse effect of continued use of solid fuels are consistently found for females and the elderly, but less stable for rural residents, the less educated, and the low-income groups.

In summary, the present study suggests that the use of solid fuels for cooking relates to worse cognitive function, while transitions from solid fuels to more cleaner fuels may associate with improved cognitive function in middle-aged and older adults. Our main finding is in line with recent pioneer studies investigating the impact of cumulative exposure to air pollution on cognitive performance. Further studies on subgroup heterogeneity and possible pathways are planned to disclose the complex relationships and identify intervention strategies.

8:30 AM –10:00 AM TUESDAY [Supply Of Health Services]

Universität Basel | Kollegienhaus – Hörsaal 118

Physician Supply and Decision-Making

SESSION CHAIR: **Christoph Napierala**, Universit Luzern

Staffing, Perverse Incentives and the Determinants of Caesarean Sections in the English NHS

PRESENTER: **Graham Cookson**, Office of Health Economics

AUTHOR: Ioannis Laliotis

Caesarean delivery is one of the most common inpatient surgeries in the UK, and like other developed countries, caesarean section rates in English hospitals are on the rise (Declercq *et al.*, 2011). For instance, according to calculations based on Hospital Episode Statistics, the overall caesarean section rate increased from 21.8% in 2000 to over 25% in 2013, and was as low as 9% and 12% in 1980 and 1990, respectively (Bragg *et al.*, 2010; Francome and Savage, 1993).

Despite a lack of consensus, there is concern about whether high rates of caesarean section are justified because the procedure is not without risk (Shorten, 2007). Furthermore, it is extremely expensive. Over £3 billion of the £97 billion gross expenditure was spent on maternity

services in 2010, of which over £1 billion was spent on deliveries. Caesarean delivery is reimbursed at approximately 3 times the rate of normal, vaginal deliveries. Besides the perverse financial incentive to perform more caesarean sections, planned procedures offer predictability and convenience - shorter procedure timing, advanced staff planning, weekday working hours for staff (scheduling births by time of day, day of week and non-holidays, which is also cheaper when outsourcing staff), quick turnover of delivery rooms and higher fees (Sakala and Corry, 2008).

Identifying the sources of variation in caesarean section rates is central to improving the consistency and quality of obstetric care in the NHS, as well as controlling cost pressures. In this paper we attempt a formal modelling of the incidence of caesarean deliveries in the English NHS for the period 2000-2013. Using richer data sources than previous relevant studies, we separately model the elective and emergency caesarean section probabilities on a full set of maternal, clinical, provider and maternity workforce characteristics after removing any time, region and provider fixed effects. Regarding the maternal and clinical characteristics our results are in line with previous cross-sectional evidence. A novel feature of this study is that it is the first one to assess the implications of medical and non-medical staff which, despite being widely discussed, they had not received any formal investigation.

We have also presented some very first evidence regarding the role of the maternity workforce in the incidence of caesarean sections. At first, our results seem to support the view that the greater use of skilled and experienced doctors (consultants) are associated with lower caesarean section probabilities. The greater use of registered midwives is also seemed to be negatively linked with caesarean deliveries, especially the emergency ones. The results obtained using the Hospital Load Ratio variables which have a greater degree of variation as compared to the annual Full Time Equivalent figures for each trust, indicate that higher levels of hospital load per staff group increase the probability of caesarean delivery. However, we further show that the greater use of consultants, doctors and midwives tends to lower the probability for a caesarean section. Moreover, caesareans are more likely to occur in providers with higher caesarean rates in the past, indicating significant levels of persistence.

De-Adoption of Therapies Shown to be Ineffective or Have Unsafe Cardiovascular Events: Do Cardiologists Respond Faster?

PRESENTER: **Dr. Molly Moore Jeffery**, Mayo Clinic

AUTHOR: Pinar Karaca-Mandic

What influences a physician to discontinue a previously-approved therapy that was subsequently proven ineffective or unsafe? It is not clear how providers modify their prescribing when the clinical literature introduces new evidence on the effectiveness or safety of a treatment. This paper analyzes the physician characteristics associated with the de-adoption of ineffective or unsafe drugs with respect to cardiovascular events. Using data from the OptumLabs® Data Warehouse (OLDW), a comprehensive, longitudinal, real-world data asset with de-identified claims and clinical information for 2007-2015, we identified cohorts of patients (Medicare Advantage and commercially insured) taking drugs considered ineffective or unsafe focusing on two case studies. First, we considered physicians' de-adoption of dronedarone use for patients with heart failure or permanent atrial fibrillation. In December 2011, the PALLAS trial provided evidence of safety concerns associated with dronedarone use, which were subsequently followed up by black box safety warnings and REMS by the FDA. Second, we considered de-adoption of fibrate use among type 2 diabetes patients. In April 2010, the ACCORD lipid trial provided evidence that using fibrates in combination with statins was no more effective in reducing cardiovascular events compared to using statins exclusively. In order to identify the physicians responsible for de-adoption following these new bodies of evidence, we used a three-step claims-based attribution algorithm to retrospectively link patients to the physicians most likely responsible for potentially administering the treatment under consideration. We then obtained characteristics of the attributed physicians from Doximity®, an online social networking site for healthcare professionals. Doximity® provides information on physicians' sex, their specialty, the number of years since they were in residency, where they went to medical school, and where they went to residency. Finally, using interrupted time series analysis, we showed that after new evidence is introduced, the de-adoption of inadequate drugs was not immediate or homogeneous among drug types or physicians. Our results showed overall differences in de-adoption by drug type (inefficient vs. unsafe) and insurance type (commercial vs. Medicare Advantage), and differences by physicians' specialty, and time since residency. Surprisingly, de-adoption of dronedarone in response to evidence on harm was substantially slower compared with de-adoption of fibrates in response to evidence on ineffectiveness. Several physician characteristics were associated with faster de-adoption. Cardiologists were faster de-adopters of both drugs. Younger and less experienced physicians (less years since residency) were both faster adopters of the drugs, and also faster de-adopters after evidence emerged on ineffectiveness or harm.

Does Regularity of General Practitioner Contact Substitute for or Complement Ongoing Contacts with the Same Provider? A Study Using Linked Self-Report and Administrative Data.

PRESENTER: **David Youens**, Curtin University

AUTHORS: Rachael Moorin, Suzanne Robinson

Background:

Studies have assessed relationships between continuity of primary care and hospital / emergency department (ED) use. Continuity of primary care is generally assessed using indices measuring whether an individual consistently visits the same general practitioner (GP) or switches between GPs. We have previously assessed the related topic of regularity of primary care contact. Regularity refers to the dispersion of visits to the GP over time, with a more even dispersion of contacts indicating better regularity. No published studies have directly compared these concepts.

Aim:

This work will assess relationships between continuity of provider and regularity of GP contacts in terms of their correlation, and interactions between the measures in terms of their associations with hospital and ED use.

Methods:

Data include linked self-report and administrative service data from the 45 and Up Study, New South Wales (NSW), Australia. The baseline survey was conducted from 2006-2009 and includes a range of socio-demographic and health status indicators including previous diagnoses and self-rated health. Administrative data include Medicare Benefits Schedule claims supplied by the Department of Human Services, capturing GP contacts, and the NSW Admitted Patient Data Collection and Emergency Department Data Collection linked by the Centre for Health Record Linkage. Continuity and regularity will be calculated over three years (July 2009 – June 2012) for those with at least three GP contacts using previously published measures. Correlations between regularity and continuity will indicate the degree to which these measures are capturing different information. Hospital and ED use (July 2012 – June 2015) will be the outcomes in models including continuity, regularity and interaction terms.

Results:

The 45 and Up Study included 267,153 participants of whom 249,918 had at least three GP contacts within the measurement period and were included in analyses. The first result of interest will be the correlation between continuity and regularity, indicating the extent to which these measures capture the same or different information on contact between the patient and the GP, and hence the value in measuring these separately. Results of the regressions of hospital / ED use on these measures will indicate the extent to which each measure is associated with subsequent hospitalisation while interaction terms will indicate whether regularity and continuity complement each other (e.g., if more regular contacts are found to be associated with lower hospitalisation amongst those who consistently see the same provider) or substitute for one another (e.g. if regularity is found to be associated with reduced hospitalisation only amongst people who do not have a consistent provider).

Significance:

The majority of published studies in this area measure continuity in the limited terms of assessing whether patients are seeing the same provider or switching between providers. This work will contribute to the literature by highlighting the potential value of capturing regularity of GP contact as an additional dimension in understanding the impact of patterns of contact between patients and GPs.

Prevalence and Predictors of Counterproductive Work Behaviour Among Different Categories of Health Professionals in Public Hospitals in South-East Nigeria

PRESENTER: **Daniel Ogbuabor**, University of Nigeria

AUTHOR: Nwanneka Ghasi

Background: Although counterproductive work behaviour (CWB) contributes to inadequate health worker performance in low and middle-income countries, relatively little is known about the prevalence of CWB and individual and workplace factors that influence CWB of health professionals in public hospitals in Sub-Saharan Africa. The study, therefore, investigated the prevalence and socio-demographic and job-related predictors of CWB among different categories of health workers in public hospitals in South-east Nigeria.

Methods: A cross-sectional questionnaire survey which involved 700 health professionals comprising 167 doctors, 346 nurses and 187 allied health professionals (AHPs) selected from 5 public tertiary hospitals in South-east Nigeria using multi-stage sampling technique was conducted between January and April 2018. Mean score differences were tested using student t-test and analysis of variance (ANOVA). Multivariate analysis was used to test prediction models for counterproductive work behaviour. Statistical significance was set $\rho < 0.05$.

Results: The prevalence of CWB among overall sample, doctors, nurses and AHPs are 8.1%, 18.6%, 2.0% and 10.2% correspondingly. Being a doctor or allied health professionals, aged ≤ 34years, male, not married, educated to masters level and employed for ≤ 4years increase the likelihood for CWB. Among the doctors, marital status ($\beta = -0.433$, $\rho = 0.017$), pay ($\beta = -0.383$, $\rho = 0.000$), participatory decision making ($\beta = 0.369$, $\rho = 0.028$), enforcement of hospital policies ($\beta = 0.213$, $\rho = 0.028$), supervision ($\beta = -0.279$, $\rho = 0.012$), job satisfaction ($\beta = -0.695$, $\rho = 0.000$) and organisational commitment ($\beta = 0.280$, $\rho = 0.030$) predicted CWB with a variance of 29.5%. Among nurses, pay ($\beta = 0.109$, $\rho = 0.010$), enforcement of hospital policies ($\beta = 0.202$, $\rho = 0.002$), supervision ($\beta = -0.186$, $\rho = 0.000$), interprofessional conflict ($\beta = -0.150$, $\rho = 0.040$) and organisational commitment ($\beta = 0.280$, $\rho = 0.030$) predicted CWB with a variance of about 17%. Among AHP, only job satisfaction ($\beta = 0.433$, $\rho = 0.000$) predicted CWB with a variance of 20%. Overall, gender ($\beta = -0.212$, $\rho = 0.003$), marital status ($\beta = -0.266$, $\rho = 0.001$), enforcement of policies ($\beta = 0.112$, $\rho = 0.023$) and supervision ($\beta = -0.107$, $\rho = 0.002$) predicted CWB with a variance of 11.7%.

Conclusions: We conclude that optimizing performance of health professionals in Nigerian public hospitals warrants tailored attention to context-specific differences in demographic and workplace predictors of counterproductive work behaviour among different categories of health workers.

Factors Associated with Providers' Partnership of the Primary Care Coordination Networks (PCCNs) Under the National Health Insurance Program in Taiwan

PRESENTER: **Ms. Shih-jung Chien**, National Yang-Ming University

AUTHORS: Dr. Nicole Huang, Yiing-Jenq Chou

Background

Integration of care has been widely recognized as one prominent solution to address many health care challenges in quality and efficiency. Many integration policies such as accountable care organization or other formal provider networks have been implemented. While effective provider relationship plays a critical role in functioning integrated care system, one fundamental question is whether these participating providers within these formal networks are “truly” partners and share patients. Analyzing patient-sharing relationship using social network analysis provides a unique lens to examine the structure of provider relationships in these formal integrated care delivery systems. There has been limited large-scale empirical studies in this regard. Of the limited evidences, they are predominantly from the United States, Italy and Australia. Due to heterogeneity in medical cultures, health care systems, and societies, it may be interesting to extend the research scope to Asia, particularly a society with a single payer system. Taiwan's primary care coordination network (PCCN) program may serve as one interesting example. The purpose of the PCCN program, implemented by the National Health Insurance Administration (NHIA) in Taiwan, is to encourage clinics to form formal alliances for enhancing quality and capacity of primary care. This study aimed to assess patient-sharing relationship among participating providers of the PCCNs from 2015-2017 and explore its influencing factors.

Method

This was a repeated cross-sectional population-based study. Social network analysis was applied to National Health Insurance (NHI) outpatient claims data from 2015 to 2017 to identify relationship among providers participating within the same PCCNs linked by shared patients. Distinct network properties (adjusted degree, density, clustering coefficient) were calculated to describe provider’s partnership within each PCCN. Higher values of these properties reflect closer partnership among participating providers within the PCCNs. We also explored factors associated with the characteristics of patient-sharing relationship. A relative threshold of 20% of the strongest ties for each provider were included for estimations.

Result

There were 424 PCCNs (3,051 providers) in 2015 and the number increased to 520 (4,080 providers) in 2017. In 2015, the median adjusted degree varied substantially across the PCCNs, ranged from 0.12 per 100 NHI beneficiaries to 5.18 per 100 NHI beneficiaries. Whereas the median clustering coefficient ranged from 0 to 0.85, and density of community healthcare group ranged from 0.07 to 0.75. Most interestingly, the patient-sharing relationship among participating providers within the PCCNs remained stable over the three-year period. The PCCNs locating in urban areas, with a lower patient volume, and those grouped by providers with similar specialties were more likely to be associated with higher degree, density and clustering coefficient.

Conclusion

Provider’s partnership under the NHI program in Taiwan varied significantly across different PCCNs. The PCCNs with similar specialty providers, a lower patient volume and locating in urban areas tend to have a stronger patient sharing relationship. A better understanding of patient-sharing relationship of these formal networks can help to facilitate partnership within these network, and to identify candidates who may be the most-ready providers to be integrated and jointly accountable for the care they deliver.

Are Physicians Immune to Financial Incentives? Lessons Learned from a Regime Change in Drug Dispensing

PRESENTER: **Dr. Tobias Müller**, University of Bern

AUTHORS: Christian Schmid, Michael Gerfin

For decades, high levels of pharmaceutical spending combined with a steep spending growth have been a key feature of all health care systems in the Western world. Since drug expenditures are in large parts determined by the prescription behavior of physicians, a central question that arises in this context is whether physicians should be given financial incentives when prescribing pharmaceuticals to their patients. Using unique administrative panel data from a large health insurer, we study the impact of a regime change in drug dispensing allowing physicians to directly dispense drugs at their doctors offices and thereby increase their income. Based on a series of dynamic difference-in-difference specifications, we find that pharmaceutical expenditures of self-dispensing (SD) physicians significantly exceed the ones of non-SD physicians by up to 10% post regime change. Moreover, we demonstrate that the increase in drug expenditures can mainly be attributed to a volume effect as the SD physicians significantly increase the number of packages prescribed and the daily defined doses as a response to dispensing. In addition, we show that the possibility to dispense induces physicians to significantly increase the volume of more profitable pharmaceuticals to their patients indicating that physicians are far from immune to financial incentives resulting in unnecessary additional health care costs to society.

8:30 AM –10:00 AM TUESDAY [Supply Of Health Services]

Universität Basel | Kollegienhaus – Hörsaal 119

Topics in the Supply of Health Services

SESSION CHAIR: **Marcos Vera-Hernandez**, University College London

Hospital Management Practices in China: Evidence from County-Level Hospitals

PRESENTER: **Min Hu**, Fudan University

AUTHORS: Winnie Yip, Wen Chen

Background: Management matters in healthcare; however, low- and middle-income countries (LMICs) have little experience in measuring hospital management. Even less is known on what to tackle first within hospital management practices. While improving hospital management is the main lever of hospital reform in China, almost no study has empirically documented the baseline situation to inform policy design.

Methods: In this study we assessed the management practices of county-level hospitals in Guizhou Province in western China during 2015. Using the World Management Survey (WMS) instrument to interview 273 managers in 139 county-level hospitals (105 public and 34 private), we scored the management practices of the sampled hospitals overall as well in four dimensions (operation, monitoring, target, and personnel management) and three processes (implementation, usage and monitoring), and compared the results with international data.

Results: The hospital sample scored 2.570 (S.D. = 0.462) overall on a scale of one ("worst practice") to five ("best practice") and ranked the seventh among the 10 countries samples, generally after six high-income countries, and higher than samples of the two other LMICs with available data (Brazil and India) in both the overall and dimensional scores. Our sample performed worst in target management and process implementation.

Conclusion: China county-level hospitals can improve the low quality of management by prioritizing target management and process implementation particularly in personnel management. Meanwhile, trainings on modern management need to be provided to the majority clinical managers. Further research effort is needed to empirically examine how management affecting service outcomes in LMICs settings, especially when interacting with other health reform measures.

Key words: hospital management; LMICs; target; personnel; health reform

The Role of Parental Transfers in the Child's Caregiving Decision

PRESENTER: **Freya Diederich**, University Medical Center Hamburg-Eppendorf
AUTHORS: Dr. Hans-Helmut Koenig, Dr. Christian Brettschneider

Background: One of the major concerns of population aging is that the future supply of long-term care (LTC) will not meet its future demand. As informal care is an important pillar in the LTC system, caregivers' willingness to provide informal care needs to be maintained if formal LTC services are not considerably extended. It is therefore of major importance to identify factors that explain why people take care of the sick and elderly. In this study, we analyze the role of past parental transfers in a child's caregiving decision when a parent is in need of nursing care. We contribute to the literature by not only considering past financial transfers but also past services (e.g., household help). In return to these past parental transfers, a child may choose to provide informal care and may also choose between caregiving tasks such as help with activities of daily living (ADL) and instrumental activities of daily living (IADL).

Methods: The analysis is based on the German "Panel Analysis of Intimate Relationships and Family Dynamics" (pairfam) study. This multi-actor panel survey includes detailed questions on intergenerational relationships every two years. We consider the caregiving decisions of adult children whose parents become care dependent during the first 8 waves (2008/09-2015/16) of the panel survey. In a first step, we estimate the association between past parental financial and service transfers and a child's decision to provide informal care to the parent using a logistic regression model. In a second step, we differentiate between the kind of caregiving tasks. In our analyses, we control for socio-demographic factors, the child's attitude towards informal care, potential sources of care such as siblings, and the parent's living arrangement. The robustness of results is assessed by regarding various time horizons and definitions of transfers.

Results: The final sample consists of 413 caregiving decisions with full information with respect to the control variables. Once parents are in need of nursing care, 70% of children provide help with IADL while only 34% of children provide help with ADL. Children who received either financial or service transfers two years before the parent's care dependence were significantly associated with a higher probability of providing informal care. Help with ADL was significantly associated with previous financial transfers while help with IADL was not. By contrast, help with IADL was significantly associated with previous service transfers. The results were robust when varying the definition of transfers. In addition, the results remained robust when parental transfers over a time horizon of four years before care dependence were considered.

Conclusion: Our findings suggest that the type of previous parental transfers matters in the child's caregiving decision. More burdensome caregiving tasks such as help with ADL are more likely given if children received financial transfers in the past.

Exploring the Determinants of Cancer Waiting Times in England: A Patient-Level Study Using Hospital Episode Statistics

PRESENTER: **Ms. Júlia González Esquerré**, NHS Improvement
AUTHORS: Sarah Karlsberg, Steven Paling

Background

Rapid diagnosis and access to cancer treatment are vital for both clinical outcomes and patient experience. However, waiting times in England are increasing and the NHS is now consistently breaching the target for cancer treatment to be provided within 62 days of referral. This research explores the determinants of cancer waiting times, with particular focus on the operational aspects of the patient pathway.

Method

We use 2016/17 Hospital Episode Statistics to construct pathways for individual cancer patients across outpatient and admitted care, from referral on a two-week wait (2WW) pathway to possible treatment. We use negative binomial and logistic models to analyse the relationship between waiting times and factors including time to first appointment, being referred straight-to-test and attending a one-stop diagnostic clinic. We include several patient and trust-level characteristics, and robustness checks for endogeneity.

Results

We find that time to first appointment has a disproportionate effect on the pathway length/probability of breaching. For example, if instead of being seen in six days, a patient waits 7-9 days for their first appointment, they are 27% more likely to breach the 62-day treatment target, all else equal. Attending a one-stop clinic and/or going straight-to-test lower the probability of breaching. Pathways that contain patient and/or hospital cancellations, and those that are shared by multiple providers, are more likely to breach.

Conclusion

To our knowledge, this is the first study using national data to identify pathway characteristics that should help meet operational standards in cancer. Our results support a focus on streamlining pathways (where clinically appropriate), and show that the benefits of reducing time to first appointment go beyond meeting the 2WW target. Finally, for certain tumour sites the results support increased rollout of one-stop clinics and straight-to-test pathways, as well as initiatives to reduce cancellations by both patients and trusts.

Exploring the Link between Organizational Change Capacity and Performance in the Medtech Industry in Switzerland

PRESENTER: **Mr. Kosta Shatrov**, University of Bern
AUTHOR: Dr. Carl Rudolf Blankart

Introduction

The new Medical Device Regulation (MDR) and the In-vitro Diagnostics Medical Device Regulation (IVDR) entered into force in May 2017 and strengthened substantially the regulation of medical devices in the EU. Switzerland has already started with the adaptation of its national law to the MDR and the IVDR. While aiming at the prevention of incidents and improving patient safety, the stricter requirements may also impede market entry and overall performance. This study examines the economic effects of the new regulations on the medtech industry in Switzerland, and provides some implications for policy makers for potential future amendments of the regulatory framework.

Methodology

To measure the Organizational Capacity for Change (OCC) we use the scale of Judge and Douglas (2009). Next, we employ a construct based on the criteria of the Malcolm Baldrige National Quality Award (MBNQA) to capture organizational performance. We created an online survey with 5-point Likert scale design, which was validated in two series of pre-tests with informed persons from the medtech industry. Our overall sample comprises firms that are members of the biggest Swiss medtech industry association. We apply structural equation modelling (SEM) to analyze the data. To distinguish between small and medium-sized enterprises (SMEs) we employ the official definition of the EU.

Results

Our preliminary results show that the prevailing opinion among the Swiss medtech SMEs, which comprise more than 90% of the Swiss medtech companies, is that the new regulations add significantly to the regulatory burden posed upon the industry. SMEs and family-owned firms show slightly higher levels of OCC. The majority of the medtech companies suggest that the stricter documentation and quality management requirements are one of the most distinct challenges for the industry as of today. Firms also expect to encounter more difficulties in bringing their products onto the market, while keeping their innovation capacity constant. The majority of the manufactures have already transferred resources from their operative to their administrative business areas, and consider undergoing a portfolio consolidation by focusing on key products. The great majority of manufactures do not believe that transition from the old to the new regulation can be completed within the initial deadline in May 2020.

Conclusion

The scheduled portfolio consolidations is highly likely to enforce the withdrawal of medical devices from the market and might also, in the worst-case scenario, endanger patient safety across Europe due to device shortages. With this in mind, a revision of the expiry date of the old regulations might be an apt measure to ensure that firms have enough time to comply with the stricter requirements of the MDR and the IVDR, and also meet the demand of physicians and patients for medical devices of higher quality.

Systematic Review of the Evidence on the Cost-Effectiveness of Pharmacogenomics-Guided Treatment for Cardiovascular Diseases

PRESENTER: **Dr. Bijan Borah**, Mayo Clinic
AUTHORS: Dr. Ye Zhu, Kristi Swanson

OBJECTIVES: Pharmacogenomics (PGx)-guided treatment holds enormous potential for individualizing cardiovascular disease (CVD) management and reducing drug-related adverse events. The cost-effectiveness of implementing PGx in CVD care needs to be examined to

advance this process in clinical practice.

METHODS: We conducted a systematic review and narrative synthesis of evidence using Medline, Embase, the Cochrane Central Register of Controlled Trials and Database of Systematic Reviews, and the NHS Economic Evaluation Database from inception to 2018. Studies using cost-effectiveness methods to assess the implementation of PGx-guided treatments in CVD care and management were screened using a two-step process: 1) title and abstract screening, followed by 2) full text screening. We extracted data on study design, outcomes, and PGx recommendations. We assessed the quality of studies using the Quality of Health Economic Studies (QHES) scoring instrument.

RESULTS: We screened 909 studies and identified 46 to be included in the final analyses. Acute coronary syndrome and atrial fibrillation were the predominantly studied conditions (59%). The majority (78%) of studies focused on the drugs warfarin (genes *CYP2C9/VKORC1)* and clopidogrel (gene *CYP2C19)*, with some studies examining lipid-lowering and hypertension treatments. Most studies examined cost-effectiveness from a payer's perspective (39%), and US patients were the most commonly targeted population (46%). The majority (67%) of the studies found PGx testing to be a cost-effective method in the treatment of CVD, but effectiveness varied across drugs and conditions studied. Only two studies in our review examined PGx panel testing, and only one examined a preemptive testing strategy, while the remaining studies considered reactive testing approaches.

CONCLUSIONS: This study found mixed evidence on the cost-effectiveness of implementing PGx in CVD care. There was overwhelming evidence of cost-effectiveness among clopidogrel-*CYP2C19* and warfarin-*CYP2C9/VKORC1* studies, while the evidence is more limited in others (e.g., ACE Inhibitors, novel oral anticoagulants, CVD panels). Gaps persist in the evaluation of PGx-guided treatment, including: perspective and cost inputs not being clearly described; study design elements critical to economic evaluations being underreported; as well as PGx panel testing and preemptive testing being rarely examined. This review identifies the need for a more standardized approach to conducting economic evaluations for PGx implementation.

Keywords: Economic evaluation, pharmacogenomics, cardiovascular disease, disease management

Building a Framework for Health Workforce Development Planning in the U.S.

PRESENTER: **Ms. Janis Barry**, Fordham University

Forecasted shortages in the number of physicians relative to estimates of future population size are ubiquitous in international health workforce planning reports. Estimating the future supply of human resources for health, as well as population demand/need is fraught with severe analytical problems. There are too few studies providing cross-national comparisons of data that go beyond the examination of physicians per capita to tackle other issues of concern. If workforce planning in each country is to be more than an exercise in demographic guesstimates, we need more data on physicians and other health workers than just their numbers, as represented by the physician to population ratio. Physician density per 1000 population in the United States in 2004 was 2.67, 2.42 in 2009; and 2.55 in 2013. But what represents a surplus or shortage of physicians compared to what is desirable, is highly contested. That is why it is essential to provide evidence on physician workforce trends.

I develop a composite profile of the U.S. health care workforce, expanding beyond doctors, and including in my study, information on nurses, and other ancillary human resources for health. Using the American Community Survey, I explore the health workforce in the United States and analyze its changing size, demographics, and skill composition during the period from 1990 through 2017. This research is part of a larger cross-country exploration of health care workforce trends using the Luxembourg Income Study, which ensures that the household-based labor force survey data are comparable across nations (i.e., harmonized).

Changes in the overall labor market share of health occupations, as well as the distribution of physicians, nurses, and other health professionals (occupational-skill mix) over the 1990-2017 time-frame are tracked and graphed. Of particular interest is the trend in the occupational distribution of physicians, and the proportion of foreign-born doctors relative to other health professions. Wage and earnings differentials between categories of workers (i.e., nurses relative to physicians) and by gender, are used to discern whether the increased demand for nurses, dental assistants, and other health workers, impacted earnings gaps across the occupational health distribution. Work hour differences across occupations, as well as trends in physicians' hours are explored.

The current shortage of physicians within some areas of the U.S is best understood as a shortfall in the number of primary care doctors. The market-based governance of the U.S. health care system hampers the geographic diffusion of doctors, whether specialists or generalists. Health workforce development efforts in the U.S. are limited by "Winner take all" markets which reinforce earnings disparities, especially among physicians. Increased reliance on international medical graduates (IMGs) to locate and practice in rural areas, means that fewer U.S. trained physicians work in primary care or underserved areas. There is a gender pay gap between female and male physicians, that is not associated with specialty preferences. And the increased use of non-physician practitioners and other substitutes (telemedicine) lowers the need for primary care doctors, and perversely hampers the recruitment of more medical students into primary care fields.

8:30 AM –10:00 AM TUESDAY [Evaluation Of Policy, Programs And Health System Performance]

Universität Basel | Kollegienhaus – Hörsaal 120

Selected Topics in Evaluation: Quality, Efficiency and Measurement

SESSION CHAIR: **Fadima Yaya Bocoum**, Institut de Recherche en Sciences de la Santé

ALTERNATE CHAIR: **Rachael Morton**, University of Sydney

Interpreting Multi-Intervention, Multi-Country Cost-Utility Analysis without Consistent Willingness-to-Pay Thresholds

PRESENTER: **Xiao Li**, Antwerpen University

AUTHORS: Marina Antillon, Lander Willem, Joke Bilcke, Virginia Pitzer, Mark Jit, Philippe Beutels

Background: Health economic evaluations for multiple interventions and multiple countries are invaluable for decision-makers involved in global initiatives. Several such analyses have been published, often for vaccination strategies where investment decisions need to be made both at the country- and a multi-country level (e.g., World Health Organization(WHO), Gavi). Unambiguous interpretation of such analyses is especially difficult in the absence of an official or fixed willingness-to-pay (WTP) threshold. The WHO explicitly discouraged the use of GDP per capita as a benchmark of the incremental direct costs that a country should be willing to pay to gain a Quality-Adjusted-Life-Year, or avert a Disability-Adjusted-Life-Year. Therefore, we aim to study ways to explore, present and interpret such complex analyses to ensure that results are correctly and easily understood by various stakeholders.

Methods: Two current topical cost-utility analyses (CUA) are presented:

(1) Four typhoid Vi-conjugate vaccination (TCV) strategies in 54 countries;

(2) Three childhood prophylactic interventions against human respiratory syncytial virus (RSV) in 72 countries.

Country- and age-specific data were used in both models, and most uncertainties were accounted for in a probabilistic way. The TCV analysis used a dynamic transmission model and the RSV analysis a static model. Standard outcomes for CUAs such as Net Monetary Benefits, Cost-Effectiveness Acceptability Curves and Frontiers, as well as Value of Information analyses were performed over a wide range of WTP values. Additionally, a range of representation formats were developed to facilitate “identifying” the optimal strategy per country or country-group for a given WTP value.

Results: The model outcomes were presented in different ways to facilitate different stages of decision-making, depending on whether the analysis was geared for country-specific stakeholders or global stakeholders. For the TCV analysis of a WHO-prequalified vaccine, country-specific guidance was illustrated. We delivered tables containing precise values for each country and a website to showcase country-specific diagrams to stakeholders and the public, as it would be intractable to display all country-specific results in any single report.

Since there is no specific licensed product to prevent RSV in developing countries, and only preliminary data regarding the efficacy and duration of protection to underpin an economic evaluation, we instead focused on global-level analyses to identify the most influential drivers of uncertainty in RSV-prophylaxis decision-making and to inform future research priorities. Plots were used to show the global trends and impact of different assumptions in both current disease trends and potential implementation programs.

Discussion: We have developed several ways of presenting and interpreting uncertainty for multi-intervention, multi-country cost-utility analysis in the absence of consistent WTP thresholds. For researchers, plots that show the most uncertain areas of data for most countries make it easy to interpret the results. For country-level decision-makers, a tabular format with color schemes indicating their country-specific results may be preferred. For global stakeholders, maps or other graphical display might be the best approach. There is a need to validate these different ways of presenting uncertainty for complex decision-making in such a way that the interpretations are correct and easy to understand.

Little Association with Socioeconomic Status in Overall Low Quality of Care for Reproductive Health Services in Ethiopia

PRESENTER: **Dr. Girmaye Dinsa**, Fenot Project

AUTHORS: Ermias Dessie Buli, Sarah Hurlburt, Bereket Yakob, Catherine Arsenault, Tsinuel Girma, Yosef Gebreyohanes, Carlyn Mann

Background

The Ethiopian health system faces persistent geographic and socioeconomic inequities in healthcare utilization, health outputs, and outcomes despite continued efforts to expand health service coverage across the country. While inequities in health service utilization and outcomes are fairly well documented, there is little evidence in the literature on the status of equity in the quality of healthcare. This paper aims to understand the disparities in quality of reproductive health services (antenatal care and family planning services) by socioeconomic status and geographic area.

Methods

We used the 2016 Ethiopia Demographic and Health Survey (DHS) household level data to compute a multidimensional poverty index (MPI), and the 2014 Service Provision Assessment Plus (SPA+) data to assess quality of antenatal care (ANC) and family planning (FP) services – defined as the level of adherence to WHO's clinical and service guidelines - in private and public facilities. We merged the two datasets using geographical coordinates, and aggregated service users into facility catchment area clusters using a 2-kilometer radius for urban and 10-kilometer radius for rural facilities. Using these geographic clusters as catchment areas we were able to compute ANC and FP quality and MPI indices for each facility and its catchment area. We evaluated whether the quality of ANC and FP services varies by socioeconomic status of catchment areas, using the international cut-off point for deprivation (MPI=33.3%) to categorize poor and non-poor catchment areas.

Results

The majority of catchment areas (75.7%) were found to be multi-dimensionally deprived – categorized as poor - based on the MPI cut-off point of 33.3%. While the overall quality of ANC and FP services are low (33% and 34% respectively), we found little disparity in the distribution of the quality of these services between poor and non-poor areas, urban and rural settings, or regionally. The quality of ANC and FP services are low, regardless of place of residence or the wealth status of a community. More specifically, the relatively more deprived catchment areas received 33.1% of the standard ANC and 32.9% of FP clinical actions, while these figures were 33.2% and 36.4% respectively for less-deprived areas.

Conclusions

The overall quality of reproductive services is low, with little disparity between less- and more-deprived areas and by public or private facilities. Hence, in the short-term the focus of the health system should be to continue improving the overall quality of services rather than primarily focusing on equitable distribution. Measuring other elements of quality such as availability, functionality and utilization of inputs and infrastructure may uncover different findings on equity of quality of care and should be undertaken to supplement these findings.

No potential conflicts of interest

Funding source: Bill & Melinda Gates Foundation

Variation in Quality of Care in Ethiopia: Do Different Measures Tell the Same Story?

PRESENTER: **Catherine Arsenault**, Harvard T.H. Chan School of Public Health

AUTHORS: Bereket Yakob, Tizta Tilahun, Tsinuel Girma, Margaret Kruk

In 2018, three publications have described the poor quality of health services across low- and middle-income countries (LMICs) and have highlighted the need to prioritize quality in the sustainable development goals era. However, important gaps remain in understanding how to reliably measure and monitor quality across countries and contexts. In addition, it remains unclear whether facilities with better structural quality (better equipped, better staffed facilities) consistently deliver higher quality care and whether higher quality care is linked to higher health care uptake (higher volume of services).

Data from the Ethiopian Service Provision Assessment survey + (ESPA+, 2014-15) linked to the routine Health Management Information System (HMIS) for the same facility and year, provided an opportunity to assess quality using multiple measures across a large sample of health facilities. This study aimed to measure variation in quality in Ethiopia, the correlation among different measures of quality, and the correlation between measures of quality within the same health facilities in Ethiopia. A total of 850 facilities were included, both public and private, at all levels of the health system (health posts, clinics, health centers and hospitals). Using the framework of the Lancet Global Health Commission on High Quality Health Systems in the SDG era, we selected 25 different measures of quality related to the processes of care and their outcomes. Process measures included: adherence to recommended evidence-based guidelines for family planning, antenatal care and sick child care consultations, appropriate patient assessments and diagnostic accuracy, continuity of care (patient drop outs) and measures of user experience (short wait times, clear explanations, respectful care). Outcome measures included facility-based maternal and neonatal mortality rates, stillbirths, inpatient mortality, viral load suppression among patient on antiretroviral therapy, pulmonary tuberculosis cure rate and patient satisfaction. We calculated variation in, and correlations among, these 25 quality measures across the 850 health facilities in Ethiopia, adjusting for facility characteristics, catchment population and case mix. Further, we created a quality index using factor analysis and correlated it with structural quality (service readiness and availability of equipment, medicine and supplies) and the annual volume of services.

The coefficients of variation of facility-level quality varied substantially. Pairwise correlations between quality measures varied according to the dimensions of quality. We found that the quality index was poorly related to structural quality and modestly positively related to volumes of services. To our knowledge, our is the first study to link a SPA survey to routine HMIS data in any LMIC. Our findings have implications relevant to the measurement and improvement of health service quality in Ethiopia and other LMICs with similar contexts. Although structural readiness of facilities is crucial to the provision of high-quality care, it does not guarantee the provision of competent, continuous, patient-centered care and good health outcomes. Our findings also point to a relation between higher quality care and higher patient volumes, indicating that patients may be able to identify and choose higher quality facilities.

No potential conflicts of interests

Funding source: Bill & Melinda Gates Foundation

Has Out-of-Pocket Spending for Public Health Facilities in Ethiopia Become More Equitable, and How Has This Affected Health Service Use Among the Poor?

PRESENTER: **Carlyn Mann**, United States Agency for International Development (USAID)
AUTHORS: Dr. Girmaye Dinsa, Zenebech Gella, Mideksa Adugna, Peter Berman

Introduction

Out-of-pocket (OOP) spending at the point of care continues to be a concern for low and middle-income countries. Concerns of financial hardships has led some countries to abolish user fees charged at the point of use. Other resource-limited countries, like Ethiopia, see user fees as a means to reduce the resource gap to provide quality health services. This study explores whether the poor in Ethiopia are paying a higher proportion of user fees for using public health facilities and the effects this has on health service use.

Methods

OOP spending for public health facilities in Ethiopia was obtained from National Health Accounts' Household Utilization and Expenditure surveys for 2012/13 and 2015/16. Concentration indices and descriptive statistics were used to conduct the analysis. OOP per use estimates were adjusted for inflation.

Findings

By 2015/16, the rich are paying a higher proportion of user fees than the poor for public health services with a positive concentration index (0.040). However, the poor were paying a higher proportion of user fees than the rich by 2015/16 for inpatient admissions among all public health facilities. Despite this finding, fees paid per use for inpatient services for the poorest quintile reduced by 21% and increased for the richest quintile between 2012/13 and 2015/16. The decrease in this financial barrier may explain the increase in inpatient service use among the poorest quintile, thus why a higher proportion of the poor are paying user fees. User fees paid for outpatient visits became pro-poor by 2015/16 with the exception of government hospitals. Fees paid per use for outpatient services decreased 39% by 2015/16. Utilization for the poorest quintile also increased as a proportion of total outpatient visits.

The continued OOP payments for the poor to use public health services is a concern but the decrease in payments per use and the reduced burden of OOP for outpatient services for the poor over time is encouraging. Nonetheless, financial barriers continue to be a problem for those trying to access public health care services. Lack of money or high cost of care was the major reason why care was not sought when ill in 2015/16. As many as 32% of health facilities are charging user fees for at least one service considered exempt from user fees by the government.

Conclusions

Reducing out-of-pocket payments at the point of care among the lower-income groups through initiatives such as community-based health insurance, restructuring of the fee waiver program, and improving the implementation of exempted services should alleviate some of the financial burden on poorer households, especially with the government subsidizing these initiatives. With that said, financial sustainability for the health system is a significant concern for Ethiopia as it faces challenges to provide quality health care given double burden of diseases, uncertainty of external support with declines in funding by some partners, and commitments to supplement the health insurance schemes while maintaining direct financial support to the health care system.

No potential conflicts of interest

Funding source: Bill & Melinda Gates Foundation

Health Systems and Efficient Matching of Patients to Hospitals

PRESENTER: **Nancy Beaulieu**, Harvard University
AUTHORS: Peter Lyu, David Cutler

Context

The choice of hospital for a particular patient depends on many factors (e.g. patient characteristics, reason for the admission, distance to hospitals, types of services available at area hospitals). Multiple reasons may explain why a patient might not be admitted to the hospital best able to efficiently meet the patient's needs (e.g. incomplete information about the patient, payment incentives, hospital capacity, and hospital affiliation of the clinician making the hospital selection decision). Health systems that include community hospitals and teaching hospitals may be able to improve upon the allocation of patients to hospitals, and alternative payment models (e.g. Accountable Care Organizations) may realign incentives to reward more efficient triage of patients to the optimal care setting.

Research Questions

Do community hospitals' acquisition by health systems with teaching hospitals lead to: 1) an increase in the proportion of patients in community hospitals' service area that are admitted to teaching hospitals for conditions that can be treated more efficiently at a community hospital? 2) an increase in the proportion of patients admitted to teaching hospitals for conditions more appropriately treated at a teaching hospital? 3) an increase in the proportion of patients in the teaching hospital service area that are admitted to a community hospital for community-appropriate conditions?

Data and Methods

We use a unique relational database containing information on physicians, physician practices, hospitals, and health systems in 2010-2016 that draws from and integrates data from many different sources. All providers can be linked to commercial and Medicare claims data. Our database of health systems enables us to identify hospitals that are part of the same system. We also identify a set of community hospitals that were acquired in each year, 2011-2015.

Our study population includes hospitalized patients living in the primary service areas of short term general acute care hospitals in the United States. We define hospital primary service areas (PSA) for rural and suburban community hospitals (urban and teaching hospitals) as all ZIP code tabulation areas (ZCTA) whose centroid coordinate falls within 25 (45) miles of each hospital's address. We stratify patients into groups based on the patient's complexity (HCC scores, CCW diagnoses and previous admissions) and the reason for admission (principle diagnosis code).

We estimate two difference in differences models at the patient admission level using Medicare claims data for inpatient care to examine the changes in the hospital's proportion of admissions originating from their own PSA before and after acquisition. First, we estimate the proportion of admissions for patients residing in a community hospital PSA who are admitted to a teaching hospital. Second, we estimate the proportion of admissions for patients residing in a teaching hospital PSA who are admitted to a community hospital.

We include hospital, year, and market fixed effects, controls for patient characteristics, and relative distance measures. We also investigate heterogeneous effects for patient type, admission type, and acquired hospital characteristics (e.g. capacity, system employment of acquired community hospital physicians).

Forecasting Waiting Time to Treatment for Emergency Department Patients

PRESENTER: **Mr. Anton Pak**, The University of Queensland

AUTHORS: Brenda Gannon, Andrew Staib

This article builds on and extends a developing agenda of operations research by applying a number of statistical learning methods and constructing the set of queuing predictors that incorporate patient flow and service rates in the Emergency department (ED). We build a prediction model for the waiting time for low acuity patients using administrative data from a large public tertiary health care centre located in the state of Queensland, Australia. Our sample consists of approximately 120,000 ED presentations over 2 years and we allocate 80% of observations for training and 20% for testing of our models.

Across different specifications, Lasso regression predicts the waiting time with slightly higher accuracy than Ridge or OLS methods based on mean squared prediction error, mean absolute prediction error and the number of under predicted and over predicted estimates. Lasso, Ridge, OLS and Random Forest methods perform significantly better when compared with best rolling average predictor that is commonly implemented in predicting waiting time for EDs in Australia and the U.S. By using regularisation term (defined by the penalty function), Lasso and Ridge prevent overfitting of the data and provide a better compromise between bias and variance of the estimated parameters resulting in 5.8% of observations under predicted by more than 30 minutes, in comparison to 8.4% using the best rolling average method. The results also suggest the differences between average actual and predicted time to treatment for low acuity patients are fluctuating diurnally and the largest error in waiting time predictions occur in the periods of low service rates and patient arrivals between 4 a.m. to 8 a.m. We find that the generated variables accounting for queueing (arrival and service rates), wait lines (number of patients waiting and the average waiting time spent in the queue) and rolling averages are the most important for improving the accuracy of the estimators.

The potential benefits to the community from the accurate waiting time forecast for the low acuity ED patients may 1) reduce anxiety associated with uncertainty about the waiting time; 2) alleviate the problem of overcrowding in EDs because the low acuity patients may be more likely to choose a nearby ED with smaller queue or decide to come later; 3) reduce the number of patients who leave without being seen and do not access the health treatment needed; 4) improve the social welfare of all patients in case of multiple hospitals reporting waiting times, as the average waiting time will decrease network wide and hospitals raise their resource utilisation.

Family Health Strategy, Perceived Health and Anthropometric Measures: Evidence from a Brazilian Community-Based Health Program on Individual Outcomes

PRESENTER: **Adriano Dutra Teixeira**, University of São Paulo - School of Economics

AUTHOR: Maria Dolores Montoya Diaz

The implementation of the Brazilian Family Health Strategy (FHS) in the 1990s was a milestone towards a primary care model based on community health workers, replacing a techno-health care model focused on hospital care. FHS aims to provide basic health through professional health-care teams (composed by doctors, nurses and health agents) working at the community level. Each team is designed for a maximum number of families, situated at a specific geographic area. Covering 967 municipalities in 1998, the program accelerated in recent years, reaching 5,482 municipalities and 39,872 teams in 2018. Despite the relevance and scope of the program, few studies addressing the impacts of the FHS are available; among the empirical studies, most are based on state and municipal data. Using the microdata from the National Health Survey and information on access and use of health services, household's registration in the FHS and frequency of the Family Health Teams, this study estimates the effects of FHS on different individual health dimensions. To avoid selection problems, our empirical strategy consists in Propensity Score Matching estimations, by taking advantage of the comparison of households enrolled in the family health unit with high frequency of Family Health visits, as opposed to households also enrolled in the family health unit which have never received a

visit from a Family Health Team. Our results show that the active presence of the program improves health perception, lowers prevalence of obesity (measured by Body Mass Index and Waist Circumference), but does not have a significant effect on hospitalization rates and emergency at home.

Are Underlying Constructs Measured By Different Quality of Life Instruments Really That Different? Using Factor and Latent Path Analysis to Compare Latent Constructs Measured By Six Instruments

PRESENTER: **Billingsley Kaambwa**, Flinders University

Introduction

It is important that quality of life (QoL) instruments measure the underlying QoL constructs that are important in their target population. A plethora of QoL instruments designed to measure different QoL constructs exist. However, it is not always clear whether the constructs purportedly measured by these instruments are really that different especially when similar language is used in describing the instruments. This study compares the constructs measured by six instruments focussing on health-related QoL (EuroQoL 5 Dimensions 5 Level (EQ-5D-5L)), older-people-specific QoL (Older People's Quality of Life brief questionnaire (OPQoL-brief)), social-care-related QoL (Adult Social Care Outcomes Toolkit (ASCOT)), capabilities (ICEpop CAPability measure for Older people (ICECAP-O), mastery (Pearlin Mastery Scale) and self-esteem (Rosenberg Self-Esteem Scale).

Methods

Data on 293 older people from the Australian general population were analysed. Exploratory factor (EFA) and confirmatory factor analysis (CFA), based on polychoric correlation matrices to accommodate the categorical nature of instrument dimensions/domains, were used to identify underlying constructs. Only factor loadings ≥ 0.4 were considered significant. The optimal number of factors to include in the EFA/CFA was determined by examining scree plots obtained from parallel analysis. Interpretation of the EFA/CFA results was based on a 'varimax orthogonal rotated' solution due to the exploratory nature of this analysis. Following the EFA and CFA, latent path analysis was conducted to examine the factor structure and test hypothesized structural relationships as defined using the International Classification of Functioning, Disability, and Health (ICF) framework. Path coefficients of close to ± 1 and 0 were respectively indicative of strong and weaker relationship between constructs measured by the instruments. Path coefficients below 0.09 were considered to show a small effect, those between 0.09 and 0.2 a moderate effect and those above 0.2 a large effect.

Results

Correlations between total/utility scores reflected those between instrument dimensions/domains. The OPQoL-Brief, ASCOT and ICECAP-O total/utility scores all loaded highly onto a common factor (factor loadings: 0.71, 0.70, 0.57, respectively). Path analysis also showed that path coefficients depicting the structural relationship between constructs measured by these instruments ranged from 0.15 to 0.31. The ICECAP-O total and EQ-5D-5L utility score also loaded sufficiently onto the same factor (factor loadings: 0.44 and 0.91, respectively) as did the Rosenberg Scale and OPQoL-Brief total scores (factor loadings: 0.48 and 0.69, respectively). The path coefficients for the structural relationship between these ranged from 0.12 to 0.19. Only the Pearlin Scale loaded onto its own separate factors.

Conclusions

The constructs measured by the instruments seem to overlap which raises the potential of their substitutability in some settings.

8:30 AM –10:00 AM TUESDAY [Demand & Utilization Of Health Services]

Universität Basel | Kollegienhaus – Seminarraum 208

Health Insurance and the Demand and Utilization of Health Services

SESSION CHAIR: **Neha Batura**, University College London

Healthcare Access and Quality in the United States: Does Insurance Coverage Explain Differences across Age Categories and States?

PRESENTER: **Marcia Weaver**, University of Washington
AUTHORS: Vishnu Nandakumar, Ryan M Barber, Nancy Fullman, Jamal Yearwood, Rafael Lozano, Diana Ngo

Introduction

The United States' (US) health system does not perform as well as our peers' in high income countries. The US ranked 29th globally on the 2016 Global Burden of Diseases, Injuries, and Risk Factors Study's (GBD) Healthcare Access and Quality (HAQ) index, which was estimated from mortality rates for 32 amenable causes of death that should not occur with timely and effective health care. The US also differed from our peers by its low health insurance coverage, and insurance programs that differed by age and state. We estimated the HAQ index by age-category and state, and tested whether or not variation in HAQ index scores by age and state was associated with insurance coverage.

Methods

We used GBD 2016 results for cause-specific mortality to estimate the HAQ index by age category and location from 1990 to 2016, and compared US estimates and trends to peer countries. We used American Community Survey's Public Use Microdata Sample PUMS to estimate insurance coverage by age category and state in 2010 and 2016, and conducted a multivariate regression analysis of HAQ index scores as a function of insurance coverage, median household income, and year.

Results

In 1990, the age pattern of HAQ index scores in the US was similar to peers. Scores were low among children less than one year of age, reached their highest values in the five to 14-year age categories, and declined gradually with age beginning at 15 to 19 years. In 2016, the decline in scores beginning at 15 to 19 years was less pronounced everywhere except the US. Among peers, the HAQ Index was above 85 for ages 15 or more. In the US, the score decreased by 9 points between the ages of 15 and 25, and was below 85 beginning at ages 25 to 29 years throughout working age. In multi-variate analysis of state-level data in 2010 and 2016, scores were statistically significantly related to private insurance coverage for all ages, and to total insurance coverage for ages 15 to 64 years. A 10 percent increase in private health insurance would account for a 1.24 increase in scores for ages 15 to 24, 0.5 for ages 25 to 54, and 2.69 for ages 55 to 65. A 10 percent increase in total health insurance would account for 1.85, 1.07, 2.31, increases respectively.

Interpretation: The HAQ index as a measure of access and quality of health services was sensitive to age differences. The observed decline in the HAQ index scores throughout working age in the US was in contrast to the relatively stable scores across working ages among our peers. Insurance coverage accounted for some of the observed variation in personal health care access and quality.

Health Financing Strategies for Universal Health Coverage: A Comparative Study of Three Indian States

PRESENTER: **Dr. Montu Bose**, TERI School of Advanced Studies

Background:

Public health spending in India is historically low. Such, low level of public investment on health, forces people to spend a large share of healthcare expenditure from their pocket. To achieve the Universal Health Coverage, India and her states have implemented different strategies (like National Health Insurance Policy (RSBY), National Health Mission etc.) to arrest high out-of-pocket expenditure (OOPE) and improve access to healthcare services. As medicine constitutes the maximum share in total health expenditure, Tamil Nadu (TN) implemented free medicine distribution scheme for all who are utilizing public healthcare facilities. Following TN, Rajasthan (RAJ) has also implemented the same strategy. However, West Bengal (WB) has implemented a public-private-partnership model to provide medicine at a discounted rate for all through fair-price medicine shop (FPMS).

Objectives:

- Study the utilization pattern of public inpatient and outpatient care facilities of the states and
- Examine the effectiveness of the strategies adopted by the states to arrest high OOP expenditure.

Data & Methodology:

Exploratory data analysis & Benefit Incidence Analysis have been applied on the National Sample Survey (NSS) 71st (2014) and 60th (2004) round unit-level data on Morbidity and Healthcare.

Results:

Inpatient care: Utilization of public-facilities in TN and RAJ has increased substantially, whereas, it has decreased in WB during this period. Moreover, when the utilization of the poorest class has increased for TN and RAJ, poorest class of WB are experiencing decrease in utilization of public-facilities. It is observed that patients who utilize public-facilities in WB don't get other services as a package which forces them to purchase these services from the market. Additionally, OOPE for both medical and medicine is the highest in WB among three states for public sector hospitalizations. Surprisingly, OOPE on medicine is the highest for the poorest class of WB. Further analyzing the data, we could see that non-communicable diseases, injuries and disabilities have increased substantially in both the sectors of the states. Moreover, most of the people suffering from these diseases prefer to utilize public-facilities in WB. However, the mandatory drug-list for FPMS mostly includes medicines related to communicable disease or antibiotics.

Outpatient: Utilization of public-facility has decreased in RAJ and WB; whereas, it has increased in both the sectors of TN. However, utilization has increased for the poorest class of RAJ & it has decreased in WB. Surprisingly, OOP expenditure for medicine and medical care have decreased in all the states and the decrease is maximum in RAJ. Further exploring the data, it is found that most of the people going to private facilities are complaining about the quality of the service and long waiting time in public-facilities of RAJ.

Conclusions:

Following TN, RAJ has improved the public inpatient care system. Additionally, provisioning of free medicine has also decreased the OOP expenditure in the state. However, improvement in overall quality of the services are need for outpatient care as well. Focused policies are required to increase public sector utilization in WB. Procuring medicine or regularly updating the essential drug list is urgently required in the state.

Determinants of Societal Willingness to Pay for NHS Dental Interventions in England

PRESENTER: **Katherine Carr**, Newcastle University

AUTHORS: Christopher Vernazza, John Wildman, Cam Donaldson, Robert Smith

Background: In England, NHS Dentistry costs £3.7bn annually yet allocation of this resource is usually historically driven. As concern surrounding efficient allocation grows, decision makers need to establish a robust system arguably taking into account opinions of the public who fund NHS Dentistry through taxation and patient co-charges. Little is known about the values held by the English population for dental interventions or determinants of willingness to pay (WTP) for dental services.

Method: This study elicited WTP for dental services in extra taxation per annum from a cohort (n=186) of the English population. This was done across four waves of data collection, using payment cards followed up by an open-ended valuation question. The interventions were societal, spanning different providers, recipient groups and type. Preventable bias was mitigated during data collection using a cheap talk script. To check intertemporal stability values for root canal were collected at each time point. Regression analysis was undertaken to determine if any of the socio-demographic information collected from participants had a statistically significant impact on WTP values. Probit modelling was undertaken to determine if any characteristics were related to the likelihood of giving a protest response.

Results:

Type	Intervention	WTP (£)		Protest responses
		Median	Mean	N (%)
Preventative	Fluoride Varnish for children	10	28.35	28 (15)
	Supervised tooth brushing in schools	10	24.74	22 (12)
	Preventative advice	10	20.65	21 (11)
	Local authority provisions in council contracts	10	16.87	19 (10)
	Tooth maintenance in care homes	15	28.05	25 (13)
Access	Dentures provided in care homes	12.53	31.03	20 (11)
	Surgery in General Dental Practices	15	26.61	20 (11)
	Cognitive Behavioural Therapy	15	24.67	32 (17)
	111 triage for dental problems	10	20.46	13

				(7)
	Dental care for the homeless	10	16.99	31 (17)
	New practices	13.50	22.98	19 (10)
	Out of hours appointments	15	22.97	21 (11)
	Scale & polish	10	15.57	26 (14)
In practice treatments				
	Root canal (value from wave 1)	15	31.75	21 (11)
	Jaw surgery	20	34.92	26 (14)
	For half the moderate need population (more severe half)	10	24.13	18 (10)
Orthodontic	Extending to everyone with moderate need)	20	35.99	21 (11)
	For severe need	15	27.68	22 (12)
	For adults	10	24.63	32 (17)

With regard to stability the median value for root canal was £15 in waves 1, 2 and 4 whilst £10 in wave 3.There is no consistent directional impact of any of the characteristics used for modelling WTP of the interventions or protest responses.

Conclusion: There is little differentiation between values at the median, however there is by mean. There is little in common between the highest (and lowest) valued options, the values do not converge when considered by type. The inconsistent results from the regression analysis and probability modelling indicates behaviour is driven by a multitude of factors not captured by socio-demographics. The instability of the root canal value may be indicative of financial constraints fluctuating throughout data collection or a spill-over effect of having more/less desirable options available in each wave.

Study on Economic Impact of Household Out-of-Pocket Health Expenditure on Thalassaemia Major Care in Mumbai

PRESENTER: **Shinde Amol**

Background: Poor health is a source of impoverishment among households in low and middle income countries as households in LMICs bear a high burden of OOP health expenditure. The threat of OOP expenditure posed to household's living standards is increasingly recognized as major consideration in financing health. Nevertheless, little information is available on economic burden of rare genetic diseases and catastrophic health expenditures (CHE) associated with it. The present study explored the Out of Pocket expenditure, incidence and major determining factors of catastrophic payment, financial coping mechanism of households with one of the commonest genetic disorder of hemoglobin synthesis namely Thalassaemia Major in metropolitan city of Mumbai. It is seen that chronic nature of illness, recurring cost of treatment throughout the life, limited subsidized care only in the form of blood transfusion, absence of safety net in the form of health insurance leaves families having Thalassemia patients more vulnerable to out of pocket health expenditure at the point of service.

Methods: The descriptive cross sectional study was conducted with members of households with Thalassaemia Major patients who were registered at either public or private Thalassaemia center. The study participants were selected by two stage sampling technique, purposive sampling followed by snowball sampling from Thalassaemia centers. Self-administered semi-structure interview schedule was used to gather data from 200 study participants through face to face interviews. Two methods used for estimating the incidence of catastrophic health expenditure.

- Capacity to Pay
- Share of non-food expenditure.

Data was analyzed using binary multivariate logistic regression models in SPSS to identify factors associated with catastrophic health expenditures, defined as OOP spending on Thalassaemia major care greater than 40% of capacity to pay and non-food expenditure.

Results: Expenditure on Iron chelation therapy and diagnostics constituted more than 60% of total OOP on thalassaemia care. According to the results, 50.5% and 59.5% of households with thalassaemia major patients faced catastrophic health expenditures by Capacity to pay and non-food expenditure methods respectively. There was a significant relationship between facing these costs and Income, HH size, type of thalassaemia centre and iron chelation therapy, and household's capacity to pay. Among the 200 households 39.5% households suffer distress financing in the form of borrowings, mortgage and selling assets.Patients taking oral iron chelation drugs, having high levels of ferritin and more complications/ co-morbidities were other important determinants of catastrophic payments for Thalassaemia Major Care.

Conclusion: The study informs the policy makers to plan health services at subsidized cost and identify interventions for reducing CHE on Thalassaemia Major. Our findings call for inclusion of Thalassaemia care in existing government-initiated health insurance schemes. Preventive methods such as prenatal diagnosis or pre-marital screening can reduce the number of thalassaemia major patients being born. Thalassaemia care and prevention programme could be an option considered which could include population education, mass screening of high risk communities and young unmarried adults, genetic counseling.

Effects of Pharmaceutical Patents on Patient Welfare: Evidence from Generic Entry of Oral Breast Cancer Therapies

PRESENTER: **Xuanzi Qin**, University of Minnesota Twin Cities

AUTHORS: Peter Huckfeldt, Beth A Virnig

We study the impact of drug prices on patient's access to care, using the introduction of generic aromatase inhibitors (AIs), an important hormonal therapy for breast cancer patients. The exclusivity period provided by patents allows pharmaceutical companies to charge high prices for brand-name drugs, and thus serves as an incentive for them to develop new drugs. However, the high costs and copays of brand-name drugs could adversely affect patients' welfare by limiting their access to treatments and increasing the financial burden of therapies for patients. Oncology drugs are a particularly important context for studying the effects of pharmaceutical policy on drug access. Recent advances have led to lifesaving treatments, but many are at an extremely high price during the exclusivity period. I study the effect of generic entry of AI drugs beginning in 2010 on overall rates of hormonal therapy initiation (including previously approved generic treatments and AIs) and specific drug choices to understand how much pharmaceutical patents affected access to these therapies.

After generic entry, median total and out-of-pocket AI prices decreased by $300+ and $30+ respectively for a 30-day supply. Adjusting for clinical factors and demographics, the availability of generic AIs was associated with 1% increase in overall hormonal therapy initiation, and 0.3 month of reduction in time to initiate. Considering most patients initiate 3 or 4 months after diagnosis, the changes in time to initiate was substantial. The three AIs as guideline preferred treatments already had 80% of market share of hormonal therapies, and this only increased by 5 percentage points after all AIs went off patent. However, the first AI that went off patent experienced a 20-percentage point increase in market share after generic entry, in part by reducing the market share of other AIs. Other AIs regained some of their lost market share after their subsequent generic entries. In summary, while overall access to hormonal therapies for breast cancer did not change substantially after generic entry in AIs, the choice of hormonal therapy drugs was very sensitive to the availability of generics. This result suggests that out-of-pocket spending, rather than clinical considerations, played a key role in choice of hormonal therapy. More work is needed to understand how this affected patient health outcomes.

8:30 AM –10:00 AM TUESDAY [Evaluation Of Policy, Programs And Health System Performance]

Universität Basel | Kollegienhaus – Seminarraum 212

Gaps in Health Insurance Coverage and Extending Financial Protection in Health

SESSION CHAIR: **Yubraj Acharya**, The Pennsylvania State University

ALTERNATE CHAIR: **Bruce Hollingsworth**, Lancaster University

Does Health Insurance Coverage Protect Against Out-of-Pocket Costs of Haemodialysis in India?

PRESENTER: **Stephen Jan**, The George Institute for Global Health

Does health insurance coverage protect against out-of-pocket costs of haemodialysis in India?

Abhinav Bassi,[1] Oommen John, [1] Stephen Jan [2]*, Rohina Joshi, [2] Sradha Kotwal, [2] Martin Gallagher, [2] Blake Angell, [2] John Knight, [2] Vivekanand Jha [1,3]

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Abstract

Background: In 2016 the Government of India announced its intention to deliver a national free dialysis programme, although the cost and feasibility of this program had been questioned. The Dialysis Outcomes in India study follows a cohort of incident dialysis patients among end-stage kidney disease patients initiated on haemodialysis in India.

Aim: The aim of the study is to determine at 6 months the extent to which patients initiated onto dialysis drop out of treatment, and to estimate the burden of out-of-pocket (OOP) costs and the difference in such OOP costs associated with health insurance coverage.

Methods: Incident patients were recruited between November 2016 and March 2018 in 16 facilities across nine states in India. We used routine medical records for the collection of demographic and clinical information. Structured interviews were conducted to collect socio-economic parameters, including OOP expenses.

Results: A total of 1000 subjects were followed up for the first six months of the study period. Median age (IQR) of enrolled participants was 58 (18) years, 29% were female. Median monthly family income was US$ 500 (586); 19% of the participants were covered under a government or employee-based scheme, and 6% had private health insurance coverage. At six months, 73% were continuing on haemodialysis, 10% of the participants had died, 6% had withdrawn, 4% had received a transplant, and 2% had switched to peritoneal dialysis. Median monthly OOP expenditure was US$ 360 (220) for uninsured participants and US$ 180 (140) for insured participants.

Conclusions: Uninsured patients on dialysis incurred a median OOP cost that amounted to around three-quarters of the median household income in our cohort. Although health insurance offsetted some of this cost, insured patients nonetheless incurred substantial burdens. Current initiatives to expand health insurance will be important in mitigating some of the financial risks associated with illness, but they may not be enough. Specific programs targeted on dialysis will be critical in ensuring that patients with end-stage kidney disease, and their families, are not forced into poverty due to health care costs.

Conflict of Interest: None. The funders had no role in the design or undertaking of the study.

Funding: Baxter Health International

A Threshold Independent Metric to Study Financial Risk Protection

PRESENTER: **Dr. Abdulrahman Jbaily**

A Threshold Independent Metric to Study Financial Risk Protection

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Abstract

Background: Universal Health Coverage (UHC) requires that those who receive care do not suffer any financial hardship. One key indicator to monitor progress towards UHC is financial risk protection (FRP), and UHC aims that by 2030 all people have financial protection from out-of-pocket (OOP) health spending. FRP is commonly estimated using the incidence of 'catastrophic health expenditures' (CHE) or 'impoverishing health expenditures' (IHE), the results of which are sensitive to pre-selected thresholds.

Methods: We develop a threshold-independent metric that reveals how OOP spending relative to income is distributed across the whole population. We also offer an FRP summary index that measures the deviation of the country's FRP state from UHC's goal.

Results: The favorable effect of decreasing medical costs on FRP using the metric is reported, as well as the ranking of countries with similar OOP medical expenditures but different income distributions. The added value of this metric to the conventional metrics such as CHE is also highlighted.

Conclusions: The threshold-independent metric can aid analysts in estimating the distribution of FRP at the population level and in tracking countries' progress in FRP provision over time and depending on the package of health services provided. It proves to be especially valuable in conducting economic evaluations of health policies and ranking countries based on their FRP performance. The metric represents a stepping stone toward better synthesizing the distribution of FRP at the country level.

Conflict of Interest: None

Funding: Bill & Melinda Gates Foundation

Role of Insurance in Determining Utilization of Healthcare and Financial Risk Protection in India

PRESENTER: **Dr. Samik Chowdhury**, Ambedkar University Delhi

Role of Insurance in Determining Utilization of Healthcare and Financial Risk Protection in India

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Abstract

Background: Achieving universal health coverage (UHC) is an important health policy goal in India. We first assessed the extent of UHC in 3 different Indian states. Second, we determined the association of health insurance (HI) schemes including the Rashtriya Swasthya Bima Yojana (RSBY) National Health Insurance Scheme on the extent and pattern of healthcare utilization, out-of-pocket (OOP) expenditures and financial risk protection (FRP).

Methods: A cross-sectional study was undertaken to interview 62,335 individuals among 12,134 households in 8 districts of three states in India i.e. Gujarat, Haryana and Uttar Pradesh (UP). Data on socio-demographic characteristics, assets, education, occupation, consumption expenditure, illness within the last 15 days or hospitalization during the last 365 days, treatment sought and its OOP expenditure was collected. We computed the incidence of catastrophic health expenditures (CHE) – OOP health expenditures surpassing a certain threshold of household consumption as indicator for FRP. Hospitalization rate, choice of care provider and CHE were analyzed to assess their association with insurance status and type of insurance scheme, after controlling for other covariates.

Results: The incidence of CHE related to hospitalization was 28% and 26% among the insured and uninsured population, respectively. Higher prevalence rate of CHE was observed for those enrolled under RSBY (39%), followed by private HI (23%) and state government schemes (21%). Enrollment in any insurance scheme including RSBY did not have a significant association with either hospitalization rate, choice of care provider or incidence of catastrophic health expenditure.

Conclusion: Health insurance in its present form does not seem to provide the necessary improvements in access to care or financial risk protection in India.

Conflict of Interest: None

Funding: Indian Council of Social Science Research

Socio-Economic Inequality in the Management of Diabetes in 21 High-, Middle- and Low-Income Countries: Findings from the Prospective Urban and Rural Epidemiology Study

PRESENTER: **Adrianna Murphy**

AUTHORS: Benjamin Palafox, Sumathy Rangarajan, Salim Yusuf, Martin McKee

Globally, diabetes affects an estimated 425 million adults and causes more than 4 million deaths per year, with most now occurring in lower income countries. Many diabetics remain undiagnosed, and among those aware of their condition, few achieve adequate control. We examined inequalities in the awareness, treatment and control among diabetic participants in the Prospective Urban and Rural Epidemiology (PURE) study across country income groups, and by sex, urban-rural location and education level.

We analyse cross-sectional data from 117,561 adults (35 to 70 years), from 4 high-income (HIC), 13 upper-middle- and lower-middle-income (UMIC and LMIC), and 5 low-income countries (LIC). Diabetes was defined as those with self-reported history of diagnosis by a health professional, treated diabetes with glucose lowering medication, or a fasting plasma glucose (FPG)>=7 mmol/L. Awareness was based on self-reports, treatment on the reported use of medications within the past 2 weeks, and control as diabetic individuals with a FPG<7 mmol/L. We used mixed-effect logistic regression to estimate the prevalence of awareness, treatment and control indirectly standardized for age, sex, abdominal obesity and physical activity levels.

A total of 13,438 (11.4%) participants had diabetes. The proportion of those aware of their condition ranged from a high of 83.2% in HICs, to a low of 66.4% in LMICs. Of those who were aware of their diagnosis, the majority in HICs (70.6%) were receiving pharmacological treatments, but only a minority of those receiving treatment were controlled (37.2%). The gaps in treatment and control were larger in LICs where only 18.3% of aware diabetics were receiving treatment, just over a third of whom (38.9%) were controlled. In HICs, levels of awareness, treatment and control were similar across sex, urban-rural location and education level, while many inequalities were noted among the lower income country groups. For example, all three management outcomes in UMICs were higher among females than males, and in urban than in rural communities. Also, levels of awareness and control were higher among males in LICs, and among the highest educated in LMICs.

Few diabetics are able to control their condition in countries at all levels of economic development, which is being driven by large gaps in detection and treatment. However, lower income countries fare worse than their richer counterparts, and exhibit greater socio-economic inequality. Strengthening health systems in these settings to reduce unequal access to health care and medicines should aim to increase case detection, continuous follow up and adherence to medication. Such action is key to improving levels of control and to reducing inequalities both across and within countries.

Patterns of Treatment Seeking and Household Out-of-Pocket Expenditure for Hypertension Care Among Poor Households in Malaysia and the Philippines

PRESENTER: **Benjamin Palafox**, London School of Hygiene and Tropical Medicine

AUTHORS: Maureen L. Seguin, Martin McKee, Antonio L. Dans, Khalid Yusoff, Dina Balabanova

Low- and middle-income countries are facing a cardiovascular disease (CVD) epidemic, and hypertension is a leading contributor to this burden. While safe and effective treatment exists, blood pressure control is poor in these settings, often reflecting barriers at the level of the health system, as well as at the broader level of patients' sociocultural contexts. This study uses baseline data from the Responsive and Equitable Health Systems – Partnership for NCD Control (RESPOND) project to examine the patterns of treatment seeking and out-of-pocket expenditure for hypertension care among adults from poor households in Malaysia and the Philippines.

Representative cohorts of 600 adults aged 35-70 years with hypertension (pre-existing and newly diagnosed) were selected from 24-30 poor urban and rural communities in each country. A structured questionnaire was used to collect information on their pathways, experiences and costs of seeking and obtaining care for their condition from May to December 2018 in the Philippines and from July 2018 to January 2019 in Malaysia.

Preliminary findings from the Philippines show that 18.6% of hypertensive adults were unaware of their condition, and among those who were aware, only 39.1% had their hypertension controlled. Regarding their pathways, 64.6% of aware hypertensives were initially diagnosed at government facilities, primarily in public clinics in response to concerns that they had specifically about blood pressure. Nearly all (97.4%) aware hypertensives were prescribed medication at diagnosis, and 99.0% of these initial prescriptions were obtained. Since starting medication, 70.0% had not changed their prescription; while 17.4% had decided to stop taking any medication, most of whom did so without consulting a health care provider. The level of self-reported medication adherence was high. On continuing care, less than half of aware hypertensives reported that they were given a follow up appointment when they were diagnosed, and in the previous 12 months aware hypertensives reported a median of 1 health care interaction with a mean out-of-pocket expenditure of 488 Philippine Pesos (USD 9.25), driven primarily by the costs for private care.

These preliminary data highlight the need to increase levels of hypertension control among poor patients as a means of protecting these households from the catastrophic impacts of CVD borne inequitably by the poor. To support this goal, the findings suggest a number of potential points for intervention along the hypertension management pathway. Public providers are crucial for maintaining access to quality,

affordable treatment in poor communities, and more effort must be placed on opportunistic screening for hypertension and maintaining each patient's ongoing engagement with health care providers. Financial protection mechanisms, including social health insurance, could be expanded to cover continuous hypertension care and medication obtained from private providers.

Is Primary Prevention of Cardiovascular Disease Implemented Effectively? Evidence from a Randomized Lottery Experiment in the Philippines

PRESENTER: **Joseph Capuno**, University of the Philippines

AUTHORS: Aleli D Kraft, Ms. Evgenia Kudymowa, Dr. Owen O'Donnell

Mortality from cardiovascular disease (CVD) is higher in the Philippines than in neighbouring high-income countries despite similar prevalence of CVD risk factors. This points to deficiencies in the prevention and control of CVD. The Philippines adopted its version of the WHO-PEN CVD screening and prevention program in 2012. PhilPEN sets out a protocol for risk assessment and screening, lifestyle counselling and medication of hypertension and diabetes in all public primary care facilities. This study evaluates whether implementation of the program is effective in delivering primary prevention of CVD to those who seek care at public rural health units (RHU) or city health centers (CTC). The objective is not to evaluate a treatment innovation, but to assess whether the standard care is implemented effectively.

An experiment was conducted in Nueva Ecija, a landlocked province of 2.15 million people with high prevalence of both major CVD risk factors and poverty. We used a *randomized encouragement design* to induce random variation in presentation for a check-up at RHU/CHC, which under PhilPEN are required to conduct CVD risk assessment of all patients and issue medication to those at high risk. Respondents in randomly selected barangays (villages/neighbourhoods) were offered a lottery ticket with a substantial money prize if they attended a RHU/CHC for a check-up within a month. In total, 137 barangays were assigned to each of the treatment and control groups. Within each barangay, respondents were randomly chosen from among those aged 40-70 with no previous diagnosis of diabetes or CVD, and who were not taking anti-hypertensive medication. In total, there are about 1700 respondents in each of the treatment and control groups.

The offer of the lottery ticket was highly effective in inducing attendance at a RHU/CHC: nearly 50 pp difference between the treatment and control groups in the proportion who visited a RHU/CHC in the last six months. Among those who did visit, the fraction for whom physical measurements were taken, diagnostic tests were made, or lifestyle counselling was given was slightly lower in the treatment group, which suggests that those induced to attend were not treated entirely like other patients. Still, even in the treatment group, over 80 percent were given measurements, tests or counselling, which suggests high compliance with the CVD screening protocol. Preliminary analysis (the follow-up was completed in the second half of November 2018) suggests that attendance at a RHU/CHC had no impact on CVD risk factors six months later. The effect on medication for hypertension, which is an important intermediate outcome, will be estimated.

Equity Implications of Expansion of CVD Screening and Preventative Treatment in Sri Lanka

PRESENTER: **Nilmini Wijemunige**, Institute for Health Policy

AUTHOR: Ravi Rannan-Eliya

Until recently, screening and preventative medication of cardiovascular disease (CVD) risks were thought inappropriate and unaffordable for low and middle-income countries (LMIC). This has changed with innovations in tools and pricing that have made screening and medication cost-effective in most LMIC. WHO now recommends that all LMIC adopt the WHO-PEN guidelines and protocols for CVD screening and treatment.

Research has established that the impact effectively implementing such recommendations depends crucially on program choices about screening and treatment protocols, plus epidemiological differences between populations. However, the distributional implications of expanding access using different screening and treatment protocols in LMIC remain unknown. We partially fill this evidence gap by using initial data from the first wave (N=5,000) of an ongoing, nationally representative, high quality population health survey – the Sri Lanka Health and Ageing Survey (SLHAS) 2018/19 – that collects detailed data on socioeconomic status (SES), CVD risks and biomarkers (including blood lipids, ECG), medical history, and medication use.

In late 2018, Sri Lanka's Ministry of Health (MOH) launched a multi-year effort to achieve universal coverage of CVD screening and treatment. This relies on a WHO-PEN protocol that uses data on total blood cholesterol. The SLHAS provides a baseline profile of population CVD risk that can be used to simulate the distributional impact of the planned national scale-up of screening and medication.

We modeled the number of people who would be screened, would qualify for treatment, how many deaths would be prevented, and the costs of new treatment with statins, antihypertensives and antidiabetics, for different screening and treatment protocols. In addition to the new MOH guidelines, we considered screening using a Framingham Risk Study based risk prediction equation that uses information on BMI.

We find that the prevalence of high CVD risk is modestly higher among the poor, and the percentage of people who would qualify for screening (no prior diagnosis) and be provided preventative therapy has a pro-poor gradient. The pro-poor gradient remains regardless of the screening tool and risk threshold used. It is stronger using the WHO/ISH screening tool than the Framingham-BMI tool. The number of additional deaths prevented is strongly pro-poor regardless of screening tool and risk threshold. For example, the model predicts that 4,389 deaths will be prevented nationally over 10 years in the lowest SES quintile over 10 years, compared to 1,308 deaths in the highest SES quintile, using the new MOH protocols. Adopting a Framingham-BMI tool and a 10% risk threshold will prevent more deaths in all quintiles (10,262 in the lowest quintile vs 4,105 in the highest quintile), maintaining a similar same pro-poor gradient. Additional modelling suggests no obvious SES gradient in overall government spending over 10 years, but that the marginal increase in spending will tend to be pro-poor.

Our results indicate that expanding access to public CVD screening and treatment will be pro-poor both in spending terms and health gains at the margin, and that using the FRS-based screening tools will benefit the poor more than WHO-PEN protocols.

8:30 AM –10:00 AM TUESDAY [Economic Evaluation Of Health And Care Interventions]

Universität Basel | Vesalianum – Grosser Hörsaal EO.16

Benefit Assessment: Outcomes, Utilities, Values and Willingness to Pay

SESSION CHAIR: **Gang Chen**, Monash University Centre for Health Economics

Outcomes of Basic Versus Advanced Life Support for Out-of-Hospital Medical Emergencies

PRESENTER: **Prachi Sanghavi**

AUTHORS: Anupam Bapu Jena, Dr. Joseph Newhouse, Alan M Zaslavsky

Background: Most Medicare patients seeking emergency med- ical transport are treated by ambulance providers trained in ad- vanced life support (ALS). Evidence supporting the superiority of ALS over basic life support (BLS) is limited, but some studies suggest ALS may harm patients.

Objective: To compare outcomes after ALS and BLS in out-of- hospital medical emergencies.

Design: Observational study with adjustment for propensity score weights and instrumental variable analyses based on county-level variations in ALS use.

Setting: Traditional Medicare.

Patients: 20% random sample of Medicare beneficiaries from nonrural counties between 2006 and 2011 with major trauma, stroke, acute myocardial infarction (AMI), or respiratory failure.

Measurements: Neurologic functioning and survival to 30 days, 90 days, 1 year, and 2 years.

Results: Except in cases of AMI, patients showed superior unad- justed outcomes with BLS despite being older and having more comorbidities. In propensity score analyses, survival to 90 days among patients with trauma, stroke, and respiratory failure was higher with BLS than ALS (6.1 percentage points [95% CI, 5.4 to 6.8 percentage points] for trauma; 7.0 percentage points [CI, 6.2 to 7.7 percentage points] for stroke; and 3.7 percentage points [CI, 2.5 to 4.8 percentage points] for respiratory failure). Patients with AMI did not exhibit differences in survival at 30 days but had better survival at 90 days with ALS (1.0 percentage point [CI, 0.1 to 1.9 percentage points]). Neurologic functioning favored BLS for all diagnoses. Results from instrumental variable analyses were broadly consistent with propensity score analyses for trauma and stroke, showed no survival differences between BLS and ALS for respiratory failure, and showed better survival at all time points with BLS than ALS for patients with AMI.

Limitation: Only Medicare beneficiaries from nonrural counties were studied.

Conclusion: Advanced life support is associated with substantially higher mortality for several acute medical emergencies than BLS.

Use of the AQol-8D Multi-Attribute Utility Instrument to Quantify Health State Utility Values, and Physical and Psychosocial Health-Related Quality of Life for People with Multiple Sclerosis Using Disease Modifying Therapies in Australia

PRESENTER: **Julie Campbell**, Menzies Institute for Medical Research, University of Tasmania

AUTHORS: Hasnat Ahmad, Bruce Taylor, Ingrid van der Mei, Steve Simpson Jr., Andrew J Palmer

Background: The AQoL-8D multi-attribute utility instrument's broad classification system is sensitive in capturing/assessing complex and interdependent physical and psychosocial health-related quality-of-life (HRQoL) for people with chronic disease, including for people with multiple sclerosis (pwMS). In Australia, the use of disease-modifying therapies ((DMTs) immunomodulating agents used to decrease severity of symptoms and/or moderate the progression of MS-disease) has increased by 40% between 2010 and 2017. Additionally, the prevalence of pwMS in Australia increased significantly by 4,324 people (p<0.05) over the same time period, due in part to greater case longevity from DMT usage.

Objectives: No studies have used the AQoL-8D to assess the HRQoL for pwMS using different DMTs. We aimed to assess the health-state utility valuations (HSUV) and the physical and psychosocial drivers of these HSUVs for pwMS who had used the same DMT for at least one year. We also aimed to assess the HRQoL between three categories of DMTs for pwMS at different levels of disability severity.

Methods: Our study population included people from the Australian Multiple Sclerosis Longitudinal Study (AMSLS) who used the same DMT for at least one year and completed the AQoL-8D multi-attribute utility instrument questionnaire. We classified 11 DMTs into three

categories based on their clinical efficacy (β-interferons (including multiples of 1A and 1B) and glatiramer acetate as category 1; teriflunomide and dimethyl fumarate as category 2; fingolimod, natalizumab, alemtuzumab and mitoxantrone as category 3). We generated mean (standard deviation (SD)) HSUVs and super and individual dimensional scores (all range 0-1) for the patient-reported responses to the AQoL-8D for each DMT category (and among those reporting no DMT usage), and individual DMTs for further comparisons. We compared results to Australian population norms. Socio-demographic and MS-severity data were also collected through the AMSLS.

Results: Preliminary univariable analyses revealed that N=608 pwMS (category 1: n=219; category 2: n=86; category 3: n=295; unknown category n=8) used the same DMT for at least one year in 2016. Eighty-percent of participants were female across the DMT-categories (typical of MS), and mean age range was 50-56 years across the categories. In the 55-64 year-old age group, 37%, 35% and 26% used category 1, 2 or 3 DMTs respectively (2% unknown). Mean (SD) HSUVs overall and for DMT categories were: overall: 0.64 (0.21); category 1: 0.68 (0.20); category 2: 0.56 (0.22); category 3: 0.63 (0.19). HSUVs for all DMT categories were reduced compared to Australian population norms of 0.80 (0.19), however they were higher than pwMS not using DMTs 0.59 (0.22). Psychosocial super-dimension scores for each DMT-category were diminished: category 1: 0.39 (0.20); category 2: 0.29 (0.17); category 3: 0.34 (0.18). People on alemtuzumab (n=24) recorded the lowest HSUV 0.56 (0.18). PwMS on interferon β-1A (Avonex, n=31; Rebif n=30) recorded the highest HSUVs of 0.72 (0.20) and 0.71 (0.18) respectively.

Conclusions: We found that diminished HRQoL for pwMS using different categories of DMTs are largely driven by reduced psychosocial health. Future analyses will investigate if the age, sex, and disease duration adjusted differences between the three DMT categories are statistically significant.

Cross-Country Comparison of Values for Health States within a Cancer-Specific Multi-Attribute Utility Instrument Based on the EORTC QLQ-C30

PRESENTER: **Richard Norman**, Curtin University

AUTHORS: Madeleine T King, Helen McTaggart-Cowan, Georg Kemmler, A Simon Pickard, Rosalie Viney

Objectives: The Multi-Attribute Utility in Cancer consortium (MAUCa) aims to facilitate the use of health-related quality of life (HRQL) data in cost-utility analysis in cancer settings by providing country-specific value sets for widely used cancer-specific HRQL questionnaires, such as the EORTC QLQ-C30. MAUCa has developed suitable descriptive systems and valuation methodologies, yielding a cancer-specific MAUI called the EORTC QLU-C10D, and has conducted 8 country-specific valuation surveys to date. The objective of this work was to compare the results across countries, both in terms of the relative value of the ten dimensions, and the willingness to trade-off between quality of life and length of life.

Methods: Participants (aged 18 years and older) recruited from online panels completed a discrete choice experiment including both a quality of life profile and a life expectancy. Data were initially analysed using conditional logistic regression, and utility weights calculated as the ratio of domain-level coefficients to the life expectancy coefficient. Countries surveyed for QLU-C10D were Australia (n=1904), Austria (n=1007), Canada (n=2345), Germany (n=2018), France (n=1033), Italy (n=1005), Poland (n=1000), and United Kingdom (UK, n=2187). Comparisons between countries were made based on both ranking of coefficients of the worst level, and on patterns in the resultant value sets.

Results: Population representativeness by age and sex was achieved by quota sampling in each country. Some domains ranked similarly across countries. Physical functioning (focusing on mobility loss) had the greatest utility decrement in all countries, pain usually ranked second, limited work/daily activities usually ranked third, and nausea usually ranked 4-5. Other symptoms such as sleep, appetite loss and fatigue had the smallest decrements. A notable difference was for the depression domain of the QLU-C10D: ranked 3-4 in the Australia, Canada, France, Italy, UK; ranked 8-10 in Austria, Germany and Poland.

Conclusions: MAUCa's standardised valuation methodology enabled unconfounded cross-country comparisons. HRQL domain rankings were generally similar, except for depression. However, differences in the absolute utility decrements confirm country-specific value sets are needed for country-specific policy decisions.

A Comparison of Patient and General Population Utility Values for Perianal Fistulising Crohn's Disease

PRESENTER: **Fanni Rencz**

AUTHORS: László Gulácsi, Márta Péntek, Gábor Ruzsa, Peter L. Lakatos, Károly Palatka, László Herszényi, János Banai, Dr. Valentin Brodszky

Background: Crohn's disease (CD) is a chronic inflammatory disorder of the gastrointestinal tract affecting approximately 2 million people in Europe. Perianal fistulas are a common manifestation of CD occurring in up to 40% of all patients. No reliable directly elicited health utility values are available for perianal fistulising CD in the literature.

Objectives: Our aims are to (i) generate utilities for perianal fistulising CD health states from the perspective of patients and members of the general public; ii) compare utilities for fistulising and non-fistulising CD; iii) explore the impact of perspectives on health utility values, and iv) determine whether utilities are related to respondents' demographics, health status or clinical characteristics.

Methods: In 2016-18, a cross-sectional survey was undertaken enrolling patients diagnosed with CD at three academic gastroenterology departments and an inflammatory bowel disease centre, and a convenience sample of members of the general population in Hungary.

Respondents were asked to evaluate four common CD heath states (severe non-fistulising disease, mild non-fistulising disease, severe disease with active perianal fistulas and mild disease with active perianal fistulas) by 10-year time trade-off (TTO). Health state vignettes were developed by a group of researchers including experts in inflammatory bowel diseases and health economists. Random-effects linear models were used to explore the predictors of TTO utilities.

Results: Responses of 206 patients and 221 members of the general population were analysed. Mean utilities among patients were 0.69±0.33 for the severe disease with active perianal fistulas, 0.73±0.31 for the severe non-fistulising disease, 0.80±0.29 for the mild disease with active perianal fistulas and 0.87±0.26 for the mild non-fistulising disease. Corresponding values in the general public were as follows: 0.59±0.31, 0.65±0.29, 0.80±0.26 and 0.88±0.25. In both groups, utility values for health states of severe and mild fistulising disease were significantly lower compared with health states describing the same disease severity but without fistula symptoms ($p<0.01$). Mean TTO utility values from patients were higher for the two severe health states compared to the general public ($p<0.01$). There was no statistically significant difference in TTO values for the two mild health states between these two groups. Among members of the general population, older age, higher subjective life expectancy and having a family member or friend diagnosed with CD were associated with higher mean utilities ($p<0.05$). Patients with older age, higher body mass index and lower severity of disease assessed by Crohn's Disease Activity Index assigned higher TTO values to health states ($p<0.01$).

Conclusions: This is the first study in the literature estimating TTO utility values for perianal fistulising CD. Overall, the results highlight the extra burden of living with fistulising disease. The differences in utility values between the two severe and mild states were smaller for patients compared to members of the general population implying that using utilities reflecting patient preferences in cost-effectiveness analyses may reduce the quality-adjusted life year (QALY) gain associated with therapy.

Willingness to Pay for Hepatitis C Treatment from Different Perspectives

PRESENTER: **Sara Olofsson**, Institutet för hälso-och sjukvårdsekonomi, IHE
AUTHORS: Frida Hjalte, Ulf Persson, Peter Lindgren

Around 45,000 individuals are living with hepatitis C (HCV) in Sweden. The infection can heal spontaneously but the majority develop a chronic infection that slowly progresses and can lead to liver disease. The second generation antiviral therapy has been shown to result in a healing rate of over 90% and has been found to be a cost-effective treatment for all levels of fibrosis progression. Providing this treatment to all individuals living with the disease would however result in high upfront costs. To enable equal access to the second generation of antiviral therapies in Sweden, the state made an agreement with the regions to help funding the new treatment.

When the government start co-funding treatment, we are moving from a health care perspective to a societal perspective and it is relevant to search for the consumer value of treatment. The consumer value of treatment can be estimated from different perspectives. First, there is the question of who you pay for. It could be for yourself (personal perspective), others (social perspective) or yourself and others (socially inclusive personal perspective). Secondly, there is the question of when you pay. It could be when you/others are at risk of becoming infected (ex ante) or after you/others have been infected (ex post).

The aim of this study is to estimate the value of HCV treatment by performing a willingness to pay (WTP) study from different perspectives. In contrast to previous research, this study presents the same payment vehicle for different perspectives. This is also, to our knowledge, the first study comparing a pure social perspective to the personal perspective.

This study estimates the WTP for getting access to a more effective HCV-treatment using the Contingent Valuation (CV) Approach. The study is based on a web-based survey to a randomly stratified sample from the Swedish general population (n=513) and applies the conceptual framework of perspectives developed by Dolan et al 2003 to empirically investigate the effect of the different perspectives regarding who to pay for and when to pay.

The personal perspective resulted in the highest WTP estimates while the lowest WTP estimates was found for the social perspective. The WTP per HCV treatment varied between MSEK 0.2 and MSEK 38. The WTP estimates were similar between the ex post perspective and ex ante perspective. Respondents who believed that others would pay more than themselves had a lower WTP in all scenarios. Respondents who believed that others would pay less than themselves had a higher WTP in all scenarios except the scenario with the social perspective.

When the government decides to finance new HCV treatments, the primary perspective is the social perspective and this perspective has sometimes also been argued to be the most suitable for preference studies. This study shows that the value is higher and more valid when individuals are asked to pay for themselves. This value is driven by a will to secure access to the treatment when others are willing to pay less and by the effect size and budget constraint.

The Acceptance and Willingness to Pay (WTP) for a mHealth Mobile Voice Messages for Preventing Diabetes and Non-Communicable Disease Risk Factors in Rural Bangladesh: A Contingent Valuation Study

PRESENTER: **Hassan Haghparast-Bidgoli**, University College London
AUTHORS: Dr. Ali Kiadaliri, Sanjit Kumar Shaha, Abdul Kuddus, Hannah Jennings, Naveed Ahmed, Joanna Morrison, Kohenour Akter, Badrun Nahar, Tasmin Nahar, Carina King, Prof. Jolene Skordis-Worrall, Dr. Jahangir A. M. Khan, A.K. Azad Khan, Anthony Costello, Kishwar Azad, Edward Fottrell

Objectives: This study aimed to elicit the acceptance and the willingness to pay (WTP) for a mHealth mobile voice messages for preventing diabetes and non-communicable disease (NCDs) risk factors in rural Bangladesh

Methods: An open-ended contingent valuation (CV) method was used to elicit the maximum monthly amount of money each participant or household would be willing to pay if an m-Health (weekly) voice message service on diabetes and NCD risk factors' prevention and management was available. WTP questions were asked from all the participants (n=12,860) at the end-line impact evaluation survey of D-Magic trial, a three-arm cluster randomised control trial aimed to assess the effectiveness of a mHealth mobile voice messages and a community group intervention in preventing and controlling T2DM and NCDs' risk factors, compared to the control. A multivariate logistic regression was used to assess the key determinants of the mHealth intervention acceptance and a parametric two-part model (TPM) was used to elicit the mean WTP value and the factors associate with mean WTP.

Results: 48% of the participants were reported that they would like to receive the mHealth messages. Participants who were younger (OR 0.99, CI=0.987,0.997), married (OR 1.54, CI=1.26,2.26), were female (OR 0.75, CI=0.58,0.98), had primary (OR 1.29, CI=1.07,1.55) or secondary and higher (OR 1.34, CI=1.04,1.72) education level, had manual (OR 1.27, CI=1.03,1.56) or professional (OR 1.44, CI= 1.11, 1.87) jobs, had no history of CVD (OR 0.71, CI= 0.56, 0.91) or pre-diabetes (OR 1.21, CI=1.02,1.45), belong to the mHealth arm of the trial (OR 3.33, CI=2.04,5.43) and belong to the highest income group (OR 1.38, CI=1.09,1.72) were more likely to accept the mHealth intervention. Among those accepted to receive the mHealth, 62% are willing to pay for it. Average unadjusted WTP value was 4 Bangladeshi Taka (Tk). The first step logit estimation of TPM showed that young individuals, married, individuals with primary, secondary and higher education, individuals with manual or professional jobs, those without history of CVD, participants from the mHealth arm, and those from the highest income group were more likely to pay for the vaccine. The second-stage regression of TPM indicated that having secondary or higher education and being from the higher income groups are the key factors that significantly affected the WTP value. Individuals with the secondary or higher education and those from the highest income group were willing to pay around 1Tk more than the other individuals.

Conclusion: There is a relatively strong acceptance toward receiving mHealth messages, particularly among the participants who previously exposed to the mHealth intervention. Considering high incidence of T2DM and NCDs and high rates of mobile phone use in Bangladesh, mHealth intervention can be a feasible and scalable intervention for increasing awareness and prevention of T2DM and NCDs.

The Value of a Statistical Life in Sub-Saharan Africa: Evidence from a Large Population-Based Survey in Tanzania

PRESENTER: **Bryan Nicholas Patenaude**, Johns Hopkins Bloomberg School of Public Health
AUTHORS: Innocent Semali, Japhet Killewo, Till Bärnighausen

Introduction:

The value of a statistical life year (VSLY)is the central number for the economic allocation of health resources. However, empirical data on VSLY is lacking for most low- and middle- income countries. In the absence of empirically established VSLY, researchers typically use an arbitrary three-times multiple of per capita gross domestic product (GDP) or per capita income per life year saved to establish cost-effectiveness. In this study, we establish an empirical VSLY for the first time for a community in sub-Saharan Africa.

Methods:

To empirically establish VSLY, we randomly selected 4,000 individuals in the Ukonga community of Tanzania and employed a contingent valuation survey to measure VSLY. Using the contingent valuation methodology, we elicited willingness-to-pay for a 2% mortality risk reduction and had individuals convert this into an annualized payment to be paid each year over their expected remaining life.

Results:

We compare our elicited value to per capita income and found that mean VSLY is $9,340 (95% CI $6,206 to $12,373). The mean annual income in our sample was $2,069, resulting in a VSLY that is equivalent to 4.5 times per capita income.

Conclusions:

Our results provide a methodology for assessing VSLY in developing settings. They also generate empirical evidence to further support a move away from utilizing the World Health Organization cost-effectiveness thresholds in practice, as they will likely result in an undervaluation of demand-side preferences, even in relatively poor samples.

10:30 AM –12:00 PM TUESDAY [Special Sessions]

Universitätsspital Basel | ZLF – Gross

Special Organized Session: Long-Term Care Financing and Markets

SESSION CHAIR: **Sally Clark Stearns**, The University of North Carolina at Chapel Hill

PANELISTS: **Adelina Comas-Herrera**, London School of Economics and Political Science; **Naoki Ikegami**, St Luke's International University; **Marcello Morciano**, University of Manchester

10:30 AM –12:00 PM TUESDAY [Evaluation Of Policy, Programs And Health System Performance]

Universitätsspital Basel | ZLF – Klein

Organized Session: Value and Drugs in the Era of Precision Medicine

SESSION CHAIR: **Dean Regier**, BC Cancer

PANELISTS: **Rosalie Viney**, Centre for Health Economics Research and Evaluation, University of Technology Sydney; **Christopher McCabe**, Institute of Health Economics; **Stuart Peacock**, Canadian Centre for Applied Research in Cancer Control (ARCC)

10:30 AM –12:00 PM TUESDAY [Production Of Health, Health Behaviors & Policy Interventions]

Universitätsspital Basel | Pathologie – Unten (U)

Organized Session: Investments in Childhood and Youth Health

SESSION CHAIR: **Hannes Schwandt**, Northwestern University

DISCUSSANT: **Pietro Biroli**, University of Zurich; **Sonia Bhalotra**, University of Essex; **Libertad González**, Universitat Pompeu Fabra

The Health Effects of Early Interventions: Evidence from Sure Start

PRESENTER: **Gabriella Conti**, University College London

Early intervention programmes which provide educational, social, and health services are increasingly being recognised as a potentially cost-effective way of promoting health and preventing the emergence of costly chronic conditions. In this paper we study the impacts of Sure Start, a large-scale, universal, area-based intervention in England which offers early child care and education, and social, health and employment services for children and their parents. We exploit unique data on the exact date of opening of all the Sure Start centres in place in England in the twenty years of the programme existence, and use the spatial and temporal variation induced by the rollout to identify the causal impact of the programme. We examine the Sure Start effects on hospitalizations and obesity until late childhood, using high-quality administrative data from the Hospital Episode Statistics and the National Child Measurement Programme. Our results will be informative as to whether large-scale early interventions are a cost-effective mean to promote health.

When Kids Get Sick

PRESENTER: **Hannes Schwandt**

Infectious diseases among children might be a leading cause of disruption and productivity decline for parents with young offspring, yet their causes and consequences remain largely unstudied. We use Danish register data to show how diseases spread across day cares and schools, as well as within families and workplaces, and how they affect health outcomes, school grades, and work place productivity. Following Abowd, Kramarz, and Margolis (1999) we employ double fixed effects models to identify highly infectious families and highly infectious day cares and to measure their effects on their families with exposed children. Our preliminary findings suggest that infectious diseases among children have high costs both in terms of health and productivity for parents. Effects are stronger for mothers, adding to the gender gap in the cost of having young children. We derive disease spread model counterfactuals for various policies limiting the spread of infectious diseases and increasing investments in child health.

Can Access to Infant Health Care Offset Damages from Fetal Scarring

PRESENTER: **Dr. Aline Bütikofer**, Norwegian School of Economics

This paper analyzes whether access to health care services for infants mitigates human capital impairments generated by in utero exposure to influenza like illnesses (ILL). We obtain two sources of exogenous variation by combining monthly historical data on the number of women of childbearing age in each municipality that were diagnosed with ILL, paired with historical records on the timing of geographic rollout of infant health care provisions from 1930 to 1950. Linking this information to the universe of administrative data from Norway, we separately

find lasting negative consequences over the whole life cycle of prenatal ILL exposure as well as benefits of access to infant health care. Both shocks significantly affect educational attainment, earnings, and health; however, children adversely affected in utero experience less lifetime scarring if they subsequently had access to improved infant health care. Our results suggest that policy interventions can compensate for initial shocks to health capital and provide evidence for dynamics in its production function.

Misperceived Parental Beliefs about the Returns to Early Childhood Investments?

PRESENTER: **Dr. Anne Ardila Brenoe**

Anthropologists, sociologists, and epidemiologists have found some evidence of sex-biased breast-feeding behavior. Most studies examine populations in developed countries (more gender equal societies) and find mainly a sex-bias in breastfeeding in favor of daughters (one caveat is that most studies have very small sample sizes). These studies have proposed the hypotheses that mothers believe they cannot provide sufficient nutrients to boys through breastfeeding for as long time as to girls. In contrast, the only economic study within this topic demonstrates a large sex-bias in favor of boys in India (i.e. a very gender unequal society) in terms of childcare time, breastfeeding duration, and vitamin supplementation. Based on this, I propose a different hypothesis that could explain sex-biased breastfeeding behavior: Parents in more gender unequal societies will invest more in their sons relative to daughters, while in more resource-rich and gender-neutral societies; the worry about sufficient nutrition might be a reason for any sex-biased behavior. To test this hypothesis, it is necessary to consider other types of early childhood investment than solely breastfeeding behavior. If parents believe that the returns to breastfeeding differ by child sex, this can rationally explain sex-biased inputs. Therefore, I will compare any potential sex-bias in breastfeeding behavior with sex-biases in immunizations, as there is no evidence that the effectiveness of any standard childhood immunization should be more productive for child health for one sex over the other.

10:30 AM –12:00 PM TUESDAY [New Developments In Methodology]

Universität Basel | Kollegienhaus – Hörsaal 001

Health Econometrics

SESSION CHAIR: **Arne Risa Hole**,

A Novel Sensitivity Analysis Approach for Addressing Missing Not at Random Data in Health Economic Studies: The Reference-Based Imputation.

PRESENTER: **Manuel Gomes**, UCL

AUTHORS: Baptiste Leurent, Suzie Cro, Nicola Wiles, James Carpenter

Missing data is a recurrent problem in health economic studies evaluating the relative effectiveness and costs of health interventions. Traditionally, econometric approaches such as inverse-probability weighting and multiple imputation have been used to handle the missing data assuming the data were “missing-at-random” (MAR). However, a major concern in health economic studies is that, conditional on the observed data, missingness tends to be related to unobserved values, i.e. missing-not-at-random (MNAR). For example, the chances of completing a health survey often depend on patient’s (unobserved) health status, after adjusting for their characteristics. In these settings, sensitivity analysis approaches, such as pattern-mixture and selection models, play a central role in assessing the robustness of study’s conclusions to plausible MNAR mechanisms.

This paper presents a novel sensitivity analysis approach, the reference-based imputation, for handling MNAR data in health economic studies. A major strength of this approach is that it allows framing relevant, accessible missing data assumptions in a qualitative way through the use of ‘reference’ groups. For example, a plausible MNAR mechanism in drug trials is to assume that participants in experimental arm who drop-out may stop taking the drug, and expected to have similar outcomes to those in placebo arm (mechanism known as ‘jump-to-reference’). This paper describes the key principles of reference-based imputation and shows how it can be extended to address key challenges faced by health economic studies, such as interim (non-monotone) missingness and joint estimations of costs and outcomes.

The method is illustrated in the CoBalT trial comparing a cognitive behavioural therapy (CBT) with usual care (antidepressants) for treating resistant depression. The estimand was the average treatment effect of CBT on quality-adjusted life-years (QALY), costs and cost-effectiveness at 12 months post-randomisation. About 20% of patients dropped out of the study, and there were concerns that patients in worse health were more likely to drop-out. Assuming both QALY and costs were MAR, patients receiving CBT had higher mean QALY (0.087, 95% CI 0.033 to 0.141), higher mean cost (£1000; £816 to £1191), resulting in cost per QALY of £11 519 and suggesting CBT is cost-effective at typical willingness-to-pay thresholds in England (£20,000/QALY). Informed by discussions with trial investigators and clinical experts, we then considered a more realistic scenario where patients were assumed to maintain treatment benefits until drop-out and then following the same (parallel) trajectory from control arm (MNAR mechanism known as ‘copy increments in reference’). We also allowed for more conservative MNAR mechanisms such as ‘jump to reference’ mentioned above, or ‘last mean carried forward’ (after drop-out endpoints remain around mean value at last time-point). Overall, study’s conclusion that CBT was effective and cost-effective was robust to alternative missing data assumptions, even when MNAR mechanisms were allowed to differ by endpoint or time-point.

The reference-based imputation provides an accessible framework for conducting sensitivity analysis to departures from the MAR assumption in health economic studies. This approach facilitates the formulation of relevant, readily-interpretable assumptions about the missing data, enabling future studies to routinely conduct such sensitivity analyses.

Program Evaluation and Causal Inference for Distributional and Functional Data: Estimation of the Effects of Retirement on Health Outcomes

PRESENTER: **Dr. Andrej Srakar**, Institute for Economic Research

AUTHOR: Valentina Prevolnik Rupel

Statistical analysis of complex, i.e. non-standard data is gaining ground. Analysis of compositions, intervals, distributions and functions has become more and more common in contemporary statistics and econometrics. Despite many types of regressions existing for symbolic (interval and distributional) data (e.g. Billard and Diday, 2002; 2006; Lima Neto and De Carvalho, 2008; Maia and De Carvalho, 2008; Lima Neto and De Carvalho, 2010; Lima Neto et al., 2011; Yang et al., 2011; Ahn et al., 2012; Neto et al., 2012; Dias and Brito, 2015; Irpino and Verde, 2015), causal inference has not been studied so far adequately with symbolic data. Furthemore, only slowly is it gaining ground using functional data (see e.g. Zhao et al., 2018).

In our analysis, we firstly develop a statistical theory for using instrumental variables with symbolic distributional data, related to the prevailing usage of regressions in such situations, the so-called "two components" Irpino and Verde model (Irpino and Verde, 2015). We apply the findings to a pressing problem in the analysis of the aging process: the effects of retirement on health outcomes. Charles (2004), Neuman (2008), Latif (2013), Insler (2014) and Eibich (2015) all conclude that retirement may lead to significant health improvements, but other studies find negative retirement effects (e.g. Dave et al., 2008; Behncke, 2012). Retirement has also been shown to negatively affect cognitive abilities (Rohwedder and Willis, 2010; Bonsang et al., 2012; Mazzonna and Peracchi, 2012), and that such impacts might depend on people's occupational choices (Coe et al., 2012; Mazzonna and Peracchi, 2014).

In the analysis, we use a panel dataset of Survey of Health, Ageing and Retirement in Europe (SHARE) in Waves 1-6. To address reverse causality in the relationship of retirement and health behaviours we use as an instrument changes in retirement age (see e.g. Komp, 2017). A novelty in the approach is that we treat countries as units and the variables are aggregated over countries. In this manner, we estimate the effect of the distribution of retirement across countries on distribution of health outcomes over countries (the instrumental variable is distributional as well). Using such approach, we are able to estimate the causal effect for a group of countries (most commonly, exogenous change is used only to estimate the effect on *one* treated population – our approach allows the estimation of the effect in multiple countries at the same time). We extend the analysis for functional data and aggregate the variables to nonparametric functions, later used in functional linear models.

The novelties of the article are multiple. Firstly, program evaluation and causal inference has so far not been studied with distributional data (and very seldom with functional data). Secondly, the method allows significantly improved possibilities for program evaluation in health care and in general – the effects can be studied aggregated over a group of populations which was not possible before. Finally, we provide a rich estimation of causal effects of retirement on physical health outcomes which is also a topic not studied sufficiently so far.

Some Implications of Dynamic Misspecification for the Arellano-Bond Estimator

PRESENTER: **Mr. Adrian Rohit Dass**, University of Toronto

AUTHORS: Prof. Audrey Laporte, Brian Ferguson

In Dynamic Panel Data (DPD) estimation, first order lag structures tend to dominate second order structures in the literature. The decision to use one lag is often not based on inherent assumptions in the DPD estimation, but rather, for practicality reasons such as losing a wave for each lag included. In addition, there are not many theoretical models that explicitly call for the presence of lags in excess of the first, particularly in the context of aggregate level dynamic modeling. This preference for first order lag structures may be an issue in applied health economics, as individual level optimization problems will generally be finite horizon problems. This implies that the optimal trajectory may follow a curved time-trajectory towards the ultimate endpoint, which implies that the Euler equations for the individual's problem will translate to a second order difference equation (SODE) for their choice variable. This paper uses Monte Carlo simulations to investigate the consequences of dynamic misspecification in the Arellano-Bond (AB) estimator. More specifically, we investigate the bias of the AB estimator when the true model is a SODE, but is estimated as a first order difference equation (FODE). The simulations are performed using different values of the roots and coefficients of the SODE. The results of the paper show that under dynamic misspecification, it is not possible to recover the true coefficient on the first lag. In addition, the commonly used test statistics to detect serial correlation in the errors may not be able to detect the misspecification. We also show that the estimate on the first lag from the misspecified AB estimator generally settles on values that are close to the larger of the two roots of the SODE. The results of the paper raise a number of issues that are important to health economists. Since many of the standard models involve individual level inter-temporal optimization, SODEs are much more likely to appear in health economics applications. In addition, currently available longitudinal data sets are becoming increasingly long enough for estimation of SODEs. Overall, the results suggest that more attention to investigating the length of the lag needs to be spent than has typically been the case in the literature.

Comparing Alternative Choice Models of Heterogeneity in the Valuation of Children's Health

PRESENTER: **Oliver Rivero-Arias**, University of Oxford

AUTHORS: David Mott, Koonal Shah, Juan Manuel Ramos-Goñi, Nancy Devlin

Background: Over the last 25 years, evidence from the economics literature has illustrated the importance of unobserved heterogeneity when modelling preferences elicited using discrete choice experiment (DCEs). Heterogeneity is unobserved when it is not explained by the observed attributes included in a DCE. In health economics, econometric models that account for heterogeneity are used but in the area of health state valuation, the majority of studies have implemented choice models that ignore unobserved heterogeneity. We are currently developing a value set for the young people's EQ-5D-Y health-related quality of life questionnaire using a DCE in the UK. In this study we

compare the performance of several alternative econometric models of heterogeneity using choice data valuing children's health elicited from an adolescent and adult samples.

Methods: Preferences were obtained from a representative sample in terms of age, gender and nation of adolescent (11-17 years old) and adult members of the UK general population belonging to an online panel. Adults completed the valuation survey from the perspective of a 10-year-old child. A blocked Bayesian efficient design was used and fifteen pairs presented to each respondent. DCE data were modelled using a main effects scaled multinomial logit (SMNL), mixed logit (ML), generalised multinomial logit (GMNL) and latent class (LC) models. ML and GMNL were estimated without correlated parameters (ML_{UC}, $GMNL_{UC}$) and with correlated parameters (ML_{C}, $GMNL_{C}$). Latent scale utilities in the latent class models were estimated as weighted average of class segments of the selected LC model. Multinomial logit (MNL) that assume homogeneity of preferences was also estimated. All models were estimated separately in the adolescent and adult samples. Model performance was evaluated using goodness-of-fit assessed with Bayesian information criteria and probability prediction accuracy using mean squared error. The three models with best fit and three models with better prediction accuracy were rescaled to sum to -1 and kernel density function for the latent utilities of the 243 EQ-5D-Y health states plotted in both samples.

Results: 1,000 adults and 1,005 adolescents completed the survey. The modelling exercise suggested consistent latent utilities for all of the models estimated. Choice models that account for unobserved heterogeneity had better goodness-of-fit and prediction accuracy than the MNL. In the adult sample, the three models with best fit were SMNL (14,927), $GMNL_{UC}$ (14,781) and LC (14,883) and three models with better prediction accuracy were $GMNL_{UC}$ (0.0026), ML_{C} (0.0025) and LC (0.0021). In the adolescent sample, the three models with best fit were SMNL (16,636), $GMNL_{UC}$ (16,414) and LC (16,581) and three models with better prediction accuracy were $GMNL_{C}$ (0.0025), ML_{C} (0.0024) and LC (0.0022). All these models produced rescaled latent scale utilities for the 243 EQ-5D-Y health state that were virtually the same.

Conclusion: Choice models that account for unobserved heterogeneity had better fit and prediction accuracy than MNL. Our performance comparison identified different models depending on fit or prediction accuracy. However, they all produced the same EQ-5D-Y latent scale value set in each sample suggesting any of these models are candidates for the potential final value set.

10:30 AM –12:00 PM TUESDAY [Specific Populations]

Universität Basel | Kollegienhaus – Hörsaal 102

Organized Session: Causes and Consequences of Poor Infant Health

SESSION CHAIR: **Amanda Abraham**, The University of Georgia

DISCUSSANT: **Joseph Sabia**, San Diego State University; **W. David Bradford**, University of Georgia; **Melinda Pitts**, Federal Reserve Bank of Atlanta

Financial Distress and Birth Outcomes

PRESENTER: **Dr. Melinda Pitts**, Federal Reserve Bank of ATlanta

AUTHOR: Ausmita Ghosh

In contrast to previous economic downturns, the "Great Recession" of the late 2000s was markedly distinct in that it resulted in precipitous declines in housing prices, placing American families and communities in economic insecurity. The Great Recession reduced average wealth sharply, driven mainly by declines in home equity (McKernan et al., 2014). Recent research has documented that economic shocks such as housing market upheavals are associated with elevated mental stress (Currie & Tekin, 2015; Houle, 2014) and increased anti-depressant use (Lin et al., 2013). There is substantial evidence that in-utero conditions are significantly associated with health at birth and later-life well-being. However, the literature on the effect of financial stress on in-utero health is surprisingly sparse (see Lhila & Simon, 2010). The Great Recession presents an excellent opportunity to uncover the relationship between financial stress and pregnancy outcomes, as it significantly affected housing prices and financial wealth, and housing wealth accounts for almost a third of total net worth for US households. The housing crisis was characterized by high rates of delinquency and foreclosure, which could affect birth outcomes through depressing neighborhood housing values, thus limiting the ability of credit constrained households to smooth consumption during the economic downturn, or through the effect of vacant properties attracting crime and vandalism in the neighborhood.

In this study, we investigate the influence of the housing crisis on fertility and pregnancy outcomes (birth weight and gestational age), by integrating vital statistics natality files with the the Federal Reserve Bank of New York/Equifax Consumer Credit Panel, which is a nationally representative 5% random sample of consumers in the US that have information in consumer credit data system. The financial health information includes foreclosures, bankruptcies and severe delinquencies, which are accounts that are 90 days or more past due and are eligible for collections. The analysis period is from 2004-2016, whichincludes the housing boom and bust, as well as the Great Recession and the subsequent recovery.

In this analysis we examine the relationship between fertility rates and birth outcomes and local area financial health to provide more evidence on the role of financial stressors on infant health outcomes. Preliminary evidence suggests that increased financial distress, as measured by county-level rates of foreclosures, bankruptcies and delinquencies, lead to reductions in fertility and an increased probability of

poor birth outcomes. The results show that foreclosures had a stronger impact than other measures, suggesting that housing insecurity is a primary stressor for expectant mothers. Future analysis will expand the types of financial stressors to include changes in average home prices and interest rates, which limit the ability to smooth consumption, changes in home ownership rates, and specific types of non-housing related delinquencies, including auto and revolving credit.

Residential Noise Exposure and Health: Evidence from Airport Runways

PRESENTER: **Dr. Laura Argys**, University of Colorado Denver

AUTHORS: Susan Averett, Muzhe Yang

Noise pollution is a threat to public health. In the United States the Day-Night Average Sound Level (DNL) is required not to exceed 65 decibels (dB). This threshold, aimed at preventing hearing loss, is significantly higher than the 55 DNL threshold used by the World Health Organization, since an increase of 10 dB means 10 times as much sound energy. We conduct the first empirical study on the causal effect of lowering the threshold to 55 DNL on infant health, using two unique datasets: one is the National Transportation Noise data, first released in 2017 and providing measured noise levels (in dB) at exact locations for the year 2014; the other is birth data from the New Jersey Department of Health, including the exact home address of each pregnant woman.

The National Transportation Noise data provide a map that reveals sharp changes in noise exposure in areas near airports, where air pollution can be evenly distributed but noise exposure differs significantly, with the pattern of noise levels closely following the airport runway layout. Because our birth data are from New Jersey, we focus on the noise exposure of mothers living close to Newark Liberty International Airport (EWR), one of the largest airports in the country. One important characteristic of EWR is that the north-south runway is frequently used, whereas the east-west runway is only occasionally used, which allows us to exploit exogenous variation in noise exposure among those living equally close to the airport: those living north-south of the runway are exposed to much greater noise pollution than those living east-west of the runway.

Note that the noise data are only available for 2014, which means the examination of infant birth outcomes by using birth data beyond years 2014 and 2015 requires the assumption of noise exposure being time invariant. To relax this assumption, we alternatively use as our measure of noise exposure the *direction*of mother's home relative to the EWR's north-south runway, controlling for the distance between the two locations. The direction is measured by azimuth (going from zero to 360 degrees). An azimuth of zero (or 180) means living due North (or due South) of the runway. We compare each azimuth with the north-south runway to create an indicator equal to one for living along the runway. While living close to the airport may not be exogenous, living along the runway could be exogenous unless the mother chooses where to live taking into account the airport's runway layout.

Our study focuses on low birth weight (LBW), an important birth outcome associated with a variety of adverse outcomes during adulthood. We find a significant increase of LBW risk due to noise exposure. Our study has important implications for the U.S. Federal Aviation Administration's NextGen program by highlighting its unintended health impact. The NextGen program aims to improve aircraft fuel efficiency by using narrower paths for airplane landings and takeoffs, which however has significantly increased the noise exposure in areas along airport runways.

10:30 AM –12:00 PM TUESDAY [New Developments In Methodology]

Universität Basel | Kollegienhaus – Seminarraum 103

Recent Advances in Health Economic Evaluation Methods

SESSION CHAIR: **Emily Lancsar**, Australian National University

Does Asking about *Health* Versus Health-Related *Quality of Life* Lead to Different Preferences for Health States? Results from a Discrete Choice Survey

PRESENTER: **Natalie Carvalho**, University of Melbourne

AUTHORS: Joshua Salomon, David Studdert

Background: To investigate differences between rankings and valuations of "health" and health-related "quality of life" using preference-based survey responses

Method: A web-based survey of the general public was used to assess preferences for health states using pairwise comparison questions in which two people with hypothetical injuries or disorders were described. Participants were randomly assigned to different survey versions: the first asked respondents to select which person had a "better overall quality of life", the second asked which person was "healthier overall". 48 health states, selected from the Global Burden of Disease Study (GBD), were considered, including musculoskeletal problems, pain and physical limitations, mental and sensory disorders, and disfigurements. Probit regression analysis was used to scale health states by mean quality of life (or health). Regression coefficients were rescaled onto the [0,1] scale by anchoring to GBD 2010 disability weights.

Result: Responses from over 5,000 adults in Australia who completed the survey between August and September 2013 were used, with over 47,900 ratings for quality of life and 15,000 ratings for health. Overall rankings of health states were similar between survey versions, with

notable exceptions: Sensory disorders (vision and hearing impairments), moderate disfigurement and paralysis ranked more severely when considering quality of life compared to health, while mild pain and physical limitations ranked more severely for health loss, compared to quality of life. A paired t-test found no significant difference in health state valuations when questions were framed as quality of life or health. For 9 of 48 health states, estimated disability weights varied by more than 0.05, with a maximum difference of 0.112 found for quadriplegia. Most differences in rankings translated to differences in health state valuations, however a mental health state (severe depression) that didn't rank differently had a >0.5 difference in health state valuation.

Conclusion: Framing survey questions in terms of quality of life or health leads to differences in ranking and valuations of health states for some groups of health states. However, these differences are likely to be smaller than other methodological choices in deriving health state valuations (for example, web vs paper survey choice of multi-attribute utility instrument or direct elicitation approach, description of health states). Nonetheless, these findings have important implications in making comparisons between utility weights and disability weights for the same health states, particularly with the most recent GBD focused on the narrow construct of health loss. Capturing and measuring these differences and how they vary across types of health states is important to understand how the choice of DALY or QALY in economic evaluation studies might impact on incremental cost-effectiveness results.

A Novel Standard-Gamble Approach for Calculating QALYs

PRESENTER: **Afschin Gandjour**

Background/aim: Quality-adjusted life-years (QALYs) combine life years and strength of preference for different health states. Strength of preference is measured on a scale that is anchored by 0 representing death and 1.0 representing perfect health. Strength of preference can be measured directly using standard-gamble (SG), time-trade-off, or visual analogue scale methods. Yet, only the SG method is able to incorporate risk. Still, SG validity hinges upon the assumption of risk neutrality with respect to life years. The purpose of this study is to develop a SG approach that is able to circumvent this assumption.

Methods: A SG procedure is developed that obeys the continuity axiom of the von Neumann Morgenstern utility theory and thus established cardinal utility but without the need to impose the assumption of risk neutrality. After defining the upper and lower bound of the utility scale, a search of the medical literature is conducted to describe the bounds more precisely.

Results: The upper bound of the scale (1.0) represents absence of negative thoughts about current health. While a zero utility score is still assigned to dead individuals for the purpose of calculating QALYs, the dead state itself is not used for dividing health states into those better or worse than death. Instead, the new SG method exploits the fact that a zero utility score can also be assigned to people who are alive but have a preference for death. Specifically, the new SG method defines the zero point as a state of suicidal ideation (wish) due to the health state in question. The zero point is more concretely described in terms of duration, frequency, and strength of suicidal ideation. Given that payoffs of the gamble need to be defined from a short-term perspective due to the inherent acuteness of suicidal ideation, the assumption of risk neutrality with respect to life years is avoided. Disease states worse than death must not be formally measured but can be included in the zero point as the real bottom of the scale, thus providing another advantage over the conventional SG approach.

Conclusion: The SG method developed in this study avoids the assumption of risk neutrality and therefore allows for a more valid assessment of preferences for health states under risk. The exclusive focus of the method on (subjective) mental states is discussed.

Breaking Away from Central Tendencies to Derive More Individualised Estimates on Costs and Effects.

PRESENTER: **Francesco Salustri**, University of Oxford

AUTHORS: Joel Smith, John Forbes

Economic models of resource use and health outcomes typically are calibrated using parametric models that focus on the average. Prognostic factors, which could support more individualised programmes of care, are seen as simply shifting the central tendency of cost and effect distributions. We argue that this conventional approach should be compared with more flexible alternative models which fully describe how given covariates influence the complete distribution, or selected quantiles, of the variation in costs and health outcomes. We employ a regression specification using the generalized additive model for location, scale and shape (GAMLSS) introduced by Rigby and Stasinopoulos (2005) where a predictor is formulated not only for the conditional mean but also for further parameters of the cost and effect distribution.

We use data from large multicenter randomised trials in stroke and diabetes to illustrate the appeal of GAMLSS to estimate costs and survival outcomes. In particular, we demonstrate the benefits of flexible specifications that allow for non-linearity in the location, heteroskedasticity in the scale and heterogeneity in the shape of outcome distributions conditional on key covariates. Our results are compared with standard generalized linear models which are commonly used for the analysis of costs in experimental studies. A semi-parametric approach using quantile regression (Koenker, 2005) is employed when we focus on specific cost quantiles (e.g., very low or high users of health care) to test for location-shift and location-scale effects as a motivation for the use of flexible specifications that allow for covariates to shift the mean, variance and shape of costs and survival distributions. We discuss the implications for the parameterisation of economic models based on selected moments of outcome distributions in which to extrapolate for long-run economic outcomes.

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A New Equilibrium Approach to Deriving the Monetary Value of a QALY

PRESENTER: **Ghada Taha Gleeson**, Australian National University
AUTHORS: Emily Lancsar, Luke Connelly, Rosemary Korda, Jim Butler

A new equilibrium approach to deriving the monetary value of a QALY

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Keywords:

QALY; willingness-to-pay; willingness-to-accept; monetary value of a QALY (MVQ).

Economic evaluation plays a pivotal role in the assessment of new technologies in health relative to current practice expressed in incremental cost per quality-adjusted life-year (QALY) gained. A key question in such analysis is what is the monetary value of a QALY or how might we estimate such a value? There is little consensus on the appropriate methods for deriving such empirical estimates. There are currently two common approaches, coming from the supply and demand sides of healthcare 'markets' respectively. The 'supply side' approach relies on observation of previous health care expenditure and the associated opportunity cost or shadow price of a QALY – also referred to as the "searchers" approach. The second 'demand side' approach solicits the monetary value individuals are willing to pay for a QALY gained through preference-based surveys – also referred to as the "surveyors" approach. An attempt to develop a framework incorporating both approaches has been advocated as preferable for optimal health care resource allocation.

We present a new approach that explicitly incorporates both supply and demand sides. We do this in the context of injuries by harnessing the monetary value individuals are prepared to accept as compensation for the injury, or health state utility decrement, and the amount insurers are willing to pay in terms of compensation. From this we derive the monetary value of a QALY.
We do this in the context of a trial of a multidisciplinary clinic that introduced a new approach to the management of whiplash injuries as a consequence of a road traffic accident. The trial was conducted in the Australian Capital Territory, Australia over the period 2006-2008. Around one-third of trial participants claimed for damages. The insurer then offered a monetary compensation amount which the injured party could accept or reject and if the latter, counter offer and so on. The agreed monetary figure was therefore based on this negotiation and represented an equilibrium between the individual's willingness to accept and the insurers willingness to pay. From this individual monetary value for a health state utility decrement, we then derive the equivalent monetary value for one full QALY. The estimated mean monetary value of a QALY was AUD $75,000 (95% CI [48540,121266]). We also explored the monetary value of a QALY by subgroups.
This setting offers a unique opportunity in which the revealed monetary value of a QALY represents a state of equilibrium between supply and demand side factors. Policy and practical implications are discussed as are opportunities for future research.

10:30 AM –12:00 PM TUESDAY [Production Of Health, Health Behaviors & Policy Interventions]

Universität Basel | Kollegienhaus – Seminarraum 104

Political Economy and Service Provision Topics

SESSION CHAIR: **Nicole L Hair**, Arnold School of Public Health

Program Delivery Effectiveness and Health Outcomes of a Maternal Cash Transfer Program in Myanmar

PRESENTER: **Elisa Maria Maffioli**, University of Michigan
AUTHOR: Erica Field

Background: Malnutrition is global health burden, and it remains prevalent in several countries in South-East Asia. In Myanmar, of the 4.4 million children under five, 35% of them are stunted. The undernourishment of mothers and young children is a result of poor infant and young child feeding practices (IYFC), high prevalence of disease, and inadequate access to nutritious food. This project was born out of recognition that inadequate nutrition especially during the first 1,000 days of life can stunt the physical and cognitive development of a child, and this deficiency has costly implications for a person's development and productivity over the life course, hampering economic growth. The Government of Myanmar launched a National Social Protection Strategy in December 2014. Among the "Flagship Programs" stated in the

Strategy, the Government committed to a universal maternity and child cash transfer program for pregnant women and their children under age two.

Method: In collaboration with Save the Children, we implemented a large-scale pilot of a maternal cash transfer program in 450 villages in the Dry Zone in Myanmar (1) to assess the effects of the program on child health, and (2) to test different approaches for the cash delivery. First, we conducted a randomized controlled trial to investigate the impacts of cash transfers only (monthly transfer of 10,000 Kyats), and cash transfers combined with different level of intensity of behavioral communication campaign strategies (BCC) on child malnutrition (stunting, wasting and underweight rates), morbidity, diet and food diversity, breastfeeding practices, use of health care services and immunization. Second, we develop a smaller randomized intervention to test two different cash delivery approaches. Understanding which are the right institutions to deliver cash transfers would help sustain a correct use of resources. This part of the project randomizes which institution delivers the cash, whether governmental health workers or a microfinance institution.

Results: Preliminary results from midline data collection (18 months) show promising results. We find evidence of improved IYFC practices, dietary diversity for mothers and children, as well as meal frequency and acceptable diet, iron rich food consumption, and early initiation of breastfeeding. The impacts are larger for the combination of cash and BCC, compared to the only cash treatment group, suggesting that BCC has been successful in reinforcing nutrition messaging within program areas. The endline data collection (30 months) just finished, and by summer 2019 the results on the primary outcomes of interest (malnutrition) will be presented. We will also be able to provide evidence on whether leakages existed in the provision of the program, and which is the most appropriate model to scale-up.

Discussion: Since the Government is extending this “Flagship Program” to the poorest states in Myanmar, answering all these research questions is key to inform the government on how to implement an efficient national welfare program. This research will not only inform the Government on how to implement a national scale-up and its effects on reducing malnutrition, but it will also have relevance for countries where similar welfare programs are implemented.

Public Health Insurance Expansions and Fertility: Evidence from the State Children's Health Insurance Program

PRESENTER: **Dr. Keshar M. Ghimire**, University of Cincinnati - Blue Ash
AUTHORS: Kabir Dasgupta, Alexander Plum

A number of economic studies have recently examined the effect of providing publicly funded health insurance coverage to low income families on fertility and produced rather mixed evidence. We augment the findings of these studies by exploring the effect of extending publicly funded health insurance coverage *to children* on fertility. We exploit the State Children’s Health Insurance Program (SCHIP) implemented in the late 1990s and early 2000s in the United States to estimate the effect of any expansions specifically targeted to cover children in low to medium income families. We draw data from the Annual Social and Economic Supplement of the Current Population Survey for the period between 1990 and 2016. We employ difference-in-difference strategy coupled with event studies models to explore both static and dynamic effects of the program. While the baseline difference-in-difference estimates show that the net effect of the program on fertility was indisntingnisable from zero, the event study models reveal interesting heterogenous dynamic effects on distinct demographic groups. Specifically, we find that the birth rate among US unmarried women of peak fertility age (20-34) remained steady after the policy implementation whereas the birth rate among US married women of same age group gradually increased. These findings not only highlight the heterogenous impact of the program across demographic groups but also underline the importance of considering dynamic effects of the intervention in exploring its overall impact.

One Step Forward, Two Steps Back: State Selection of ACA Exchanges and Health Outcomes

PRESENTER: **Dr. Sabrina Terrizzi**, Moravian College
AUTHORS: Dr. Michele Deegan, Dr. A. Lanethea Mathews-Schultz

Background: In this analysis, we consider the various state-level implementations of the Patient Protection and Affordable Care Act (ACA) to explore the current effects of intergovernmental relations within the U.S and their effects on health outcomes across states. While the ACA represents a significant policy change at the national level, the largest expansion of the national government into the health insurance arena in over 50 years, our enduring federal system has provided opportunities for states to assert power over implementation; thereby, affecting access to health insurance and health care for millions of Americans. States have had the most influence over two key components of the ACA implementation: Medicaid expansion and the health-insurance exchanges. In this analysis, we focus on the state’s selection of the type of health-insurance exchange, as this may help or hinder health outcomes and access for individuals who are ineligible for Medicaid, who also lack employer-provided private health insurance. We seek to understand how the choice between state-run exchange, federal-only exchange, or one of the two hybrid approaches influences individual health outcomes.

Methods and Data: We conduct state-level analysis using the BRFSS data from 2010 – 2017 combined with state characteristics and political variables that could influence a state’s decision to choose one type of exchange over another, including: legislative and governmental control, partisanship levels of citizens, and spending rates on public benefits programs. Our goal is to isolate the effect of the type of health-insurance exchange to determine how the political structure within a state influences individual health outcomes measured through the BRFSS data. Our state-level outcome variables include: percent of individuals with a primary-care physician, percent of individuals who identify cost as a barrier to access to care, and percent of individuals who are insured. We use a standard OLS regression and conduct sub-analyses by type of health-insurance exchange. Further, we explore the use of instrumental variables (IV) to mitigate the potential endogeneity of each state’s choice of type of health-insurance exchange.

Preliminary Results: Preliminary results indicate there is a significant difference across outcomes by type of health-insurance exchange, while controlling for confounding state-level variables. As compared to the federal-only exchange, states with federally-supported state-based marketplaces have lower rates of residents with primary-care physicians, and states with state-partnership marketplaces have higher rates of citizens with primary-care physicians. It is important to understand the mechanisms by which the type of health-insurance exchange can affect access to care, as measured through our outcome variables. We expect our continued analysis to provide additional insights.

The Impact of Social Accountability Monitoring on Availability of Essential Medicines: Quasi-Experimental Evidence from the Tanzanian Region of Dodoma

PRESENTER: **Mr. Igor Francetic**, SUPSI
AUTHORS: Günther Fink, Fabrizio Tediosi

Accountability and transparency in health systems are a major concern for policy makers across low- and middle-income countries. Social accountability is a popular tool to enhance bottom-up accountability in provision of health care and other public services. Social accountability tools include different mechanisms to involve local communities in management, monitoring and oversight of public providers.

The Tanzanian region of Dodoma is composed of seven districts. Since 2012, the entire region experienced a common effort to improve the health system through a sector-wide project called Health Promotion and System Strengthening (HPSS). The HPSS project addresses different components of the health system with a systems thinking approach. Independently, a local non-governmental organization implemented from 2012 a social accountability monitoring programme to improve health services in two districts in the region: Kondoa and Mpwapwa.

Our research aimed at assessing the impact of the social accountability monitoring programme implemented in Kondoa and Mpwapwa on the availability of essential medicines at health facility level. The specific outcomes considered are the total number of stock-out days for different categories of selected tracer medicines. Our analysis is based on a difference-in-difference approach that accounts for the small number of clusters included in the analysis. Controlling for various confounders at facility and district level, we found a consistent and significant effect of social accountability on the number of stock-out days. Depending on the specific group of medicines analyzed, health facilities exposed to the programme experienced a reduction of 60 to 90 days of stock-out.

This result contributes to the limited literature on the impact of social accountability on health services. We also shed light on bottom-up mechanisms to reduce stock-outs in essential drugs. This latter issue is highly prioritized in health systems in low- and middle-income countries. The reason is that stock-outs affect negatively both patients' experiences and perceived quality of health care. Negative spill over effects include negative impact on future health seeking behaviour, discouraged access to care in public health facilities and lower enrolment in voluntary health insurance schemes.

10:30 AM –12:00 PM TUESDAY [Demand & Utilization Of Health Services]

Universität Basel | Kollegienhaus – Seminarraum 105

Diabetes/BMI

SESSION CHAIR: **Tor Iversen**, Universitetet i Oslo

Uncontrolled Diabetes and Health Care Utilisation: A Bivariate Latent Markov Model Approach

PRESENTER: **Eugenio Zucchelli**, Lancaster University
AUTHORS: Joan Gil, Paolo Li Donni

Diabetes is a major public health concern and one of the most widespread chronic conditions worldwide with a rapidly increasing prevalence, especially among low- and middle-income countries. Among individuals with diabetes, uncontrolled diabetes (UD) or poor glycaemic control is a prevalent condition, concerning around 50 percent of patients, with potentially life-threatening consequences. Despite its relevance, there is sparse robust evidence of the effects of UD on health care utilisation.

The main objective of this paper is to jointly model the propensities towards poor glycaemic control and the use health care services using a bivariate Latent Markov (LM) model. This novel approach extends recent developments within the literature concerning latent class models and allows accounting for the potential endogeneity of UD as well as *time-varying* unobserved heterogeneity using *dynamic* latent classes. We apply this model to the relationship between UD and utilisation of primary and secondary health care services among individuals with type-2 diabetes. We employ six waves (2005-2010) of a longitudinal administrative dataset from Spain including detailed medical records of adult individuals with diabetes. We measure UD using glycated haemoglobin (HbA1c) levels, a biomarker providing an accurate measurement of glucose (sugar) concentration.

Contrary to the majority of previous studies, we find that UD does not appear to have a statistically significant effect on either GP or specialist visits. Moreover, the association between UD and health care use tends to disappear when controlling for unobservable factors, suggesting that these may drive part of their otherwise perceived association. Our specifications also suggest that such unobserved factors are

time-varying by rejecting time-invariant unobservables and identifying the presence of individuals switching between latent classes over time. These movements between classes show a tendency towards higher propensities to poor glycaemic control and health care use, reflecting changes in behaviours. Our models also reveal differences in the propensities to poor glycaemic control and health care utilisation between latent states.

Overall, our results suggest that by ignoring time-varying unobserved heterogeneity and the endogeneity of UD, the effects of UD on health care utilisation might be overestimated and this could lead to biased findings. Our approach also shows heterogeneity in behaviour well beyond standard groupings of *frequent* versus *infrequent* users of health care services. We argue that this dynamic latent Markov approach could be used more widely to model the determinants of health care use.

The Risk and Costs of Major Diabetes-Related Complications: Using Administrative Data in China

PRESENTER: **Dr. Nina Wu**, China Capital Medical University
AUTHORS: Philip Clarke, Dr. Bin Cui, Xinyang Hua, Andrew J Palmer, Lili Wang

Objective

The aim of this study is to estimate and compare health service utilization, incidence and costs of diabetes-related complications by using administrative data in mainland China.

Research Design and Methods

Data. This study is based on analysis of data from the China Health Insurance Research Association (CHIRA) in 2015, which includes patients covered by the Urban Employee Basic Medical Insurance (UEBMI) and the Urban Resident Basic Medical Insurance (URBMI). CHIRA data 2015 comprises 7.13 million randomly sampled beneficiaries from 744 million people across different economic-geographic regions of mainland China.

Study population. Patients with diabetes were identified using two criteria, (1) diagnosis of diabetes (ICD-10: E10-E14), or (2) diabetes-related medication. Exact matching (based age, sex, city, health insurance type) with a 1:1 matching ratio was used to obtain a control group of individuals where there was no evidence of diabetes based on the above criteria. A total of 331,490 diabetes patients were matched to a control group.

Methods. We reported summary statistics for health care utilization. The differences between cases and controls were compared by estimating odd ratios. Regression analyses were used to estimate and compare disease-specific costs. Annual healthcare costs included hospital, clinic and pharmacy costs. All cost data were reported in US dollars based on the 2015 average exchange rates ($1=6.228 Chinese Yuan).

Results

Health service utilization. The mean (SD) annual average outpatient consultations, hospital episodes and inpatients' length of stay of people with diabetes were 19.08 (31.36), 2.01 (3.11) and 22.27 (40.42), compared with control subjects: 10.55 (20.05), 1.68 (2.27) and 17.02 (38.63), respectively.

Risk of complication. Compared with the control group, people with diabetes had a higher incidence of vascular diseases, such as myocardial infarction (OR 2.65, 95%CI [2.09 to 3.36]; $P < 0.001$) as well as several non-vascular diseases including renal failure (2.14, [1.93 to 2.38]; $P < 0.001$).

Health care costs. The average annual health care cost of diabetes patients was $1,795 (SD 5,468) compared to $765(SD 3,022) for control subjects. The average annual cost of diabetes patients accounted for 22% of the GDP per capital ($8,069 reported by the National Bureau of Statistics of China) in 2015. Average annual costs of diabetes patients with heart failure, stroke, retinopathy, and ischaemic heart disease (IHD) were 140%, 96%, 91%, and 88% higher than the costs of control subjects, separately.

Conclusions

In China, diabetes patients with complications need more health services and have higher health costs than those without diabetes due to extra admissions, increased length of stay per admission, and greater treatment costs of diabetes-related complications. This research provides comprehensive national data about diabetes-related complications incidence and costs in China to support health policy decision makers and international researchers. A major strength of this study is its use of administrative claims data that is a large sample (>300,000) across wide geographic areas (34 major cities) in mainland China. The use of claims data also means that costs are based on payments from the insurer so reflect real costs that are incurred with the Chinese health system.

Regional Disparity in Health Service Utilization and Cost of Diabetes Patients in China

PRESENTER: **Dr. Nina Wu**, China Capital Medical University
AUTHORS: Philip Clarke, Dr. Bin Cui, Lili Wang

BACKGROUND

In spite of universal coverage of health insurance, there exist large regional disparities in the health care system in China. In this study, regional disparities of the consumed quantities of health care services and benefits from health insurance were estimated and compared between diabetes and control groups by using big data.

RESEARCH DESIGN AND METHODS

Data. This study is based on analysis of data from the China Health Insurance Research Association (CHIRA) in 2015, which comprises 7.13 million randomly sampled beneficiaries from 744 million people, who were covered by the urban health insurance across different economic-geographic regions of mainland China.

Study population. Patients with diabetes were identified using two criteria, diagnosis or diabetes-related medication. Exact matching (based age, sex, city, health insurance type) with a 1:1 matching ratio was used to obtain a control group of individuals. A total of 331,490 diabetes patients from 34 cities were matched to a control group.

Methods. The total of 34 cities was classified into developed, intermediately developed, and underdeveloped areas by GDP per capital in 2015. We reported summary statistics for health care utilization. The differences between cases and controls were compared by estimating odds ratios. Regression analyses were used to estimate and compare costs. Annual healthcare costs included hospital, clinic and pharmacy costs. All cost data were reported in US dollars based on the 2015 average exchange rates ($1=6.228 Chinese Yuan).

RESULTS

In the developed area, the health care utilization and costs of diabetes patient were higher than the other areas (average annual outpatient visits 40.6 times, hospital discharge 0.7 times, and inpatients' length of stay 7.8 days, total costs $3,274 that account to 41% of the GDP per capital in 2015), while the proportion of OOP in total costs (30%) was lower. Regression results indicated that inpatient costs of developed area(coefficient=13,276) and intermediately area (coefficient=4,584) were higher than under-developed area.

Compared between diabetes and control groups, in the developed and underdeveloped areas, the health care utilization, average annual total costs and OOP of diabetes patients were 2-3 times of control subjects, the proportion of OOP in total costs was around 30% (diabetes) and 35% (control). In the intermediate developed area, the health care utilization and costs of diabetes group were 70%-80% higher than control subjects, but the proportion of OOP in total costs was 43%(diabetes) and 48%(control).

Alpha-glucosidase inhibitor, sulfonylurea derivatives, and biguanide were top three prescribed diabetes drugs. The utilization quantity of these medications in the developed area was the highest, while the price and cost per prescription in the intermediately developed were the highest.

CONCLUSIONS

There was the significant regional disparity in health service utilization, costs, and benefits from health insurance in China. In the health care system, the structure of regional health care supply seems to generate effects. Strategies and guideline for primary health care and cost control should be reinforced. Meanwhile, the extent of driving factors on the demand side (e.g., chronic disease condition) or financing instruments (e.g., health insurance reimbursement policy) should also be considered.

The Effect of BMI on Healthcare Costs: Based on Genetic Variation in BMI As Instrumental Variables

PRESENTER: **Christina Hansen Edwards**, Norwegian Institute of Public Health
AUTHOR: Dr. Jonas Minet Kinge

Background: Past studies have found positive associations between obesity and healthcare utilization, but have not been able to establish causality. We aimed to investigate the effect of BMI (body mass index) on healthcare costs using genetic variants related to BMI as instruments. Since genes are randomly assigned at birth, this method largely overcomes issues related to simultaneity and omitted variable bias.

Data and methods: Individual-level data on measured BMI, genetic information from venous blood samples, and sociodemographic information, were obtained from two waves of The Nord-Trøndelag Health Study (HUNT 2 (1995-1997) and HUNT 3 (2006-2008)). These data were combined, using a unique anonymized identification number, with register-based information from 2008 on healthcare utilization. Information about general practitioner (GP) contacts was obtained from the Norwegian Control and Distribution of Health Reimbursement database and information about in- and outpatient secondary care utilization and DRG-weights were obtained from the Norwegian National Patient Register. To compute yearly costs per person we combined our utilization data with published GP reimbursement rates, and Norwegian DRG prices for hospital–based costs in 2008. Our final dataset contained information about measured height and weight, GP costs, secondary care costs, sociodemographic characteristics, and genetic information for 65,237 participants. For each of the participants we combined information from 97 SNPs (Single Nucleotide Polymorphisms) known to be associated with BMI into an allelic score. We examined the relationship between BMI and primary and secondary care costs by conducting an IV analysis with two-stage least squares regression using the allelic score as an instrument. The analyses were performed with stratification on gender. To evaluate our findings, we compare the results from the IV model with estimates from OLS (Ordinary Least Squares) regression.

Results: Our preliminary results based on the IV analysis contradict the findings we obtained from OLS regression. For males we found a positive association ($p<0.01$) between BMI and secondary care costs when using an IV approach, and did not find an association between BMI and primary care costs. From the OLS regression we found that there was no significant association between BMI and secondary care costs, but there was a positive association ($p<0.001$) between BMI and primary care costs. For females, we did not find any positive association between BMI and healthcare costs in the IV-analyses. From the OLS regression we did not find any association between BMI and secondary care costs, but we did find a significant positive association ($p<0.001$) between BMI and primary care costs. Our instrument was well-powered, and was significantly associated ($p<0.00$) with BMI.

Conclusion: The true effect of BMI on healthcare costs may be smaller than previous studies have reported. This may be due to simultaneity or omitted variables bias in the relationship between BMI and healthcare costs.

10:30 AM –12:00 PM TUESDAY [Organization Of Health Care Markets]

Universität Basel | Kollegienhaus – Seminarraum 106

Competition and Integration in Health Care

SESSION CHAIR: **Søren Rud Kristensen**, Imperial College London

Do General Practitioners in Scotland Locate Their Businesses in Line with Economic Models of Spatial Competition?

PRESENTER: **Verity Watson**, University of Aberdeen - HERU

AUTHORS: Melanie Antunes, Rainer Schulz, Yann Videau

"Access to the right professional, at the right time, as near to home as possible" is one of the main objectives of the Scottish Government's 2020 vision for the country's healthcare system. In the Scottish National Health Service (NHS), general practice primary care is mainly provided on contract by general practitioners (GPs). In addition to local health care provision, GPs act as gatekeepers to secondary care. GP practices, while independent, fulfil thus an essential role for the NHS. However, as GP practices are small businesses, owned by a single or a partnership of GPs, their location decisions might conflict with Government's objective.

In this study, we analyse the location choice of GP practices in Scotland over time and identify determinants of this choice using a rich panel data set. This contributes to the literature that has examined whether the distribution of physicians is driven by competitive forces. Previous studies have used cross-sectional data to examine whether, all things being equal, GPs locate where healthcare demand is high and have also examined whether factors such as amenities and composition of the local population help to explain the distribution of GPs in a given country.

Our data set covers all GP practices in Scotland between January 2008 and September 2018. Data are administrative data about GP practices recorded quarterly (postcode, list sizes by gender and age group) and we combine this with administrative data on population composition (at different levels: settlements, localities) and location characteristics (rurality, presence of amenities such as hospital or private school, Scottish Index of Multiple Deprivation). We use this to test if GPs locate their business as predicted by economic location theories such as spatial competitive forces and profit maximisation. We investigate how the probability that a town has a practice is influenced by population size, patient health needs, location-based variations in the capitation-based remuneration, area's attractiveness using several different amenity proxies.

A preliminary analysis focussed on cross-section data for the second quarter of 2018. We find that GPs locate their business in line with economic theory. The probability of a GP practice increases with the town's population and health needs. This effect depends on the level of rurality, the probability of a GP practice being more sensitive to population size in rural areas. Furthermore, after controlling for population, rural areas are less likely to have a GP practice. The next step (by the time of the conference) will consist in exploiting the panel dimension of our dataset (from 2008-2018) to estimate factors influencing the probability for a GP practice to settle in a new locality by controlling for time invariant unobserved heterogeneity.

The Impact of Integration on Outpatient Chemotherapy Use and Spending in Medicare

PRESENTER: **Dr. Jeah Jung**, Pennsylvania State University

AUTHORS: Roger Feldman, Yamini Kalidindi

Hospital-physician integration has substantially grown in the US for the past decade, particularly in certain medical specialties, such as oncology. Yet evidence is scarce on the relation between integration and outpatient specialty care use and spending. We analyzed the impact of oncologist integration on outpatient provider-administered chemotherapy use and spending in Medicare (a federal health insurance program for the elderly and the disabled). In Medicare, prices are fixed and do not depend on providers' negotiating power. However, Medicare payments for outpatient services differ by location of care. Medicare pays more when the service is offered in hospital outpatient departments (HOPDs) than when the service is given in physician offices (Offices). In addition, Medicare allows practices acquired by a hospital to be re-classified as HOPDs. Thus, services offered by acquired physicians can be billed as HOPD care even when they are performed in Offices. This creates incentives for integrated providers to choose a higher-paid site, which in turn increases Medicare spending

on outpatient care. We investigate how integration changes utilization and spending on chemotherapy services. Analyzing utilization is important because it assess whether spending impacts of integration are driven by utilization changes versus payment effects, and thus helps identify mechanisms by which integration affects spending.

The study population is a random sample of Medicare beneficiaries who had cancer between 2009 and 2013 and who received provider-administered outpatient chemotherapy. We used Medicare claims data and obtained information on provider integration from SK&A data by Quantile/IMS. We addressed oncologists' selective integration and patients' non-random choice of oncologists using a difference-in-differences (DD) approach and an instrumental variables (IV) analysis. In all analyses, we used oncologist fixed effects and clustered standard errors within oncologists.

We measured five outcomes at the patient-year level: frequency of chemotherapy drug claims; frequency of chemotherapy administration claims; chemotherapy drug spending; and chemotherapy administration spending. We also created a "treatment mix" variable – spending per chemotherapy drug claim – to examine whether integrated providers used more expensive drugs. We obtained quantity and spending measures separately for chemotherapy drugs and administration because Medicare pays separately for the drug and its administration (the act of injection).

We found that integrated oncologists reduced the quantity of outpatient chemotherapy drugs but used more expensive treatments. This led to an increase in chemotherapy drug spending after integration. These findings suggest that changes in treatment patterns – treatment mix and quantity – may be an important mechanism by which integration increases spending. We explored the implication of high treatment mix for patient care and found that integration did not improve patient outcomes. We also found that integration increased spending on chemotherapy administration. This is because integration shifted billing of chemotherapy to hospital outpatient departments, where Medicare payments for chemotherapy administration are higher than those in physician offices.

As integration increases, efforts should continue to assess how integration influences patient care and explore policy options to ensure desirable outcomes from integration.

The Effect of Managed Care on Hospice Use and Symptom Burden Near the End-of-Life

PRESENTER: **Lauren Nicholas**, Johns Hopkins School of Public Health

Healthcare near the end-of-life in the United States is frequently characterized by aggressive care delivery that may be inconsistent with patient preferences. Medicare Advantage (MA) plans, the managed care alternative to Fee-for-Service (FFS), face financial incentives to enroll patients in hospice care that are not present in FFS. These financial incentives may promote higher quality of death among MA patients. Using Health and Retirement Study survey data linked to Medicare claims from 2009 - 2015, I show that MA patients are 3 percentage points (7%) more likely to use hospice care in the last six months of life. After using instrumental variables to correct for non-random selection into managed care, I find no effect of MA on hospice use, in-hospital death, or receipt of burdensome end-of-life treatments. Similarly, there are few differences in symptom burden at the end-of-life (as reported by next of kin proxy informants), though MA patients are less likely to experience fatigue and difficulties breathing. Though MA plans face significant financial incentives to improve the quality of end-of-life care, we find little evidence that this is happening in practice.

Chinese Medicine's Integration within a Care Network and Health Care Costs and Patient Outcomes Among Breast Cancer Survivors

PRESENTER: **Ms. Chiu-Mei Yeh**

AUTHORS: Yiing-Jenq Chou, Chia-Jen Liu, Dr. Nicole Huang

BACKGROUND

Breast cancer survivors represent a unique group of patients with complex and continuous care needs following their cancer treatment. They frequently see a large number of providers of different specialties. The role of complementary and alternative medicine such as traditional Chinese Medicine (TCM) has been commonly discussed in care management of cancer survivors. However, the extent to which TCM is integrated into patient's care network and how the level of their integration influence medical costs and patient outcomes among cancer survivors have remained to be explored. Using shared patients to define provider relationship has been increasingly applied in the empirical literature using claims data, which is based on the premise that some aspects of formal or informal physician relationship may be reflected or facilitated by physicians whose patient panels significantly overlap over time. The National Health Insurance program (NHI) in Taiwan provides a unique opportunity for this research as the program not only offers comprehensive coverage for western medical services, but also TCM services. Therefore, this study aimed to apply social network analysis to analyze how the level of TCM integration within breast cancer patient's care networks may be related to health care costs and patient outcomes under the NHI program in Taiwan from 2000 to 2013.

METHODS

We enrolled all patients receiving definitive mastectomy for newly diagnosed breast cancer between 2000 and 2010. Assuming that breast cancer treatment would occur in the first year following cancer diagnosis, each patient was followed from 1 year post-diagnosis and continuing through year 3. Patients who died during the follow-up period were excluded. The integration of TCM provider within patient's care network were defined as the presence of TCM provider and care density within the care network. Care density describes cohesion among physicians within a network (i.e. number of existing ties among physicians divided by the total number of possible ties in a network). The

main dependent variables were medical expenditure, which were analyzed using Tobit models, and patient outcomes (hospital stay (≥ 14 days) and emergency department visit.)

RESULTS

There were 54,026 breast cancer patients in this study. 41.4% of patients had at least one TCM provider in their care network and care density ranged from 0.04 to 1.50. After adjusting for other factors, of all groups, patients with the lowest care density had the highest health care expenditure and likelihood of having poorer outcomes (hospital stay ≥ 14 days: OR = 1.40, 95% CI: 1.27–1.55; ED visit: OR = 2.16, 95% CI: 2.05–2.28), followed by patients whose care network with middle care density, and then by those without any TCM provider in their care networks. Patients with the highest care density among their physicians had the lowest expenditure and least likely to have poorer outcomes.

INTERPRETATION

Under the NHI program in Taiwan, TCM provider is commonly involved in cancer survivorship care among breast cancer patients. The relationship between and the TCM integration within patient's care network, heath care expenditure and patient outcome may be bell-shaped.

10:30 AM –12:00 PM TUESDAY [Demand & Utilization Of Health Services]

Universität Basel | Kollegienhaus – Regenzzimmer 111

Demand and Utilization of Breast Cancer Screening: Weighing up Benefits and Costs

SESSION CHAIR: **John Cullinan**, NUI Galway

Mammographic Screening, Socioeconomic Status and Breast Cancer Mortality: A Difference-in-Differences Analysis

PRESENTER: **Dr. John Cullinan**, NUI Galway

AUTHOR: Pat Moran

Breast cancer is the most common cancer globally and mammographic screening programmes are a common policy response across developed countries. Given the considerable costs of delivering screening programmes, measuring their impact is important. In this paper we exploit the phased geographic roll-out of a national breast cancer screening programme as a natural experiment to examine the impact of mammographic screening and socioeconomic status on breast cancer mortality. We also consider the pathway to mortality reductions by modelling the impact of the programme on factors likely to affect mortality, namely clinical presentation and late-stage incidence. Our difference-in-differences methodology provides estimates of the benefits of the screening programme and is also used to investigate the importance of socioeconomic status for the various outcomes, as well as the extent to which the screening programme impacted on socioeconomic disparities in outcomes. Overall we find that mammographic screening leads to a large increase in the number of breast cancer cases that are diagnosed, with significant decreases in the proportions of women presenting clinically and with late-stage tumours. Our results suggest that, conditional on being diagnosed with breast cancer, there are significant reductions in mortality as a result of screening and that this is a result of fewer clinical presentations and late-stage tumours. However, our central estimate of the impact of screening on population breast cancer mortality rates is considerably lower than previous estimates from large-scale clinical trials, many of which were conducted over thirty years ago. We conclude that the mortality benefits from mammographic screening are considerably lower previously thought. We also find little evidence of a reduction in socioeconomic disparities in the outcomes we consider.

Incorporating Breast Density in the Design of Optimal Screening Strategy for Breast Cancer

PRESENTER: **Ya-Chen Tina Shih**

AUTHORS: Wenli Dong, Ying Xu, Yu Shen

OBJECTIVE: Growing evidence has established the association between high breast density and increasing risk of breast cancer. However, unlike other risk factors for breast cancer that can be discovered through genetic testing (e.g., BRCA1/2) or family history intake, breast density is determined from screening mammography. This presents a challenge for policy makers when designing breast cancer screening strategies for population at various risk levels because women will need to be screened with mammography to know their breast density and yet the screening initiation age varies across breast screening guidelines. This study explore optimal breast cancer screening strategy by incorporating the information of breast density for women without genetic markers or family history of breast cancer.

METHODS: We modified a previously developed and validated microsimulation model for women at average risk for breast cancer to assess the cost-effectiveness of screening strategies that incorporates information on breast density. Strategies included in the evaluation consisted of a combination of a baseline mammography screening at the age of 40 (vs. 45, vs. 50) to determine whether a woman had dense breast and screening strategies stratified by breast density. For those without dense breast, the model considered three guideline-recommended strategies for average-risk women (annual screening starting at 40, biennial starting at 50, and a hybrid strategy with annual screening starting at 45 and switching to biennial at 55). For those with dense breast, we explore strategies that augment screening mammography with ultrasound and/or magnetic resonance imaging. We obtained clinical parameters from the literature or statistical modeling and cost parameters from Medicare fee schedule and SEER-Medicare. All costs (in 2018 US dollar) and effectiveness were discounted at 3%. We conducted deterministic CEA

based on simulation results of 500,000 women and probabilistic CEA from 100 repetitions of the simulation, each with a cohort of 100,000 women.

RESULTS: Preliminary results supported screening strategies that involve a baseline assessment of breast density with screening mammography at age 40. Upon determination of women's breast density, the optimal screening for women without dense breast was the hybrid strategy with cessation age 75, yielding an incremental cost-effectiveness ratio slightly above $40,000 per quality-adjusted life years (QALYs) and the highest probability of being optimal at the societal willingness-to-pay (WTP) of $50,000/QALY and $100,000/QALY. Among women with high breast density, strategies that augment mammography with ultrasound overall dominated those that augment mammography with MRI, regardless of screening intervals as well as initiation and cessation ages.

CONCLUSIONS: Current medical literature justifies the need to incorporate baseline breast density information in the design and implementation of population-based cancer screening strategies. Our modeling study suggests that the optimal screening strategy would most likely involve a baseline breast density assessment at age 40, followed by a strategy that augments screening mammography with ultrasound for women with dense breast and a hybrid strategy starting at age 45 for women without dense breast.

Breast Cancer Screening Programme in Rural China: Does Disutility from Screening Matter?

PRESENTER: **Li Sun**, London School of Hygiene and Tropical Medicine
AUTHORS: Zia Sadique, Isabel dos-Santos-Silva, Li Yang, Rosa Legood

Background In low and middle-income countries mammographic breast cancer screening is prohibitively expensive and a cheaper alternative option is to use ultrasound as the primary screening test. In 2009, China launched a breast cancer screening programme for rural women aged 35-64 years with clinical breast examination coupled with ultrasound as the primary tool. It is argued that ultrasound is associated with higher false-positive rates and hence a higher level of unnecessary anxiety and biopsy. This study aimed to analyse the cost-effectiveness of breast screening compared with no screening among Chinese rural women and to explore the impact of disutility from false-positive screening.

Methods We developed a Markov model to estimate the lifetime costs and effects for rural women aged 35 years from a societal perspective. Asymptomatic women in the intervention arm were screened every three years before age 64 years. Breast cancer in the non-screening arm can only be diagnosed on presentation of symptoms. We explored the parameter uncertainty using one-way and probabilistic sensitivity analyses, and conducted a scenario analysis where there was no disutility from false-positives.

Results Compared to no screening, the rural breast cancer screening programme cost $186.7 more and led to a loss of 0.20 quality-adjusted life years (QALYs) because of disutility from false positives. Breast screening was more expensive and did harm to health among rural women with an incremental cost-effectiveness ratio (ICER) of $-916/QALY. The sensitivity analysis identified the utility loss from false positives as the factor that most influenced the results. If we were to assume no disutility from false-positive screening results, breast cancer screening in rural China would achieve an ICER of US$5,078/QALY, well below the threshold of US$ 23,050/QALY in China.

Conclusions With the reduction in quality of life associated with a diagnosis of breast cancer considered, there is much uncertainty about the cost-effectiveness of breast cancer screening. Due to a relatively small number of studies, the long-term effects of false-positive breast cancer screening are still unknown. This requires careful consideration and further research is required to reduce uncertainty.

10:30 AM –12:00 PM TUESDAY [Evaluation Of Policy, Programs And Health System Performance]

Universität Basel | Kollegienhaus – Fakultätenzimmer 112

Lifetime Aspects of Nutrition and Obesity

SESSION CHAIR: **Fabrice Etile**, Paris School of Economics

What Trajectory Are You on? Association between Life-Course Body Mass Index and Physical Activity Trajectories in Adulthood and Medicare Costs

PRESENTER: **Dr. Diarmuid Coughlan**, Institute of Health and Society, Newcastle University
AUTHORS: Pedro Saint-Maurice, Charles Matthews

Background: Latent class trajectory modelling is a relative new methodology in epidemiology to describe life-course exposures, which simplifies heterogeneous populations into homogeneous patterns or classes. Examples of this methodology in health economics are even fewer. However, given recent efforts to link health surveys to Medicare claims in the US, some exciting research for policy-makers to consider based on trajectories are likely.

Lifestyle behaviours and characteristics at various times-points are subject to enquire in longitudinal data-sets and health surveys. Healthy body weight, as measured by body mass index (BMI) and Leisure time physical activity (LTPA) are two such lifestyle characteristics/ behaviours. Both are malleable over the life-course allowing for meaningful trajectory modelling. Our empirical work explores the association between life-course BMI and LTPA trajectories with later life Medicare costs.

Methods: Using data from respondents of the NIH-AARP Diet and Health Study who consented to have their data linked to Medicare claims data, we prospectively examined the association between BMI and LTPA trajectories in adulthood with available Medicare claims. Trajectories were based on lowest Bayesian Information Criteria (BIC), sufficient numbers in each class assignment and clinical plausibility. Trajectories modelling was conducted using SAS ('proc traj') and stata ('traj') commands. Two-part models were used to estimate the magnitude of the association between trajectories and average annual Medicare costs in the 10 years between 1999 and 2008 adjusting for known covariates.

Results: Based on our inclusion criteria that aimed to mitigate temporal biases, we had 21,750 respondents that were classified into 4 BMI trajectory and 10 LTPA trajectory classes. The magnitude of the associations are based on 6.2 years of Medicare claims (Range 1-10 years).

- **BMI:** Maintaining a healthy weight throughout adulthood was associated with lower healthcare costs in later life than becoming overweight ($1,332/year), being consistently overweight ($1,968/year) and becoming obese ($4,404/year).
- **LTPA:** Compared to respondents who were consistently inactive, Medicare costs were $1,054/year lower for respondents who maintained LTPA throughout adolescence and adulthood and $1,585/year lower for those who increased LTPA in early adulthood and maintained it over time. Those respondents that were active early in adulthood but become sedentary in middle-age had modest savings (~$200/year).

A range of exploratory sensitivity analyses showed that the results of our trajectory models held for various subgroups and restrictions. We do note that the associations in LTPA are greater in men than women and are probably attributable to diabetes and premature mortality.

Interpretation: Our findings suggest remaining at a healthy weight and sustaining a physically active lifestyle through adulthood is associated with lower Medicare costs. Our findings are reassuring to decision makers working in a variety of sectors including public health, business and industry, and education. Perhaps, the life and health insurance industries, who now promote and incentive healthy behaviors as a way of controlling healthcare costs, will be most re-assured and interested in our study.

Priority-Setting for Obesity Prevention in Australia: Methods and Challenges from the ACE-Obesity Policy Study

PRESENTER: **Vicki Brown**, Deakin University
AUTHORS: Jaithri Ananthapavan, Gary Sacks, Marjory Moodie, Phuong Nguyen, Lennert Veerman, Ana Maria Mantilla Herrera, Anita Lal, Anna Peeters, Rob Carter

Background

Overweight and obesity is a serious public health issue in Australia, with approximately 63% of Australian adults and 27% of children classified as overweight or obese. There is increasing recognition that individual responsibility alone will not solve the problem of obesity, and that policy-level interventions addressing upstream determinants and drivers of obesity are required. ACE-Obesity Policy was a National Health and Medical Research Council funded project conducted in Australia between 2012 and 2018, aiming to assess the cost-effectiveness of multi-sectoral, policy-level interventions for obesity prevention.

Objective

The research question for the ACE-Obesity Policy priority-setting study was: "What are the most effective, cost-effective, affordable and implementable policy options to prevent obesity across a range of settings?". This presentation aims to summarise the methodological advancements made to estimate the cost-effectiveness of policy-level interventions for obesity prevention in Australia, and to discuss key methodological challenges.

Data and Methods

The Assessing Cost-Effectiveness (ACE) approach combined rigorous methods for technical cost-effectiveness analyses of policy-level interventions reported according to Consolidated Health Economic Evaluation Reporting Standards, with qualitative analyses of key implementation considerations relevant to policy decisions (strength of evidence, equity, acceptability, feasibility and sustainability).

Results

Key features of the ACE-Obesity Policy study included: (i) a clearly specified rationale for intervention selection; (ii) standardised evaluation methods; (iii) a common setting, decision context and comparator across all evaluations; and (iv) extensive uncertainty incorporated into parameter inputs, including the costs, epidemiological assumptions and process/effectiveness estimates. Evidence for the effectiveness of policy-level interventions was assessed by undertaking scoping reviews of the literature. A framework was developed that allowed for the assessment of strength of evidence of effect of potential obesity prevention interventions; this was used to select interventions to progress to cost-effectiveness modelling. Relevant intervention costs accruing to a range of sectors were identified using a limited societal perspective. Implementation considerations were ranked, and presented in a colour-coded table to provide a succinct overview of the other factors likely to be important to decision-makers but difficult to quantify in cost-effectiveness analyses.

The modelling of expected health benefits and related costs in response to an intervention was based on a previously developed proportional, multi-state, life table Markov model, with several key modelling advancements made. These advancements included: (i) the integration of

physical activity and fruit and vegetables intake as risk factors (in addition to body mass index); (ii) the development of an equity-focused version of the model that allowed the quantification of the differential cost, health and cost-effectiveness outcomes across different socio-economic position groups; and (iii) modifications to allow better quantification of interventions targeted at children. Key challenges in intervention modelling included: limited evidence of effect of interventions on body weight outcomes, limited evidence on sustainability of intervention effect and limitations in the availability of epidemiological and cost data to inform cost-effectiveness analysis.

Conclusions

The ACE-Obesity Policy study methodology represents a significant advancement for obesity prevention priority-setting in the Australian context, and is adaptable to other contexts.

Priority Setting for Obesity Prevention in Australia: Results from the ACE-Obesity Policy Study

PRESENTER: **Jaithri Ananthapavan**, Deakin Health Economics
AUTHORS: Vicki Brown, Gary Sacks, Marjory Moodie, Phuong Nguyen, Ana Maria Mantilla Herrera, Lennert Veerman, Anita Lal, Anna Peeters, Rob Carter

Background

The current obesity epidemic in Australia and around the globe has significant negative health and economic consequences. Addressing this problem will require a comprehensive societal response, including implementation of a suite of multi-sectoral government policies. Informed government action requires reliable comparative evidence on the costs and benefits of various policy options.

Objective

To present the results from the Assessing Cost-effectiveness of Obesity Prevention Policies in Australia (ACE-Obesity Policy) priority-setting study.

Data and Methods

This study assessed the cost-effectiveness of policy-level interventions for obesity prevention in Australia. The Assessing Cost-Effectiveness (ACE) approach to priority-setting was used. The ACE approach is characterised by the combination of rigorous methods for technical cost-effectiveness analyses along with qualitative analyses of key implementation considerations relevant to policy making (strength of evidence, equity, acceptability, feasibility, sustainability). A proportional, multi-state, life table Markov model estimated the health benefits and healthcare cost-savings arising from reductions in diseases causally linked to obesity and physical inactivity as a result of intervention. The interventions were ranked on their cost-effectiveness credentials in a league table, and presented with the results of the implementation considerations.

Results

Cost-effectiveness analyses were undertaken for sixteen obesity policy interventions across a range of sectors (education, transport, health) and multiple levels of governance (local, state, federal governments, the private sector). All sixteen interventions were found to be cost-effective approaches to addressing obesity in the Australian population. Eleven interventions were assessed as dominant. The five remaining interventions were estimated to produce health benefits at a cost well below the common willingness-to-pay threshold used in Australia. Extensive uncertainty, threshold and scenario analyses showed that results were robust to changes in intervention-specific input variables and assumptions.

An intervention to increase the price of alcohol through a uniform volumetric tax performed best in terms of cost-effectiveness and health benefits, followed by a 20% tax on sugar-sweetened beverages and restricting television advertising of unhealthy foods. The vast majority of regulatory interventions evaluated were dominant (seven out of nine), compared to around half (four out of seven) of the program-based interventions. These differences were largely driven by the greater implementation costs of program-based policies. Two interventions (taxing sugar-sweetened beverages, restricting television advertising of unhealthy foods) were quantitatively evaluated for their impact on equity. Both evaluations found a positive impact on health equity, with higher health gains in lower socioeconomic position groups. Only two interventions scored a high on their strength of evidence for BMI outcomes (‘Community-based interventions’, ‘Financial incentives for weight loss by private health insurers’). Nine interventions were rated as having high acceptability to the relevant government (state, federal, local). Interventions that were assessed as having low public acceptability (‘Fuel excise: 10c per litre increase’, ‘Package size cap on sugar-sweetened beverages’, ‘Alcohol price increase: uniform volumetric tax’, ‘Restrictions on price promotions of sugar-sweetened beverages) all impacted the cost or value-for-money of products.

Conclusions

The ACE-Obesity Policy study provides important information on the cost-effectiveness of policy options for obesity prevention. Study results should be particularly instructive for governments aiming to develop comprehensive obesity prevention strategies.

Joint Impact of the Conditional Cash Transfer on Child Nutritional Status and Household Expenditure in Indonesia

PRESENTER: **Toshiaki Aizawa**, University of York

In developing countries, malnutrition is a substantial factor in the causes of death among children aged under five and it also impedes their sound human capital development beyond the health domain. Mounting evidence has shown that health conditions in childhood have persistent and continued effects on adult health, cognitive development, educational achievement and even future income. Malnourished children may be at high risk of impaired health and function throughout their lives. As these conditions extend into adulthood and hence the reproductive years, restricted development in childhood affects subsequent generations, perpetuating an intergenerational vicious cycle of economic and health inequality

Conditional cash transfer (CCT) programmes, which transfer money to households contingent on investments in human capital, have been some of the most adopted initiatives in the last two decades after the success of the CCT programmes in Mexico (Progresa/Oportunidades) and Brazil (Bolsa Escola). To date, these CCT programmes have been launched in several countries in Latin America, Africa and Asia. They target low-income households with pregnant mothers and/or children who face barriers to healthcare and educational investment. The primary objectives of the CCTs are to mitigate short-term poverty, assist long-term well-being through investments in human capital development and break the vicious cycle of intergenerational poverty.

CCTs are expected to improve the welfare of beneficiaries through two main mechanisms: cash transfer and conditionality. Conditionality is considered to be the main driver of behavioural change in beneficiaries but its effectiveness and necessity have been questioned. An unconditional cash transfer (UCT), which transfers cash without any strings attached, may be theoretically preferable to CCTs under the assumption that individual beneficiaries are rational and fully informed and that the market is functioning perfectly. Nevertheless, imposing conditionality is justified in situations where myopic individuals undervalue the long-term benefits of human capital development and do not recognise the risk of child malnutrition; imposing conditionality can help them attain a desirable level of healthcare utilisation and food consumption. However, there is little evidence, for example, as to whether and how much conditionality itself contributes to human capital development, conditional on the household purchasing power. This study attempts to disentangle the mechanism by which CCTs influence a child's nutritional status.

The objective of this study is to investigate the impact of a conditional cash transfer programme in Indonesia, the PKH, on the joint distribution of nutritional status and household expenditure. The cluster-randomised control trial project conducted in Indonesia provides an opportunity to semi-parametrically estimate the causal impacts on the dependence between them. The results show that the PKH improves the weight-for-age zscore among children aged between 25-36 months. Its improvement is not explained by the rise in the household expenditure due to the PKH. Furthermore, the PKH strengthens the positive association between nutritional status and household expenditure among them. The results suggest that the conditionality attached to the PKH plays a role in improving the nutritional status and a conditional cash transfer could be more effective than an unconditional cash transfer programme.

10:30 AM –12:00 PM TUESDAY [New Developments In Methodology]

Universität Basel | Kollegienhaus – Hörsaal 114

Organized Session: Stated Preferences and Willingness to Pay Methods Applied in Africa

SESSION CHAIR: **David Bishai**, Population, Family and Reproductive Health, Johns Hopkins Bloomberg School of Public Health, Baltimore, Maryland

DISCUSSANT: **Sachiko Ozawa**, University of North Carolina-Chapel Hill

Willingness to Pay for Long-Lasting Insecticide Treated Bed Nets: A Discrete Choice Experiment with Real Payment in Ghana

PRESENTER: **Ms. Yira Natalia Alfonso**, Johns Hopkins Bloomberg School of Public Health

ABSTRACT

Introduction: The expansion of long lasting insecticide nets (LLINs) is difficult due to limited government and donor financial resources. Commercial private markets could play a larger role in the continuous distribution of LLINs by offering bed nets with features that are most highly valued among middle-income populations living in malaria prone regions. This could take some of the financial pressure off of governments who could then focus resources to offer protection to those who cannot afford commercially sold products. Given a backdrop of subsidized undifferentiated LLINs available for free in both rural and urban areas, bed net firms contemplating market entry would need to gain confidence that they could derive revenue from a more user friendly commercially sold LLIN. **Methods:** This study conducted a discrete choice experiment (DCE) followed by a real payment choice among a representative sample of 628 middle-income households living in malaria prone regions in Ghana to better understand the demand for LLINs with add-on features. Participants were given a cash payment of ($14.30 or GHS 65) that they could either keep or spend on one of the LLIN products that they stated a willingness to purchase. We use the results to simulate sales under alternative scenarios of private sector entry into bed net sales in Ghana to compute the public costs and coverage outcomes under scenarios with and without the private LLIN market conforming to the WTP estimates. **Results:** Descriptive

statistics showed that while 70% of households worried about getting malaria, only 29% owned a bed net. Likewise, out of the owners, only 50% used the net and 2% purchased them (for $5.5 or GHS24) while the remaining 98% got them for free. DCE results showed that households' average probability of purchasing a LLIN with add-on features was 43.8% (S.D. 0.07) and the average purchaser's WTP for was $7.48 (GHS34.0). The preferred LLIN features were shape conical or rectangular one-point-hang, size queen, and the zipper entry design and the least preferred LLIN features were shape rectangular four-point-hang, size double and entry designs lift-over-head or flap-over-lapping. The average WTP for a LLIN with all the preferred features was $18.48 (GHS 84). Simulation results show that among the 1.7 million middle-income households living in malaria prone areas in Ghana, the public sector outlay could be reduced by 64% from $5.2 million to $1.8 million and private LLIN sales would generate $5.3 million in revenue (or $312 per every 100 households in the study area) that would support jobs for Ghanaian retailers, distributors, and producers of LLINs. **Conclusion:** Our results support a scenario in which commercial markets for LLINs could play a significant role in improving access to LLINs for middle-income Ghanaians prone to malaria. Manufacturers interested in making differentiated bed nets should focus their LLIN designs to maintain a retail price that could yield sufficient economic return and offer features that are most highly valued among middle-income households living in malaria prone regions in Ghana.

Health Versus Other Sectors: Resource Allocation Preferences from a Best-Worst Scaling Study in Uganda

PRESENTER: **Tatenda Tariro Yemeke**

Background: Low health sector spending and investment is a perennial challenge, especially in low and middle-income countries (LMICs). Efforts to create more fiscal space for the health sector occur in the context of competing demands from other sectors and political contest. Hence, there is need to generate evidence to support increased resource allocation to the health sector. Understanding citizens' preferences for resource allocation and valuation of health can be a powerful tool for policymakers and other stakeholders to meet voters' demands, make evidence-based decisions and collectively set priorities.

Objective: To elicit Ugandan citizens' preferences for national budget resource allocation, examine people's preferences for health vis-à-vis other sectors, and compare these preferences with actual government budget allocations.

Methods: We elicited Ugandan citizens' preferences for resource allocation across all sectors using a best-worst scaling (BWS) survey and examined how their stated preferences compared with actual government budget allocations. We surveyed 432 households in urban and rural areas of Mukono district in central Uganda and utilized the relative best-minus-worst score method for analysis.

Findings: The health sector was the top ranked sector where 82% of respondents selected health as the most important sector for the government to fund, but was ranked sixth in national budget allocation, encompassing 6.4% of the total budget. Beyond health, water and environment, agriculture and social development sectors were largely underfunded compared to citizens' preferences. Works and transport, education, security, and justice, law and order received a larger share of the national budget compared to people's preferences.

Conclusion: Our results call for greater investment in health in Uganda to meet citizens' preferences. Moreover, we found that Ugandan citizens' preferences for resource allocation across sectors were fundamentally misaligned with current government budget allocations. Policy makers in Uganda should take citizens' preferences into consideration when allocating resources and mobilize more domestic funds for the health sector. Greater investment in health is not only essential to satisfy citizens' needs and preferences, but also to meet the government's health goals to improve health, strengthen health systems, and achieve universal health coverage.

Willingness to Pay for Mortality Risk Reductions in Uganda

PRESENTER: **Dr. Anthony Ssebagereka**, Makerere University School of Public Health

Background: Cost benefit analyses require the quantification of health impacts in monetary terms. A key measure used in such analyses is the economic value of a statistical life (VSL), which includes measuring people's willingness to pay (WTP) for mortality risk reductions through contingent valuation survey methods. To date, most studies measuring WTP for mortality risk reductions have been conducted in high-income country settings with few in sub-Saharan Africa. We collected primary data in Uganda on WTP for mortality risk reductions.

Methods: We surveyed 434 households in urban and rural areas of Mukono district in central Uganda to elicit WTP for hypothetical health related mortality risk reductions in a contingent valuation survey. We elicited WTP from the individual and community perspective, and explored the effect of non-monetary payment mechanisms, including travel time and household assets, on WTP amounts. We used multivariate regression analyses to explore the impact of demographic and socioeconomic characteristics on WTP, measured using the same questions and weights from the demographic and health survey (DHS) to generate a wealth index.

Findings: Preliminary results indicate that WTP increased with increasing risk scenarios, including across alternative payment mechanisms of travel time and household assets, suggesting that respondents comprehended the concept of risk. Based on a scenario with the highest mortality risk reduction of 1-in-10 within one month, mean and median WTP was US$17.04 (equivalent to 2.8% of Uganda's gross domestic product per capita) and US$5.51, respectively. Individuals' WTP ranged widely, with 10.6% of individuals willing to pay more than $30, while 8.2% offered less than $1. Respondents who had higher levels of education or were not married had the highest mean WTP. Across national wealth quintiles, respondents with the lowest socio-economic status had the highest WTP, followed by the wealthiest respondents. Individual WTP was higher than social WTP which measured individuals' willing to contribute for communal risk reductions.

Conclusion: Collecting primary WTP data is feasible in low resource settings and can reveal people's tolerance toward health risks. The use of alternative, non-monetary mechanisms should be explored further to improve the validity of findings. However, significant methodological

challenges remain to contextualize these findings, and more primary studies should be conducted in African countries to foster learning across contexts.

10:30 AM –12:00 PM TUESDAY [New Developments In Methodology]

Universität Basel | Kollegienhaus – Hörsaal 115

Organized Session: Innovations in Cost Estimation for Health Services in Low and Middle-Income Countries

SESSION CHAIR: **Nicolas Menzies**, Harvard University

DISCUSSANT: **Anna Vassall**, London School of Hygiene & Tropical Medicine

Estimators Used in Multi-Site Healthcare Costing Studies in LMICs: A Systematic Review and Simulation Study

PRESENTER: **Emma C Clarke**, Harvard University

AUTHORS: Nicolas Menzies, Anna Vassall

Introduction: There is increasing interest in understanding the costs of healthcare programs in low- and middle-income countries (LMICs), such as those that deliver vaccines or provide HIV treatment. In recent years, several large multi-site costing studies have been conducted to improve the availability of cost data for global health programs when routine data are unavailable. These studies share a similar objective: they aim to make inferences from a sample of sites to estimate the unit or total costs of the overall program from which the sample is drawn, that can then be used in economic evaluations and other analyses. However, in published studies, a variety of estimators are used to summarize cost data collected from multiple sites. In this paper, we describe current estimation practices in the multi-site healthcare costing literature in LMICs, compare different estimation methods, and make recommendations for calculating and presenting summary statistics in these studies.

Methods: We conducted a pre-registered systematic review of the summary estimators used in published multi-site costing studies from LMICs. We then evaluated estimator performance using a simulation study based on cost data from 20 healthcare interventions in 11 LMICs. We used empirical datasets to impute cost and service delivery volume information for all healthcare delivery sites in each program (e.g. all routine immunization delivery sites in Honduras). Then, from each imputed dataset, we drew repeated samples of varying sizes and analyzed each sample using five estimators of central tendency: the simple mean, the volume-weighted mean, the median, a calibration estimator that reweights the sample to reproduce known features of the population (in this case, total delivery volume), and a regression estimator. We then compared evaluated estimator performance by calculating the bias, variance, and root mean squared error of each estimator.

Results: In the systematic review, we identified 100 multi-site costing studies in LMICs. We found that the most commonly used estimators in the literature were the volume-weighted mean (reported in 52% of studies) and the simple mean (reported in 34% of studies), despite theoretical reasons to expect bias in the simple mean estimator. When we tested various estimators in realistic study scenarios, the simple mean exhibited substantial upward bias in large and small samples, ranging from 12% to 113% of the true cost across a range of study sample sizes and datasets. In contrast, the volume-weighted mean exhibited minimal bias and substantially lower root mean squared error. Further gains were possible using calibration and regression estimators that incorporated auxiliary information on delivery volumes.

Conclusions: In this study, we found wide variation in the methods used to summarize cost data collected from a sample of delivery sites, and demonstrated large and avoidable deficiencies with some of these methods. The choice of summary estimator in multi-site costing studies can significantly influence study findings and, therefore, the economic analyses they inform. Using the simple mean to summarize the results of multi-site costing studies should be considered inappropriate. Our study demonstrates that several alternative better-performing methods are available.

Producing Standardized Country-Level Immunization Delivery Unit Cost Estimates

PRESENTER: **Ms. Allison Portnoy**, Harvard T.H. Chan School of Public Health

AUTHORS: Kelsey Vaughan, Ms. Annette Ozaltin, Emma C Clarke, Christian Suharlim, Mr. Stephen C Resch, Nicolas Menzies

Background: To plan for the financial sustainability of immunization programs, and make informed decisions to improve immunization coverage and equity, decision-makers need to know how much these programs cost. Cost estimates can significantly influence the cost-effectiveness and budget impact estimates used to allocate resources at the country level. However, many low- and middle-income countries (LMICs) do not have immunization delivery unit cost estimates available, or have estimates that are uncertain, unreliable, or old. While new immunization costing exercises will narrow this evidence gap, such studies are resource-intensive and hard to implement routinely. This project aims to produce standardized country-level estimates of immunization delivery unit costs for LMICs.

Methods: We extracted estimates of the economic cost per dose for infant immunization services from the Immunization Costing Action Network (ICAN) Immunization Delivery Cost Catalogue (IDCC). We used these data to construct a prediction model for estimating standardized immunization delivery unit costs. A meta-regression approach was used to incorporate factors expected to predict unit costs as a function of a set of country-level (GDP per capita, reported diphtheria-tetanus-pertussis (DTP3) coverage, and under 5 mortality) and study-

level predictors (study year, cost categories included, and delivery platform (routine or supplementary immunization activities (SIA)). The fitted prediction model was used to estimate immunization delivery costs per dose for each LMIC for 2009-2017.

Results: We estimated the prediction model using the results from 69 individual studies, representing 18 countries. The fitted model demonstrated a declining time trend—on average, each additional calendar year was associated with a 4% decrease in the economic cost per dose. For 2017, the predicted mean economic cost per dose was $0.49 (95% CI: $0.09–1.59), averaged across all LMICs. For routine immunization delivery in 2017, the mean economic cost per dose was $0.44 ($0.08–1.38) compared to $0.55 ($0.08–2.02) for SIA immunization delivery.

Conclusions: Immunization delivery costs are a necessary component of high-quality cost-effectiveness models, and are also used to inform budgeting for immunization programs. Our study provides estimates produced via meta-regression analyses that can help refine evaluation of vaccination programs and improve budgeting and planning in situations where empirical cost data are unavailable.

Examining Approaches to Estimate Catastrophic TB-Related Costs in South Africa

PRESENTER: **Ms. Sedona Sweeney**, London School of Hygiene & Tropical Medicine
AUTHORS: Anna Vassall, Mariana Siapka, Natsayi Chimbindi, Don Mudzengi, Gabriela B Gomez

Introduction: The estimation of nationally-representative catastrophic costs is a priority for normative bodies such as WHO-TB as part of their End TB Strategy. These country-wide cross-sectional surveys require ample resources and time to complete. In many settings, data on patient costs have been collected as part of trials or smaller-scale projects. We explore methods to pool small-sample study data to provide a useful resource for countries looking for decision-making support.

Methods: We obtained four patient-level datasets from three authors working in South Africa, and conducted a pooled analysis to estimate catastrophic costs for TB in South Africa. We used two approaches to use existing data to parameterize a model estimating the national prevalence catastrophic cost using the pooled dataset: a regression analysis with multiple imputation, and a meta-analysis of summary data. We summarize the findings from each approach, and examine the potential usefulness of each approach to inform different questions for policy purposes.

Results: The different methods of model parameterization resulted in differences in the overall estimates of direct non-medical and indirect costs, however these differences did not translate into significant differences in the estimations of the overall prevalence of catastrophic cost. Overall, the median prevalence of catastrophic costs encountered at the population level using both approaches was 10-11% of households. There was some uncertainty around these estimates using both approaches, varying from 7-15% for the meta-analysis approach and from 7-14% using the regression approach. Both approaches indicated that the large majority of the burden of catastrophic costs falls on households in the first income quintile.

Conclusions: The similarity of estimates using two different approaches to model parameterization suggests that an individual-level analysis did not reduce uncertainty compared to a study-level meta-analysis. However, this analysis required intensive recalculation of variables in order to reconcile cost estimation methods and time periods across studies before it was possible to conduct the meta-analysis. This analysis would not have been possible using only the summary statistics reported in the study papers. In order for meta-analysis to be a feasible alternative for policymakers seeking to track prevalence of catastrophic costs due to TB, there is an urgent need for more standardized methods to collect cost and income data, and standardized reporting of cost estimates.

Moving Away from the Unit Cost. Estimating Country-Specific VMMC Average Cost per Service Curves Accounting for Variations in Implementing Platforms

PRESENTER: **Sergio Bautista**, National Institute of Public Health, Cuernavaca
AUTHORS: Mr. Carlos Pineda, Lily Alexander, Diego Cerecero, Drew Cameron, Steven Forsythe, Gabriela B Gomez, Michel Tchuench, Chris M Chiwevu, Jim Kahn, Anna Vassall, Dr. Carol Levin, Dr. Lori Bollinger

Background: The policy relevance of cost information hinges on it being specific and timely. However, cost studies are expensive and slow to implement. Results from those studies are often not available at moments of critical decision-making. Moreover, those costs estimates are usually aggregated and unspecific to and unrepresentative of implementation realities – most of them based on ad hoc samples of facilities. As a result, policy-makers must rely on flawed, unspecific unit costs even though in reality, unit costs are a direct function of service delivery characteristics and scale levels. The implication of using unspecific unit cost is that not only are policy-makers using poor estimates, but they have no information to assess the level of uncertainty and the likely direction and magnitude of the potential bias imposed by random estimates.

Objective: The objective of this work is to analyze primary facility-level and secondary data on costs of VMMC services from several independent studies, combined with aggregated results from published studies (secondary data), to extrapolate cost curves of VMMC to all relevant countries in Sub-Saharan Africa and specific implementing scenarios within those countries.

Methods: We identified 15 high-quality VMMC cost studies through a literature review. Authors were contacted to share their data on costs and service delivery characteristics. We standardized the disparate datasets into an aggregated database which included 220 facilities from seven studies in eight countries. We estimated the average cost per circumcision for each facility and conducted OLS and GLM regression models to predict average costs curves against scale for each combination of three platform characteristics in each country; type of facility,

ownership, and urbanicity. To extrapolate the estimates to countries not included in the sample, we combined the primary data (simplified to the scenario-level with 38 observations) with values from the literature (9 observations and two additional countries). We used multivariate regression methods to predict unit costs for each country by iteratively excluding it from the sample, running the models and predicting the observed values. We validated extrapolations by comparing predicted against observed costs.

Results: Average unit cost was 66 USD, and the average unit cost for each scenario of implementation ranged from 14 to 170 USD. Our results showed evidence consistent with economies of scale. Furthermore, the cost curves showed a considerable variation of costs estimates across implementation scenarios within countries. We were able to validate the extrapolations in ten countries and found that the predictions from our models were not statistically different from observed values - the median percentage variation between observed and predicted values was 18 percent with respect to the total unit cost or 9 USD.

Conclusion: Our results showed significant variation in VMMC unit costs across and within countries. The results reveal the potentially large bias implicit in using unspecific unit cost data. Ours is a novel alternative to assess costs of services explicitly taking into account the implementation reality of programs and provide a path to move away from overly simplistic estimates of unit costs.

10:30 AM –12:00 PM TUESDAY [Production Of Health, Health Behaviors & Policy Interventions]

Universität Basel | Kollegienhaus – Hörsaal 116

Organized Session: The Interplay between Mental Health and the Economy

SESSION CHAIR: **Nicolas Robert Ziebarth**, College of Human Ecology, Cornell University

DISCUSSANT: **Matthew C Harris**, University of Tennessee; **Stephanie von Hinke**, University of Bristol; **Fabrizio Mazzonna**, Universität della Svizzera italiana

Mental Health, Human Capital and Labor Market Outcomes

PRESENTER: **Dr. Christopher Cronin**, University of Notre Dame

There are two primary treatment alternatives available to those with mild to moderate depression or anxiety: psychotherapy and prescription medications. The medical literature and our analysis suggest that in many cases psychotherapy, or a combination of therapy and medication, is more curative than medication alone. However, few individuals choose to use psychotherapy. To explain this pattern, we develop and estimate a dynamic model in which individuals make sequential medical treatment and labor supply decisions while jointly managing mental health and human capital. The results shed light on the relative importance of several drawbacks to psychotherapy that explain patients' reluctance to use it: (1) therapy has high time costs, which vary with an individual's opportunity cost of time and flexibility of the work schedule; (2) therapy is less standardized than medication, which results in uncertainty about it's productivity for a given individual; and (3) therapy is expensive. Preliminary results suggest that, while these factors affect treatment decisions, their role is small relative to the estimated utility cost of therapy, which may capture stigma, lack of information on the returns to therapy or other unobserved factors.

Employment Effects of Healthcare Policy: Evidence from the 2007 FDA Black Box Warning on Antidepressants

PRESENTER: **Dr. Meghan Skira**, University of Georgia

Public policies and regulatory decisions aimed at improving health may have indirect effects on outcomes such as education and employment. We study the labor market effects of the US Food and Drug Administration's 2007 expanded black box warning on antidepressants. A black box warning appears on a prescription drug's label (or package insert) and is meant to call attention to serious adverse or life-threatening side effects. It is the strongest warning required by the FDA. In October 2004, the FDA required that drug manufacturers of 36 antidepressants include a black box warning of increased risk of suicidal thinking and behavior (suicidality) for children and adolescents. The warning was expanded in May 2007 to include young adults aged 18-24. Furthermore, the expanded warning contained language recommending patients of all ages who are started on antidepressant therapy be monitored carefully.

Using nationally representative data from the National Survey on Drug Use and Health and a difference-in-differences strategy, we find that employment among women aged 35-49 with a history of depression decreased by 6.1 percent (4.4 percentage points) in response to the 2007 warning. We explore potential mechanisms generating these employment effects and find antidepressant use among women aged 35-49 decreased along both the extensive and intensive margins after the warning. Our estimates suggest these same women did not substitute towards medical or non-medical alternatives such as marijuana, alcohol, or psychotherapy. We find no employment or antidepressant response among men or among women younger than 35. Overall, our analysis suggests that the 2007 expanded black box warning reduced US labor force participation by 0.23 percentage points and led to roughly $13 billion in lost wages.

Economic Downturns and Individual Wellbeing

PRESENTER: **Daniel Avdic**

While there is little doubt that the economic environment affects health, the direction appears to be highly outcome- and context-dependent. We empirically assess the impact of economic downturns on individual well-being by linking rich Australian and German survey data to regional and sector-specific economic growth measures obtained from official country statistics. To tackle endogeneity concerns, we

instrument the exposure to economic downturns with the industry composition adjusted national economic development. The results of this shift-share approach reveal strong negative effects of recessions on both subjective life satisfaction and a more objective, validated mental health measure. However, a mere cooldown of economic growth has no effect on well-being. An event study approach assessing the impact of the 2008–09 financial crisis indicates that the negative effect on life satisfaction persists well beyond the duration of the economic recession and is driven by the perceived downturn in 2008 rather than the actual decline in gross domestic production in 2009.

New(spaper) Evidence on the Relationship between Business Cycles and Suicides

PRESENTER: **Christoph Kronenberg**, CINCH

Suicides hurt families and the economy with an annual cost of $69 billion in the USA. The literature typically finds that suicides are countercyclical in contrast to most other health outcomes. Thus, if the economy improves, the number of suicides tend to go down and vice versa. If this was a causal finding, governments should heavily invest into suicide prevention during economic recessions and reduce that investment during economic booms. However, the majority of the empirical evidence is based on association studies from the 20th and 21st century. This is the first work to extend this literature to the 19th century. Shifting the time horizon limits the possible confounding effects of health insurance, labor market protections and mental health care on the relationship between the state of the economy and suicides, as they were either not existent or in their infancy. Furthermore, regular business cycle movements are somewhat predictable by individuals. We therefore use the value of gold and silver discoveries as an economic shock, while previous works used GDP or the unemployment rate to proxy business cycles.

Given that no suicide records exist for the 19th century, we build an index of newspaper suicide mentions by dividing the number of suicide mentions through the total number of newspaper pages available for a given year and state.

Preliminary results confirm previous findings. Gold and silver discoveries are associated with a reduction of suicide mentions. However, gold discoveries did not universally lead to wealth and thus provide an opportunity to explore the effect of an economic shock on its winners and losers. Therefore, future steps include looking at Chinese, Mexican and Native American miners who were met with varying degrees of animosity. Exploring the effect on them is an avenue to study the effect heterogeneity of gold discoveries on suicides.

10:30 AM –12:00 PM TUESDAY [Health Care Financing & Expenditures]

Universität Basel | Kollegienhaus – Hörsaal 117

Organized Session: Extracting Better Value Instead of Teeth: The Economics of Preventing and Managing Dental Diseases.

SESSION CHAIR: **Stefan Listl**, Radboud University

Projecting Dental Health Expenditures into the Future: OECD Countries up until the Year 2040

PRESENTER: **Milica Jevdjevic**

AUTHORS: Dr. Stefan Listl, Maroeska Rovers, Yusuke Matsuyama

Background: Against the background of increasing cost pressures in health care, warranting an efficient and equitable allocation of health care resources is a longstanding concern for policy makers. Dental diseases remain among the most prevalent diseases worldwide and substantiate a considerable economic impact to society in the size of about 5% of total health expenditure. Yet little is known about the potential future dynamics of dental expenditures and this is partly due to lack of consistently reported data. The aim of our study was to explore the extent to which dental expenditures can be forecasted for OECD countries up until the year 2040.

Methods: Our analyses relied on univariate and multivariate dynamic modeling approaches. For univariate modeling, an Auto-Regressive Integrated Moving Average (ARIMA) dynamic model was employed which relied on historical trends in dental expenditures (OECD database, 1990-2016). Missing values on expenditure were imputed using a multiple imputation technique using the “Amelia” package for the R statistical computing environment. For multivariate modeling, we relied on previous historical trends and relationships between dental expenditures, disease morbidity (incidence and prevalence of caries in permanent teeth, periodontal disease, and severe tooth loss; Institute for Health Metrics and Evaluation, 1990-2016), economic growth in terms of gross domestic product (GDP; International dollar [Int.-$], 2010 values; OECD, 1990-2040) and demographic changes (ageing and population size; United Nations, 1990-2040). Model fit was assessed by means of the out-of-sample predictive validity with relative to 2012-2016 data and using Root Mean Square Error (RMSE). We reran the model with the smallest RMSE using 1990-2016 data to obtain parameters for the extrapolation through the year of 2040.

Results: Across different model specifications, the dental expenditure in OECD countries was forecasted to range between Int.-$348 billion and Int.-$487 billion in 2020, Int.-$520 billion and Int.-$593 billion in 2030, and Int.-$750 billion and Int.-$892 billion in 2040. According to the RMSE criterion, the best performing model was yielded by means of the ARIMA approach. Using the ARIMA model specification, OECD countries’ dental expenditures were estimated at Int.-$343 billion for the year 2015 and forecasted at Int.-$487 billion (2020), Int.-$593 billion (2030), and Int.-$892 billion (2040). In 2040, per capita spending was forecasted to be highest in Germany (Int.-$1157) and lowest in Mexico (Int.-$61).

Discussion: Our findings indicate a substantial extent of uncertainty in forecasting dental expenditures into the future. This is mainly due to limited availability of data which would be relevant for more accurate forecasting. Within the limitations of available data sources, our findings suggest that total dental expenditures in OECD countries may double over the next two decades. Increases in spending on dental health may be expected for almost all OECD countries. For more accurate estimation and better understanding of determinants of dental expenditures, more country-specific, more reliable and more up-to-date data on dental spending and dental morbidity are needed. Various potential health policy measures may be amenable to warrant efficiency and sustainability of dental care systems in the future.

Needs-Based Planning for the Oral Health Workforce – Development of a Planning Model

PRESENTER: **Dr. Stefan Listl**, Radboud University
AUTHORS: Susan Ahern, Noel Woods, Olivier Kalmus, Stephen Birch

Background

Successful health workforce planning is critical to the sustainability of a healthcare system as it encompasses the delivery of the right care, in the right place, at the right time, by the right number of people, to those most in need. While many health system policy makers recognise the need to better plan human resources, most countries across the globe have struggled to successfully develop and implement health workforce planning models which are fit for purpose. Workforce planning in dentistry has typically been limited to a simplistic target dentist-population ratio, a widely used measure for transforming demographic projections into required numbers of dentists. However, this measure does not account for the ever-changing oral health needs of populations. Our aim was to develop an oral health needs-based workforce planning simulation tool which compares provider supply to provider requirement to identify imbalances in the market for oral healthcare providers.

Methods

Using a conceptual framework for health needs-based workforce planning as described in previous literature [1], we systematically structured a simulation model by building a series of linked MS Excel spreadsheets, populated with publicly available data (where available) to illustrate the feasibility of establishing a useful, workable, oral health needs-based workforce planning simulation tool.

Results

Our hypothetical model has been initially developed for dentists only and consists of two components: Provider Supply which encompasses four sub components: (i) existing stock of dentists (ii) inflow and outflow of dentists (iii) newly trained dentists and (iv) productivity levels, and Provider Requirement which encompasses three sub components: (i) demography (ii) health status and (iii) type and frequency of service. Using hypothetical data for provider supply components and publicly available data from national and international databases and the Eurobaromter 330 Oral Health survey data for provider requirement components, we have developed a needs-based model that provides an estimate of dentist supply and dentist requirement (FTE equivalent) for each year of the planning period. Our model results enable the identification of any imbalance in the market for dentists.

Discussion

Our model provides a starting point for further elaboration and refinement of an oral health needs-based workforce planning tool. We illustrate the output possible with the limited public data currently available and the potential of the model to incorporate skill-mix changes in the dental workforce and to examine the associated economic impact. The model is also informative with respect to highlighting the current scarcity of data required to populate the model and the need for routine collection and timely availability of relevant oral health data to successfully implement needs-based workforce planning for oral health. Further development of the model will allow for the explicit incorporation of skill-mix changes and an analysis of associated economic impacts.

Economics of a Referral Management & Triage Programme for Minor Oral Surgery Referrals in Primary Care Dentistry.

PRESENTER: **Stephen Birch**, The University of Queensland Centre for the Business and Economics of Health
AUTHORS: Harry Hill, Joanna Goldthorpe, Tanya Walsh, Martin Tickle, Caroline Sanders, Paul Coulthard, Iain Pretty

Oral surgery referrals from primary dental care practices in the NHS in England are rising and increasing pressures on finite hospital resources. It has been suggested that primary care specialist services can provide care for selected patients at reduced costs and similar levels of quality and patient satisfaction.

We explore the impact of an electronic referral system with consultant or peer led triage aimed at diverting patients requiring oral surgery into primary care specialist settings using an interrupted time series study conducted in a geographically defined health economy with appropriate hospital services and no pre-existing referral management or primary care oral surgery service. Referrals from primary care dental practices for oral surgery procedures were analysed over a three-year period. A consultant led triage system for oral surgery referrals embedded within an electronic referral system for oral surgery was introduced with an adjunct primary care service. Diagnostic test accuracy metrics for sensitivity and specificity were calculated. Total referrals, numbers of referrals sent to primary care and the cost per referral were measured.

During consultant-led triage 45% of referrals to hospital were diverted to primary care. The diversion rate was reduced but remained substantial (43%) when s general dental practitioner (GDP) performed the triage. Only 4% of referrals were sent from the specialist primary

care to hospital suggesting a highly efficient triage of referrals. A significant per-referral saving of £108.23 (SE £11.59) was seen with Consultant triage, compared to £84.13 (SE £11.56) with GDP triage. Cost savings varied according the methods used by hospitals in applying the national tariff for referred patients. Patients reported similar levels of satisfaction for both settings and speed of treatment was their overriding concern. Implementation of electronic referral management in primary care when combined with triage, can lead to appropriate diversions of cases to primary care leading to cost savings. However the level of cost reductions are dependent on tariff application by hospitals, with savings being overestimated where hospitals currently use more costly day case tariffs extensively.

Switching the Dentist: Does Patients' Exposure to X-Rays Depend on Dentist Remuneration?

PRESENTER: **Olivier Kalmus**, University Hospital Heidelberg

AUTHORS: Martin Chalkley, Dr. Stefan Listl

Background: Medical radiography is associated with a radiation risk for patients. X-rays are recommended to be used only if the patient's benefits exceed the risks, that is only upon strict clinical indication. Current dental clinical guidelines in Scotland indicate that dental X-rays should not be part of routine screening. This includes patients visiting a new dentist, especially when a previous dentist has already undertaken intraoral X-rays. The purpose of this study was to assess the impact of dental remuneration on the probability of a patient receiving a dental radiograph when switching to a new dentist. The context of NHS Scotland provides a unique and suitable analytical setup because Scottish dentists can be remunerated on a fee-for-service or on a salary basis. Our analyses were informed by previous research which has established a general relationship between dentist remuneration and dental X-raying.

Methods: The analysis relied on 10-year longitudinal data from NHS Scotland for the years 2005 to 2016. Our data include more than 4 million claimed services provided to a randomly selected 5 percent of the covered population. We employed fixed-effects panel regression analyses to determine the impact of provider remuneration on a patient's likelihood to receive bitewing radiography upon switching to a new dentist. To control for unobserved heterogeneity, we estimated models including patient, dentist and two-way fixed effects. To account for variance based on demand side incentives and changes therein, we estimated the same models on two narrower samples. One only including patients that were never exempt from co-payments for dental services during the study years; and the other model being limited to patients who were fully or partially exempt from treatment charges throughout the study period. A number of potential confounders were controlled for.

Results: Patients switching to a dentist who is paid fee-for-service had a by an average of 11 %-points (95% CI: 10.1-12.4; $P<0.001$) higher probability to receive a dental radiograph compared to staying with their current dentist. The effect of a patient switching to a salaried dentist was found to be non-significant in comparison to not switching the dentist. These results hold robust against various robustness checks (including for restricting the sample to patients who are either exempt or non-exempt from treatment charges) and when accounting for patient, dentist, and two-way fixed effects.

Discussion: Our findings suggest that, in comparison to staying with the same dentist, patients are being exposed to substantially more X-rays upon switching to a dentist who is paid fee-for-service. Switching to a salaried dentist does not seem to result in such increases in X-raying. These findings may be of interest (and potential concern) for those interested in warranting patient safety by means adequate incentive structures for and regulations with respect to medical X-raying. Unwarranted variation in X-raying upon switching medical providers may at least partially be avoidable by means of information systems which facilitate safe and timely exchange of medical records between providers.

10:30 AM –12:00 PM TUESDAY [Production Of Health, Health Behaviors & Policy Interventions]

Universität Basel | Kollegienhaus – Hörsaal 118

Organized Session: Antimicrobial Resistance: What Solutions Can Economists Bring to This Challenge?

SESSION CHAIR: **Richard Smith**, University of Exeter

The Challenge of Antimicrobial Resistance: What Economics Can Contribute?

PRESENTER: **Sarah Wordsworth**, University of Oxford

Authors: Laurence S. J. Roope, Richard D Smith, Koen B. Pouwels, James Buchanan, Lucy Abel, Peter Eibich, Christopher Butler, Pui San Tan, A. Sarah Walker, Julie V. Robotham, and **Sarah Wordsworth**

Background: Antimicrobial resistance (AMR) is increasing, driven by widespread, often inappropriate, antibiotic use. The existence of effective antibiotics is under serious threat, jeopardising modern healthcare. Forecasts of costs to the economy are similar to those of a 2 degree Celsius rise in global average surface temperature, above pre-industrial levels. Tackling AMR is an urgent priority for policymakers. Substantial research funds are being invested and pressure is mounting to secure international commitments to tackle AMR.

Advances: Estimating the value of interventions to reduce antibiotic use requires predictions of future population levels of antibiotic resistance. However, modelling the trajectory of antibiotic resistance is complex. Despite undeniable evidence that rising antibiotic consumption increases resistance at a population level, the impact of individual consumption of antibiotics on total AMR at the population

level is infinitesimally small. The challenge of estimating the resulting marginal impact on health and the economy is similarly daunting. As with the cost of climate change, estimates of total AMR costs are uncertain and may be far higher than current estimates. Much of the uncertainty arises from the complexity of estimating the cost of changes in overall resistance levels, which depend on which drug and pathogen are involved, the prevalence of that pathogen, the infection types caused by it, how transmissible it is and whether there are alternative treatments available. The uncertainty over the costs of increased resistance feeds through to uncertainty over the level of the AMR threat, level of investment required to control the threat, and ultimately the value of antibiotics.

Outlook: There are striking similarities between climate change and AMR, both described as a global 'tragedy of the commons'. There is some consensus that we should treat cutting carbon emissions as an insurance policy against the possibility of a catastrophic climate outcome – and avoid the trap of waiting for a definitive optimum abatement policy to emerge from complex cost-benefit analyses. A similar paradigm shift is needed in how interventions to reduce antibiotic use, and subsidies to incentivise development of new antibiotics, are evaluated. Rather than taxing the price, and letting the market dictate the quantity of antibiotics, an alternative could be to establish a regulatory body giving prescribers tradable permits, letting the market determine the price. This could create a predictable revenue stream, through more foreseeable licensing fees, for important antibiotics, in a way that could de-link the return on investment from the volume used. Such approaches could incentivise industry to develop important new antibiotics for which there would otherwise be too small a market to provide sufficient returns on investment. This presentation will explore the opportunity for economists, across many different fields, to engage with the AMR challenge, and highlight potential solutions that have been used in other areas of economics for similar problems.

Modelling the Long-Term Consequences of Antibiotic Use

PRESENTER: **Koen Pouwels**, University of Oxford

Authors: Koen B. Pouwels, Berit Muller-Pebody, Susan Hopkins, Julie V. Robotham, Sarah Wordsworth

Background: Although antibiotic use is associated with some side effects for treated patients, the largest costs are expected to be due to increases in future antimicrobial resistance (AMR) levels, affecting the society as a whole. Various studies have estimated the current costs of AMR, but estimates of the potential future costs of AMR are scarce, often simple 'what-if' scenarios not supported by empirical data, and no link is made with the effect of antibiotic prescribing. To be able to estimate justified levels of investment and the potential cost-effectiveness of interventions reducing antibiotic prescribing, models predicting future AMR levels as a function of antibiotic use are needed. A pathogen of particular interest is *Escherichia coli*, given concerns about increasing AMR levels and the increasing incidence of bloodstream infections caused by this pathogen. Given the high carriage of *E. coli*, these bacteria are frequently exposed to antibiotics, even if used for different infections. Here we model current and future AMR levels among *E. coli* as a function of antibiotic use.

Methods: Monthly primary care prescribing data were obtained from NHS Digital. Positive *E. coli* urinary and blood samples between January 2014 and April 2018 were obtained from Public Health England's Second Generation Surveillance System (SGSS). Bayesian spatiotemporal models using Integrated Nested Laplace Approximation (INLA) were used to account for geographical correlation between neighbouring areas, antibiotic use, and other risk factors. Non-linear relationships between antibiotic use and AMR, as a consequence of transmission of resistance elements or bacteria, were modelled using B-splines or random walks. These models were subsequently used to predict the impact of changes in antibiotic prescribing on future AMR among *E. coli* based on spatiotemporal variation in the data and changes in predictors.

Results and Conclusions: Preliminary results showed that resistance against a particular antibiotic is not only driven by use of the same antibiotic, but also by use of other, unrelated antibiotics. This can be explained by the fact that resistance genes against different antibiotics are often linked on mobile genetic elements. In contrast to previous studies that assumed that relationships between antibiotic use and resistance can be modelled using a linear model, we found that it is important to account for potential non-linear relationships because bacteria and resistance elements are transmissible. More realistic estimates of current local AMR levels were produced by the spatiotemporal models than by simply looking at the proportion of tested samples that were resistant to the antibiotic of interest. Further analysis will aim to predict future AMR levels as a function of changes in antibiotic use and other predictors using the developed spatiotemporal models. Findings will be presented at this organized session, including the estimated effect of changes in antibiotic prescribing on associated costs due to changes in the incidence of resistant infections and the probability of treatment failure.

Reducing Expectations for Antibiotics in Primary Care: A Randomised Experiment to Test the Provision of Different Types of Information

PRESENTER: **Laurence Roope**, University of Oxford

Authors: Laurence S. J. Roope, Sarah Tonkin-Crine, Natalie Herd, Susan Michie, Enrique Castro-Sanchez, Anna Sallis, Derrick W. Crook, Tim Peto, Michele Peters, Christopher C. Butler, A. Sarah Walker, and Sarah Wordsworth

Background: Public health campaigns often provide information about antimicrobial resistance (AMR). However, informational messages have been found to have varying effects on thinking and behaviour.

Methods: We developed and tested informational messages intended to reduce expectations for antibiotics for influenza-like-illnesses. Members of an online panel representative of the United Kingdom general adult population were randomised into three groups to receive different information about antibiotic use and AMR. All groups received 'fear' messages about the dangers of AMR. Two groups also received reassuring messages that influenza-like-illness symptoms are easily self-managed without antibiotics, with one group having a

strong ‘fear’ message and the other a mild ‘fear’ message. The main outcome measures were self-reported effect of information on the likelihood of visiting a doctor, and requesting antibiotics, for influenza-like-illness; analysed separately according to whether or not information about AMR was “new” to participants, pre-specified based on results of an original non-randomised survey.

Findings: The ‘fear only’ message was “very/somewhat new” to 285 (28·5%) of 1,000 respondents; ‘mild fear plus reassurance’ was “very/somewhat new” to 336 (22.4%) of 1,500 respondents; ‘strong fear plus reassurance’ was “very/somewhat new” to 388 (25·9%) of 1,500 respondents. Of those for whom the respective information was “very/somewhat new”, only those given the ‘strong fear plus reassurance’ message said they would be less (versus more) likely to request antibiotics ($p<0·0001$) if they consulted a doctor for an influenza-like-illness. Of those given the ‘fear only’ message, a larger proportion said the information would lead them to be more (versus less) likely to consult a doctor for influenza-like-illness ($p<0·0001$). There was also a trend towards being more likely to consult in the ‘mild fear plus reassurance’ group ($p=0·07$), but no evidence of such a trend in the ‘strong fear plus reassurance’ group ($p=0·85$). Among those for whom the respective information was not “new”, a larger proportion said they would be less (versus more) likely to consult/request antibiotics for influenza-like-illness ($p<0·0001$) across all groups (interaction $p<0·0001$). Results were similar in subgroups defined by believing antibiotics would “definitely/probably” help an influenza-like-illness.

Interpretation: Fear could be effective in public campaigns aimed at reducing antibiotic use, but only if combined with reassuring messages that patients can self-manage symptoms effectively without antibiotics.

What Influences Public and GP Willingness to Use Delayed Prescribing? A Series of Discrete Choice Experiments

PRESENTER: **Liz Morrell**, University of Oxford

Authors: Liz Morrell, James Buchanan, Laurence Roope and Sarah Wordsworth

Health Economics Research Centre, Nuffield Department of Population Health, University of Oxford, UK

Background: Delayed prescribing is an approach to reducing antibiotic consumption in general practice. The clinician prescribes antibiotics, but the patient is advised to ‘wait and see’ if the condition improves with self-management. The approach has been found to be effective, and is enshrined in clinical guidelines in the United Kingdom (UK), but has not been widely adopted by general practitioners (GPs). Our work aims to shed light on the facilitators and barriers to using delayed prescribing rather than an immediate prescription. As these prescribing decisions are multi-faceted, involving trade-offs between multiple factors, a discrete choice experiment (DCE) is an appropriate experimental method, allowing exploration of the relative importance of the various factors. Although the prescribing decision is made by the GP, the expectations of the patient may influence that decision, hence, it is important to identify the trade-offs being made by patients as well as the GP. We use the example of respiratory tract infections – a common reason for consulting a GP, and familiar to the public. These infections account for three-quarters of human antibiotic consumption; surveys suggest that less than half of such patients actually have a bacterial infection, making this indication a valid target for consumption reduction.

Methods: We designed two discrete choice surveys – one for GPs, and one for the general public; in addition to a representative adult sample, we also specifically surveyed parents, to explore differences in preferences when considering treatment for a sick child. Attributes expected to influence prescribing strategy in respiratory tract infections were identified through literature reviews, followed by surveys to identify the most important attributes; appropriate levels were identified from literature and clinical guidelines. Attributes were consistent between the two surveys where possible, whilst allowing for differences in vocabulary and medical knowledge between the public and GPs. The surveys also gathered data on respondent demographics, antibiotic attitudes and experience, and personality traits. On-line panels were used to recruit samples of 800 adults, 800 parents, and 200 GPs.

Results and Conclusions: Our analysis of the adult survey indicates that the symptoms being experienced by the patient, and the duration of illness, have a strong effect on attitudes to delayed prescribing. The risks due to delaying antibiotics, or of adverse effects, have a smaller though statistically significant effect. There is a high level of heterogeneity in respondents’ choices. Further analysis will aim to understand this heterogeneity, and incorporate the results from the parent and GP studies. These findings will be presented during this organized session, with implications for targeting future interventions discussed.

10:30 AM –12:00 PM TUESDAY [Supply Of Health Services]

Universität Basel | Kollegienhaus – Hörsaal 119

International Comparisons of Drug Reimbursement and Pricing Approaches

SESSION CHAIR: **Dominic Hodgkin**, Brandeis University

Oncology Drug Reimbursement Recommendations in Canada: A Review of Submissions to the Pan-Canadian Oncology Drug Review

PRESENTER: **Adam JN Raymakers**

AUTHORS: Stuart Peacock, Dean Regier

Background: In Canada, drugs reimbursement is done on a provincial basis based in part on recommendations from the Canadian Agency for Drugs and Technologies in Health (CADTH). For oncology drugs, the CADTH pan-Canadian Oncology Drug Review (pCODR) is charged with evaluating submissions from manufacturers and providing an assessment to its Expert Review Committee (pERC), which makes recommendations to provinces. pCDOR assesses new oncology drugs in terms of clinical benefit, economic evidence, and relevance to patients.

Objective: To examine the degree to which the evidence from economic evaluation influences the final recommendation decisions from pCODR.

Data and Methods: We reviewed reports published online by pCODR from December 2015 to June 2018 available publicly (https://www.cadth.ca/pcodr). We restricted our search to submissions that were listed as 'Notification to Implement Issued'; this status restriction ensured that a report was available from the Clinical Guidance Panel (CGP), the Economics Guidance Panel (EGP), and the final recommendation from the pERC for each specific submission. The search was restricted to these years due to a format change in how the report from the EGP was produced.

A data abstraction form was constructed *a priori* to collect information from the EGP report on the characteristics of each submission. The abstraction included data sources, submitted and re-calculated incremental costs and effects (quality-adjusted life-years (QALYs), model structure, drug costs, and the source of HRQoL data used in the analysis. We also reviewed the final report from the pERC, which provided the recommendation and the associated justification.

Results: We found 44 submissions that met our inclusion criteria. More than half (64%) of incremental cost-effectiveness ratios (ICERs) from the manufacturers' submission were in excess of $100,000/QALY and seven (16%) were over $200,000/QALY (16%). For each submission, the EGP calculates a best-case (lower bound) and worst-case (upper bound) ICER. In only 11 (25%) studies did the submitted ICER from the manufacturer fall within the range calculated by the EGP. Drug prices were drivers of the ICERs. Additionally, small incremental gains in QALYs between the new drug and the standard of care were very influential. In most studies, the incremental gain in QALYs from the new technology was small (the median incremental QALY gain was 0.86 (IQR: 0.6 to 1.39). Of the 44 submissions made to pCODR, 32 were recommended for reimbursement (73%). Notably, of all submissions, only 1 (2%) was considered to be cost-effective. This appears to indicate that while pCODR may consider cost-effectiveness as part of reimbursement recommendations, there are clearly attributes of new drugs beyond cost-effectiveness that are weighted more importantly.

Conclusions: The basis on which pCODR makes recommendations on the reimbursement for oncology drugs extends beyond the results of economic evaluation and cost-effectiveness. Net clinical benefit from the new drug relative to the comparator appears to be the main driver of the pCODR recommendations. Given the trend in the prices of oncology drugs, and the associated small incremental benefits accruing from many products, pCODR may need to place more importance on the results of economic evaluation in its review process.

Development of Prices in the Early Benefit Assessment of Orphan Drugs in Germany

PRESENTER: **Judith Gibbert**, Institute for Quality and Efficiancy in Health Care

AUTHORS: Christiane Balg, Sarah Mostardt, Min Ripoll, Astrid Seidl

Background: Orphan Drugs are pharmaceuticals used for the treatment of rare diseases. In order to advance the development of orphan drugs, the European Union provides financial and regulatory incentives. In Germany, for example, statutory provision assumes an additional benefit for the orphan drug authorized. The Federal Joint Committee (G-BA) therefore assesses orphan drugs (solely) to determine the extent of additional benefit. Assessment of data and methods regarding patient population and therapy costs is carried out the by the Institute for Quality and Efficiency in Health Care (IQWiG). Both assessments provide a decision-making basis for the G-BA and influence price negotiations, which will typically commence 1 year after the initial proceedings.

Aim: Analysis of price development of orphan drugs for oncological and non-oncological indications at market entry and after concluded price negotiations (in Germany). Criteria such as the extent of additional benefit, number of patients in the target population and annual therapy costs in the early benefit assessment are considered in further analyses.

Methods: Assessments of orphan drugs between 2011 and 2017, with subsequent results of price negotiations in 2018, were included in the analysis. Exclusion criteria were a premature discontinuation of the assessment as well as a new evaluation of the drug in a further benefit-assessment context. Basis of the analysis was the price information provided in the German price database of pharmaceuticals *Lauer-Taxe* (manufacturer's selling price and rebates at the time of market entry and after price negotiations).

Further separate analyses, based on Federal Joint Committee's appraisals, regarding indications (oncological diseases versus other diseases), extent of additional benefit, number of patients in the target population and total annual treatment costs from the statutory health insurer's perspective, were carried out.

Results: The analysis included 48 orphan drug assessments in Germany with completed price negotiations (42% oncological drugs, 58% other). Prices of orphan drugs showed a mean price difference of 18% before and after price negotiations. A mean reduction in the price for oncological drugs was 19%, slightly higher than for drugs with other indications (17%).

The smallest price difference was identified for non-oncological orphan drugs with a substantial additional benefit (-7%), as well as non-oncological orphan drugs with a very small target population of ≤ 100 patients (-5%). An analysis of prices for oncological drugs with a comparably large target population (10 000 - 50 000 patients) at market entry and after negotiations showed the highest before / after difference.

Discussion: Our analysis showed significant differences in the price development of orphan drugs between market entry and after price negotiations in Germany. A differentiated view at the total annual treatment costs showed the largest variation in the minimum and maximum price difference for oncological drugs. To determine the influence of other determinants, further analyses are needed.

How Does External Reference Pricing Compare to Other Cost Metrics Available in the United States for Medicare Part B Drugs?

PRESENTER: **Dr. Joseph Frank Levy**, Johns Hopkins Bloomberg School of Public Health
AUTHOR: Benedic N Ippolito

Background: In 2018 the United States Department of Health and Human Services announced plans to substantially alter reimbursement for physician-administered drugs covered by the Medicare Part B program. The proposal utilizes external reference pricing (ERP), tying the price Medicare will pay to a weighted average of prices in 16 other wealthy nations. This is in contrast to the current policy of reimbursing at the average rate hospitals pay to acquire these drugs plus a fixed percentage mark-up. The proposal leverages various cost containment strategies of ex-US systems but may have substantial impact on prices paid in ex-US markets and does not necessarily align price and value in the US setting.

Our goal was to compare this approach with other price metrics currently available in the United States that, if adopted, may lessen concern about pressure on ex-US prices while allowing innovation to be rewarded for adding value in the US market.

Methods: We identified the unit cost currently paid for the top 27 Medicare Part B drugs in Q3 of 2018, the average sales price (ASP). We then collected aggregate ERP data for the average unit price currently paid around the world. Finally, we identified alternative US price metrics, the Veterans Affairs Federal Supply Schedule (VA) which is the price currently negotiated by a single large US insurer believed to receive among the lowest price in the US market and the Value-Based Price Benchmark (VBP) based on a model from the Institute for Clinical and Economic Review (ICER) at a US willingness to pay threshold of $150,000 per additional quality adjusted life year. We compare the metrics and speculate about the advantages and disadvantages of each approach.

Results: Unit cost for ASP, ERP and VA were found for all 27 drugs and of these, eight had a reported VBP in an ICER report. On average the ERP as a percentage of the ASP is 51% ranging from 12% to 102%. Comparing the VA price to ASP we find the average percentage is 66% (25% to 79%). Finally, the percentage of the VBP for the eight drugs was 60% (42% to 76%). The percentage of the ERP price compared to VBP ranges from 27% to 158%.

Discussion: While adopting the ERP would have the immediate effect of substantially reducing Medicare spending on physician-administered drugs, it would likely impact the price paid around the world, possibly mitigating much of the potential US savings. Further, based on the comparison with the VBP it appears that the ERP may not well align with value in the context of the US system. Utilizing the VA price, based on negotiations in the US system, would reduce spending less than with the ERP, but would similarly exert pressure on other payers.

Conclusion: Costs and consequence of radically changing the pricing structure of a large program such as Medicare Part B must be carefully considered. It is instructive to compare the current prices from proposals and alternatives to inform logical policy reform and implementation.

Reducing Reimbursement Drug Price Risk to Enhance R&D Incentives without Raising Drug Prices/Expenditures: Questionnaire Survey and Simulation Results

PRESENTER: **Dr. Naohiko Wakutsu**
AUTHOR: Prof. Hiroshi Nakamura

Almost all prescription drugs are reimbursed by the national health insurance system in Japan and the prices are determined and controlled by the Japanese government. Hence, with higher reimbursement drug prices, the government provides pharmaceutical firms with stronger R&D incentives, but the higher prices also increase the financial burden on the national health insurance system and patients. Considering the existence of unmet medical needs and the severe financial situation that the government faces, it is important to analyze how to achieve higher R&D incentives without raising drug prices/ expenditures. To seek such a policy measure, this paper focuses on reimbursement drug price risk that pharmaceutical firms face.

For this purpose, we first conduct an original questionnaire survey to collect data on attitudes toward risk of research-oriented pharmaceutical firms in Japan. Second, with the collected data, we do numerical simulations to quantify the effect of reducing reimbursement drug price risk on those firms' R&D incentives. Lastly, we check whether our results are robust to some assumptions.

The following results emerged. First, a questionnaire survey result shows that many research-oriented pharmaceutical firms in Japan are risk averse. The implied level of relative risk aversion from a power utility function is on average about 10, which is somewhat greater than the estimates often reported for firms in agricultural and financial economics.

Second, numerical simulation results show that lowering price risk is effective to enhance R&D incentives. We find that for a pharmaceutical firm, the initial entry price of 100 in the presence of a 10% price risk is equivalent to the initial entry price of 95.7 for sure. Hence, approximately, the simulated impact is equivalent to winning a 5% premium on initial entry price, which is relatively big.

Third, these results are robust to a change in utility form and sales and price patterns while increased price risk increases the simulated impact.

An important policy implication is that it is possible to avoid a trade-off between lower drug expenditure and stronger R&D incentives of pharmaceutical firms, i.e. to enhance R&D incentives without raising drug expenditures by creating appropriate guidelines, enhancing information disclosure and/or extending public-private dialogue.

10:30 AM –12:00 PM TUESDAY [Economic Evaluation Of Health And Care Interventions]

Universität Basel | Kollegienhaus – Hörsaal 120

Organized Session: China Health Policy and Management Society (CHPAMS) Session: A Behavioral Economic Approach to Design Health Interventions and Evaluate Health Care in the U.S. and China.

SESSION CHAIR: **Qi Zhang**, Old Dominion University

Leveraging Health Information Technology to Improve the Safety of Opioid Prescribing

PRESENTER: **Dr. Yuhua Bao**, Weill Cornell Medical College

AUTHOR: Jessica Ancker

The opioid epidemic has reached crisis proportions in the United States, with the rate of overdose deaths currently exceeding that of traffic deaths. Physicians themselves have inadvertently contributed to the problem by prescribing more than the minimum dose required to control pain. It is now well-established that higher doses and durations of initial opioid prescriptions are associated with a substantially increased risk of misuse and abuse in the long term.

Quality improvement initiatives and targeted continuing education often produce only modest changes in physician prescribing behavior. By contrast, redesigning the e-prescribing system to “nudge” physicians toward the desired prescribing level has been shown to be effective while preserving physician autonomy. In the current project, we applied e-prescribing redesigns to facilitate opioid prescribing that was consistent with the US Centers for Disease Control’s Prevention Guideline for opioid-naïve patients. In the redesign, typing the name of an opioid medication into an order triggered an auto-complete with the recommended duration and quantity (generally, a 3-day supply) for new opioid prescriptions. Physicians could simply type over the fields to reject or override the suggestion.

The Weill Cornell Physician Organization is the multi-specialty faculty practice of the Weill Cornell Medical College in New York City, representing both private practices and hospital-based clinics that accept Medicaid. The Institute for Family Health is a community health center that serves patients with and without insurance throughout New York City. Both institutions use the Epic EHR. Prescriptions for short-acting opioids written by providers in the Weill Cornell internal medicine department were retrieved from the EHR database from 2016 through 2017. A first prescription of an opioid was defined as a prescription for a patient who had no recorded opioid prescriptions in the previous 12 months. The EHR redesign intervention was implemented at Weill Cornell in March 2018 and at the Institute for Family Health in June 2018. Effects of the intervention will be evaluated with an interrupted time series study.

The proportion of new opioid prescriptions complying with the recommended 3-day-or-less supply standard rose modestly throughout 2016 and 2017, coinciding with initiatives that included hospital-based education about opioid risks, New York State Department of Health letters to high-volume opioid prescribers, and hospital quality improvement meetings with local high-volume prescribers. Nevertheless, as of late 2017, this constituted less than 20% of new opioid prescriptions that met the CDC recommendations. More positively, during this period the numbers of new opioid prescriptions declined, but only slightly. The demonstrated difficulty of changing prescribing behavior through persuasion supports the need for our human factors/behavioral economics intervention to reduce risky prescribing.

The post-intervention data collection for this study will be completed in December 2018 (9 months of post-intervention data for Weill Cornell and 6 months for Institute for Family Health). The interrupted time series analysis will be completed by mid-2019.

Nudging Participants in the Women, Infants, and Children (WIC) Program to Redeem More Fruits and Vegetables Benefits

PRESENTER: **Dr. Qi Zhang**, Old Dominion University

The Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) is a national food assistance program in the U.S. targeting low-income pregnant and postpartum women, infants, and children younger than 5 years. The WIC program allows $11/month to a woman and $8/month to a child for the purchase of any fruits and vegetables (FV) in grocery stores. Although the amount of this benefit is

modest, its under-redemption is prevalent in the state of Virginia. Only one out of six participants fully redeemed the benefits, and more than one-third of participants redeemed less than half of the FV benefits.

We conducted focus group interviews to identify the barriers and facilitators to redeeming FV benefits. One barrier was trying to remember the expiration date of the benefits. The other barrier was the mental challenge of identifying an optimal basket of FV with varying prices and units given the budget restriction. For example, it is difficult to find a preferred package of FV that generates the total sum of exactly $8 or $11. We implemented two field experiments among Virginia WIC participants to overcome these barriers.

The first study is entitled “Just-in-Time Intervention (JITI),” in which texts were sent to WIC participants to nudge them to redeem more FV benefits. Three BE strategies were used: time reminder, positive nudge, and negative nudge. We developed eight combinations of texting modules based on the three BE strategies and randomly assigned 160 WIC under-redeeming participants to these text groups. We tested the text messages for 12 weeks and compared the redemption rates before and after the intervention and between the eight groups. Only the time-reminder strategies achieved a 15.5% increase in redemption rates ($P < 0.05$).

The second study is entitled “WIC App Project,” the first randomized controlled trial in the nation to examine the effectiveness of a WIC app. This app was revised based on BE principles and included a new adaptive calculator for FV benefits. The goal of the calculator was to reduce the cognitive load for WIC participants. 800 participants from 16 WIC districts in Virginia were randomized at the site level into an app group and a non-app group. Although the app group’s redemption rate increased from 69% to 73%, there was no statistical significance ($P > 0.05$). Further analyses found that the app only prompted participants who were more likely to redeem FV benefits, but had little effect on the under-redemption participants it was originally designed to help. Therefore, an adverse selection effect was identified in the experiment.

In summary, these studies are among the first applications of behavioral economics nudges in the WIC program, which can help WIC administrators design and implement more effective programs to promote health among low-income women, infants, and children in the U.S.

Who Wants Long-Term Care Insurance and How: A Discrete Choice Experiment in China

PRESENTER: **Judy Xu**, Southwestern University of Finance and Economics
AUTHOR: Chengxiang Tang

As of 2017, the number of senior people aged 65 or above reached 158 million in China, accounting for 11 percent of its population and 2 percent of the world’s population. Starting in June 2016, 15 cities/regions in China were selected for trial implementations of long-term care (LTC) insurance, which is particularly useful for senior citizens. Currently, the LTC insurance coverage rate is very low. However, very few theoretical and empirical studies are available in China to guide policy-makers to appropriately design LTC insurance and improve enrollment. This paper describes our study that aimed to (1) identify the relevant behavioral barriers and factors influencing LTC insurance enrollment, (2) measure and quantify the preferences of the targeted population using a discrete choice experiment (DCE), and (3) design nudging interventions based on behavioral economic principles.

A qualitative research study was conducted to guide appropriate design of DCE and nudging interventions. Specifically, we conducted a systematic literature review on LTC, from which we were able to synthesize a list of barriers and factors that influence LTC insurance enrollment. Based on this list, we conducted a focus group discussion (FGD) with 12 participants ages 22-51 to evaluate the appropriateness of these attributes and the practical issues involved in improving LTC insurance enrollment. Their socioeconomic status information and past experience with LTC insurance were also collected. Two more focus group discussions and interviews will be conducted with more participants, including those with LTC insurance and managers from LTC insurance agencies. Field data collection and DCE analysis will be conducted to further identify behavioral barriers and analyze preferences surrounding LTC insurance enrollment.

From the existing literature on LTC and LTC insurance, we identified 18 attributes and levels influencing LTC insurance enrollment, including types of enrollment, risk attitude, family structure, income and homeownership, reimbursement rate, and consumer knowledge etc. Based on the focus group discussion, most of the18 attributes are relevant, but some of the levels require adjustment. The focus group discussion results suggested that bounded rationality and bounded selfishness are at work. Both salient nudging and incentive nudging could be effective in improving LTC insurance enrollment. The results also show that the preference for LTC insurance varied across socioeconomic backgrounds. The preference also varied when participants were asked to considered it from individual or societal perspectives.

We need to consider behavioral barriers as well as other factors that influence LTC insurance enrollment when designing LTC insurance programs and policies. Although nudging interventions may be effective at improving LTC insurance enrollment, we need to further evaluate their value from both individual and societal perspectives. This study will be helpful for policy makers as they provide and disseminate strategies for designing LTCI and improving LTCI enrollment.

Climate Change and Quality of Healthcare: Evidence from Extreme Heat

PRESENTER: **Mr. Yafei Si**, Xi'an Jiaotong University
AUTHORS: Xi Chen, Zhongliang Zhou

There is a growing consensus that extreme temperatures, one of the most notable consequences of climate change, can reduce worker productivity in physically demanding occupations and even inhibit cognitive skills. In this paper, we provide the first evidence that heat waves may affect access to and quality of healthcare provided by physicians, a well-recognized high-skilled sector of the community. In

particular, we used unique data on the quality of healthcare provided at Community Health Centers (CHCs) in the city of Xi'an, China, to investigate the effect of heat waves on physicians.

To measure quality of healthcare, we used standardized patients recruited from the local community and trained to present consistent cases of illness to providers. Adherence to clinical checklists, thoroughness of physical examinations, and accuracy of diagnoses were employed to assess quality of primary care through 492 interactions between physicians and standardized patients (SPs) in 63 CHCs in August of 2017 and again in July through August of 2018. Exploiting random fluctuations in temperature and other weather patterns (air pollution, wind speed, humidity, etc.) according to the exact time and geographic locations of the interviews, we identified the effect of transitory exposures to heat waves on the quality of health service delivery in models with day and CHCs-specific fixed effects.

We found that extremely hot days were associated with improved quality of care. Specifically, one degree Fahrenheit of temperature increase improved the adherence to a clinical checklist of interactions by 1.51 units, an effect statistically significant at the 1-percent level, representing an increase of 36.92% over the mean number of checklist items completed by physicians (4.09 items). This improvement could be explained by there being fewer patients waiting for services during hot days. However, the improved adherence to clinical checklists was not accompanied by a greater chance of physicians offering correct diagnoses or appropriate treatments. Rather, results suggested that on average 7.91 CNY more costly examinations were ordered by physicians.

One advantage of using standardized patients is that it can eliminate confounding factors that may exist in real patients, which facilitates estimating the effect of the variables under consideration on providers' behavior. Higher temperatures improved quality of care via inducing fewer patients to seek necessary health services, which increased physician adherence to clinical checklists when interacting with patients. To our knowledge, this is the first study demonstrating the potential negative impact of climate change on the healthcare sector.

10:30 AM –12:00 PM TUESDAY [Demand & Utilization Of Health Services]

Universität Basel | Kollegienhaus – Seminarraum 208

Selection and Insurance

SESSION CHAIR: **Marisa Domino**, University of North Carolina-Chapel Hill

Moral Hazard and Selection for Voluntary Deductibles

PRESENTER: **Dr. Laura Viluma**, University of Groningen

AUTHORS: Rob Alessie, Dr. Viola Angelini, Jochen Mierau

It is well-known that comprehensive health insurance may lead to moral hazard – change in health behavior in response to lower out-of-pocket healthcare costs. Various cost sharing options are used to counteract moral hazard, such as co-payments and deductibles. In the Netherlands, a voluntary deductible is offered to the consumer on top of a mandatory deductible in return for a premium rebate (Winssen et al., 2015). However, the current empirical evidence for the existence of moral hazard effects for a voluntary deductible in a managed competition health care system setting, such as the Netherlands, is mixed (Crus *et al.*, 2018; Schellhorn, 2001; Gardiol *et al*., 2005; Gerfin and Schellhorn, 2006). This paper investigates weather the voluntary deductible in the Netherlands reduces moral hazard in healthcare utilization.

The main econometric difficulty in estimating moral hazard effect lies in establishing causality. When the deductible is voluntary, the estimated relationship between health insurance coverage and healthcare utilization is influenced by endogenous selection into insurance contracts with a voluntary deductible (Cameron et al. 1988; Jones et al. 2006; Bolhaar et al., 2012; Kiil and Arendt, 2016). We solve this issue by the use of bivariate parametric models that jointly model the selection decision and the healthcare utilization outcome. Even though the bivariate models are identified due to functional form, we supplement the identification by an instrumental variable. In particular, we use the availability of supplementary insurance cover as an instrumental variable for the endogenous deductible choice.

In addition, the complexity of the analysis is increased by the possibility of selection on moral hazard. Iindividuals might buy insurance because they expect an increase in their healthcare consumption due to better coverage (Einav et al., 2013). In econometrics literature this is more generally known as selection on returns or essential heterogeneity (Heckman and Vytlacil, 2001). Ignoring selection on returns might lead to overestimating the effect of deductibles. Hence, in a sensitivity analysis, we allow for heterogeneity in the moral hazard effect and estimate marginal treatment effects of the deductible to test for selection on moral hazard.

For our purpose, we use LISS panel data from years 2009 – 2016. This panel is based on a true probability sample of Dutch households drawn from the population register. Our sample consists of 14,089 observations, comprising of 2939 individuals over 7 waves. This dataset allows us to control for a rich set of covariates, including risk aversion and subjective and objective health measures. We consider four healthcare utilization measures in our analysis – visits to a specialist, visits to the general practitioner, visits to mental care providers and days spent in hospital. We separately model the probability of having any visit or hospital day (extensive margin) and the actual number of visits/ days (intensive margin).

We find that the voluntary deductible reduces moral hazard in the Netherlands, especially in the decision to have any doctor's visits as compared to the number of visits. Moreover, our results suggest that selection on moral hazard is not a concern in this setting.

Risk Selection in the Australian Private Health Insurance Market

PRESENTER: **David Rowell**, The University of Queensland Centre for the Business and Economics of Health
AUTHORS: Jonas Fooken, Alexander Buckmaster

The dynamics of insurance markets can be affected by risk selection, which implies that individuals with a higher [lower] risk of experiencing an adverse event and using insurance purchase insurance with a higher [lower] probability. The risk selection can be adverse and advantageous. Adverse selection leads the pool of insured individuals to be of increasingly high risk, as those who currently have the lowest, among those in the pool of insured individuals, decide to leave the insurance. Adverse selection has long been described as a theoretical problem of insurance markets. However, empirically, also advantageous selection has been observed. Advantageous selection leads lower-risk individuals to purchase insurance with a higher likelihood, possibly because lower risk and other factors that make decision makers seek insurance (e.g., income) and are positively related to health are correlated. While adverse selection can make insurance markets instable and lead to market breakdown, advantageous selection stabilizes insurance markets. However, both adverse and advantageous selection may be undesirable because they can lead to welfare losses, because they cause some individuals to take or not take insurance for whom this decision is suboptimal. In our paper we study the welfare effects of adverse and advantageous selection in the market for private health insurance in Australia, which is described by predominantly advantageous selection. This advantageous selection may be both voluntary and government-induced. That is, advantageous risk selection occurs in a highly regulated market for private health insurance, which is present additional to a general social insurance scheme covering the whole population. However, complementary private health insurance is common, with more than half of Australians holding private insurance in addition to their social insurance coverage. This high level of private insurance is partly due to a number of strong mandate policies that set tax penalties for individuals with a medium or high income. In our paper, to determine the welfare effects of risk selection in Australia, we estimate the demand and supply curves for private health insurance using longitudinal survey data that includes information about insurance coverage and risk profiles of households. We use the regulated annual increases in insurance premiums, as well as taxes that are linked to health insurance status, to identify price changes. Additional to these government policies, we also draw on data of policies scope and prices of health insurance plans offered in the Australian market.

The Health Gap for the Self-Employed in Europe: Selection, Depreciation, Under-Consumption

PRESENTER: **Nicolas Sirven**, LIRAES (EA 4470)
AUTHORS: Alain Paraponaris, Clementine Garouste

Context. Although some studies based on population health surveys regularly report a positive effect of being self-employed on health outcomes in cross-sectional settings, recent work by Rietveld et al. (2015) suggested that this healthy worker effect is mainly due to a selection process of healthier individuals into self-employment (SE). In addition, they “present tentative evidence that, if anything, engaging in self-employment is bad for one’s health.”

Research question. The assumption that self-employment could be more harmful for health than employee work needs to be addressed in a dynamic perspective, taking into account the potential selection mechanism accounting for better health at start. The patterns of healthcare consumption of the SE should also be analysed in a dynamic perspective. Should SE lead to higher health depreciation, we should investigate why this sub-population systematically report lower volumes of care than (former) employee workers.

Data. Using panel data from the Survey of Health, Ageing and Retirement in Europe (SHARE) between 2004 and 2015, we expanded the scope of analysis over a life-course perspective that goes beyond the usual working-life period, for Europeans aged from 50 years onwards. For the working population, SE status is defined as the share of individuals who currently work for themselves, while fully retired individuals are asked whether they previously worked as self-employed in their life.

Method. We used dynamic panel models for health and health care use to account for potential endogeneity issues, where instruments are given by change in SE status in previous periods. In alternative models, we also used the discontinuity in the legal retirement age induced by recent reforms in European countries to check for a ‘caching-up’ process in healthcare after retirement. We also used the heterogeneity of SE legal statuses in Europe to estimate endogenous switching models with the aim to compare what would be the levels of health care consumption if self-employed behaved like employees. In ancillary analyses, the first two waves of SHARE provided vignettes to test for response styles (or differential item functioning, DIF) according to occupational status.

Results. Our results are in line with Rietveld et al. (2015) seminal work. We accounted for a selection effect for SE, with higher levels of physical health at younger ages, and a higher health depreciation rate over time that led to worse health status for self-employed. We did not find a systematic bias in response style and we used objective measures of health, meaning that this health gap is not artificial. Counterfactual simulations indicate that self-employed would consume much more health care if they were employees. We also found evidence that self-employed have a more disrupted health care pathway than employee workers. These results support public policy interventions aiming at improving access and continuity in health care in favor of self-employed.

Keywords. Self-employment, health, life-course perspective

Who Depends on Dependent Coverage? Insurance Coverage and Prescription Drug Utilization for Young Adults with Chronic Medical Conditions.

PRESENTER: **Giacomo Meille**, University of Michigan

Approximately one fifth of adults in their early 20s has a chronic medical condition. Health insurance is particularly valuable for this segment of the population because of recurrent expenditures, such as prescription drug purchases. Many young adults with chronic conditions obtain health insurance through dependent coverage. They are eligible for dependent insurance coverage until their 26th birthday.

I use a regression discontinuity design to estimate the fraction of young adults that loses health insurance at the eligibility threshold. Roughly 3 percent of the population with chronic conditions loses insurance at age 26. This substantially affects their utilization of prescription drugs. In an administrative dataset of Kentucky pharmaceutical sales, the population with ADHD substantially reduces their expenditures on central nervous system stimulants. Approximately to 80% of people who would have purchased a prescription with insurance coverage do not purchase a prescription when they become uninsured. Expensive branded medications are most affected. Most people who lose coverage go without a prescription, but some switch from branded prescriptions to generics.

10:30 AM –12:00 PM TUESDAY [Health Care Financing & Expenditures]

Universität Basel | Kollegienhaus – Seminarraum 209

Improved Efficiency and Increases in Public Health Expenditure for UHC: Impact on Health Services, Health Outcomes and Economic Performance

SESSION CHAIR: **Joseph Dieleman**, University of Washington

The Impact of Affordable Care Act (ACA) Federal Funding Increases on Quality of Care and Service Use for Community Health Center Patients

PRESENTER: **Megan Beth Cole**, Boston University School of Public Health

Background: Community Health Centers (CHCs) are safety-net providers that provide access to comprehensive primary care services to 27 million low-income patients annually, the majority of whom are uninsured or publicly insured and from racial/ethnicity minority groups. To bolster the ability of CHCs to provide care to these patients, the Affordable Care Act (ACA) allocated $11 billion from 2011-2015 to expand CHC capacity, with an additional $3.6 billion extension for 2016-2017. However, there is little evidence about whether this funding improved quality outcomes or service use for CHC patients. Our objective was to assess the impact of funding increases on quality of care and service use for CHC patients.

Study sample: A 100% sample of all US health centers (n=1047 centers/year after exclusions), representing 20.1 million patients/year.

Methods: Using 2009-2017 CHC-level data from the Uniform Data System (UDS), we used a difference-in-differences (DID) framework combined with inverse probability of treatment weights (IPTWs) to estimate the effect of post-ACA increased federal funding per patient (below/above-median) on seven process measures (e.g. pap testing, colorectal cancer screening, pharmacologic treatment of asthma), three intermediate outcome measures (hypertension control, diabetes control, and birthweight), and 23 types of services (including preventive care, chronic disease management, and mental health and substance use services). For all outcomes, DIDs with IPTWs were calculated using generalized estimating equations with outcome-dependent specifications. We included a treatment indicator based on increased federal funding-levels/patient, a post-period indicator (2009-10 vs. 2011-17), an interaction between treatment status and post-period (the DID), a vector of time-variant confounders (percent patients uninsured, percent homeless, total patients/center, urban vs. rural location, Medicaid expansion status of state, EHR use, medical home recognition, non-federal grant funding/patient), and state and year fixed effects. Standard errors were clustered at the center-level.

Results: At baseline, CHCs receiving high levels of post-ACA federal funding, on average, had fewer patients, were more rural, had more uninsured patients, were located in states that did not expand Medicaid eligibility, and had worse quality outcomes. Preliminary results suggest that compared to similar CHCs receiving lower levels of federal funding following the ACA, those receiving higher levels of federal funding experienced relative improvements in 3 of 7 process measures, including pap testing (DID=3.1 percentage points, 95% CI 2.0-4.2); relative improvements hypertension control (DID=1.9 percentage points, 95% CI 1.1-2.7), especially for black patients (DID=2.6 percentage points, 95% CI 1.0-4.1); and relative increases in 16 of 23 service use measures, especially for mammograms, alcohol-related disorders, other substance use disorders, and anxiety ($p<0.05$ for all).

Conclusions: Increased federal funding to CHCs was associated with improved quality of care and service use. Sustaining CHC funding in future years may be important for improving outcomes and access to care for low-income patients, many of whom would otherwise be without access. More so, policymakers should be attentive to the fact that other policies resulting in reduced total revenue to CHCs, including reduced Medicaid eligibility and Medicaid block granting, may counteract these important gains in quality and capacity associated with the ACA funding increases.

Does Higher Public Expenditure on Health Leads to Faster Achievement of Health-Related Sustainable Development Goals? Evidence from State-Level Panel Data in India for the Past Two Decades

PRESENTER: **Sumit Mazumdar**, University of York, Centre for Health Economics

AUTHORS: Jessica Ochalek, James Lomas, Rodrigo Moreno-Serra, Marc Suhrcke, Prof. Karl Claxton

Public spending on strengthening health systems and implementing key health interventions are considered critical to maintaining steady progress towards health system goals, including global commitments such as the health-related Sustainable Development Goals (SDGs). For large and diverse federal countries such as India, national achievement is highly contingent on how individual states perform in committing budgets to health and translating them into outcomes associated with the health SDGs. Investigating these links between spending decisions and resulting outcomes is not trivial, however. Cross-national analysis of public health spending and health outcomes cannot adequately account for sub-national variations in levels and trends of both health spending and other associated inputs, as well as in health outcomes. On the other hand, existing sub-national level analyses of public spending and health outcomes have important methodological limitations of their own. Apart from being largely based on cross-sectional, individual-level data, most of these studies do not adequately account for crucial – and potentially endogenous – health system factors that are likely to influence health outcomes. This is also the case in India, where available state-level analyses offer mixed evidence about the impact of public expenditure on health across states (e.g. on early childhood mortality).

In this paper, we estimate the causal impacts of sub-national government health spending on health outcomes, providing evidence on whether and how higher government expenditure on health influences progress towards three health-related SDGs: reductions in child mortality, tuberculosis incidence and improved coverage of skilled birth attendance. We use a novel state-level panel data for the 20 major Indian states constructed for the period 1995-2015, a period characterised by a number of health system reforms across Indian states. We adopt a panel instrumental variable methodology that accounts for the potential endogeneity of health spending and outcomes, and simultaneity biases. Two variables are used as instruments, which reflect infrastructural and institutional aspects arguably correlated with public expenditure but not with outcomes directly: density of paved roads in the states and whether the political party in power in the state is the same as that in the national government. We undertake robustness checks to assess the validity and relevance of both instruments.

Our preliminary results indicate that higher state-level public expenditures on health lead to modest reductions in child mortality and increases in skilled birth assistance coverage, but we find no effects on TB incidence. Moreover, we find that for both the mortality and delivery coverage outcomes, and among states with similar levels of per capita public expenditure on health, spending impacts are stronger for states with better primary health care infrastructure (e.g. recommended standards in primary health centres) and higher maternal education levels. Our results provide hard evidence about the importance of the complementarity of public spending in the health sector with wider health system strengthening and social development, to facilitate better progress towards SDGs.

Economic Impacts of Investing in Universal Health Coverage: Analysis of Ten Low- and Lower-Middle Income Countries

PRESENTER: **Jeremy A. Lauer**, World Health Organization
AUTHORS: Seoni Han, Jean-Louis Arcand

To support the technical basis of WHO's first-ever investment case, "A Healthier Humanity: The WHO Investment Case for 2019–2023", published to accompany WHO's 13th General Programme of Work, we investigated the impacts of increasing investments towards Universal Health Coverage (UHC) on economic outputs in 10 selected countries for the period 2019–2023. We used WHO's Economic Projections of Illness and Cost of Treatment (EPIC) model, which is based on a human-capital augmented Solow model and incorporates a recursive production function and exogeneous equations of motion for the two production factors – stocks of physical capital and effective labour. The EPIC model thus relates market-valued economic outputs to the direct and indirect impacts of the burden of disease averted and computes outputs in terms of GDP and GDP p.c. under controlled assumptions for the scenarios of "business as usual" and "ambitious realization of UHC" (Stenberg et al., Financing transformative health systems, Lancet, 2017).

This paper presents the development-accounting mechanisms of improved health status and economic performance for these countries. We focus on two main channels through which health interventions affects a country's economic outcomes: the cost effects on physical capital accumulation, and the demographic and health impacts on effective labour supply. Secondly, we allow for heterogeneity at a country level using country-specific economic and disease assumptions. By using concrete measurements of mortality and morbidity, we estimate the economic impacts for countries which have experienced different stages of demographic and epidemiological transitions. Moreover, we take into consideration the fact that the improved health status of children impacts on the productivity of their caregivers of working age. Synthesizing changes in the health outcomes and the consequences in physical capital and the labour force, we compare gain/loss of the economic outcomes for the two scenarios.

We show results for 10 low- and lower-middle income countries (India, China, Nigeria, Pakistan, Indonesia, the Democratic Republic of Congo, Bangladesh, Ethiopia, Angola, and Brazil), which would benefit most from UHC as accounting for 67% of the total averted deaths worldwide for the period 2019-2023. The selected diseases are Childhood diseases (Malaria, Diarrhea, Pneumonia), Noncommunicable diseases, Tuberculosis, and HIV/AIDS, as well as other programmatic investments necessary for UHC that do not generate economic returns on our time horizon. Results suggest that investing in UHC would generate average GDP gains of 0.66% and average GDP p.c. gains of 0.25% over the 5-year period. These results differ from those presented for malaria alone in that the gains in GDP are larger but the gains in GDP p.c. are smaller.

In general, the gains of reaching UHC in mega-countries that are well along in the demographic and epidemiological transitions (India, China, Indonesia, Brazil) are smaller (<1% of GDP) than those in similar countries with less advanced transitions (Nigeria, Pakistan, Bangladesh; 2–4% of GDP). Sub-Saharan African countries (D.R. Congo, Angola, Ethiopia) show wide variability in gains (1–10% of GDP). Overall, our results are consistent with those presented in the WHO investment case.

10:30 AM –12:00 PM TUESDAY [Health Care Financing & Expenditures]

Universität Basel | Kollegienhaus – Seminarraum 212

Issues on Socioeconomic Disparities

SESSION CHAIR: **Ayako Honda**, Sophia University

Does the Hospital Readmission Reduction Program Reduces the Supply of Hospital Care in Minority and Low-Income Communities?

PRESENTER: **Darrell Gaskin**, Johns Hopkins Bloomberg School of Public Health

AUTHORS: Hossein Zare, Benjo Delarmente

Objective

The primary goal of the Center for Medicare and Medicaid Services Hospital Readmission Reduction Program (HRRP) is to reduce costly preventable hospital readmissions. Numerous studies have been conducted to determine how this program has impacted hospitals and in particular hospitals serving socially disadvantage patients. They find that safety net hospitals and hospital serving minorities are more likely to be penalized. However, little is known about how this program has impacted patients' access to care and their healthcare outcomes. This study determines if the HRRP reduced hospital discharges for penalized conditions in minority and low-income communities.

Data Sources

Our primary data sources are hospital discharge data for 2006 and 2013 from Arizona, California, Colorado, Florida, New Jersey, New York, North Carolina and Wisconsin and readmission data from the Medicare Hospital Compare. We compute the number of discharges for AMI, congestive heart failure and pneumonia for 7442 zip codes in eight states.

Study Design

Negative binomial regression was used to estimate the association between the expected penalty for an excess readmission in the hospital service area and the number of hospital discharges for penalized conditions (acute myocardial infarction (AMI), congestive heart failure (CHF) and pneumonia (PN)) for zip codes. We compared utilization for AMI, CHF and PN in pre and post implementation period. We determine if the amount of the expect penalty had a greater impact on the amount of hospital utilization in minority and low-income zip codes. We controlled for other market-level characteristics including demographic, socioeconomics, and healthcare supply and demand factors.

Principal Findings

The expected penalty for excess readmissions had a negative association with the number of discharges for AMI, congestive heart failure and pneumonia. The negative association increased with the percentage of minority residents but not with the poverty rate. In fact, while the main effect of poverty was associated with a decrease in discharges for targeted conditions, the interactive effect with the expected penalty was positive. We used COPD, CABG and knee procedures that were be targeted post 2013 as a falsification test. Because these procedures were not penalty during the study period we do not expect them to be associated with the expected penalty. The falsification test suggests that the association with minority residents was robust. The expected penalty did not impact the use of other procedures that were not targeted.

Conclusion

The Hospital Readmission Reduction Program may have reduced hospital inpatient services available to AMI, congestive heart failure and pneumonia patients from minority communities. Future research should explore whether the reduction in discharges was an improvement or worsening of care for patients with targeted conditions residing in minority communities.

Does Social Capital Help Households to Pay for Health? Evidence from Rural Uttar Pradesh, India

PRESENTER: **Md Zabir Hasan**, Johns Hopkins Bloomberg School of Public Health

AUTHORS: David Bishai, Akshay Ahuja, Dr. Krishna Rao, Shivam Gupta

Background:

Financial stress compels rural households to adopt coping strategies, such as selling assets or borrowing with high interest. A household's ability to access external sources of health finance (*EHF*) often depends on its strength of the relationship with the community which can be quantified with a social capital metric. This study examines the association of household head's (HH) social capital and drawing on *EHF* from the community during illness events in a sample from rural Uttar Pradesh (UP), India.

Method:

Data from a community-based cross-sectional survey among 6,218 HHs (≥18 years) from two rural districts of UP was used in this analysis. After providing verbal informed consent, participants reported information related to illness and care-seeking events within the household in last six months, including receiving any *EHF* and the amount received (*AR*) by borrowing or as a gift. Self-reported data from a modified Adapted Social Capital Assessment Tool (SASCAT) was used to generate factor scores of four unique social capital constructs (*Organizational Participation [OP]*, *Social Support [SoS]*, *Trust [TR]* and *Social Cohesion [SC]*) using multilevel confirmatory factor analysis. After performing descriptive analysis, the explanatory power of the four social capital constructs was assessed using a two-part model with Huber/White/sandwich estimator. The first part (probit model) estimated the probability of acquiring *EHF* as a function of all four dimensions of social capital while controlling other covariates. The second part implemented a generalized linear model with log link and gamma distribution to estimate *AR*, conditional on any *EHF* received as a function of the same regressors.

Results:

Households, who sought healthcare within last six month (n=1,761), spent on average International $256 (Standard Deviation [SD]=1246) (International $1 = Indian Rupee 17.73) which was 15% (SD=21) of the total household expenditure. While paying for care, 20% (n=358) of those households acquired *EHF* and with an average *AR* of International $583 (SD= 879). Controlling for confounders including socioeconomic status, both the probability of receiving *EHF,* and *AR* (conditional on any *EHF* received) had a significant positive association with *SoS*, and both outcomes were negatively correlated with *SC*. Although *TR* was not associated with the probability of receiving any *EHF*, higher *TR* was significantly associated with higher *AR* (conditional on any *EHF* received) after adjusting for all covariates.

Conclusion:

Trust and social support may enable HHs to cope up with financial stress. However, controlling for the other dimensions of social capital, social cohesion had a paradoxical effect on receiving *EHF*. Defining this as the dark side of social capital, in 1998, Alejandro Portes explained - a high level of cohesiveness often restricts access to external sources of support. This effect was robust to models that eliminated outliers and models with alternative control variables. We conclude that different dimensions of social capital can have contrasting effects on a household's ability to secure financial assistance with health expenses. The result of our study points out the necessity of a deeper, possibly qualitative, exploration of social capital and healthcare financing in rural UP, India.

Racial Disparities in Low Birthweight and Preterm Births Following Public Health Insurance Expansion By Medicaid in the United States

PRESENTER: **J. Mick Tilford**, University of Arkansas for Medical Sciences

AUTHORS: Clare C Brown, Jennifer E. Moore, Holly C Felix, M. Kathryn Stewart, Curtis L. Lowery, T. Mac Bird

Importance: Low birthweight and preterm births are associated with adverse consequences including increased risk of infant mortality and chronic health conditions over the life course. The United States has much higher rates of low birthweight and prematurity relative to other industrialized countries. Black infants are almost twice as likely to be born premature compared to white infants, leading to large disparities in infant mortality and other chronic conditions.

Objective: To evaluate whether public expansion of health insurance through the Medicaid program in the United States reduced low birthweight and preterm births especially among racial/ethnic minorities.

Design: Difference-in-difference and difference-in-difference-in-difference models were estimated using multivariable linear probability regressions to compare birth outcomes among infants in Medicaid expansion states relative to non-Medicaid expansion states and changes in disparities among racial/ethnic minorities. State-level factors were included for a given state in a given year. Regression analyses included state-level dummy variables to control for any unobserved state-level effects that were time invariant, with standard errors clustered at the state level to control for correlations between observations within states.

Setting: Population-based data from the National Center for Health Statistics Birth Data Files, years 2011-2016.

Participants: Singleton live-births to women aged 19 and older residing in the United States, along with subsamples of Medicaid-covered births, births to women with at most a high school degree, and Medicaid-covered births to women with at most a high school degree.

Exposures: 1) State Medicaid expansion status and 2) racial/ethnic category.

Main outcomes: Preterm birth (<37 gestation), very preterm birth (<32 weeks gestation), low birthweight (<2,500 grams), and very low birthweight (<1,500 grams).

Results: A total of 7,100,423 births in expansion states and 8,530,751 births in non-expansion states were included. Unadjusted rates of low birthweight and preterm birth outcomes declined between 1.0% and 4.3% among infants in expansion states after Medicaid expansion. There was no difference in adjusted models. Among black infants in expansion states, low birthweight and preterm birth outcomes declined between 5% and 15%. In difference-in-difference-in-difference models, there were reductions in disparities for black infants in expansion states with relative reductions of 1.0-percentage points (pp) (p=0.001) in low birthweight, 0.37-pp (p=0.004) in very preterm births, 0.45-percentage points (pp) (p=0.119) in preterm births, and 0.37-pp (p=0.005) in very preterm births among Medicaid-covered births to women with at most a high school degree. Outcomes for Hispanic infants remained largely unchanged.

Conclusions and Relevance: Given the adverse health effects of low birthweight and premature births and the large disparities in birth outcomes in the United States, policy makers in states that have yet to expand should consider public expansion of health insurance through Medicaid as a means for reducing disparities in infant mortality and in chronic health conditions over the life course, especially for black infants.

10:30 AM –12:00 PM TUESDAY [Economic Evaluation Of Health And Care Interventions]

Universität Basel | Vesalianum – Grosser Hörsaal EO.16

Incorporating Demand into Economic Evaluations: The Role of Discrete Choice Experiments

SESSION CHAIR: **Fern Terris-Prestholt**, Faculty of Public Health and Policy, London School of Hygiene and Tropical Medicine

Multi-Country Discrete Choice Experiments to Parameterise Vaccine Demand and Behavioural Change in Models for Infectious Disease Transmission.

PRESENTER: **Frederik Verelst**, University of Antwerp

AUTHORS: Lander Willem, Roselinde Kessels, Philippe Beutels

Introduction

The (cost-)effectiveness of infectious disease interventions is subject to people's adaptive behaviour under the influence of changing risk perceptions, and of experiencing different disease stages, because this will affect their and other people's exposure risk to pathogens. The literature shows an increasing use of dynamic transmission models that can account for behavioural changes taking place, but only a small minority of these use empirical data for parameterization or validation. Models including observational data in behavioural change models stem mostly from the 2009 influenza pandemic. Very few of these are integrated with economic evaluation.

Game theoretic approaches with the central hypothesis that individuals, under some circumstances, can free-ride on herd immunity, are still widely used. It is often assumed that (rational) individuals incorporate this externality in their strategic vaccination decision.

Methods

Given this scarcity of data and the abundance of theoretical research, we performed discrete choice experiments (DCE) in the United Kingdom (UK), France, Flanders (Belgium) and South Africa in order to capture the vaccine-related decision-making process. These countries were selected as study sites because of their different vaccine uptake characteristics, health care organisation, sociocultural background and attitudes.

Choice sets with vaccine profiles were constructed, based on the literature, a focus group discussion and a pilot study, resulting in the selection of six attributes: vaccine effectiveness, frequency of mild vaccine related side-effects (VRSE), accessibility (in terms of convenience and reimbursement), vaccine-preventable burden of disease, local (respondents' network of contacts) vaccination coverage, and population (the population at large) vaccination coverage. For each country, we surveyed a total of about 1500 respondents, of which about 750 were parents of at least one child below the age of 18 years. Half of the respondents were asked about vaccination decisions for their youngest child, and the remainder about decisions for themselves. We estimated the relative utility of all attribute level combinations using a Panel Mixed Logit model.

Results

Preliminary results indicate vaccine effectiveness, population coverage and burden of disease to be the most influential attributes, followed by local coverage, accessibility and frequency of mild VRSE. Note that we found both population coverage and local coverage to show a positive relation with vaccine utility. We ranked all attribute level combinations and found the highest relative utility for a vaccine with 90% effectiveness, that is free and available at the vaccinator, protecting against a common and severe disease, with rare VRSE and with high local and population coverage. Deviating from this best-case scenario results in a decrease in relative utility. These utility estimates can be used to incorporate demand in behavioral change models. The estimates for population and local coverage, as well as disease prevalence directly connect disease transmission to behavioral changes. Other dynamics can influence vaccine demand through exogenous behavioral changes (e.g. a vaccine scare).

Discussion

DCEs are instrumental to incorporate demand in infectious disease transmission models and economic evaluation of vaccination programs. There is rising evidence that the free-rider hypothesis as a driver of vaccine demand seems inappropriate.

A Discrete Choice Experiment to Assess Patients' Preferences and Willingness to Pay for Cancer Treatment at the End of Life in China

PRESENTER: **Dr. Anli Leng**, Shandong University

A Discrete Choice Experiment to Assess Patients Preferences and Willingness to Pay for Cancer Treatment at the End of Life in China

Anli Leng[1], Shaonan Kong[1], Jian Wang[1,2]

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Background：

Majority of treatment decisions are made by family caregivers rather than advanced cancer patients themselves in China. The surrogates may often have greater willingness to pay than patients to extend life and suffer a negative emotional effect. Lack of knowing the patient's real preferences of treatment may be detrimental to achieve the patient-centered health care models and quality of end-of-life care.

Objective：

This study aims to examine the stated preferences of patients with cancer and the trade-offs between care attributes at the end of life using discrete choice experiment (DCE).

Methods：

Patients with end-stage cancer at hospitals who were at least 50 years old completed a face-to-face DCE. Each scenario described 6 attributes: days of hospitalization, survive time, quality of life(QoL), side effect, place of death and out-of-pocket payments. Patient preferences were derived using mixed logit model and the marginal willingness to pay (WTP) were estimated from regression coeffcients.

Results：

183 patients were included in our survey. The mean age was 62 years, and 70% of respondents were male. Patients' preferences for longer survive time,better quality of life, lower risk of treatment,and home death were all statistically significant in driving choice between treatment models. The most important attributes were extending life and quality of life of patients at the end of life. However,days of hospitalization was least likely to affect patient's preferences. The maximum WTP for ideal end-of-life treatment developed (i.e. prolonging time by 10 months,very good quality of life,0% side effects,dying at home) is US$79,863. Patients were willing to pay US$33,964(95%CI, 17,070-77,225) for extending life from 4 months to 10 months,US$37,376 (95%CI, 18,727-91,478) for improve the quality of life from bad level to very good level, and US$8,523 (95%CI, 597-25,467) to change from the hospital deaths to home deaths.

Conclusion:

Our study could contribute to the development of patient-centered stated preferences for treatment models that improve advanced patient's quality of end-of-life care and educate physician and family caregivers about patient's real demand for the optimal care.

Using Stated Preference Data in Economic Evaluation to Reduce Bias from Uncertainty and Heterogeneity

PRESENTER: **Matthew Quaife**, London School of Hygiene & Tropical Medicine

AUTHORS: Henk Broekhuizen, David J Bath, Kaat De Corte, Alec Miners, Fern Terris-Prestholt

Cost-effectiveness estimates in economic evaluations (EEs) are subject to uncertainty and heterogeneity. Average costs and benefits of a particular treatment or technology may belie uncertainty in parameter estimates or differ for patients with different characteristics.

Some parameters are more uncertain or heterogeneous than others. An important parameter for EEs of technologies which prevent disease is uptake, a critical component of use and coverage. Yet uptake can be both hard to predict before a product is introduced (leading to parameter uncertainty) and highly heterogeneous. Even when a mean value is known, the plausible range of uncertainty around this value may not be.

Where revealed preference data are unavailable, stated preference (SP) data can be used to characterise parameter uncertainty and heterogeneity in models. Using an example of a new HIV prevention product, this paper provides a practical guide for the integrated use of SP data in EEs, detailing required steps, and discussing extensions and limitations of the approach.

First, we address parameter uncertainty, describing how predictions are made from SP data. We demonstrate how sampling uncertainty in SP models can be used to characterise parameter uncertainty in EEs. We show how SP results compare to other methods of eliciting uncertainty bounds.

Second, we propose methods of modelling heterogeneity. Using SP data to model HIV prevention product uptake among condom users and non-users, we show how averages can be misleading – demonstrating it is the *who* rather than *how much* that matters when modelling uptake. We demonstrate how latent class models can be used to identify population subgroups based on preferences, and characterised by observable, targetable factors. We also show how SP data could inform equity analyses. Finally, we discuss the limitations of the proposed approach, compare with other alternatives, and identify situations where SP data may be more or less informative.

12:00 PM –1:30 PM TUESDAY [Special Sessions]

Universität Basel | Kollegienhaus – Hörsaal 102

iHEA Members' Meeting

1:30 PM –3:00 PM TUESDAY [Special Sessions]

Universitätsspital Basel | ZLF – Gross

Student Prize Papers

SESSION CHAIR: **Bruce Hollingsworth**, Lancaster University

1st Prize 2018: Your Retirement and my Health Behavior: Evidence on Retirement Externalities From a Fuzzy Regression Discontinuity Design

PRESENTER: **Mujaheed Shaikh**, Vienna University of Economics and Business, Health Economics and Policy Division

AUTHOR: Dr. Tobias Müller

This paper presents evidence on intra-household retirement externalities by assessing the causal effect of spousal retirement on various health behaviors and health status across 19 European countries. We identify partner's and own retirement effects by applying a fuzzy regression discontinuity design using retirement eligibility as exogenous instruments for spousal and own retirement status. We find significant increases in the frequency and intensity of alcohol consumption combined with a significant decrease in moderate physical activities as a response to partner's retirement. In line with the existing literature, we find that own retirement has significant positive effects on engaging in moderate and vigorous physical activities but also leads to a significant increase in the frequency of alcohol intake. Overall, subjective health is negatively affected by spousal retirement and positively by own retirement.

1st Prize 2019: Differential Impact of Hospital and Community Factors on Medicare Readmission Penalties

PRESENTER: **Monica Aswani**

Objective. To identify hospital/county characteristics and sources of regional heterogeneity associated with readmission penalties.

Data Sources/Study Setting. Acute care hospitals under the Hospital Readmissions Reduction Program from fiscal years 2013 to 2018 were linked to data from the Annual Hospital Association, Centers for Medicare and Medicaid Services, Medicare claims, Hospital Compare, Nursing Home Compare, Area Resource File, Health Inequity Project, and Long-term Care Focus. The final sample contained 3,156 hospitals in 1,504 counties.

Data Collection/Extraction Methods. Data sources were combined using Medicare hospital identifiers or Federal Information Processing Standard codes.

Study Design. A two-level hierarchical model with correlated random effects, also known as the Mundlak correction, was employed with hospitals nested within counties.

Principal Findings. Over a third of the variation in readmission penalties was attributed to the county level. Patient sociodemographics and the surrounding access to and quality of care were significantly associated with penalties. Hospital measures of Medicare volume, percentage dual-eligible and Black patients, and patient experience were correlated with unobserved area-level factors that also impact penalties.

Conclusions. As the readmission risk adjustment does not include any community level characteristics or geographic controls, the resulting endogeneity bias has the potential to disparately penalize certain hospitals.

2nd Prize 2018: It's About Time: Cesarean Sections and Neonatal Health

PRESENTER: **Ana Rodriguez-Gonzalez CRES, Universitat Pompeu Fabra**, Univ Pompeu Fabra

AUTHOR: Ana María Costa-Ramón

Cesarean sections have been associated in the literature with poorer newborn health, particularly with a higher incidence of respiratory morbidity. Most studies suffer, however, from potential omitted variable bias, as they are based on simple comparisons of mothers who give birth vaginally and those who give birth by cesarean section. We try to overcome this limitation and provide credible causal evidence by using variation in the probability of having a c-section that is arguably unrelated to maternal and fetal characteristics: variation by time of day. Previous literature documents that, while nature distributes births and associated problems uniformly, time-dependent variables related to physicians' demand for leisure are significant predictors of unplanned c-sections. Using a sample of public hospitals in Spain, we show that the rate of c-sections is higher during the early hours of the night compared to the rest of the day, while mothers giving birth at the different times are similar in observable characteristics. This exogenous variation provides us with a new instrument for type of birth: time of delivery. Our results suggest that non-medically indicated c-sections have a negative and significant impact on newborn health, as measured by Apgar scores, but that the effect is not severe enough to translate into more extreme outcomes.

Joint 3rd Prize 2018: Pay Less, Consume More? The Price Elasticity of Home Care for the Disabled Elderly in France

PRESENTER: **Marianne Tenand**, Erasmus University of Rotterdam

AUTHOR: Quitterie Roquebert

Little is known about the price sensitivity of demand for home care of the disabled elderly. We partially fill this knowledge gap by using administrative data on the beneficiaries of the main French home care subsidy program in a department and exploiting inter-individual variation in provider prices. We address the potential endogeneity of prices by taking advantage of the unequal spatial coverage of providers and instrumenting price by the number of municipalities served by a provider. We estimate a price elasticity of around -0.4 that is significantly different from both 0 and -1. This less than proportionate response of consumption to price has implications for the efficiency and redistributive impact of variation in the level of co-payments in home care subsidy schemes.

Joint 3rd Prize 2018: Low-Cost, Limited-Service Private Healthcare Providers: Evidence from Mexico

PRESENTER: **Adrian Rubli**

Private primary healthcare in developing countries has been shifting toward low-cost providers offering basic services. While these may expand access, there are important concerns about their quality of care. This paper focuses on private pharmacy-adjacent doctor's offices (PADOs) in Mexico to characterize this tradeoff. I begin by documenting that the first PADO entry in the vicinity of a public clinic leads to a 6% decline in public outpatient service use. I then focus on PADO quality, by first showing that there are no changes in an extreme patient outcome, namely public inpatient care, as a result of the substitution from public clinics to PADOs. However, I find that each additional PADO is associated with a 14% increase in private pharmacy sales of stronger types of penicillin, consistent with misaligned financial incentives in prescribing behavior. I conclude that PADOs may decrease welfare by fostering bacterial resistance in the long-run.

3rd Prize 2019: Stress on the Sidewalk: The Mental Health Costs of Close Proximity Crime

PRESENTER: **Panka Bencsik**

I apply novel, extremely micro-level datasets to provide new evidence on crime's impact on mental health. I find that each reported violent and sexual crime significantly increases the stress levels of those in the vicinity for three days after the crime was committed. The temporal aspect of the effect is specifically driven by violent and sexual crimes committed two days earlier, a lag which suggests the presence of a mediator of the information–word of mouth or the media. To measure that, I scrape news data and observe significant increases in nationwide stress levels in response to the number of articles published on the topic of crime in the domestic news section of multiple daily newspapers. I measure crime's effect on stress by merging a unique daily response panel dataset that has over 75,000 responses from 2010 to 2017 in the Thames Valley region of England with secure access data containing every reported crime in the same region with exact location, time, and event characteristics. The result that violent and sexual crimes increase stress holds with extensive controls for individual fixed effects, circumstantial characteristics, and spatial fixed effects, including fixed effects for the smallest level of census geography in England that contain only an average of 250 people.

1:30 PM –3:00 PM TUESDAY [Economic Evaluation Of Health And Care Interventions]

Universitätsspital Basel | ZLF – Klein

System-Level Economic Evaluation: Ensuring Efficiency in the Allocation of Resources

SESSION CHAIR: **Christopher McCabe**, Institute of Health Economics

Improving Efficiency in Health Care Systems: Complicated Problems, Simple Rules and Applying the Economics Toolkit.

PRESENTER: **Stephen Birch**, The University of Queensland Centre for the Business and Economics of Health

AUTHOR: Amiram Gafni

Drummond (1980) notes that developing an efficiency ranking of health care programmes under conditions of scarcity is "quite complicated" and lies beyond the "simple rules" of CEA and CUA, requiring methods that lie "outside the scope" of traditional economic evaluation methods. Yet almost 40 years later the traditional methods of CEA and CUA and the ratio of incremental costs to incremental effects, remain the analytical basis of most economic evaluation studies and provide the evidence base for decision-making in many areas of health care systems. The assumptions on which cost effectiveness and cost utility analyses are based, in particular perfect divisibility and constant returns to scale in all programmes, have been identified. The implications of adopting these assumptions and the resulting risk of misallocation of resources associated with the use of the ICER are also well established yet the ICER remains the 'tool of choice' in both academic and real world applications. In this presentation we explore three ways in which economic evaluation methods need to be adopted to generate more meaningful information for decision makers concerned with the efficient use of available resources. First we relax the divisibility assumption in the presence of incremental fixed costs and show how the ICER becomes a function of programme size. Second we relax the assumption of constant returns to scale in the programme under evaluation to consider the implications of increasing the size of a programme within a given patient population. Finally we relax the assumption of constant returns to scale in other programmes to consider the implications of reproducing a programme in a different population for an identical patient group. Together these considerations provide an analytical link between the traditional models of CEA/CUA and the mathematical programming techniques identified by Drummond as required to establish efficiency rankings.

The Marginal Benefits of Healthcare Spending in the Netherlands. Estimating Cost-Effectiveness Thresholds Using a Translog Production Function

PRESENTER: **Dr. Eddy Adang**, Radboudumc

AUTHOR: Niek Stadhouders

New technologies may displace existing, higher-value care under a fixed budget. Countries aim to curtail adoption of low-value technologies, for example by installing cost effectiveness thresholds. Our objective is to estimate the opportunity cost of hospital care to identify a threshold value for the Netherlands. To this aim, we combine claims data, mortality data and quality of life questionnaires from 2012 to 2014 for 11,000 patient groups to obtain QALY outcomes and spending. Using a fixed effects translog model, we estimate that a 1% increase in hospital spending on average increases QALY outcomes by 0.2%. This implies a threshold of €73,600 per QALY, with 95% confidence intervals ranging from €53,000 to €94,000 per QALY. The results stipulate that new technologies with ICERs exceeding the Dutch upper reference value of €80.000 may indeed displace more valuable care.

Introducing HTA to a Sub-Saharan Country: The Case of Tanzania

PRESENTER: **Gavin Surgey**, Health Economics and HIV and AIDS Research Division (HEARD), University of KwaZulu-Natal

HTA is a mechanism to support decision-making in health towards setting more cost-effective priorities. It has increasing recognition of its role as an important component to achieving UHC through more efficient allocation of resources. HTA considerations in decision-making processes are almost non-existent in the SSA (Sub Saharan Africa) region.

In LICs (Low Income Countries) there is a necessity to ensure value for money due to tighter resource constraints. There is also a growing need as many countries transition out of dependence on development aid and aim towards UHC.

Tanzania is categorised as a low-income country (LIC) with a population of 54 million and a per capita expenditure on health of about US$32 per year. It is the largest country in the East Africa region. The health system faces large challenges: Life expectancy at birth is 52, infant mortality and under five mortality 51 and 81 per 1000 respectively.

There is no formalized priority-setting mechanism in Tanzania, and current decision-making processes do not incorporate health economic analysis (efficiency, effectiveness, value and behaviour). Decisions are taken by the leadership at the national level and are made in a bureaucratic fashion, with little or no evidence to underpin them. Very hot debates among the researchers, politicians and in the communities called for more systematic discussions at the ministry level.

As Tanzania moves toward universal coverage reforms, are focused on improving efficiency, for example, through strategic purchasing. Health services are not well defined and there is desperate need for HTA to help define priority services as well as a process for doing so, in order to ensure best value for money and broader stakeholder buy in of coverage decisions. This work aims to present, as a case study, the successful establishment of the Tanzania HTA committee in 2017/18. It aims to answer the following question:

- How does one introduce the concept of HTA such that HTA becomes an integrated part of routine decision-making for planning and operational policy within the health care system?

From the groundwork in Tanzania and through our experience in country we are able to answer the following sub-questions:

1. What are the potential applications of HTA for evidence-based policy development?
2. What factors are conducive to introducing HTA, and what are the barriers?
3. Who are the key stakeholders in supplying HTA and who are the target users of HTA results?

Understanding these questions and answers will help other countries, and partners, establish HTA mechanisms in other countries which plays a major role in the achievement of HTA.

Tanzania has shown remarkable political will to establish an HTA process. The development and implementation of a functional and robust national HTA system is starting to inform the provision of healthcare services. The systematic process for the incorporation of HTA will help institutionalise HTA for decision-making in the health system. Linking outputs with the explicit decision-making needs of the health system, provides the best opportunity to realise a functioning and sustainable HTA system in Tanzania supporting the attainment of UHC.

Does the Use of Economic Evaluation Have an Impact on the Utilization of Health Care Resources? Evidence from Two European Countries

PRESENTER: **Michael Drummond**, Centre for Health Economics

AUTHORS: Belen Corbacho, Rita Santos, Elizabeth Jones, Jose Borras, Jorge Mestre, Jaime Espin, Nathaniel Henry

BACKGROUND: A number of European countries employ health technology assessment (HTA), incorporating economic evaluation, to formulate recommendations on the use of health technologies. However, countries differ in whether the HTA effort is organized centrally or locally (regionally) and whether the guidance issued is mandatory. A centralized approach to health technology assessment (HTA) may facilitate the production of consistent, high quality, reports. A regional approach may increase the chances of local implementation of recommendations. Although the processes of conducting HTA with economic evaluation have been widely studied, there has been relatively little exploration of whether there is an impact, in terms of the utilization of health care resources.

OBJECTIVES: The objective of this study was to compare assessment procedures in England (centralized HTA approach) with Spain (regional HTA approach)and to explore the impact of HTA recommendations on the use of health care resources.

METHODS:A comparative analysis was conducted of the technology assessments of anticancer drugs in different clinical indications in the two jurisdictions from 2008 to 2015. The outcomes of the assessments were classified by whether the drug was recommended (without restrictions), restricted or not recommended. In order to assess the implementation of HTA recommendations, a regression analysis was performed to explore the level of association between HTA guidance and drug usage over the period January 2011 to December 2016, for a sample of 11 anticancer drugs assessed in both jurisdictions.

RESULTS: In England 67 assessments (13% Recommended; 45% Restricted; 42% Not Recommended) of drug/indication pairings were undertaken from 2008-2015. All the assessments were performed by NICE, using a standardized methodology. In Spain there were 96 assessments undertaken by a range of bodies, including pharmacy groups in different regions: 17 IPT reports, at national level (41% Recommended; 53% Restricted; 6% Not Recommended); and 79 GENESIS reports at regional/hospital level (13% Recommended; 65% Restricted; 16% Not Recommended; 6% Compassionate use). The methods used varied substantially. Descriptive analysis of drug usage indicated variable responses to positive and negative recommendations in the two countries. Regression analyses on the use of 11 drugs indicated that where there is a positive recommendation by NICE or Spanish bodies, the usage of the drug responded in both jurisdictions, but more strongly in England than in Spain.

CONCLUSIONS: This study suggests that the use of economic evaluation as part of HTA can have an impact on the utilization of health care resources. However if HTA capacity is organized regionally, considerable effort may be required in coordination, in order to ensure consistent and rigorous assessments and adequate implementation of HTA findings.

1:30 PM –3:00 PM TUESDAY [Production Of Health, Health Behaviors & Policy Interventions]

Universitätsspital Basel | Pathologie – Unten (U)

Organized Session: New Causes of Infant, Child, and Adolescent Health

SESSION CHAIR: **Janet Currie**, Princeton University

Fertility, Health Endowments and Returns to Human Capital: Quasi Experimental Evidence from 20th Century America.

PRESENTER: **Sonia Bhalotra**, University of Essex

Infectious disease mortality registered a sharp fall upon the introduction of antibiotics in 1937 in America and this fall was most marked amongst infants. Infant survival chances improved and survivors started life with a better health endowment. We study the fertility responses to this exogenously determined improvement in early life health. While both blacks and whites experienced an improvement in early life health, the resulting decline in fertility is significant only for whites. We argue that this is consistent with their making greater investments in their children stimulated by the post-sulfa increase in the returns to education. Investments in black children were relatively limited on account of institutionally determined race differences in returns to schooling at the time. We contribute to a small literature that seeks to identify the “quantity-quality” tradeoff and provide what may be the first evidence of the role of investment returns in determining the tradeoff. These results are relevant to today’s developing countries where infectious disease prevalence is currently higher than it was in the 1930s in America, and fertility rates (in many cases) remain persistently high.

Diesel Cars, Pollution, and Health

PRESENTER: **Hannes Schwandt**

While passenger cars are a leading source of pollution in highly populated areas, the effects of car pollution on health in the general population are not yet fully understood. Diesel exhaust contains particularly harmful pollutants, but measuring effects on population health is difficult due to consumer sorting and avoidance behavior. We exploit the Volkswagen emissions scandal as a natural experiment that unknowingly introduced highly polluting diesel cars into wealthy areas with ex-ante low levels of pollution. We find strong increases in diesel-associated pollutants in areas with higher shares of cheating models, causing decreases in birth weight and gestational length among newborns, and increases in asthma attacks among children.

The Effect of an Income Shock at Birth on Child Health: Evidence from a Child Benefit in Spain

PRESENTER: **Dr. Libertad González**, Universitat Pompeu Fabra

Family income has been shown to be strongly associated with child health and development. However, the extent to which this relationship is causal has been hard to establish. I take advantage of the unexpected introduction of a generous child benefit in Spain in 2007 to analyze the effect of a (transitory) shock to household income right after birth on child health outcomes. I follow a regression discontinuity approach, comparing children born in a close neighborhood of the threshold date for benefit eligibility (which was unknown in advance), from birth to age 8. I use administrative data from birth and death certificates, as well as hospital and primary health care records. My contribution relies on a credible identification strategy, combined with high-quality administrative data, for the effects of a type of subsidy that is common in many countries (a “maternity allowance”). I find no significant effect of the subsidy on neonatal, infant, or child mortality. Children whose mothers were eligible for the transfer had significantly higher hospitalization rates in the first two years following benefit receipt. I study

potential channels, and conclude that the child benefit increased health care utilization. Eligible mothers took longer to go back to work after birth and children started daycare later, which may have improved detection and treatment of child health problems.

Childhood Socioeconomic Status Moderates Genetic Predispositions for Peak Smoking

PRESENTER: **Pietro Biroli**, University of Zurich

Smoking is the leading cause of preventable disease and death in the U.S., and it is strongly influenced both by genetic predisposition and childhood socioeconomic status (SES). Using genetic variants exhibiting credible and robust associations with smoking, we construct polygenic risk scores (PGS) and evaluate whether childhood SES mediates genetic risk in determining peak-cigarette consumption in adulthood. We find a substantial protective effect of childhood SES for those genetically at risk of smoking: adult smokers who grew up in high-SES households tend to smoke roughly the same amount of cigarettes per day at peak (~23 for low and ~25 for high genetic risk individuals, or about 8% more), while individuals from low-SES backgrounds tend to smoke substantially more if genetically at risk (~25 for low and ~32 for high genetic risk individuals, or about 28% more).

1:30 PM –3:00 PM TUESDAY [Production Of Health, Health Behaviors & Policy Interventions]

Universitätsspital Basel | Klinikum 1 – Hörsaal 1

Economics of Ageing: Long-Term Care

SESSION CHAIR: **Sabrina Lenzen**, The University of Queensland

Long-Run Costs of Informal Elderly Care and Implications of Long-Term Care Insurance

PRESENTER: **Thorben Korfhage**, RWI - Leibniz-Institut für Wirtschaftsforschung

Background

Informal caregivers provide valuable services to elderly persons with long-term care needs. Yet, they are confronted with opportunity costs due to the negative effects of caregiving on labor marked outcomes, such as employment or retirement. These costs can be even larger if informal care also affects future outcomes. After a care spell has ended, individuals who have reduced labor supply before could be confronted with a lower joboffer probability and stay unemployed or retire early if they cannot find a new job. To mitigate these negative effects, many OECD countries have introduced long-term care insurance schemes that offer benefits to impaired elderly and their informal caregivers. In this paper, I estimate a dynamic model to identify long-run costs and how they are affected by different features of the German public long-term care insurance (LTCI).

Methods

I set up a dynamic structural single agent model which is solved by dynamic programing and estimated by maximum likelihood. In this model agents can make discrete decisions about their labor supply, their retirement state and whether they want to provide informal long-term care to a relative. Each choice yields a payoff in the current period but also affects future payoffs due to the transition of state variables. For instance, the probability of receiving a job-offer in the next period crucially depends on the labor marked choice of today's period. The agent is expected to make decisions based on their current as well as future discounted utility. The model is estimated using the years 2001 until 2014 of the German Socio-Economic Panel (SOEP) which includes nearly 11,000 households and about 30,000 persons each year. The estimated model is used for simulations in which counterfactual situations are compared to the status quo baseline. The simulations allow to calculate long-run costs of informal care accounting for labor market frictions and the tax benefit system. The costs on the individual level measured in lifetime income are contrasted with the fiscal consequences of caregiving measured in tax revenues and social security contributions. Furthermore, counterfactual policy simulations are used to analyze how different features of the German LTCI affect the behavior of caregivers and the resulting cost of caregiving.

Results

Simulation results show that informal care has adverse and persistent effects on labor supply and therefore also affects lifetime income and pension benefits. Personal costs of caregiving are heterogeneous and depend on age, previous earnings and largely on institutional regulations. Even though fiscally costly, compulsory long-term care insurance can offset the personal costs of caregiving to a large extent.

Should I Care or Should I Work? The Impact of Working in Older Age on Caregiving

PRESENTER: **Ludovico Carrino**, King's College London

AUTHORS: Vahé Nafilyan, Mauricio Avendano

While there is evidence that having informal-care responsibilities has an adverse effect on labour supply, far less is known about the effect of working longer in older age on informal-caregiving for family and friends. This research question is timely and relevant since, due to population ageing and tightened public budgets for pensions, most OECD countries implemented reforms aimed at prolonging working lives of older people. If these policies reduce informal caregiving this may increase the prevalence of unmet needs among dependent older people, especially given the undergoing reduction in funding and tightened eligibility rules for public Long-Term Care in western economies.

We explore whether prolonging working careers reduces the amount of help provided by women around their pensionable age (55-65 years old), which constitutes the largest source of informal-care in most advanced economies. Although both the economics and sociological theoretical literature predict that working longer would reduce the supply of care, causal empirical evidence is very limited and susceptible to endogenous selection between employment and caregiving decisions.

We focus on the United Kingdom and exploit a recent major pension reform which gradually increase the State Pension Age for women born after April 1950, with a postponement up to 6 years (from 60 to 66 years old). This resulted in a 11% increase in employment rates. We use eligibility to the State Pension, defined as being above or below the State Pension age at the time of interview, as an instrument to overcome the endogeneity of labour supply decisions: owing to the reform, people of the same age face different pension eligibility, due to their birth-date. We use data from the Understanding Society survey which includes respondents' month-of-birth and detailed information on care-supply, including care-setting (in-household or extra-household), care-hours provided (in brackets), and the relationship with the care recipient. We also exploit information on socioeconomic and demographic characteristics. Our sample includes 6,832 women (23,912 observations) aged 55 to 65. We estimate a two-part model to explore separately the participation decision (probit model) and the intensity of care among caregivers (interval-regression model). We instrument respondents' working hours (in logs) with a pension-eligibility dummy, and add dummies for age and time (in years).

We find that working longer as result of changes in State Pension eligibility significantly reduces caregiving intensity among caregivers in extra-household settings: an increase of 1 work-hour reduces caregiving by up to 25 minutes, with an elasticity of 0.7. Crucially, such reduction is found to be larger for women with physically and mentally demanding jobs. Results hold when implementing alternative definitions for caregiving (using cutoffs for 5+ and 20+ care-hour/week), as well as when accounting for respondents' health and income. Conversely, we find no effect at the extensive margin, or for in-household care-settings. Our results suggest that policy makers should account for the unintended consequences of changes in the state pension age on informal care supply and the demand for Long-Term care.

The Effect of Informal Caregiving to Old Parents on Employment Status across Europe.

PRESENTER: **Manuel Serrano Alarcon**, Escola Nacional de Saúde Pública, NOVA University of Lisbon

Objective

Our objective is to estimate the opportunity cost of informal caregiving to old parents in terms of employment in Europe. We then evaluate how this cost varies with carers' gender and education, and with country´s Long-Term Care (LTC) expenditure.

Methods

We used data from waves 5(2013) and 6(2015) of the Survey of Health, Ageing and Retirement (SHARE), formed by individuals older than 50 from 14 European countries. We transformed the parent-level data into child-level data. Our final sample was formed by adult children living outside the household who were not providing any informal care at baseline and responded in both waves (n=47,091). We used an ordered probit model, with employment status at wave 6 (full-time, part-time or non-work) as dependent variable, and intensity of informal caregiving at wave 6 as independent variable. We controlled for employment status at baseline (wave 5), sociodemographic individual characteristics (age, sex and education), and country fixed effects. Furthermore, to control for the potential endogeneity of informal caregiving, we used a bivariate probit, where informal caregiving at wave 6 is determined by the functional status of the parents. In particular, we used the subsample of children whose parents were not functionally dependents at baseline (Wave 5). Transition towards functional dependency at wave 6 acts as an instrumental variable for informal caregiving at wave 6. We stratified our analysis by sex, education level, and country groups (High vs Low LTC expenditure). We used inverse probability weights to correct for attrition bias.

Results

4.22% of the adult children provided at least weekly caregiving, varying from 2.7% in countries with high LTC expenditures to 5.7 in countries with low LTC expenditure. Daily caregiving was provided by 1.33% of the adult children (0.6% and 2% in high and low LTC expenditure, respectively). Prevalence of informal caregiving was higher among women as compared to men. Regarding employment status, 18.4% of the sample was outside of work, 7.6% employed part-time and 74% full-time. Results from the ordered probit show that weekly or more often caregiving significantly increased the probability of part-time work by 0.4 percentage points (pp) and non-work by 1.3 pp, with no significant differences between sexes, education or LTC expenditure. Estimates of bivariate probit were larger, showing that informal caregiving increased the probability of no work by 15 pp.

Conclusions

Caregiving to old parents significantly leads to non-work, and to part-time employment. The effect is higher when accounting for endogeneity of informal caregiving. Still, results from the bivariate probit can reflect short-term shocks of children whose parents become functionally dependent at wave 6, and might adjust their labour situation afterwards. Results were consistent across sex and education groups, reinforcing the hypothesis of a causal mechanism. Informal caregiving is more prevalent in countries with low LTC expenditures. However, the link between informal caregiving and employment status was independent of the country-level LTC supply suggesting that, when a person opts to provide informal care, the existence of formal care structures may be insufficient to reduce the sacrifice this decision implies.

1:30 PM –3:00 PM TUESDAY [Demand & Utilization Of Health Services]

Universitätsspital Basel | Klinikum 1 – Hörsaal 2

Organized Session: The Economics of Health Care in Late Life

SESSION CHAIR: **Joachim Marti**, University of Lausanne

High Costs in End-of-Life Care: An Alternative Economic Perspective

PRESENTER: **Peter May**, Trinity College Dublin

AUTHORS: Charles Normand, J. Brian Cassel

It is long established that the last year of life is associated with much higher healthcare costs. Prior economic work has identified valuation of life under threat of imminent death, where utilisation has negligible opportunity cost, as an explanation. However, medical and health services research studies often find that end-of-life care is not delivered consistently with patient preferences and that death is not predictable. Palliative care, the interdisciplinary specialism that aims to improve quality of life for those with life-limiting illness, is associated with improving patient decision-making and lower costs of care. This paper analyses ~110,000 hospitalisations of adults with life-limiting illness in the United States, to identify those for whom palliative care is more or less impactful on costs. Palliative care is found to be more cost-saving for those with higher illness burden and higher costs. An alternative economic perspective on high end-of-life care costs is proposed.

Costs of Healthcare Utilisation in Frail Patients Using Administrative Data

PRESENTER: **Khanh Ha Bui**, Imperial College London

AUTHORS: Søren Rud Kristensen, Elias Mossialos

The concept of frailty was introduced to capture the heterogeneity of the aging process, where some people remain very healthy until their 90s, whereas others begin to develop symptoms of health-related problems in their 50s or 60. Frail patients have been identified to be more susceptible to adverse outcomes, one aspect of which is increased health care utilization and costs of hospital admissions. Evidence has shown that frailty is associated will increased use of health care services but studies on the association between the frailty and costs of hospital utilisation are still limited.

For this study, we set to evaluate the effect of frailty on healthcare costs and utilisation among elderly patients in England. We use the Clinical Practice Research Datalink (CPRD) for assessment of frail cohort in primary care and Hospital Episode Statistics (HES) for frail patients in secondary care. Patients included are those aged 55 years and older who are registered in UK General Practices or have emergency or planned admissions to NHS hospitals from 2003 to 2014. We define frailty according to the electronic Frailty Index (eFI) and the Hospital Frailty Risk Score and conduct a retrospective longitudinal analysis with healthcare costs as outcome variables of interest and frailty according to the two definitions as the main explanatory variable of interest, adjusted for patient demographics using age, sex, their neighbourhood's index of multiple deprivation level (IMD). Using information on costs of care for primary care and secondary care utilisation, we estimate the association between frailty and healthcare costs and how each of the frailty syndrome components drive healthcare resource use.

Cost Trajectories and Intensity of Care at the End of Life: An Analysis Using Routinely Collected Data from England

PRESENTER: **Xhyljeta Luta**, Centre for Primary Care and Public Health (Unisantè), University of Lausanne, Switzerland

AUTHOR: Dr. Joachim Marti

Every year more than 500,000 people die in the UK and the number of deaths is expected to increase by 17% by 2030. The majority of deaths occur in hospitals where patients often undergo intensive treatments without any tangible benefits in terms of survival or quality of life; importantly, inequalities in access to appropriate services have been highlighted. The cost of caring for dying patients, measured in billions of pounds, is therefore set to increase, putting additional pressure on already strained health and social care budgets. In this paper, we exploit a rich patient-level linked dataset in England to study health care use and cost trajectories in the last year of life and describe the geographical and socioeconomic variation in the intensity of care received at the end of life. Specifically, we use data from ca. 300'000 patients and construct their care trajectories between primary (Clinical Practice Research Datalink) and acute care (Hospital Episode Statistics). In the descriptive part of the study, we use cluster analysis to identify groups of patients with similar cost trajectories, and describe how intensity of care varies at the regional level and according to a measure of multiple deprivation. We then exploit specific clinical codes included in both datasets and apply propensity score matching to identify patients that are similar in observable characteristics but have different levels of exposure to palliative care services and assess the association between access to such services and cost trajectories.

1:30 PM –3:00 PM TUESDAY [Health Care Financing & Expenditures]

Universitätsspital Basel | Klinikum 1 – Hörsaal 3

Organized Session: Optimal Health Sector Budgeting

SESSION CHAIR: **Dr. Logan Brenzel**, Bill and Melinda Gates Foundation

DISCUSSANT: **Jennifer Asman**, UNICEF

Program-Based Budgeting in Health: Panacea or Placebo?

PRESENTER: **Mr. Jason Lakin, Ph.D.**, IBP

AUTHORS: Suad Hasan, Sally Torbert

Program-based budgeting may sound like a technical PFM reform, but the design of programs is about foundational matters: making budgets more transparent, ensuring that public money is spent on the right priorities, and linking budgets more closely to the purposes of spending. This paper, prepared with financial and technical assistance from the World Health Organization, aims to contribute to global knowledge of program budgeting in low- and middle-income countries (LMICs) through the lens of program structure and its definition and evolution in the health sector. By examining budget documents from 30 LMICs, including four case studies, we are able to provide a description of challenges and achievements in existing program-based budgeting globally.

Background: Much has been written about program-based budgeting as a tool for improving public finances generally, and in-service delivery sectors like health specifically. However, this literature has gaps. Much of it is normative rather than empirical, and the empirical literature focuses more on rich countries than LMICs. The literature is also general, and eschews analysis of how program budgeting is implemented within specific sectors of government. These gaps limit our understanding of program-based budgeting at a time when many if not most LMICs are undertaking new program budgeting reforms.

Objective: To document practices in LMICs regarding program-based budgeting in health with the goal of informing reform efforts globally.

Methods: Budget documents were reviewed in 30 countries, mainly in Latin America and Africa, but also Asia, the Middle East and Eastern Europe. Four case studies were carried out, based on a review of documents and interviews with key informants in Brazil, Indonesia, Mexico and Philippines. Data from interviews and documents was synthesized to characterize the nature of program structure across the sample.

Results: LMICs vary widely in their program-based budgeting practices and the degree to which their program structures facilitate transparency, expenditure prioritization and control and accountability for results. Different combinations of programs, sub-programs and performance indicators and targets can serve the fundamental goals of program budgeting, but gaps are observed in most countries in the way program structure supports better PFM. The paper points to communication failures, poor decisions about what to include and exclude from programs, limited explanatory value for budget users of existing program and indicator hierarchies, and a lack of ownership of programs and performance information by legislatures or the wider society, which undermines accountability.

Conclusion: Program-based budgeting has the potential to improve public financial management, but only if certain weaknesses are addressed. Fortunately, while no country has a perfect program-based budgeting system, there are aspects of many countries' systems from which peers can learn as they design their own approaches. Paying attention to the core purposes of programs in a program-budgeting system can help ensure that health budget programs serve the needs of health sector practitioners while also advancing public financial management.

Strengthening Budgeting and Planning As Countries Prepare for Transition from Development Assistance: Experiences from GAVI Eligible Countries

PRESENTER: **Dr. Sarah Alkenbrack**, World Bank Group

AUTHORS: Sally Lake, Mustafa Babak, Chijioke Okoro, Vibhuti Hate

Background:

Achieving universal health coverage (UHC) in LMICs will require governments to mobilize additional domestic resources and ensure those resources are pooled for financial protection. Within this context, countries are also trying to increase sustainability of programs that have traditionally relied on development assistance for financing a substantial share of commodities and operational costs. Increasing domestic resources takes place mainly through the budget appropriation process and is highly influenced by a country's capacity to plan, prepare and defend budgets in ways that align with the country's health sector and development strategies.

Objectives:.

Objectives are: 1) to highlight good practices in budgeting and planning as countries transition from development assistance; 2) to present findings from Ghana, Cameroon and Nigeria looking specifically at budgeting and planning practices needed to ensure sustainable immunization financing as countries prepare for transition from Gavi support; and 3) to discuss how countries are using findings to strengthen their budgeting and planning practices as they plan the transition from development assistance.

Methods:

The case studies in Ghana, Cameroon and Nigeria were conducted using a public financial management assessment protocol developed by the World Bank and tailored for immunization programs. The protocol has informed a series of milestones in budgeting and planning that need to be in place to ensure a sound, credible budgeting process. The protocol was applied to pinpoint specific problems in the budgeting and planning processes, while also identifying at which level the problems can be addressed (e.g., above the health sector; health sector; immunization program level). The findings were used to identify policy actions that could be taken to improve sustainable financing of immunization within the context of UHC.

Results:

The case study from Ghana found that fragmentation in the budgeting and planning process due to a mixed financing system increasingly financed through the National Health Insurance Scheme hinders the predictability of government financing for vaccines and service delivery. The Cameroon study found a disconnect between decentralization of service delivery and the government's budget allocation formulas, which are still highly centralized and therefore undermines the government's ability to increase allocative efficiency and improve equity. In Nigeria it was found that budgeting for vaccines has occurred largely outside the overall budgeting process, with off-budget resources being used to finance the resource gap in an ad-hoc manner. These findings were used to inform the Nigerian Gavi transition plan and the government is now using the Gavi transition to absorb vaccines and immunization service delivery into the government budget, by linking to the medium-term expenditure framework; decreasing reliance on off-budget financing from development partners to fund vaccines; and implementing the Basic Health Care Provision Fund (BHCPF).

Conclusion:.

Strengthening budgeting and planning is critical for mobilizing domestic resources for health as well as ensuring that resources are used efficiently and effectively as countries transition from development assistance and progress towards UHC.

Budgeting for Immunization in 32 African Countries

PRESENTER: **Ulla Kou Griffiths**, UNICEF
AUTHORS: Jennifer Asman, Alex Adjagba, James Odhiambo Oguta, Marybennah Nasimiyu Kuloba, Chloe Cho

Background:

When seeking to ensure financial sustainability of a health programme, existence of a line item in the Ministry of Health (MOH) budget is often seen as an essential, first step. Budget execution and budget monitoring are the remaining two necessary functions in the public financial management system. Vaccine supplies is a basic commodity that can be expected to be included with a specific line item in all MOH budgets. In this study, immunization was used as a reference point for cross-country comparison of budgeting methods in Sub-Saharan African countries.

Objectives:

Study objectives were to (i) verify the number and types of budget line items for immunization services, (ii) compare budget execution with budgeted amounts (iii) compare values with annual immunization expenditures as reported to WHO and UNICEF (iv) analyse whether planning and budget execution differ for countries using programme vs. line item budgeting, (v) determine how countries with no line item plan and execute their vaccine procurement, and (vi) determine whether countries with many line items are constrained in their budget execution.

Methods:

Thirty-eight UNICEF country offices were contacted for obtaining a copy of the pages in the MOH budget and budget execution report where immunization expenses were budgeted for. Open budget portals were also searched for MOH budgets. Budgets were compared across countries in terms of budget structure and amounts budgeted. Following cross-country analysis, five countries were selected for in-depth assessment of the budget implementation process.

Results:

MOH budgets for 2016 and/or 2017 were obtained from 32 countries (84%). We were however only able to gather eight budget execution reports (Lesotho, Mali, Mauritania, Kenya, Kiribati, Niger, Rwanda and Senegal). Seven budgets were easily accessible to the public on either a government website or an open budget portal (22%). The number of line items for immunization ranged between zero (Zimbabwe) and 30 (Cote d'Ivoire), with a median of six. Donor funding was transparently integrated into three budgets; Comoros, Sao Tome and Uganda. The difference between budgeted amounts and expenditures reported to WHO/UNICEF were greater than 50% in 47% of countries. Immunization budgets per child in the birth cohort ranged from US$ 0.50 (Mozambique) to US$ 37.50 (Congo Republic), with an average of US$ 6.79. Out of the total Government health budget, immunization ranged from 0.46% in Uganda to 7.76% in Central African Republic, with an average of 2.01% across the 32 countries.

Conclusion:

While it was challenging to obtain MOH budgets in most countries, it was largely impossible to get hold of budget execution reports. This is highly concerning for budget credibility. Great differences between budgeted amounts and expenditures reported to WHO/UNICEF leads to questioning reporting reliability. Hence, methods used by countries when reporting expenditures must be assessed. Case studies for investigating the remaining study objectives, with the aim of defining optimal budgeting methods, will be completed in time for the conference.

1:30 PM –3:00 PM TUESDAY [Production Of Health, Health Behaviors & Policy Interventions]

Universitätsspital Basel | Klinikum 1 – Hörsaal 4

Organized Session: Mortality

SESSION CHAIR: **Grace Bagwell Adams**, University of Georgia

DISCUSSANT: **Hope Corman**, ; **Laura Argys**, University of Colorado Denver; **Pinka Chatterji**, State University of New York-Albany

Killer Debt: The Impact of Debt on Mortality

PRESENTER: **Dr. Melinda Pitts**, Federal Reserve Bank of ATlanta

In this research, we explore the impact of delinquent debt and creditworthiness on mortality. To do this we take advantage of the individual panel component of the Federal Reserve's Consumer Credit Panel (CCP). The CCP is a nationally representative 5% random sample of U.S. consumers and their household members with information in the consumer credit data system. The quarterly panel follows these individuals from 1999 to the present, with refreshing to account for attrition. The data contain credit balances and delinquencies for different categories of debt. In addition to age and geographic information, the CCP includes an indicator of the quarter of death for individuals who died while part of the panel. This individual-level, objective measure of health can be linked directly to objective measures of the individual's financial well-being. The CCP allows us to follow financial well-being and mortality within the context of a single, individual panel data set.

To address the possibility of reverse causality (poor health leading to increased debt), we use geographic variation in financial distress related to the housing crisis and the Great Recession to identify the causal impact of personal debt on mortality. This is accomplished by identifying the impact of an adverse economic event that is plausibly exogenous to individual financial choices, in our case the housing crisis of 2006-2010, using mortgage delinquency data from the Residential Mortgage Servicing Database from McDash Analytics. We use this information to construct an instrument for individual debt and creditworthiness later in life. To avoid conflating our results with the impact of the time-period of the financial crisis, the analysis of the impact of creditworthiness and debt on mortality is focused on the post-recession time-period of 2011-2016. This is one of the few studies in this literature to address the possibility of reverse causality through the use of an instrument. In addition, our analysis does not rely on self-reported health measures, utilizes individual-level panel data, and has finely detailed individual financial information. This is also the only study in this literature to remove the effect of endogenous migration: we calculate our instrument based on an individual's location before the housing crisis.

Our results are consistent with those establishing a negative association between individual delinquent debt and health. We find that individuals with better credit risk and smaller amounts of delinquent debt have a lower probability of mortality. Addressing issues of reverse causality by use of an instrumental variable strengthens the claim that these findings as causal. Our results imply that policies aimed at improving individual financial solvency may have the additional benefit of promoting health.

Revisiting Maternal Health Programs: Evidence from India

PRESENTER: **Deepmala Pokhriyal**, Georgia State University

India accounts for two-thirds of global maternal deaths and highest number of infant deaths in a year. Given the poor performance of maternal and infant healthcare service indicators, India launched *Janani Suraksha Yojna* (JSY- Safe Motherhood Programme) under National Rural Mission in 2005 to incentivize pregnant women to deliver in health facilities. JSY is one of the largest conditional cash transfer (CCT) programs in the world and aims to increase access to safe pregnancy and delivery services, with the goal of decreasing maternal and child mortality, and morbidity. The program is different from other CCT programs around the world and addresses the key issue of linking supply and demand of maternal healthcare services via a network of village-based health workers. The introduction of poor women to the formal health systems, however, brought additional costs. Thus, in 2011, the government introduced *Janani Shishu Suraksha Karyakaram* (JSSK) to eliminate out of pocket expenditures for pregnant women and provide free services to women giving birth in public institutions.

In this paper, we estimate the causal impact of the introduction of two different maternal health program interventions- CCTs and free health services- on utilization of healthcare services and health outcomes. Primarily, we study the differential impact of the two programs on infant and maternal mortality rates. Although studies have estimated the impact of JSY, some of them do not use nationally representative samples and suffer from external validity while others are flawed mainly due to their improper definition of the treatment. To add, most studies only look at the short term post- period of three years since the implementation of JSY. On the contrary, no study has yet estimated the impact of JSSK on healthcare services. Here, we propose to use nationally representative samples from different data sources to create a new dataset (N ≈ 350,000) with information on maternal health practices, expenditures and health outcomes. The new dataset consists of data from National

Sample Survey Organization, Demographic Health Survey and Indian District Household Surveys. This allows us to have a longer pre- and post- treatment periods for reliable long term effects of the programs. For estimation, we rely on the differences in eligibility rules across states and individuals as our main identification strategy. We expect to find that the programs have a negative impact on the mortality rates and improve the utilization of maternal healthcare services.

Child Access Prevention Laws and Juvenile Firearm-Related Homicides

PRESENTER: **Dr. Joseph Sabia**, San Diego State University, University of New Hampshire & IZA

The most recent mass school shooting in the United States has intensified the discourse over the safe storage of firearms after it was learned that the guns were taken from the shooter's home and belonged to his father (Coaston 2018, Mann 2018). This comes at a time of rising gun violence and increasing support for gun restrictions. A 2017 U.S. survey found that approximately 60 percent of gun owners backed safe-storage requirements for guns in households with children (Barry et al. 2018).

CAP laws encourage the safe storage of firearms by imposing liability on adults who allow children unsupervised access to guns (Giffords Law Center to Prevent Gun Violence 2018). Accordingly, gun safety advocates support CAP laws as a way to limit firearm-related homicides, decrease suicides among minors and decrease the number of children killed by unintentional shootings (Jones 2017, Iannelli 2018). Contrarily, critics argue that safe-storage requirements impede a person's ability to defend their home during a violent intrusion, and that these laws may increase incidences of murders, rapes, robberies, and other violent crimes (Kopel et al. 2000).

As public calls for safe storage grow louder, it is likely that an increasing number of state legislatures will come under pressure to pass CAP laws or toughen their existing CAP requirements. 27 states and the District of Columbia currently have some form of CAP law as of now. Recent estimates suggest that 7 percent of U.S. children (≈ 4.6 million) live in homes with an unlocked firearm (Azrael et al. 2018).

While a literature on CAP laws exists, its focus is almost entirely on unintentional shooting deaths among children (Cummings et al. 1997, Webster and Starnes 2000, Lott and Whitley 2001, Hepburn et al. 2006, DeSimone et al. 2013, Gius 2015) and youth suicides (Cummings et al. 1997, Lott and Whitley 2001, Webster et al. 2004, DeSimone et al. 2013, Gius 2015). With a few exceptions, little is known about how these laws affect violent crime and, specifically, homicides.

Using the FBI's *Supplementary Homicide Reports* (SHR), a data source unique to the literature, we are the first to explore the relationship between CAP laws and firearm-related homicides committed by juveniles. We focus on homicides, rather than other forms of violent crime, because information on the offender's age is available and the laws generate predictions as to which age groups should be most affected, predictions that could not be tested without age-specific information. Examining the period 1985-2013, a span when 26 states and the District of Columbia adopted CAP legislation, our estimates suggest that CAP laws are associated with a 19 percent reduction in the expected number of firearm-related homicides committed by juveniles, and this effect is driven by states enforcing a "negligent storage" standard, the strictest form of CAP legislation. Furthermore, we find that CAP laws are not associated with firearm-related homicides committed by adults nor are they associated with non-firearm-related homicides committed by juveniles, providing evidence that the relationship between CAP laws and juvenile firearm-related homicides is causal.

Effects of Residential Segregation on Black and White Mortality in the United States

PRESENTER: **Dr. Nancy Breen**

AUTHORS: Johan Uribe, Mark Fossett, Marcia Gomez, Ernest Moy

Since 1900, public health data consistently have shown persistently higher rates of mortality among blacks compared to whites in the United States. Understanding the causes for this disparity has eluded researchers. Previous studies have shown that mortality is associated with a range of social determinants, including education, income, and wealth. Living in segregated areas --whether segregated by race/ethnicity or income-- affects health, schooling, employment and other factors including quality of life, and these factors accumulate over the life course. Historically, laws, regulations, and zoning have crowded blacks into areas isolated from jobs and schools, which has led to poor schools, unemployment, and over policing observed in resource-deprived black neighborhoods today. Because geographic isolation creates the conditions for systematic sub-standard resource distribution, this study explores a Residential Isolation Index. Since there may be complex interactions between racial segregation and socioeconomic segregation, two causal variables are examined, Racial Isolation (RI) and RI's joint incidence with economic deprivation, namely Racial Isolation of Poverty (RIP). Pathways from RIP to premature mortality for blacks and for whites is tested and compared with RI alone. Age-adjusted mortality in metropolitan counties stratified by race (non-Hispanic white and non-Hispanic black) is the outcome derived from the US National Vital Statistics System. Data from the American Community Survey, Small Area Income and Poverty Estimates, and the FBI Uniform Crime Reporting Program were used to construct measures of county-level social stressors, including RI and RIP, for every metropolitan county in the United States with a sufficiently large population to produce reliable estimates. Data from 307 different metropolitan counties across the United States, encompassing every state except Alaska and Wyoming were used to test whether metropolitan areas with high rates of RIP are associated with preventable mortality. The study found that RI and RIP effects are similarly associated with black mortality. For example, RI is associated with 107 more deaths and RIP is associated with 105 more deaths. RIP had a large effect on white mortality (86 more deaths) and RI was insignificant. The innovation of this approach is to consider the long-term effects of racial isolation and economic deprivation in combination using RIP.

1:30 PM –3:00 PM TUESDAY [New Developments In Methodology]

Universität Basel | Kollegienhaus – Hörsaal 001

Recent Advances in Health Econometrics

SESSION CHAIR: **Stefan Boes**, University of Lucerne

Copula Models for Addressing Non-Ignorable Missing Data in Health Econometric Evaluation

PRESENTER: **Manuel Gomes**, UCL

AUTHORS: Rosalba Radice, Giampiero Marra

Missing data remain a major concern in health econometric evaluation. For example, health-related quality-of-life (HRQL) outcomes are widely used for establishing the benefits of health interventions, but these are prone to missing data. Patient's HRQL are typically self-reported and the chances of completing the HRQL questionnaires tend to be related to patient's true health status, i.e. missing data are 'non-ignorable'. Non-ignorable missing data pose major challenges for estimating causal effects because the substantive model is typically not identifiable without imposing further assumptions. For example, the Heckman selection model has been widely used for handling non-ignorable missing data (also known as 'incidental truncation') typically by jointly estimating the missingness and outcome, assuming these are normally distributed. While recently proposed econometric approaches showed increased robustness to departures from normality, these are limited to specific joint distributions (e.g. bivariate *t*-distribution). Semi-parametric/non-parametric selection models are also available but they have limited applicability and their implementation is challenging in causal inference.

This paper addresses these concerns by proposing a copula-based selection approach that accommodates a wide range of non-normal distributions. For example, HRQL outcomes (e.g. EQ-5D-3L) often raise challenging distributional features such as left-skewness and bimodality. The approach also offers greater flexibility in the choice of functional form for outcome and selection models. While the copula approach is fully parametric, it is computationally more tractable than semi-parametric/non-parametric approaches in a regression context, and allows the analyst to explore the robustness of the results to different *untestable* modelling assumptions. Another advantage is that the approach allows the correlation structure between the missingness and outcome models to be specified independently from the marginal distributions.

This work is motivated by the REFLUX study, which evaluates the causal effect of laparoscopic surgery compared to medical management on long-term HRQL in patients with reflux disease. The HRQL outcome (EQ-5D-3L) is missing for 55% of patients and study investigators were concerned that patients who responded poorly to surgery lost interest in the study and were less likely to return EQ-5D-3L questionnaires. They were also concerned about the lack of valid 'exclusion restrictions', i.e. variables strongly predictive of missingness but conditionally independent of patient's health status. When applied to the REFLUX study, the copula approach reported a smaller effect of surgery and narrower 95% CIs compared to commonly used selection models in health econometrics, such as Heckman model and full-likelihood methods.

Through simulations we compared the relative performance of the copula approach with other methods for estimating treatment effects. In settings with valid exclusion restriction(s), all methods produced unbiased estimates, but the copula model provided the lowest mean squared error. With weak/no valid exclusion restriction(s), unlike the other methods, the copula model provided unbiased, precise estimates. These results were robust to alternative outcome and selection model specifications, and outcome distributions.

In conclusion, the paper shows that copula models can make more plausible distributional assumptions when handling non-ignorable missing data, and illustrates how to implement the approach in standard software. Ongoing work is extending this approach for handling both missing outcomes and confounders.

Bayesian Estimation of Food Price Elasticities Using Prior Price Elasticities and Experimental Data in a Large Demand System

PRESENTER: **Nhung Nghiem**

AUTHORS: Liana Jacobi, Andres R Hassan, Wilma E Waterlander, Tony Blakely

Background:

Diets are a major cause of disease burden, and influencing population diets through pricing interventions is an important policy option. Food price elasticities (PE) are essential to assess the potential impacts of such interventions. However, food PEs are notoriously difficult to estimate. Existing econometric estimates of food PEs are often poor, being based on observational datasets that are not good for policy analysis due to low price variations and failing to utilise prior information.

Methods:

We have introduced two major innovations to obtain PE estimates: (i) the use of experimental data through 'virtual shopping' for a wide range of foods with price variations maximised along dimensions of potential public health interventions (sugary drinks tax, fruit and

vegetables subsidy, saturated fat tax, sugar tax, and sodium tax); and (ii) the inclusion of food PEs from previous observational studies within the analysis of multi-stage Linear Almost Ideal Demand system (LAIDS) via prior assumptions in a Bayesian estimation framework.

We combine a multi-stage Bayesian approach to estimate a set of demand systems using the Edgerton aggregation approach to obtain PE matrices for a total of 23 food groups.

Then we simulate policy implications from a soft drinks tax, saturated fat tax and fruit and vegetables subsidy, using our posterior PE matrix in order to illustrate changes in food purchase and expenditures.

Results:

The outputted posterior PE matrices, with small cross-PEs between foods theoretically unlikely to be complements or substitutes, have face validity. As expected, all own-PEs are negative (range: -0.31:-2.62) reflecting that these foods are normal goods. Diet and regular soft drinks had own-PEs of -0.62 & -0.77, respectively, with standard errors below 0.1. The estimated own-PEs for fruits, vegetables, and cheese, cream and milk & yoghurt and eggs on the other hand were either close to or greater than 1 in absolute terms ranging between -0.93 and -1.52.

We found meaningful changes in food and selected nutrients purchase under the three food policies. For example, regular soft drink consumption reduced by 20.8% for a 30% soft drinks tax; fruit and vegetables increased by 21.1% and 39.3% with a 20% fruit and vegetables subsidy; and saturated fat reduced by 26.4% for a $3 per 100g saturated fat tax.

Conclusions:

This paper demonstrates innovations and an interdisciplinary approach in food PE estimation that we believe should increase the rigour of PE estimation. The aggregation and optimisation approach for the prior elicitation enables researchers to include PE information from different studies and food groups while ensuring that the model parameters are sensible and consistent with microeconomic conditions.

While natural experiments (with growing momentum from countries around the world introducing food taxes and subsidies, including Mexico, Hungary, the UK and numerous others) and randomized trials provide evidence that we must consider when informing policy. Inevitably when policies are being newly considered – or applied in new contexts and ways – estimation using PE is highly likely. We proffer the methods in this paper as one attempt to increase the rigour of that estimation.

Difference-in-Differences Estimation When the Dependent Variable Is Ordinal

PRESENTER: **Arne Risa Hole**
AUTHOR: Anita Ratcliffe

This paper proposes an estimator for the treatment effect when using difference-in-differences with ordered data. Ordered data are pervasive in health economics, with examples including self-assessed health and subjective wellbeing, and these data are routinely analysed using non-linear models, such as the ordered probit model. At the same time, the method of difference-in-differences is widely applied in policy evaluation, but while this identification strategy readily applies to continuous outcomes, it is often implausible to assume common trends in models respecting the statistical properties of limited dependent variables (Blundell and Costa Dias, 2009; Lechner, 2011). Consequently, ordered outcomes are frequently analysed with linear regression methods when using a difference-in-differences strategy (see e.g. Gregg et al., 2009; Brodeur and Connolly, 2013). As an alternative approach, we suggest analysing the treatment effect in terms of the response probability, and assuming common trends at the level of the latent index. An advantage to this approach is the ability to investigate whether the treatment effect materialises across the entire distribution of the outcome variable or is limited to particular sections of it. For example, a reduction in subjective wellbeing (SWB) driven by a shift from high to moderate levels of SWB might warrant a different policy response compared with a shift from low to very low SWB levels. In an application of the estimator to the impact of the 2005 London bombings on the wellbeing of adolescent Muslims we find that linear regression performs relatively well if the goal is to estimate changes in the conditional mean of happiness and depression. However, by retaining the ordinal character of subjective wellbeing, we find strongest evidence that the bombings influenced the lower end of the happiness distribution, with suggestive evidence of an impact across the entire distribution.

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Mean-Variance Social Welfare, Risk and Non-Normality

PRESENTER: **Raf Van Gestel**, Erasmus University Rotterdam

AUTHORS: Tom Van Ourti, Dr. Owen O'Donnell

A quadratic, prioritarian and symmetric Social Welfare Function summarizes social preferences on outcome distributions with the mean and variance. Because this approach is commonly thought to be restrictive, we extend this Mean-Variance framework to non-normal distributions by allowing for a probability mixture of the outcome distribution. This reflects a situation in which for example some individuals benefit from the treatment while others do not. Individuals may then be uncertain about which group they belong to and which position they take in the group. In other words, they face two different risks: between-and within-group risk.

We use this prioritarian SWF to evaluate and choose between different treatments. In general, with a quadratic SWF, a decision maker prefers treatments with a higher mean and/or a lower variance. When allowing for a probability mixture, there is also a preference towards treatments with lower between-group risk.

We obtain the parameters used in the SWF from applying Finite Mixture Models to estimate group-specific means and variances. We apply our suggested approach to data from the Trials of Hypertension Prevention. I.e. we compare how different non-pharmacological interventions affect systolic blood pressure. While applied to medical trial data our approach is readily extended to other applications.

1:30 PM –3:00 PM TUESDAY [Evaluation Of Policy, Programs And Health System Performance]

Universität Basel | Kollegienhaus – Hörsaal 102

Inpatient Care and Patient Outcomes

SESSION CHAIR: **Jonathan Stokes**, The University of Manchester

Estimating the Impact of Patient Safety Incidents on Patients' Quality of Life Using Patient Reported Outcome Measures

PRESENTER: **Ms. Mimi Xiao**, Centre for Health Policy, Imperial College London

AUTHORS: Søren Rud Kristensen, Elias Mossialos

The burden of patient safety events is most often characterised in terms of their impact on treatment costs, including length of stay or readmission. Only a few studies have attempted to estimate the impact of patient safety events on patients' quality of life (QOL) and these have primarily relied on primary data collection focusing on a narrow set of conditions, or relied on strong assumptions about the impact of incidents on healthy life years. The existence of Patient Reported Outcome Measures (PROMS) data linked to large routinely collected data allows us in this paper to estimate the impact of patient safety incidents on patient reported quality of life.

We use English PROMS data linked to Hospital Episode Statistics from 2013/14-2016/17. The PROMs data covers 4 elective conditions: hip surgery, knee surgery, hernia repair and varicose veins. Quality of life is measured using generic (EQ-5D) and condition specific QOL instruments (Oxford Hip and Knee score, Aberdeen Vericose Vein score). Patient Safety Incidents (PSIs) are measured using 12 of the US Agency for Healthcare Research and Quality (AHRQ) PSI indicators.

We estimate loss in quality adjusted life years (QALYs) attributable to PSIs by comparing quality of life improvements after surgery between groups of patients that do and do not experience a PSI, using difference in difference estimation. On average, patients undergoing surgery reported higher quality of life after surgery, but this varied between conditions, with most patients reporting improvements after hip replacement, and fewest patients reporting improvement after groin hernia surgery. Incidence rates for the general sample population varied between 0,005% (retained surgical item after surgery) and 4.5% (postoperative sepsis). Our analysis is still ongoing, but we will compare our findings to previous studies that found that QoL improvements were 4-7% lower for patients reporting complications after surgery.

The Influence of Insurance Status on Waiting Times for Hospital-Based Services in Ireland

PRESENTER: **Richard Whyte**, Economic and Social Research Institute

AUTHORS: Sheelah Connolly, Maev-Ann Wren

Introduction: An objective of most healthcare systems is to ensure timely access to necessary healthcare services. However, in Ireland long waits for public hospital services are common. There is a belief that those with private health insurance can access private services in a more timely manner. In 2008, a number of reforms were introduced in an attempt to ensure a more equitable access to hospital-based services. These included the development of a 'common waiting list' for all patients, irrespective of their public or private status.

Aim: The aim of this paper is to analyse waiting times in Ireland for hospital services for public and private patients before and after the introduction of the 2008 reforms.

Methods: The analysis uses data from the 2007 (n = 21,253) and 2010 (n=15,673) health module of the Quarterly National Household survey (QNHS) in Ireland. The module includes information on demographics, socio-economic and health status, insurance status and waiting times for hospital based services. The proportion of the population who experienced a long wait, defined according to service specific national and

international waiting time targets, for outpatient, inpatient and day-case procedures was quantified in the period before (2007) and after (2010) the reforms.

Results: Initial analysis found that a large proportion of those waiting for treatment waited 9 months or longer in 2007: that is 16% of those waiting for an outpatient appointment, 24% of those waiting for an inpatient admission and 11% of those waiting for a day-case procedure. There was an increase in the proportion of those waiting 9 months or longer in 2010.

There was also evidence of a differential in the proportion waiting 9 months or more between those with and without insurance. In 2007, 16% of those with insurance and 28% of those without insurance waited nine months or more for an inpatient admission, while in 2010, 14% of those with insurance and 34% of those without insurance waited nine months or more. For outpatient appointments, the proportion of uninsured people waiting 9 months or longer increased by a larger amount than did the proportion of insured people waiting over 9 months. The difference in waiting times for day-case procedures between those with and without insurance narrowed slightly during this period.

Discussion: The analysis has shown differences in waiting times for people with and without private health insurance in Ireland. These differences persisted after the introduction of a common waiting list for public hospital treatment. Further policies may be required to reduce the proportion of the population with long waits as well as to reduce the inequity between those with and without private health insurance. Subsequent analysis will use regression techniques to examine the contribution of various factors (including insurance, health and socio-economic statuses) to long waiting times.

Spatial Interdependence of Acute Inpatient Care in Canada

PRESENTER: **Li Wang**, McMaster University
AUTHOR: Michel Grignon

ABSTRACT

Objective. To evaluate the interdependence of productive efficiency across hospitals in Canada: is efficiency in producing acute inpatient care in one hospital affected by the efficiency of neighbouring hospitals? There can be negative influence, if hospitals are in competition (e.g., shift higher risks to other hospitals) or positive ones if hospitals collaborate and transfer patients according to need.

Data Sources/Study Setting. We use administrative data collected by the Canadian Institute for Health Information (CIHI): the Canadian Management Information System (MIS) database (CMDB), the Discharge Abstract Database (DAD) for fiscal year 2012– 2013, and addresses of hospitals from Hospital Service Providers (HSP).

Data Collection/Extraction Methods. Information on acute inpatient episodes of care (number weighted by intensity of care and quality of outcomes) was extracted from the DAD. The cost of the inpatient care was extracted from the CMDB. Spatial contiguity (distance) and binary (province) weighting matrix are derived using GIS. Determinants of efficiency scores (such as average length of stay or level of education in the population living in the catchment area of the hospital) were extracted from Indicators of Health System Performance (a database on hospital maintained by CIHI).

Study Design. The first stage is to generate standard bias-corrected efficiency scores through data envelopment analysis. The second stage is to detect spatial interdependence on these efficiency scores using the spatial regression model (SRM), varying the distance threshold used to define maximum distance of influence. We then estimate the influence of determinants of efficiency controlling for the effect of spatial interdependence among hospitals.

Principal Findings. The analysis shows substantial and significantly positive spatial interdependence effects on the efficiency of acute inpatient care in Canada: with maximum distance defined as120km, productive efficiency in acute inpatient care in one hospital is increased by 0.3% for each percentage increase in efficiency of other hospitals in the area. These are robust to changes in the definition of catchment areas but there is no spatial interdependence effect if we add provincial boundaries to the definition of maximum distance for influence. However, adding spatial interdependence to the list of determinants of productive efficiency does not affect their estimated influences and we find that hospitals with fewer long term patients, more acute transfers and more beds are more efficient.

Conclusion. Hospitals in Canada are part of a network of cooperation, through transfers of patients on the basis of need, and not in a competitive environment. This may be linked to the main mode of payment (global budget), even though many provinces are now moving toward activity-based funding.

Key Words. Interdependence, Technical efficiency, Data Envelopment Analysis, Spatial regression model, spatial weighting matrix

The Effect of the Portuguese Primary Care Reform on Avoidable Hospitalizations (2000-2015): A Difference-in-Difference Analysis.

PRESENTER: **Klara Dimitrovova**, Escola Nacional de Saúde Pública, Universidade NOVA de Lisboa
AUTHORS: Mr. Julian Perelman, Manuel Serrano Alarcon

Background

In 2006, a major Primary Care (PC) reform was initiated in Portugal. The most significant aspect of this reform was the creation of a new organizational model of PC provision: the Family Health Practices (FHP), which consist of small voluntarily constituted multidisciplinary teams, with functional autonomy and partly financed through pay-for-performance (P4P). The P4P is based on quality and efficiency indicators that can be general or specific to certain health conditions, such as diabetes and hypertension. Also, all patients covered by FHPs have a designated general practitioner (GP), which ensures the continuity and comprehensiveness of care. By exploiting the non-coincident creation of FHPs over municipalities and years, we assessed the impact FHPs on ambulatory-care sensitive conditions (ACSC), that is, on hospitalizations that can be avoided through adequate PC.

Methods

We used data from the 278 Portuguese municipalities, from 2000 to 2015 (n=4,448). The outcomes were measured by the overall rate of ACSC, diabetes-related-ACSC, and circulatory-disease-related-ACSC. To estimate an overall effect of the PC reform we used a difference-in-differences (DiD) approach, by contrasting the evolution of the rate of ACSC in adopting and non-adopting municipalities. Since FHPs were voluntarily created, we expect that their opening might be associated with municipality characteristics. Actually, descriptive analysis show that FHPs have mainly opened in urban municipalities with a lower proportion of elderly and a higher purchasing power. Such characteristics were included in our DiD regression, as well as municipality fixed-effects, to account for other pre-existing conditions and regional specific non-linear trends. In this context, our main identifying assumption implies that ACSC trends in all municipalities would be parallel in the absence of the PC reform, conditional on the set of variables we control for. We also estimated the intensity of the implementation of the PC reform, using as dependent variable the rate of FHP per 10,000 inhabitants. Finally, we included leads and lags in our DiD model to test for the parallel trends assumption and to evaluate the impact of the reform over time, respectively.

Results

During the period under analysis, 448 FHPs were created over 126 municipalities. As a result, in 2015, there was an average of 0.67 FHP per 10,000 inhabitants in the municipalities under the reform. The average ACSC rate was 8.59 in 2000, per 1,000 inhabitants, for 13.02 in 2015. DiD results showed that the PC reform significantly decreased the yearly ACSC rate by an average of 0.9 per 1,000 inhabitants ($p<0.01$). In particular, we estimated that establishing one more FHP per 10,000 inhabitants reduced the ACSC rate by 0.85 per 1,000 inhabitants ($p<0.1$). Regarding the incentivized areas, we found contrary results: a positive but non-significant effect of the reform in diabetes-related-ACSC ($\beta=0.07$, $p=0.196$) and a negative and significant effect on the circulatory-disease-related-ACSC ($\beta=-0.34$, $p<0.01$).

Conclusions

The Portuguese PC reform significantly reduced the rate of ACSC. Specifically, FHPs have improved the global responsiveness of PC, decreasing globally the inadequate use of hospital care. However, this finding was not confirmed for diabetes care, which was however a major P4P indicator.

1:30 PM –3:00 PM TUESDAY [Economic Evaluation Of Health And Care Interventions]

Universität Basel | Kollegienhaus – Seminarraum 103

Emerging Issues and Methods in Economic Evaluation

SESSION CHAIR: **Paula Lorgelly**, King's College London

Fat to the Future: A Dynamic Microsimulation Model to Evaluate the Long-Run Health and Economic Effects of Obesity Policies

PRESENTER: **Dr. Norman Maldonado**, Jorge Tadeo Lozano University

AUTHORS: Sandra Marcela Camacho MD, Enriqueta Cueto, Carlos H Arango-Bautista

Background. Obesity is an epidemic that has reached global proportions. As an important risk factor for medium and long-term development of Non Communicable Diseases (NCDs), obesity has become a priority for public health policy.

Motivation. Design, adoption and implementation of effective policies to control the epidemic need evidence linking obesity with (i) its determinants, to get multiple sectors on board, (ii) health outcomes (comorbidities and mortality) to raise awareness of the loss in human lives, (iii) costs for the health system and the economy to galvanize ministries of finance and development to make social investments, and (iv) time, to do target monitoring on Sustainable Development Goals (SDGs) and to make politicians and policymakers accountable and liable between political cycles. This evidence need to be available for the inaction scenario as well as for scenarios of implementation of the policies.

Objective. This paper develops a dynamic microsimulation model to analyze the health and economic effects of obesity policies in the medium and long-term. These effects are based on the backward and forward linkages of obesity. For the first ones, the model includes intermediate determinants of obesity such as calorie intake and expenditure, physical activity and diet as well as structural determinants such as income and education. Forward linkages include the relationship between obesity and cardiometabolic diseases, as well as utilization and costs of healthcare.

Methods. The model uses complexity theory to create an artificial society that reproduces the observed characteristics of a population. Then, it uses microsimulation to calibrate the artificial society, and to simulate the life course of every person in the artificial society year by year, creating yearly microdata for the period 2019-2050. Simulation of the life course is based on available scientific evidence and on parameters estimated from representative surveys and administrative data. Results are summarized in a set of aggregate indicators for every year, calculated from the microdata.

Results. In 2018 51.5% of adults had excess weight, and with no intervention it is expected to reach 63.6% in 2050. Policy evaluation shows that, on average, a 20% tax on SSBs would reduce consumption of SSBs on 24% and prevalence of excess weight (overweight and obesity) would decrease in 1.2 percentage points per year. This reduction is expected to avoid 0.2% of incident cases of diabetes mellitus and 1.4% of incident cases of high-blood pressure between 2020 and 2050. Tax revenue is estimated to represent 40% of the current budget for public health in Risaralda, providing significant resources for complementary actions on obesity.

Conclusion. Evaluation of obesity policies needed to make the case for policymakers, must be based on a comprehensive understanding of the problem, including its intermediate and structural determinants as well as its consequences on the health system and the economy overall. This paper shows that complex systems, artificial societies and microsimulation, can provide that kind of evidence. For the particular case of Sugar-Sweetened Beverages (SSBs), the paper shows that taxes on SSBs are a necessary but not a sufficient intervention to control the obesity epidemic.

Cost-Effectiveness of Bariatric Surgery for Type 2 Diabetes Mellitus in China：Results from a Markov Model Analysis

PRESENTER: **Dr. Xin Li**
AUTHORS: Bing Wan, Wei Guan, Yi Yang Zhan

Objective: To estimate the cost-utility of bariatric surgery relative to ordinary medication therapy for the management of recently diagnosed type 2 diabetes in obese patients in a 40-year time horizon from a Chinese health insurance payer perspective.

Methods: A decision analytic model using the Markov process was built and analyzed to compare the 40-year time costs and quality-adjusted life-years (QALYs) beweeen bariatric surgery and ordinary medication therapy. Intervention and health care costs for obese patients with type 2 diabetes in bariatric surgery group were calculated based on observed resource utilization in real medical practice from the hospital information system. The corresponding costs in ordinary medication therapy group were derived from Nanjing urban employee basic medical insurance database. The proportion of patients in each group with remission of diabetes at 1 year was observed in the hospital information system. Health-related quality of life was estimated from published literature. Future costs and health outcomes were discounted at 5% annually. A series of sensitivity analyses were performed.

Results: In the base-case analysis, bariatric surgery was both more effective and less costly than the ordinary medication therapy. Over a 40-year time horizon, the mean discounted costs were 79317.80 RMB per surgical therapy patient and 157703.16 RMB per ordinary medication therapy patient. The surgical and ordinary medication therapy patients lived 16.84 and 15.24 discounted QALYs, respectively. Compared to medication therapy, bariatric surgery was associated with a mean health care saving of 78385.36 RMB and 1.6 additional QALYs per patient. Uncertainty around the parameter values was tested comprehensively in sensitivity analyses, and the results were robust.

Conclusions: Bariatric surgery is a dominant intervention over a 40-year time horizon, which leads to significant cost savings to health insurance payer and increases in health benefits for managing recently diagnosed type 2 diabetes in obese patients in China.

Multiple Effect Health Economic Evaluation of the Ahead of the Game Study in Adolescent Males

PRESENTER: **Simon Eckermann**, University of Wollongong
AUTHORS: Stewart Vella, Utsana Tonmukayakul, Nikki McCaffrey

Background

Robust health economic analysis in comparing relative incremental effects and costs of alternative strategies needs to jointly consider decision analytic coverage and comparability principles to avoid bias. In this respect there can be dangers where health economic evaluation attempts to collapse relative effects across alternative interventions or strategies into a single effect measure. While quality adjusted life years can weight and combine patient morbidity effects over survival time in many health related settings multiple key effects are not able to be integrated with patient survival, for example in palliative care patients ability to finalise affairs, family distress and personal choice for place to. Joint orthogonal evaluation of multiple effects and costs has previously been developed using the net benefit correspondence theorem (NBCT) and illustrated in palliative settings for 2 effect and 3 strategies cost effectiveness evaluation. Employing these methods cost and effect evidence is compared in cost disutility space rather than with historical convention on the cost effectiveness plane. Importantly this enables radial properties (performance improves in reducing cost and disutility) which have also previously been illustrated to provide distinct advantages in multiple strategy as well as relative efficiency comparisons in practice.

Study aim

This paper aims to extend and illustrate NBCT methods for an even more challenging setting, evaluating 13 relative effects alongside implementation cost and hence a 14 dimensional analysis of a mental health promotion community intervention in adolescent males, the Ahead of The Game intervention.

Methods

The evaluation represents a form of cost consequences analysis under uncertainty or a cost effectiveness analysis allowing for multiple effects. The net benefit correspondence theorem is applied with non orthogonal methods employing radar plots on the C-DU space. This enables simple and feasible graphical presentation not feasible with orthogonal methods in comparing 13 effects and costs. For analysis under uncertainty given pre-post change and different levels of missing data across 14 variables, a robust bootstrapping approach was developed which importantly allowed inclusion of all observed effect change and cost data observed by individual. Specifically, randomly resampling with replacement for each of 1000 replicates of the same number of individuals as in the study in each arm who had change data on any variables (effect change from baseline and /or cost data), 343 participants in the AOTG arm and 273 in the control arm.

Results

Deterministic analysis show the AOTG strategy having lower disutility and higher effects in all 13 dimensions and statistically significant benefits on 10/13 dimensions and all 5 domains when dimensions were simply aggregated. This points to AOTG dominating current practice if down-stream health system cost savings associated with better mental health management are greater than the conservatively estimated $37.47 mean direct cost per individual of implementing the AOTG program.

Conclusion

The AOTG strategy is shown as an effective mental health intervention that also likely has net cost saving. Methods presented have distinct advantages over cost consequences analysis in allowing for uncertainty and avoiding perils of partialisation with single effect cost effectiveness analyses.

Health Service Planning for the Future: Using Simulation Modelling to Bridge the Gap in Overburdened Specialist Outpatient Service Planning

PRESENTER: **Tracy Comans**, The University of Queensland
AUTHORS: Maree Raymer, Angela Chang, Shaun O'Leary, Sonya Osborne, Hannah Carter, Tania Cavanagh, Dean Blond, David Smith, Nicole Moretto

Background: Demand for public hospital services in Australia continues to rise above capacity. Patients with musculoskeletal conditions wait too long on specialist outpatient waiting lists; the majority of whom do not require surgical intervention and can be managed by advanced physiotherapists. Physiotherapist-led services are highly cost-effective and have been embedded in orthopaedic and neurosurgery outpatient services across Queensland, Australia, to help ameliorate capacity constraints. Simulation modelling has recently been applied to inform the optimal scale and professional mix of services required to meet key access targets, but little is known about the factors that influence the adoption of simulation modelling findings and its value in healthcare settings. This study aimed to: (i) apply simulation modelling to identify the optimal scale and mix of surgeon and physiotherapist-led services, (ii) assess the adoption of simulation modelling recommendations into proposals for service re-design, (iii) explore stakeholder perspectives about the role of simulation modelling in service planning, and (iv) investigate the economic impact of using simulation modelling in service planning.

Methodology: We constructed discrete event simulation models using AnyLogic software to determine the optimal scale and combination of services to meet target wait times for five orthopaedic and neurosurgery outpatient services in Queensland, Australia. We undertook a qualitative study using an implementation science approach to assess the adoption of, and stakeholder perspectives about, simulation modelling in service planning. We conducted a cost-consequence analysis to investigate the economic impact of simulation modelling to change service delivery from an Australian health system perspective.

Results: The simulation modelling base case showed the orthopaedic and neurosurgery outpatient waiting lists are projected to grow, resulting in the majority of semi- and non-urgent patients (74–100%) breaching target wait times at 5 years. Scaling up services and maximising physiotherapist-led activity can help achieve wait time targets in the medium term. We used scenario analysis to test the likely impact of different feasible service changes. Four of the five services incorporated modelling recommendations into proposals for service re-design. We identified leadership engagement, knowledge and beliefs about modelling, timing and the need for change as factors influencing the adoption of the modelling results. Stakeholders reported that modelling encouraged evidence-based, strategic and longer-term service planning. The cost-consequence analysis of the modelling showed that the additional investment committed by one of the services would result in 2,344 fewer patients breaching target wait times at 12 months, at an estimated cost of AU$373 per long wait case avoided.

Conclusions: To the authors' knowledge, this is the first time discrete event simulation has been implemented to inform decision making for outpatient service provision across multiple public health districts in Queensland and the first attempt to evaluate the implementation and its economic impacts on outpatient service delivery. Our high rate of adoption of modelling recommendations and qualitative findings may provide valuable insights to increase the uptake of healthcare modelling recommendations in outpatient service planning. Taking an active approach to waitlist management could improve patient access to care, representing good value for money to the health system funder.

Using Latent Class Growth Analysis to Identify Quality of Life Trajectories in Total Knee Replacement Patients

PRESENTER: **Michelle Tew**, University of Melbourne

AUTHORS: Philip Clarke, Kim Dalziel, Peter Choong, Anne Smith, Michelle Dowsey

Background

Total knee replacement (TKR) is widely regarded as an effective and cost-effective treatment for osteoarthritis. Patients' health-related quality-of-life (QoL) generally improve following surgical intervention however, up to 20% of TKR patients do not gain clinically meaningful improvement following surgery. There is growing evidence that QoL is an important predictor of outcomes such as hospitalisation and mortality. Therefore, understanding patients' QoL trajectories can reveal important information on disease progression and outcomes. Several studies have demonstrated TKR to be most cost-effective among those with severe knee osteoarthritis, poorer functional status and lower pre-surgery QoL. However, standard approach in economic evaluations is to treat patients as a homogenous group and cost-effectiveness results are presented as a group average with given uncertainty.

Objectives

The aim of this study was to employ latent class growth analysis (LCGA) to 1) identify specific QoL trajectories following TKR, 2) examine patient characteristics of identified trajectory groups and 3) estimate quality-adjusted life-years (QALYs) of each trajectory group.

Data

Data on all patients who had elective TKR between January 1, 2006 and December 31, 2011 were extracted from the St. Vincent's Melbourne Arthroplasty Outcomes Registry which captures patient demographics, existing co-morbidities, operative and post-operative complications, death and patient reported outcomes (SF-12). Responses from SF-12 were transformed into utility scores using the published SF-6D algorithm. Utilities at baseline (pre-surgery), year 1, 2, 3, 4 and 5 were used for analysis.

Methods

LCGA was conducted using utility scores to categorise patients into classes based on their QoL trajectories over 5 years post-surgery. Assessment to identify the optimum number of classes was considered using minimum values of goodness of fit measures Bayes Information Criteria (BIC) and posterior probability diagnostics. Multinomial logistic regression weighted by the probability of class membership was used to determine patient characteristics that contribute to the heterogeneity in QoL trajectories. QALYs were calculated using area under the curve. The number of QALYs gained from TKR was calculated as the difference in QALYs observed and QALYs expected assuming a control group where the patient did not undergo surgery and experienced no change from baseline utility.

Results

A total of 1,553 patients contributed to the analysis. Preliminary analysis indicates the presence of 6 distinct QoL trajectories; minimal improvement following surgery (18%), low baseline QoL with moderate QoL improvement (30%), significant improvement with sustained effect (19%), significant improvement without sustained effect (18%), slow, progressive improvers (9%) and high baseline QoL with moderate improvement (7%). Age and presence of co-morbidities appear to be important determinants of low QoL trajectories. Gains in QALYs varied across different trajectory groups.

Conclusions

There appears to be important unobserved heterogeneity in QoL trajectories in patients undergoing TKR resulting in variable gains in QALYs across different trajectory groups. This heterogeneity can matter to cost-effectiveness estimates. LCGA has the potential to provide valuable information in assessing sub-groups and heterogeneity in cost-effectiveness analysis.

1:30 PM –3:00 PM TUESDAY [Production Of Health, Health Behaviors & Policy Interventions]

Universität Basel | Kollegienhaus – Seminarraum 104

Income and Inequality #1

SESSION CHAIR: **Simantini Mukhopadhyay**, Institute of Development Studies Kolkata

The Impact of Income on Mortality: Evidence from a Natural Resource Boom

PRESENTER: **Dr. Jonas Minet Kinge**, Norwegian Institute of Public Health

AUTHORS: Jostein Grytten, Jonathan Skinner

Income is positively associated with longevity at the individual level. However, it is intrinsically difficult to establish how persistently high levels of income affect health over the long run. We examine the effects of quasi-experimental variation in short- and long run income on cause specific mortality. We undertook a register-based population study of Norwegian residents aged 18 years and above, between 1967 and 2016, using data from the Norwegian Income Register and the Cause of Death Registry. We estimate how the Norwegian oil boom, centered

in the Rogaland region starting in the 1970s, affected income and mortality using difference-in-difference, difference-in-difference-in-difference and instrumental variable designs. To address the concern for in-migration induced by the oil boom, we use the municipality of residency in 1967, prior to the boom, to determine whether they belong to treatment or comparison municipalities. Our preliminary findings suggests that the oil boom increased short- and long run income significantly for men in Rogaland, compared with men in other counties in Norway. The increase in both short- and long run income was significantly more pronounced for men in Rogaland with vocational education, compared with an academic education. The increased income, resulting from the oil boom, reduced mortality in men, with the largest impact on ischemic heart disease mortality. Our results are consistent with the hypothesis that higher income reduces stress-related mortality.

Income Inequalities in Mortality: Evaluating Long Term Mortality Gap Trends in Brazil

PRESENTER: **Dr. Carlos Riumallo Herl**, Erasmus University Rotterdam
AUTHOR: Philipp Hessel

Background

Evidence from recent studies has shown that mortality inequalities in terms of education and income have been narrowing in recent decades. While optimistic, such studies provide a limited vision of progress around the world since all of them have been developed in developed countries where such trends may be more likely, and more importantly, most studies have only evaluated inequalities in terms of education. In line with current objectives of development it is important to carefully evaluate whether similar progress has been made in developing countries where trends and policies may be different. Furthermore, providing such estimates in terms of income provides further evidence for policy making since income, in contrast to education, is modifiable at older ages.

Methods

In this paper we implement the methodology proposed by Currie and Schwandt (2016) to explore the trends in life expectancy and mortality by municipal income levels in Brazil from 2000 to 2015. To achieve this, we use publicly available data from the mortality registers, and administrative data on population and income at the municipality level. Using this data, we first rank municipalities by their income level and partition them into groups representing 5% of the Brazilian population. Such an approach helps us account for potential changes in the sizes of municipalities over time that may be linked to income. Following this, we are able to compare the mortality rates and life expectancy across the income spectrum, as well as estimate the gap in mortality between high- and low-income municipalities. To provide a comprehensive vision of the mortality trends, we evaluate our results using life expectancy at birth, mortality rates by gender, and finally by age group to disentangle whether trends are different across age groups.

Findings

Our results show that there have been important improvements in terms of mortality in Brazil from 2000 to 2015. These have been particularly large for low income municipalities thus leading to a narrowing in the mortality gap by income over time. We find that such narrowing has been particularly large for health care avoidable mortality, therefore highlighting the potential role of social policies and health care expansion. Nevertheless, the gap in mortality between high and low-income municipalities remains large.

Interpretation

The results from our study show that mortality inequalities by income have been decreasing in Brazil. This suggests that the narrowing of inequalities is not limited to developed countries but may be a worldwide phenomenon linked with improved living standards and the expansion of health care. However, the gap in mortality between high- and low-income municipalities remains large and therefore calls for a greater effort to address inequalities by income at the population level. Finally, this study highlights the feasibility of evaluating mortality inequalities in developing countries over time where individual level data is not available.

Norwegians' Health and Wellbeing: To Which Extent Can We Observe a Social Gradient?

PRESENTER: **Jan Abel Olsen**, University of Tromsø

Norway is one of the world's most egalitarian countries when it comes to income distribution and social benefit schemes. Still, inequalities in life expectancies persist. This paper investigates the degree of inequalities in health related quality of life (HRQoL) and subjective well-being (SWB) across each of four alternative indicators of socio-economic position (SEP).

We use data from two waves of a comprehensive health survey of the adult population resident in the city of Tromsø in 2007/8 (N = 13,000 aged 30 +) and 2015/16 (N = 21,000, aged 40 +). HRQoL was measured by the EQ-5D-3L in the first wave and EQ-5D-5L in the second. SWB was measured by the first three items of the satisfaction with life scale (SWLS-3) in both waves. SEP was measured by education, occupation, household income, and subjective social status.

Mean HRQoL values are presented by sex and age-groups, using alternative preference based value sets. Responses to the three items of the SWLS are aggregated and converted onto a [0-1] scale for SWB. Each of the SEP-indicators are split into four levels. Cross-sectional regression analyses are performed on each of the two waves, and longitudinal analyses are performed to study changes in HRQoL and SWB between the two waves. Separate analyses are presented for male vs female, adjusted for age and marital status.

While men have higher HRQoL than women, there was no significant gender differences in SWB. HRQoL at older age decline, while SWB tend to increase with age. The social gradient showed a consistent pattern for health, but less so for subjective wellbeing. HRQoL in both

gender increased with socio-economic position, whether measured by education, occupation, income or subjective social status. Interestingly, income had a stronger effect than education on health. The only socio-economic indicator that had a strong consistent positive effect on SWB in both waves was income. While people in the top level of education and occupation appeared to express highest SWB, the pattern was less consistent and less significant across the other levels. Consistent with earlier studies, living with a partner is associated with higher SWB. However, marital status did not affect HRQoL. In the longitudinal regressions on the determinants of changes in health and wellbeing, the highest income quartile was the only SEP variable to show significant (positive) impacts.

The Local Health Impacts of Natural Resources' Booms

PRESENTER: **Elisa Maria Maffioli**, University of Michigan

Background: Do natural resources' booms benefit or harm human health? Many low and middle-income countries are endowed with a variety of natural resources, such as agricultural products, minerals and oil. Despite booms in production might increase local economic opportunities, the net impacts on well-being are still under-studied. This paper explores the relationship between natural resources and children's health at birth, focusing on 46 types of minerals (metals, industrial or other minerals) in the context of an emerging economy, Brazil.

On the one hand, booms in mineral resources can benefit local economies by bringing jobs and economic development. Taxes on exports also increase governmental resources, which, if properly invested in public goods, could improve health outcomes. On the other hand, booms in production increase environmental degradation. Water, air pollution, and soil contamination from the industries' waste could negatively impact health. We could also observe worst health outcomes at birth because of selective migration, selection into fertility or changes in mothers' behavior, due to higher employment.

Method: I construct a novel dataset on mineral reserves for all Brazilian municipalities from 1996 to 2010. I explore the richness of health administrative data and data sources on international prices, economic activities, governmental budgets, etc. to study impacts on infant mortality, birth weight, gestational length, APGAR score and anomalies. The empirical strategy follows a difference-in-difference estimator, which assesses whether changes in international prices affect health outcomes disproportionately in municipalities that historically have more endowments of these resources. I use historical reserves determined by the exogenous spatial distribution of mineral resources, to circumvent potential endogeneity concerns.

Results: The net effects of *all* minerals on health are mixed. On average, booms in mineral resources decrease infant mortality, but increase premature births and births with low APGAR score. *Metal minerals* mainly drive these effects, while *industrial minerals* do not have any impact on health at birth, and *other minerals* (ex. coal, gemstones, etc.) have negative impacts. Investigating the mechanisms, (1) I find evidence of positive effects of resource windfalls and higher employment for *metals*, which might explain the reduction in infant mortality. Still, pollution remains a concern especially for heavy metals and gold. (2) *Industrial minerals* do not show any benefit in term of resource windfall or employment. Instead, pollution is balanced-off by private investments in health workforce, leading to a null impact on health at birth. (3) For *other minerals* pollution overcomes any positive effect from higher employment and investment in health facilities and workforce. Exploring heterogeneous impact by "polluted" and "non-polluted" minerals, evidence confirms that heavy metals, mercury-related metals, lead, and coal have the worst negative impacts on health at birth. Corruption boosts these effects.

Discussion: The study provides key insights into the trade-off between wealth and health, which local booms in mineral resources create. I find evidence that not all minerals benefit communities' well-being. Instead, pollution can overcome local benefits from more economic opportunities and investment into public goods. I provide comprehensive evidence on which specific minerals have positive or negative impact on human well-being.

1:30 PM –3:00 PM TUESDAY [Demand & Utilization Of Health Services]

Universität Basel | Kollegienhaus – Seminarraum 105

Out-of-Pocket Costs and Deductibles

SESSION CHAIR: **Ghada Taha Gleeson**, Australian National University

Role of Out-of-Pocket Medication Expenses of Blood Pressure and Diabetes in Household Resource Allocation in Pakistan

PRESENTER: **Dr. Muhammad Jami Husain**, Centers for Disease Control and Prevention (CDC)

AUTHORS: Dr. Biplab Datta, Sohani Fatehin

Background: High blood pressure and diabetes are two major non-communicable diseases (NCDs) that expose households to high out-of-pocket treatment costs in the low-and-medium-income countries. Medication represents a large portion of the blood pressure and diabetes (BPD) treatment expenses, and households affected by BPD may need to adjust consumption of other commodities to pay for BPD medicines. Previous studies examining the impact of out-of-pocket (OOP) treatment costs of NCDs on households mainly focus on three aspects – incidences of catastrophic spending, impoverishment, and households' coping strategies. Our paper examines how BPD medication

expenditure is associated with crowding-out of other household commodities in Pakistan, and this study is the first in literature to assess this relationship.

Methods: We analyzed self-reported information on household consumption of non-durable commodities from the nationally representative Pakistan Household Income and Expenditure Survey 2015-16 to examine the differences in average consumption share between BPD medication consuming and 'not' consuming households. We assume that BPD medication consumption is "preallocated", i.e. households consuming BPD medication, first allocate necessary amount of income to purchase required quantity of BPD medication, and then spend the rest of income on other commodities. Household consumption of non-durable commodities was aggregated to 11 broad consumption categories. We further assume that BPD medication and other consumption commodities are weakly separable. We then estimate conditional Engel curves for broad consumption categories under the Quadratic Almost Ideal Demand System (QAIDS) framework, using the seemingly unrelated regression (SUR) model to obtain adjusted differences in consumption share and the crowding-out effects.

Findings: On average 25.4% of the households in Pakistan report positive spending on BPD medication. We find that average food expenditure share of BPD medication consuming households is lower than that of households 'not' consuming BPD medication at the bottom of the household expenditure distribution (below 40^{th} percentile). Education expenditure share of BPD medication consuming households is also lower for all except the poorest households (below 20^{th} percentile). BPD medication expenditure is associated with crowding-out of food and crowding-in of other medical expenditure for all households, but the magnitudes of crowding-out and crowding-in are larger for poorer households. BPD medication spending is also associated with crowding-out of education and personal care for households at the middle or top of the expenditure distribution (above 30^{th} percentile).

Conclusion: Our results facilitate understanding of how households modify consumption decisions and reallocate resources across broad commodity groups in response to out-of-pocket BPD medication expenses. We find that in Pakistan, the proportional allocations for essential expenditure items, like food and education are smaller for BPD medication consuming households compared to households 'not' incurring expenditure on BPD medication. The analysis informs policymakers in evaluating poverty alleviation strategies through low-cost health care, preventive health promotions, and affordable treatment for blood pressure and diabetes.

Potential Exposure of Enrollees in Private-Sector Employer-Sponsored Insurance to Out-of-Pocket Costs, 2006 to 2017

PRESENTER: **Dr. Edward Miller**, Agecny for Healthcare Research and Quality
AUTHORS: Patricia Keenan, Jessica Vistnes

Over the past decade, private-sector employers in the United States have taken a number of steps to limit the growth of health care costs, including requiring larger employee premium contributions and greater cost sharing from enrollees and increasingly turning to high deductible health plans (HDHPs) with or without extra employer funds to help employees pay for cost-sharing. Although these measures may have contributed to decreased growth in total premiums relative to growth in the previous decade, the increases in deductibles and employee premium contributions have far outpaced increases in enrollees' incomes. Little is known about how these trends have affected employer-sponsored insurance (ESI) enrollees' potential exposure to out-of-pocket (OOP) costs and how that cost compares to workers' incomes. Evaluating the potential exposure to financial risk in the plans offered to workers requires data on workers' incomes, employee premium contributions and deductibles for the full range of plans offered by their employers. Unfortunately, no national survey in the United States collects linked data on employers and employees.

Our solution to this data problem is to construct a synthetic linked data set and simulation model. We use pooled data on workers from the 2004-2006 and 2014-2016 Medical Expenditure Panel Survey-Household Component (MEPS-HC) to form synthetic workforces for establishments in the 2006 and 2017 MEPS Insurance Component (MEPS-IC). In particular, for each establishment we select workers who match establishment characteristics (e.g., region, industry, size, offers of insurance) as closely as possible. We then fine-tune each synthetic workforce by adjusting sampling weights to align workers' characteristics (e.g., the percent that are women, over age 50, low/medium/high wage, and have single/non-single coverage) to match the percent distributions reported by establishments. The resulting model provides a unique data resource that preserves correlations between establishments' characteristics (including the health plans they offer to their workers) and workers' characteristics (including family incomes), to the greatest extent possible.

We use these linked data to examine the choice set of plans offered to employees and the range of exposure to financial risk across these choices. We examine the percentage of individuals and families that would be exposed to potential OOP costs exceeding 10% and 20% of workers' family incomes under different scenarios. We use two measures of potential out-of-pocket medical care costs, annual deductibles and OOP maximums, in combination with employee premium contributions. In characterizing the employees' choice set we explore the trade-offs employees face between choosing lower employee premium contributions versus lower exposure to financial risk from possible medical care use. Given the trends noted above, the primary goal of our analysis is to examine how ESI enrollees' exposure to financial risk has changed in the decade from 2006 to 2017. We examine overall levels and trends and also compare levels and trends for subgroups of enrollees such as those in small and large firms, in majority low-wage and majority high-wage establishments, and in different regions of the country.

User Fees and Healthcare Use: Does the Utilization Response Depend on the Quality of the Health Services?

PRESENTER: **Dr. Peter Hangoma**, University of Zambia

Background

Low- and middle-income countries (LMICs) face substantial healthcare financing challenges, with most of them depending on external financing for as much as 60% of their health budgets. Limited funding has results in poor quality services. Given flattening external resources, there are calls to find ways of generating resources from within their countries in order to ensure sustainability and improve the quality of health services. The role of user fees, or some form of cost-sharing/co-payments at the point of using healthcare, remains debatable. While their demand effects have been adequately studied and results suggest that they indeed deter access to care, especially for low-income groups, the related question of whether these effects depend on the quality of health services has not been addressed. In other words, we do not know whether the effects of co-payments on healthcare demand depends on the quality of care so that people may remain willing to access health services despite the existence of co-payments or user fees if healthcare quality is improved. With the increasing interesting in implementing Social Health Insurance in sub-Saharan Africa, there are concerns of sustainability of these insurance schemes

There are concerns that sustainability of Social Health Insurance schemes in sub-Saharan Africa are threatened by lack of some form of co-payment in contrast with similar systems in Latin America and Asia. It is important to see whether indeed copayments can deter access or this would only be the case if the quality of care is poor.

Data and Methods

The study uses data from a nationally representative retrospective panel data of 252 health facilities covering the period 2006-2010. Utilization is measured using outpatient visits while healthcare quality is proxied using two indices, constructed using principal component analysis (PCA), namely, drug availability and total health facility expenditure. User fee is an indicator variable equal to one if a health facility charged any user fees. A long set of control variables is also included in the analysis.

The empirical model is a pooled OLS with Panel Corrected Standard Errors. Specifically, the user fee dummy is interacted with various quartiles of health care quality. I also control for regional, time, and regional by time specific effects.

Results

We find that user fees are associated with 22.7% lower outpatient visits. However, user fees are not associated with lower utilization if a health facility has sufficient drugs, and utilization increases even with user fees at higher levels of drug availability. Similarly, facilities that have similar levels of health expenditure have similar levels of utilization regardless of whether they charge user fees or not. Interestingly, utilization is increasing in both total expenditure and drug availability regardless of whether user fees are charged.

Conclusion

Although the results in this study cannot be interpreted in a causal way, there is suggestive evidence that some form of co-payment may be introduced with a corresponding improvement in quality without affecting utilization of health services. This may be important because only care that is of good quality may improve health.

The Deductible Is Killing Me!: The Effect of High Deductibles on Inpatient Mortality

PRESENTER: **Mr. Michal Horný**, Emory University

Background: Rising health care expenditures in the United States have led to substantial growth in health insurance premiums. Reduced affordability of health care has become a pressing national concern, and a variety of proposals have been suggested to limit costs and increase access to health care. A prominent strategy for containing health insurance premiums is through increasing demand-side cost-sharing. As a result, the U.S. health insurance markets have recently experienced a boom of high-deductible health plans (HDHP). Several studies have documented that many HDHP enrollees defer essential medical care and experience diagnostic and treatment delays.

Objective: To test whether enrollment in an HDHP leads to an increased in-hospital mortality.

Sample: We used data from the Truven Health MarketScan® Commercial Claims and Encounters database for 2009-2015. We limited the sample to individuals aged 26-64 years who were enrolled in an employer-sponsored health plan at any given year within the study period from January 1 to December 31 or in-hospital death.

Methods: The study was observational. Because health plan choices are endogenous, we estimated the effect of HDHP enrollment on in-hospital mortality using a 2-SLS approach. We instrumented the indicator of HDHP enrollment by predicted probabilities based on enrollee's age, sex, and whether the enrollee's employer offered an HDHP in that year. The second stage logistic regression model was adjusted for age, sex, and year fixed effects. We corrected standard errors for clustering by employer and year.

Results: The sample consisted of 1,681,813 distinct individuals (6,625,501 person-years), 51.3% of which were female. The mean age was 45.2 (SD = 10.1) years. On average, employers offered an HDHP in a given year within the study period for 58.9% of study subjects; however, only about 13.5% of study subjects enrolled in an HDHP while the rest chose different health plan types. Over the seven-year study period, we observed 2,494 deaths within the study sample (death rate of 37.6 per 100,000 individuals per year). The second stage logistic regression results revealed a strong effect of HDHP enrollment on age- and sex-adjusted in-hospital mortality with a point estimate of 1.4952 (SE = 0.4357, p = .0006) and the odds ratio of 4.46 (95% CI: 2.76, 7.22). The predicted 1-year mortality in a cohort of 100,000 60-year-old

women was 257.1 and 57.8 for those enrolled in an HDHP and those enrolled in another health plan type, respectively. For 60-year-old men, the predicted 1-year mortality was 317.5 and 71.4 per 100,000 for those enrolled in an HDHP and those enrolled in another health plan type, respectively.

Conclusion: Enrollment in an HDHP leads to significantly increased in-hospital mortality likely due to diagnostic and treatment delays caused by the substantial financial barriers to care. Policymakers should abandon annual deductibles and consider other cost-sharing mechanisms that better reflect people's ability to afford health care.

1:30 PM –3:00 PM TUESDAY [Evaluation Of Policy, Programs And Health System Performance]

Universität Basel | Kollegienhaus – Regenzzimmer 111

Organized Session: Developing the Health Economics Case for Early Cancer Diagnosis in Primary Care

SESSION CHAIR: **Antonieta Medina-Lara**, University of Exeter

DISCUSSANT: **Anne Spencer**, University of Exeter; **Qin Zhou**, Stanford University

A Systematic Review of Discrete-Choice Experiments in Colorectal Cancer Screening

PRESENTER: **Rebekah Hall**, University of Exeter

AUTHORS: Antonieta Medina-Lara, Willie Hamilton, Anne Spencer

Background: Cancer is the second leading cause of death globally with colorectal cancer (CRC) ranking third and second among cancer sites in men and women, respectively. CRC screening offers the potential to reduce incidence and mortality. However, screening rates remain low even in countries where national screening programs have been implemented. Understanding individual's preferences may provide information on the most appropriate choice of test to recommend and allow for enriched communication between the health care provider and the patient contributing to higher uptake rates.

Objectives: To assess the evidence generated in discrete choice experiments (DCEs) of CRC screening.

Methods: A systematic review of DCEs of CRC screening using pre-tested key terms was carried out in Medline, Medline®, Embase, PsycINFO, HMIC, Web of Science, Econlit and NHS EED between 1990 and June 2018. Results were summarised in a narrative synthesis focusing on attribute generation, type of attributes, mode of administration and type of analysis. The quality of the DCEs was assessed using an existing checklist.

Results: From the systematic searches a total of 15,349 unique hits were obtained after deduplication, but only 23 studies met the inclusion criteria. Almost 50% (11/23) of the studies selected attributes using a mixed methods approach where studies typically included a combination of process and outcome attributes. The purpose of the studies varied but generally aimed to address policy questions such as increasing uptake rates or the implementation of new screening programmes (19/23). Overall, studies favoured the comparison of multiple tests (14/23) as opposed to attributes of a single screening test (6/23). Over 86% (20/23) of the DCEs elicited preferences from the general population with mixed screening experience. DCEs were generally administered using self-completed postal (9/23) or online (8/23) surveys. There was a clear variation in the type of analysis conducted over time, with earlier DCEs choosing probit and multinomial logit models and more recent studies using latent class and hierarchal Bayes analyses. Over 60% (14/23) of the DCEs included no screening as an option, however, results consistently demonstrating that individuals had a strong preference for screening regardless of the specific test. Also the outcomes of DCEs varied according to the type of attributes included and the range of corresponding levels; nevertheless when test sensitivity (13/23) and ability to reduce mortality (10/23) were included, these were consistently statistically significant and among the most influential attributes but in general respondents showed a willingness to make trade-offs across all attributes. Furthermore where analysed, certain socioeconomic factors including family history of CRC, screening history, education, and income were shown to have a significant influence on the initial choice of whether to participate in screening and the importance of attributes associated with different tests.

Conclusion: We have demonstrated that CRC screening DCEs vary considerably with respect to aim of the study, attributes included and type of statistical analysis. These variations limit the ability to draw an overall conclusion but it appears that individuals favour screening to no screening irrespective of the type of test offered.

Keywords: colorectal cancer; discrete choice.

What Factors Influence Non-Participation Most in Colorectal Cancer Screening? a Discrete Choice Experiment

PRESENTER: **Dr. Esther de Bekker-Grob**, Erasmus School of Health Policy & Management, Erasmus University Rotterdam

AUTHORS: Bas Donkers, Marcel Jonker, Dr. Jorien Veldwijk

Background: Colorectal cancer (CRC) is one of the most common causes of cancer death in developed countries. Population-based CRC screening is widely recommended as it can reduce the incidence and mortality of CRC. Current failure to prevent CRC is partly due to non-participation in population-based CRC screening. To facilitate the development of CRC screening programs and information directed towards

unscreened and underscreened individuals, obtaining insights into determinants that drive non-participation is crucial. This study aimed to quantify the impact of screening- and individual characteristics on non-participation in CRC screening.

Methods: An online discrete choice experiment (DCE) was conducted among 406 representatives of the Dutch general population aged 55-75 years. In the DCE (constructed by a heterogeneous Bayesian efficient design), we used CRC screening scenarios based on five CRC screening characteristics: effectiveness of the faecal immunochemical screening test (FIT), risk of a false negative FIT outcome, frequency of the FIT, waiting time for FIT results, and waiting time for a colonoscopy follow-up test. These screening characteristics were determined from literature, expert interviews and focus groups. The DCE data was analysed using a heteroscedastic multinomial logit model, while taking scale and preference heterogeneity based on 15 respondents' characteristics into account. The validity of the DCE results was measured at an aggregate and an individual level.

Results: Screening characteristics and respondents' characteristics both influenced non-participation in CRC screening. Assuming a base case respondent and a realistic CRC screening scenario, the probability to opt for CRC screening was 75.3%; hence corresponding with a non-participation rate of 24.7%. One-way changes in screening characteristics and respondents' characteristics changed this non-participation rate from 21.7% up to 28.0% and from 8.4% up to 75.5%, respectively. From the screening characteristics, the risk of a false negative FIT outcome had the strongest impact on the non-participation rate in CRC screening. However, certain respondent's characteristics had an even stronger impact on non-participation. The strongest impact on non-participation was the respondent's general attitude towards CRC screening followed by whether the respondent had participating in a cancer screening program before, the decision making style of the respondent, and the educational level of the respondent. The DCE results showed a high level of validity.

Conclusions: Although screening characteristics proved to influence non-participation in CRC screening, certain respondent's characteristics had a much higher impact on CRC screening non-participation; particularly the individual's general attitude towards CRC screening and whether the individual had participating in a cancer screening program before. Policy makers can use these insights to improve and tailor their communication plans regarding CRC screening for unscreened and underscreened individuals.

Keywords: colorectal cancer screening; non-participation; screening characteristics; individual's characteristics; discrete choice experiment.

Developments in Duration of the Diagnostic Pathway for Cancer and Reasons for Delayed Referral in Primary Care in the Netherlands

PRESENTER: **Niek De Wit**

AUTHORS: Nicole van Erp, Charles Helsper, Petra Peeters

Background*:* In gatekeeper healthcare systems, an efficient diagnostic process in primary care is pivotal for reducing cancer related disease burden. In the DICKENS study we explored the duration of the diagnostic pathway and reasons for prolonged time to referral, for patients with 10 different types of cancer in Dutch primary care.

Methods: In retrospective cohort studies, using anonymized free text primary care records of 6 routine primary care databases with more than 600.000 patients in the Netherlands, we analysed the diagnostic pathways of patients diagnosed with 10 different types of cancer, who symptomatically presented in primary care. Diagnoses were validated through linkage with the Dutch National Cancer registry. Based on manual free text exploration, we determined the median duration of (1) Primary Care Intervals (IPC) - first cancer related GP consultation to referral, (2) Referral Intervals (IR) - referral to diagnosis, and (3) Treatment Intervals (IT) - diagnosis to treatment. We also calculated the overarching Diagnostic Intervals (ID) (IPC and IR combined) and Health Care Intervals (IHC) (IPC, IR, IT combined). For the 5 most prevalent cancers (breast, colon, lung, prostate and melanoma), we analysed durations of these interval from 2007 to 2011 and again from 2012 to 2017. For 5 more rare types of cancer (esophagus, stomach, ovaries, kidney, bladder), we performed similar analyses from 2010-2017. For IPC, we also performed multivariable regression analyses to find associations of patient- and presentation characteristics with relatively "long duration" (≥75th percentile value). Routes to referral of patients with relatively "longest durations" (≥90th percentile value) were explored using thematic free text analyses.

Results

Preliminary results show that, for the five most prevalent cancers, times to diagnosis were shorter between 2012 – 2017 as compared to 2007-2011. Median IPC was shortest for breast cancer and melanoma, intermediate for lung- and colon cancer and longest for prostate cancer. Median ID durations were one to eight weeks. For all cancers, duration of intervals increased steeply for the 10 to 25% with longest durations. For colorectal cancer increasing ID durations showed increasing proportions of time attributable to primary care.

Conclusion

Diagnostic intervals in cancer diagnosis in the Netherlands generally seem acceptable and are getting shorter. Nevertheless, a small proportion of patients experience substantial delay. Further reduction of primary care delay in diagnosing cancer seems needed and possible for improving cost-effective cancer management. The results of the full analysis will be available for presentation at the conference.

Keywords: Primary care, general practice, delay, duration, diagnostic interval, cancer, Netherlands

Lifetime Medical Costs and Medication Use for Advanced Lung Cancer Patients in China

PRESENTER: **Gordon G. Liu**, National School of Development, Peking University, Beijing

Objectives: The lifetime medical costs of Chinese advanced lung cancer were unknown. This paper is intended to document the lifetime direct medical costs and medication use for advanced lung cancer patients in China.

Methods: Patients with a new diagnosis of advanced lung cancer between 2012 and 2015 are tracked retrospectively first. The patients are then stratified by therapies, including target therapy group (TAR), chemotherapy group (CHE), combination therapy group (COM), and supportive therapy group (SUP). Further investigation of cost changes in subgroups is conducted by disease phases of care, including initial, continuing, and terminal phase. Upon a descriptive analysis of unadjusted mean lifetime and monthly medical costs, adjusted costs are estimated using the propensity score matching (PSM). Non-parametric bootstrapping method is further employed to analyze the differences in unadjusted and adjusted cost per patient.

Results:

- For a total of 2275 advanced lung cancer patients in the study sample, the distributions of lifetime medical costs are shown as a "U-shaped" curve for each cohort with 6-, 12-, 18-, 24-month follow up. The mean lifetime medical costs are $14,580, ranging from $5,880 in SUP group to $20,736 in COM group. The mean monthly costs in initial and terminal phase are $2,147 and $2,789 respectively, which are about twice than those in continuing phase ($1,222). The leading driver of lifetime medical costs are medication costs (71%), ranging from 66% in COM group to 83% in TAR group, followed by laboratory tests and examination costs (11%), radiation cost (6%). Of the total lifetime medical costs, 76% were paid by medical insurance, and the rest paid by patients.
- In the medication costs, most spending was on antineoplastic drugs for 38%, followed by traditional Chinese medicine for 17%. Patients in TAR group have a higher proportion of antineoplastic agents compared with CHE group (53% vs 41%), while with lower proportions of traditional Chinese medicine (9% vs 15%), immunostimulants (10% vs 12%), gastrointestinal regulations (1% vs 3%), and antiemetics (2% vs 4%), especially in the initial phase of care.

Conclusions: Lifetime medical costs for advanced lung cancer patients are distributed as a U-shaped curve of stages, with the use of antineoplastic drugs and Chinese medicine as the two major drivers. While lung cancers are at high risk and costly in China, public insurance pays the majority of these costs.

Key words: Lung cancer; lifetime medical costs; medication use; China

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1:30 PM –3:00 PM TUESDAY [Evaluation Of Policy, Programs And Health System Performance]

Universität Basel | Kollegienhaus – Fakultätenzimmer 112

Organized Session: Evaluating Taxes on Sugar-Sweetened Beverages: How Are We Doing It?

SESSION CHAIR: **Richard Smith**, University of Exeter

Impact Evaluation of an SSB Tax Policy in Chile: How Much Do Methods Matters?

PRESENTER: **Dr. Cristóbal Cuadrado**, School of Public Health, University of Chile

AUTHORS: Ryota Nakamura, Andrew Mirelman, Nicolas Silva-Illanes, Jocelyn Dunstan, Marc Suhrcke

This paper focuses on the analysis of the impact analysis of the tax policy applied to Sugar-Sweetened Beverages (SSBs) in Chile. The tax, enacted in Chile in October 2014, affected any non-alcoholic beverages with added colorants, flavorings or sweeteners. For beverages above an added sugar concentration of at least 6.25 grams per 100ml (or equivalent proportion), the ad-valorem tax was increased from 13% to 18%, while for those below this threshold the tax was decreased to 10%. We evaluate the impact of increasing the tax as well as of decreasing the tax on relevant soft drink categories, using two unique datasets from Chile before and after the implementation of the tax. First, monthly market price time-series data collected by the national institute of statistics. Second, a large household panel with weekly grocery purchasing data. We apply a series of quasi-experimental approaches to evaluate the causal impact of the SSB tax policy on prices, volume purchased and consumers' behavior. We explore distributional effects of the policy based on subgroup analysis and quantile regression. Different approaches to model time trends were used, analyzing their impact of the intervention estimates. Our findings show that the tax policy increased SBB market prices, effectively trespassing to consumer prices, but with heterogeneous pass-through across different product categories. Moreover, decision to purchase and purchasing behaviors were affected by the policy, especially in middle and high socioeconomic status households. Nevertheless, different approaches for modelling the time trends substantially affected our impact estimates. This highlights the relevance of testing the assumptions underlying methodological approaches used to assess the impact evaluation of population-wide intervention in the absence of an adequate control group. As more SSB taxes are proposed and implemented worldwide, our findings provide useful insights for the implementation and evaluation of similar policies in the future. Policy design, implementation process and contextual factors that could contribute to the different result found in Chile compared to other countries are discussed.

The Incidence of Soft Drink Taxes on Consumer Prices and Welfare: Evidence from the French Soda Tax

PRESENTER: **Prof. Fabrice Etile**, Paris School of Economics

AUTHORS: Sébastien Lecocq, Christine Boizot-Szanta

Objectives

The worldwide rise in obesity and diabetes has prompted public health officials to pay attention to sugar intake from Sugar-Sweetened Beverages (SSB). The taxation of SSB is viewed as a means of decreasing SSB consumption by increasing prices. A tax is unlikely to be shifted 1:1 onto equilibrium prices because of changes in consumer, producer and retailer behaviour on both sides of markets. We propose an ex-post evaluation of the pass-through of the 2012 French soda tax (a unit excise tax of 0.0716 Euro/Litre) on the consumer prices of SSB and Non-Calorically Sweetened Beverages (NCSB), with a particular focus on tax heterogeneity across local markets.

Method

We estimate the impact of the tax on SSB and NCSB prices using nationally representative homescan data provided by Kantar Worldpanel (2008-2013). Our dependent variables of interest are local Exact Price Indices (EPI) for SBB and for NCSB, which are constructed from local price series and estimations of nested CES demand functions for product varieties (Handbury and Weinstein, 2015). These EPI are true measure of consumer welfare, accounting for consumer substitutions between varieties and for variations in the availability of products across local markets and time. We estimate the impact of the tax on the EPI, using a before-after approach that carefully controls for a confounding shock on the cost of sugar, and a difference-in-difference design that uses variations in the EPI of waters as a counterfactual.

Results

Our two identification strategies yield the same results. Taking the before-after estimates, the tax resulted in a tax incidence of 40.1% for SSB, and 39.9% for NCSB. At a national level, the tax incidence did not vary across income or consumption groups. However, at a local level, tax incidence decreases when retailer competition or market size increases. Conditional on local market structure, initial prices are higher but tax incidence is 5 percentage points lower in high-income markets. The tax incidence in less competitive markets is about 12% higher for SSB and 33% higher for NCSB. Welfare variations due to varying product availability across markets account for less than 10% of the overall tax incidence.

Discussion

Working on a price index for SSB rather than on separate price series of product varieties is crucial, because the sugar content of SSB products is quite homogenous: the key margin for public health policies is the quantity of SSB that is purchased by households, which depends on the EPI of SSB. We have two important findings.

First, the default pass-through applied in most health econometric simulation studies of nutritional taxes is 100%. Our pass-through rates are much lower, in line with recent ex-post evaluation studies on the Berkeley soda tax.

Second, our study contributes to a burgeoning literature on spatial and socioeconomic variations in prices and tax incidence. We show that key market characteristics influence the distributional impacts of the tax. The French Soft-drink tax was regressive because low-income consumers, endowed with higher preferences for soft-drinks are more likely to live in markets characterized by lower competition.

Market Reaction to the UK Soft Drinks Industry Levy Announcements: Event Study Analysis of Soft Drink Companies Quoted on the London Stock Exchange

PRESENTER: **Laura Cornelsen**, London School of Hygiene & Tropical Medicine

AUTHORS: Cherry Law, Jean Adams, Tarra Penney, Harry Rutter, Martin White, Richard Smith

On 16th March 2016, the UK government announced a tax on sugar-sweetened beverages, known as the Soft Drinks Industry Levy (SDIL), which would have two tax bands – one for total sugar content above 5g per 100ml, and a higher band for drinks with more than 8g per 100ml. This announcement was met by a largely negative response from the soft drinks industry which claimed that the SDIL will *"threaten the economic viability of our industry"*. It is common with such announcements to ask 'how will the market react'? Here we analyse the market response to the announcement of the SDIL and two follow-up announcements related to the SDIL. This provides an insight into the impact of the SDIL on the UK soft drinks producers without the need for company-specific financial data, which is often not available until years after events and with detail that is commercially sensitive.

We applied an event study methodology to analyse the effects of the announcement of the SDIL on the stock market value of UK soft-drink firms, as well as two follow-up events: the release of draft legislation and the public consultation summary on 5th December 2016; and the confirmation of SDIL rates on 8th March 2017. The stock market reaction to these SDIL announcements is examined through identifying the direction and magnitude of the excess (abnormal) returns, which are defined as the difference between the actual stock returns and the expected returns if the events did not occur. To account for the overall performance of the UK market, we used a market return model to compute daily abnormal stock returns.

We found that the SDIL announcement on the 16th of March 2016 had a short-lived negative impact on the stock returns of three out of the four UK operating soft drink firms listed on the London Stock Exchange. On average, the listed soft drinks companies experienced a significantly negative abnormal return on the day the SDIL was announced. However, their daily stock returns bounced back to the benchmark level shortly after the announcement. There was no evidence of a significant negative stock market reaction to two follow-up SDIL announcements. The results suggest that while the market initially perceived the announcement of the levy as a negative shock to the

soft drinks industry, it quickly overcame these concerns and did not predict the SDIL would have a sustained negative effect on the future profitability of the listed soft drinks firms.

The (small) Effect of a (large) Soft Drink Tax in Mexico

PRESENTER: **Dr. Daniel Flores**, Universidad Autonoma de Nuevo Leon

AUTHORS: Julio Cesar Arteaga, Edgar Luna

We use a time series approach and industry data to estimate the effect on consumption of a relatively large excise tax on soft drinks imposed recently in Mexico. The tax caused a price increase of 12.8% and reduced per-capita consumption about 3.8%. This effect is fairly small in comparison to the effects that are suggested by most studies that estimate price elasticities using an almost-ideal-demand-system and household survey data.

1:30 PM –3:00 PM TUESDAY [Demand & Utilization Of Health Services]

Universität Basel | Kollegienhaus – Hörsaal 114

Public Preferences in Screening and Prevention Uptake

SESSION CHAIR: **Fern Terris-Prestholt**, Faculty of Public Health and Policy, London School of Hygiene and Tropical Medicine

Targeting Using Differential Incentives: Evidence from a Field Experiment

PRESENTER: **Yubraj Acharya**, The Pennsylvania State University

AUTHOR: Dr. Jiyoon Kim

Background. The utilization of preventive health services remains low in developing countries, especially among the traditionally disadvantaged groups. Outreach workers are often used to solve the problem of low access. However, advantaged groups tend to be overrepresented among such workers. If there are barriers to inter-ethnic interactions, these outreach efforts may not solve the problem of low utilization of health services by disadvantaged groups. Our study is designed to answer two policy-relevant questions. First, can we incentivize outreach workers to refer individuals from disadvantaged group through financial incentives? Second, on the demand side, does providing financial incentives directly to disadvantaged clients encourage them to utilize healthcare services more?

Design. We randomized 72 health volunteers (HVs) in semi-urban Nepal into four arms, provided them a basic training on diabetes and asked them to recruit clients from the community for a free sugar-level assessment at their local health center. We tracked the referral cards they distributed and the receiving individuals who came to the checkup. We varied the amount of financial incentives the HVs received. In the *Low* and the *High* arms, the amount of incentive did not depend on the type of the referral. In the two remaining arms, the amount depended on the ethnicity of client—one targeted toward referring disadvantaged clients (*NudgeDis*) and another targeted toward referring advantaged clients (*NudgeAdv*). We then test if different incentives provided to the HVs influence the likelihood of a disadvantaged client being referred.

We included a second level of randomization to evaluate barriers faced by disadvantaged patients in coming to the checkup due to their ethnicity. Specifically, we randomly offered different financial incentives to the clients for coming to the checkup.

Key findings. The HVs distributed the referral cards to 2,825 clients (average = 40.9 cards per HV). Of these clients, 85% showed up for the checkup.

In the *Low* arm, 43% of the clients receiving the referral cards were disadvantaged, lower than the share of disadvantaged individuals in the population (56%). The incentives geared toward a disadvantaged referral increased the chances of such referral by approximately 11.6 percentage points. This effect represents an increase in the number of disadvantaged referrals of 27% and translates to an incentive elasticity of referral of 0.2. The effect is not driven by factors other than the differential incentives, including those related to accessibility.

Higher incentives as well as the incentives geared toward an advantaged referral (which are policy-irrelevant) had no effect on the number of disadvantaged referrals. This suggests that, while higher (non-differential) incentives may improve health services utilization in general, they are not effective in improving health service utilization by the disadvantaged. We find no evidence that the HVs engage in 'gaming'—i.e., referring healthier disadvantaged clients to benefit from higher incentives.

On the demand side, the disadvantaged clients were less likely to come to the checkup compared to the advantaged clients even after receiving a referral card. However, overall, the incentives to the clients did not affect the clients' decision to come to the checkup.

Long-Term Effects of Human Capital on Health Behavior after Screening for Colorectal Cancer

PRESENTER: **Tor Iversen**, Universitetet i Oslo

AUTHOR: Eline Aas

Objectives

We study the changes in demand for health that occur after cancer screening, and more specifically, whether these changes in demand vary with human capital. Our approach is linked to the theory of motivated beliefs. We expect that misinterpretation of test results occurs more

frequently among individuals with a low level of human capital compared with individuals with a high level of human capital, i.e. human capital makes the information updating based on the screening result more accurate. If this is true, the implications for health policy are profound.

Data

The analyses are based on unique data from a randomized controlled screening trial in Norway, NORCCAP (NORwegian Colorectal Cancer Prevention) running from 1999 to 2001. The dataset now covers the period 1997 – 2015 and consists of approximately 100 000 individuals born between 1935 and 1950, of whom 21 000 were invited to participate in a once only screening with sigmoidoscopy. The Cancer Registry of Norway provided information on screening participation status and screening outcome (positive and negative test and cancer diagnosis). For all individuals we also have information on outpatient consultations and inpatient stays, human capital, measured by education, income, wealth, marital status and working status. Since we are working with data from a randomized trial, we can approximate the result of health behavior by health care utilization both ex ante and ex post of screening. The result of health behavior is mainly measured by mortality in addition to occurrence of lifestyle related diseases, such as COPD, hypertension and diabetes type 2, identified by ICD10 codes either as main or secondary diagnosis. To control for the time trend of change in health care utilization, we also include health care utilization in the same period for non-lifestyle related diseases, such as hip fractures and hearing aid. We have also access to mortality data.

Methods

Relevant regression models are used to estimate whether the interaction between screening outcome and human capital changes the utilization of health care for lifestyle related diseases and mortality. In particular, we estimate hazard rates from flexible parametric survival models. We start by dividing the sample in invited and control groups, to see if there are changes in lifestyle related utilization in an intention-to-treat setting. Further, we divide the invited into participants and non-participants, and next the participants according to screening outcome. In these models, we take account of the non-random selection of the participants among the invited.

Results

We find that for individuals with primary education and high school education the incidence of lifestyle-related diseases in the screening group is greater than in the control group during the 15-year period after the screening year. We find no such difference for individuals with university education.

Implication

One implication is that the assessment of screening programs should include potential adverse effects of screening in terms of health loss, costs of medical care, and lost production.

Traditional and Religious Leaders: A Promising, Cost-Effective Intervention to Reduce the Rate of Unvaccinated Children in Nigeria.

PRESENTER: **Patrick Hanlon**, Swiss Tropical and Public Health Institute
AUTHORS: Angela Oyo-Ita, Dachi Arikpo, Ekperonne Esu, Amanda Ross, Christian Auer, Xavier Bosch-Capblanch, Martin Meremikwu

Background

Vaccination has been shown to be a cost-effective public health intervention. It is estimated to cost less than $100 to $1000 per disability-adjusted life year averted in low-and-middle-income countries (Ozawa, 2017). Despite its benefits, vaccination uptake is still as low as 25% for all vaccines in Nigeria (DHIS, 2013). Apart from the weakness of the health system, parental attitudes and behaviours, family characteristics, limitations in immunization-related communication and information have all been associated with under-vaccination and non-vaccination of children (Bosch-Capblanch, 2012; Rainey, 2011). Due to the multiplicity of the factors that are associated with under-vaccination and non-vaccination, multi-faceted local interventions may have promising beneficial effect (Rainey, 2011), despite the paucity of existing evidence (Oyo-Ita, 2016).

Community gate keepers have been portrayed to be beneficial in Nigeria (Nwaeze & Mohammed, 2013). Traditional and religious leaders (TRLs) are influential and respected in their communities as opinion formers and guides in religious, social and family life. In playing their role, they often engage in getting their communities informed and educated on pertinent health issues. This study measured the impact of community engagement through TRLs in improving uptake of routine immunisation services in communities in Cross River State, Southern Nigeria, and the cost-effectiveness of this strategy.

Methods

A multi-faceted intervention was designed and delivered within a cluster-randomized controlled trial. The study setting was Cross River State, South of Nigeria. Four Local Government areas (Abi, Odukpani, Ogoja, and Calabar Municipality) were randomly allocated to the control arm and another 4 (Etung, Biase, Obudu, and Ikom) to the intervention arm. The interventions included training of TRLs and health workers, strengthening of the Ward Development Committees (WDCs) and community engagement. WDC meetings and community engagements were routine activities that were strengthened in this project. Related activities with communities, TRLs and health workers incurred additional costs. Costs of the interventions were compared with costs of routine care, based on the analytical project accountancy.

Results

In total, the caregivers of 1268 children in the control areas and 1302 children in intervention areas were surveyed at midterm of the study.

- *Vaccination coverage among 0 to 23 months:* Logistic regression with random effects for LGA, ward and village indicated a statistical significant drop in the proportion of unvaccinated children from 7% to 2% in the intervention arm (p=0.01). However, there was no significant difference in up-to-date vaccinations between the intervention and control areas (p=0.5).

- *Cost effectiveness analysis*: The incremental cost-effectiveness rate for the outcome **reduction of 'unvaccinated' children** was 203.13 USD (reduction of 64 unvaccinated children at an incremental cost of 13,000 USD), in the mid-term analyses.

Conclusion

The cost for an additional reduction of one unvaccinated child is not negligible. However, this effort brings life-saving vaccinations to the hardest-to-reach children in a given population, bringing completely unvaccinated children back into the health care system. Our preliminary findings indicate that the tested intervention significantly reduces the proportion of unvaccinated children.

1:30 PM –3:00 PM TUESDAY [Economic Evaluation Of Health And Care Interventions]

Universität Basel | Kollegienhaus – Hörsaal 115

Organized Session: Cost Modelling for Decision-Making: Alternative Methodological Approaches from the Fields of Malaria, Tuberculosis, HIV, and Maternal, Newborn, and Child Health

SESSION CHAIR: **Anna Vassall**, London School of Hygiene & Tropical Medicine

DISCUSSANT: **Sergio Bautista**, National Institute of Public Health

Lessons Learned from LiST: Innovations in Cost Estimation from Maternal, Newborn, and Child Health

PRESENTER: **Dr. Lori Bollinger**

Model-based impact analyses that address costs can be used to strengthen a country's health sector investment case, as well as contribute to discussions around domestic resource mobilization and identification of health program investment priorities. The results can be used beyond planning for a health sub-sector, including feeding into the development of a national health sector strategy, or even beyond the health sector to position the health budget within the broader government budget. The Lives Saved Tool (LiST) is a standardised application that can be used to calculate both the cost and impact of maternal, neonatal and child health (MNCH) interventions for the purposes of program planning at a country level and global advocacy. It has been used in several *Lancet* Series commissions and in other applications, including the recent *Lancet* analysis of the impact of increasing coverage of community health workers on the health of mothers and children.

LiST is embedded within the overall model OneHealth Tool. This is a cost and impact model which utilizes an ingredients-based, sector-wide approach to costing. Because many stakeholders expressed an interest in planning for the MNCH sub-sector separately, a methodology was developed to assist stakeholders in estimating MNCH sub-sector-specific costs and cost-effectiveness ratios. The objective for developing the LiST costing module was to provide a means for estimating the financial cost of providing a service at scale, while ensuring as much consistency as possible with data already available in LiST, as well as consistency with other methodologies followed by the WHO, such as the OneHealth Tool. This paper briefly reviews the development and application of the LiST costing methodology at the country level, and then discusses in some detail several important lessons learned that could be applied to other health areas.

These lessons include: (1) utilizing an ingredients-based costing approach which maintains quantities of inputs while allowing for price changes at the country level is an efficient approach to tailoring general models to country-specific contexts; (2) rather than spend a great deal of time and resources gathering primary-source data on cost elements that form a small portion of overall costs (e.g., capital costs and some overhead expenses), instead econometric estimation of cost share equations can be utilized to infer the share of these costs in overall total costs; (3) including the calculation of costs for above-site level expenditures (e.g., district- and national-level program management, monitoring and evaluation, etc.) is critical if the total resources required for a specific health sub-sector are to be calculated accurately.

Limitations of this approach include a lack of synergistic effects of delivering multiple services, for both impact and cost; and utilizing a dataset on voluntary medical male circumcision to estimate factor shares for MNCH costs.

Applying these lessons learned from developing the LiST costing module to other health areas could facilitate the development of other sub-sector-specific applications to ensure that correct, consistent costing methodologies are followed when estimating costs and impacts of health interventions at scale.

Developing Cost Models for New Strategies from Primary Data: A Case Study from Geographically Targeted Malaria Interventions

PRESENTER: **Catherine Pitt**, London School of Hygiene & Tropical Medicine

Estimates of the financial and economic costs of alternative interventions and strategies are crucial for budgeting and priority setting. When new interventions are implemented initially, whether in pilots or trials, prospective economic evaluations can generate initial cost estimates, but problems with transferring such small-scale findings to real-world settings and across geographies have long been recognized. Further, all possible variants of an intervention cannot be piloted in all settings, so those data that do exist must be used to explore how modifications to an intervention may affect costs. While empirical data are often adjusted or used in models to estimate “scale-up costs”, the assumptions in such cost models are sometimes implausible and/or opaque.

I illustrate how primary data can be used to model in a simple, transparent, flexible, and intuitive way how costs may be expected to vary outside the study setting, in other contexts, and with certain changes to the interventions themselves, as well as with input prices and epidemiology. I argue that the usefulness of cost data for such models depends on how the data are collected and analysed; activity-based unit costs, such as the cost per training may be unhelpful when seeking to reflect economies of scale and scope in cost models. I use a case study from rural Senegal, where three geographically targeted public health interventions for malaria were implemented by the Ministry of Health in a three-arm cluster-randomized trial in a population of ~577,000 persons. Prospective micro-costing was conducted to estimate financial and economic costs of identifying hotspot villages and of implementing geographically targeted mass drug administration, mass screening and treatment, and indoor residual spraying. For each intervention, we combined primary data, secondary data, and understanding of the implementation process to develop a mechanistic cost model. Observed costs were disaggregated by the implementation round and by the health system or output level with which they would be expected to vary. The average cost per round per health system or output level was modelled as a function of input prices, resource use, and epidemiology. For a given epidemiological and health system context, number of intervention rounds, targeting strategy, and input prices, total costs were then estimated as the sum of the product of the number of units at each health system or output level and the relevant average costs. The model predicts how costs could be expected to vary in other contexts.

For new interventions and strategies, cost data collection alongside pilots and trials should be used to develop and populate flexible and transparent cost models, which can inform prospective decision making in various contexts. Once a novel intervention is implemented more widely, further cost analyses are valuable in validating and refining the mechanistic model and in informing approaches for the development of cost models more generally.

Modeling Costs at Scale in Dynamic Transmission Models: A Case Study of Tuberculosis

PRESENTER: **Gabriela B Gomez**, London School of Hygiene & Tropical Medicine
AUTHORS: Don Mudzengi, Fiammetta Maria Bozzani, Andrew Siroka, Nicolas Menzies, Anna Vassall

Background In a context of limited resources, mathematical and economic modelling is used to inform prioritisation processes and resource allocation decisions within the health sector in general and disease programmes in particular. A key challenge in this optimisation process is to estimate the relationship between marginal costs, scale and coverage levels with limited data available.

Objective We aim to develop a framework to estimate cost functions suitable for infectious disease modelling and improving upon the assumption of linearity of costs.

Methods We expanded on a theoretical frame based on concepts of transport economics, namely economies of capacity utilisation, economies of density as well as economies of scope. We illustrate our framework through a TB case study, using secondary data available from the literature and routine reporting systems in South Africa.

Results We postulate that a cost function, in the case of scale-up of disease-specific services, is derived both by considering the optimal relationship between service coverage and the number/type of facilities included during (density of provision), and the number of people serviced at each facility (capacity utilisation within those facilities). Additionally, strategies within disease areas may exhibit economies of scope (reduction in cost from joint production). The assumption of a linear relationship between costs, scale and coverage can give predictions of total costs that are systematically biased. Economies of capacity (or scale at facility level) and scope can substantially change cost estimates over time. However, assumptions about how a program expands within the network of facilities (economies of density) will affect costs estimates depending on the intervention specificities. In our example, the man drivers of total costs were teh assumptions of facility level capacity, instead of the network expansion. While this framework has the advantage of being transparent and based on empirical data, there are health system-wide constraints that need to be better defined. For example, more information is needed to characterise the distribution of spare human resource capacity as well as our ability to reallocate this capacity.

Conclusions The functional form an analyst may choose to use will determine the magnitude and shape of costs when increasing the outputs and coverage. This in turn will impact the results of any optimisation routine. Ultimately, infectious diseases modellers and economists should aim to include more transparent and empirically-based cost models into the analysis to be able to inform resource allocation processes. The framework presented here should be viewed as a first step in this direction.

Answering the Exact Question the Government Is Asking: The Use of Budget Impact Analysis in HIV and TB Policy in South Africa

PRESENTER: **Gesine Meyer-Rath**, Boston University

AUTHORS: Caroline Govathson, Craig Andrew van Rensburg, Lise Jamieson

Background: Affordability is often a secondary consideration in deciding on new health policies in low- and middle-income countries, ranging after cost effectiveness, pressure by international organisations, or domestic political expediency. We report on our experience supporting decision makers in the South African Department of Health and Treasury with modelled budget-impact analyses for HIV and TB interventions.

Methods: We developed a range of health-state transition models using outcomes data from public-sector cohorts and our own microcosting analyses to supply evidence for decisions ranging from the expansion of eligibility and new drug regimens for antiretroviral treatment (ART) to the optimal target population for pre-exposure prophylaxis (PrEP) of HIV, the value of community-based HIV testing, and novel TB diagnostics, amongst others. Following current standards for budget impact analysis, models captured public-sector prices, budgets accruing to different funders where relevant, and different implementation scenarios. These scenarios were informed by assumptions regarding replacement effects of current intervention modalities by new ones, different service platform configurations and other technical efficiencies.

Results: Results varied depending on the decision problem. We showed that the cost of expanding ART eligibility could be more than recouped by implementing task shifting to lower staff cadres and opening the antiretroviral drug market to international competition, that PrEP cost varied between the first and any other year of provision as well as, marginally, between different target populations, that community-based HIV testing had similar average costs but a potential larger reach than facility-based testing, and that South Africa alone could break through several pre-negotiated volume-based price tiers for point-of-care TB diagnostics. Results tended to be most sensitive to the price difference between the novel and existing interventions as well as assumptions regarding, in the short term, the pace of scale-up on the supply side, and, in the long term, uptake on the demand side. The results of most of these analyses informed policy changes in the shape of new or updated national guidelines, as well as the budgets needed to implement them.

Conclusions: After a government has made a decision regarding the desirability of a novel intervention, or an expansion of an existing one, based on cost effectiveness and other criteria, evidence regarding budget impact and affordability needs to be supplied before additional budget allocations can be committed and implementation can start. Custom-made budget impact models can supply this information in a timely fashion, based on relatively easily available data, while taking uncertainty into account through simple scenario analysis.

1:30 PM –3:00 PM TUESDAY [Production Of Health, Health Behaviors & Policy Interventions]

Universität Basel | Kollegienhaus – Hörsaal 116

Infant & Child Health #1

SESSION CHAIR: **Andres I. Vecino-Ortiz**, Johns Hopkins University

Nutrition and Cognitive Capital: A Theoretical and Empirical Approach to the Lasting Effects of Early Nutrition

PRESENTER: **Ms. Stephanie Puerto**, Instituto de Salud Pública, Pontificia Universidad Javeriana

AUTHOR: Dr. Andres I. Vecino-Ortiz

Early nutrition is a key factor for cognitive ability during the life cycle. Previous research has documented the effects of nutrition in the cognitive ability of children, adolescents and young adults. However, there are no previous studies describing the effects of early nutrition on cognitive ability during the seniors years in Latin America, a region where malnutrition problems persist in children. Based on Grossman's demand for health framework and assuming the depreciation rate as endogenous, we propose a theoretical model for cognitive capital and identify two transmission channels in which nutrition, as input, affects the production and stock of cognitive capital: one is the early accumulation of cognitive stock, and the variation of the lifecycle's depreciation rate.

We tested the model using nationally-representative aging surveys of two Latin America's countries: the CRELES survey panel of seniors with three waves from 2005 to 2009 of Costa Rica; and the Colombia SABE 2015 cross-sectional aging survey. We take advantage of 1) knee height biomarker as exogenous proxy of the early nutrition environment of surveyed individuals, and 2) the measurement of cognitive ability through the Mini-Mental State Examination by Folstein as a current metric for cognitive ability in elderly. Different linear, count data and panel data specifications are used to test the relationship between early nutrition environment and cognitive ability in the elderly. In the case of Costa Rica's panel, we used Pooled OLS and Generalized Estimating Equations (GEE) with Poisson and Gaussian specifications, nonetheless for Colombia's survey we applied OLS and a Generalized Poisson because the cognitive ability is an underdispersed variable.

Our study shows a positive and significant relationship between early nutrition in Colombia and Costa Rica. In Colombia 1 centimeter more of knee height is related to 1 to 1.8 points more of cognition scores, for males and females respectively. Besides, in Costa Rica 1 centimeter more of tibia size is related to 0,4 points of higher cognitive scores in elderly. Results suggest a positive relationship between early investments in nutrition and lasting effects on cognitive capital in the elderly. From this study we can highlight the importance of ensuring optimal early conditions for children as its effects will remain for the entire lifecycle and subsequent generation. Finally, we discuss potential pathways and policy implications of this evidence.

Healthcare at the Beginning of Life and Child Survival: Evidence from a Cash Transfer Experiment in Nigeria

PRESENTER: **Dr. Edward Okeke**, RAND Corporation

Households in poor countries are encouraged (and sometimes coerced) to increase investments in formal health care during pregnancy and childbirth. Is this good policy? The answer to a large extent depends on its effects on child welfare. In this large-scale randomized trial designed to shed light on this question, households in Nigeria were randomly assigned to receive a cash transfer of $14 conditioned on uptake of a package of health services by pregnant women in the household or to a control group that received a small gift worth $0.43 for participating in the trial. We show that women in treated households were substantially more likely to use healthcare services. We then show that this led to a large and significant increase in child survival (about 7% relative to the control group mean). We explore causal mechanisms and present evidence suggesting that the key driver is prenatal health investments and not health care at birth.

Access to Tap Water in Utero and the Childhood Well-Being: Evidence from Rural China

PRESENTER: **Yun Xiao**, Tinbergen Institute

AUTHOR: Li Li

This paper examines the impacts of in utero access to tap water on childhood health. We exploit the variation in the timing of tap water connection across communities imposed by a major drinking water program in rural China. Using data extracted from the China Family Panel Studies 2010, we find that in utero access to tap water increases the height-for-age z-score for children aged 12-132 months by 0.311 standard deviations and reduces the probability of getting any sickness in the first year of life by 13.2 percentage points. Our estimates remain robust to a series of sensitivity analyses, including taking into account possible effect of sanitation, other potential confounding factors, addressing the possible reporting error and measurement error in the treatment variable, and discussing the possible impact of sample selection. The event study estimates reveal in utero as the critical time window of the impact. The mechanism analysis suggests that the health benefits may stem from the improvement in drinking water quality, rather than the increase in water quantity.

Bullying at Birth? Obstetric Violence Laws and C-Section Rates in Mexico

PRESENTER: **Fernanda Marquez-Padilla**, CIDE

AUTHOR: Jimena Delgado

Over the past few decades there has been a dramatic increase un C-Section (CS) rates, many of which are deemed unnecessary and which may pose more health risks than benefits, both for mothers and newborns. This paper explores the effects that changes in Mexican local laws have in the rate of CS. In particular, we exploit the fact that in recent years several states have legally recognized "obstetric violence" (OV) in their local laws and penal codes, many of which directly recognize unnecessary or unwanted CS as OV. If health providers perceive greater legal liability (i.e less protection from supervisors, higher exposure to lawsuits or higher monitoring on all stages of obstetric care) from performing unnecessary CS when OV laws exist the probability of performing this procedure will be lower. We use the universe of registered births in Mexico from vital statistics' birth certificates 2008-2016 to explore the effects of OV laws at the state level. We find a negative and significant decrease in CS when states include OV directly in their penal codes, but no effect when included only in local laws. Our results suggest that OV laws reduced the probability of performing only unnecessary CS and had no effect when the procedure was necessary. We find that the effect of these legislative reforms on the probability of delivering via CS is stronger for younger, less educated mothers. Additionally, the effect seems to be concentrated in public healthcare units, whereas private facilities show no decrease in CS following OV legislation. We find suggestive evidence of some degree of demand-driven CS: as the supply of unnecessary CS is reduced in public hospitals certain women appear to reallocate to private health centers in order to receive the type of obstetric care they want.

1:30 PM –3:00 PM TUESDAY [Health Care Financing & Expenditures]

Universität Basel | Kollegienhaus – Hörsaal 117

Organized Session: Understanding the Dimensions of Heterogeneity in Performance Based Financing Schemes in Low and Middle-Countries

SESSION CHAIR: **Laura Anselmi**, Health Organisation, Policy and Economics, University of Manchester

Paying for Performance to Improve the Delivery of Health Interventions in Low- and Middle-Income Countries – a Cochrane Review (2018 update)

PRESENTER: **Sophie Witter**

Introduction

Paying for performance is viewed as a principal mechanism for aligning the incentives of health providers with public health goals. A 2012 Cochrane review on the topic explored the effectiveness of these strategies in improving healthcare and health, particularly in low- and middle-income countries. The review included nine studies, most which were of low quality; no general conclusion on the effects of paying for performance could be drawn. Here we present the findings of an updated Cochrane review on the topic conducted in 2018.

Methods

Review objectives: to assess the current evidence for the effects of paying for performance on the provision of healthcare and health outcomes in low- and middle-income countries.

In line with the original review, we searched 10 bibliographic databases (including CENTRAL, MEDLINE, CINAHL, LILACS) and 30 grey literature sources/databases (including Cordaid, Department for International Development UK, Centre for Global Development, Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ), KfW Entwicklungsbank, The Global Fund to Fight AIDS, Tuberculosis and Malaria, The Inter-American Development Bank, World Health Organization).

Studies were included if they reported at least one of the following outcomes: changes in targeted measures of provider performance – such as the delivery or utilisation of healthcare services; changes in patient outcomes; unintended effects; or changes in resource use. Studies needed to be conducted in low- or middle-income countries (as defined by the World Bank), and use one of the following designs: randomised control trial, non-randomised trial, controlled before-after study, or interrupted time series study.

Preliminary Findings

Data extraction and analysis are on-going, however we note high levels of heterogeneity in the intervention designs and study methods reported, as well as wider contextual factors affecting intervention design and roll-out. The majority were focused on the evaluation of pay for performance schemes in Sub-Saharan Africa; however, we identified studies across Latin America, Asia and the Middle East meeting our inclusion criteria. Only a limited proportion of studies included were randomized control trials; most studies were quasi-randomized or controlled before and after studies. Intervention designs outlined across this body of literature are varied and include payments linked to: increases in quality of care, service, and a mix of the latter two. In general, interventions targeted multiple services, including in and out-patient; however, some focused on specific clinical areas (e.g. tuberculosis or maternal and child health).

Conclusion

The presentation will cover a summary of included studies and narrative synthesis of intervention effects by key outcomes; additionally, we will attempt a meta-analysis for studies of sufficient comparability. We will present sub-group analyses highlighting the heterogeneity in effects of pay for performance schemes, for example, differences due to: design of the pay for performance scheme (e.g. conditional cash payments vs. target payments); level of the health system at which payments are disbursed (e.g. district vs. health facility); and setting (both regions and in country settings, e.g. urban vs. rural).

Heterogeneity in Burkinabé Health Workers' Satisfaction with Performance-Based Financing

PRESENTER: **Julia Lohmann**, London School of Hygiene and Tropical Medicine

Background

One mechanism by which PBF is assumed to strengthen service delivery is motivating health workers to improve their work performance. Existing qualitative studies, however, have shown large variation in health workers' affective reactions to PBF, challenging this assumption. Our study is the first to quantify and explore factors associated with heterogeneity in health workers' reactions to PBF in Burkina Faso to inform future successful PBF implementation.

Methods

We assessed health workers' overall satisfaction with PBF, basic knowledge, earnings, and fairness perceptions in relation to PBF as part of the endline health worker survey of the PBF impact evaluation in Burkina Faso. A representative sample of 1405 health workers from 408 primary-level and 12 secondary-level health facilities in the 12 intervention districts were interviewed. We further used data on facility performance collected by the program. We employed multi-level linear regression analysis to explore factors associated with heterogeneity in satisfaction with PBF, controlling for general work attitudes. Following quantitative data analysis, we performed in-depth interviews with five program managers to triangulate the quantitative findings and better understand observed heterogeneity.

Results

Health workers' mean satisfaction score was 6.4 on an answer scale from 0 (not satisfied at all) to 10 (completely satisfied), with substantial variation at the individual level (sd=2.4; min=0, max=10), between health facilities (range of means 1.3-10), and between health districts (range of means 5.1-7.7). Program managers attributed individual-level variation primarily to personality and frustration tolerance regarding various implementation challenges, notably the substantial payment delays incurred by the intervention, and health facility and district variation primarily to the respective facility and district managers' enthusiasm and engagement in regard to PBF as well as to experienced achievements made possible through PBF.

No relationships between health workers' satisfaction with PBF and their sex, seniority, cadre, or level of care were found. Satisfaction with PBF was neither related to actual facility performance as measured by the program, nor to change in performance since the start of PBF, nor to the absolute amounts of money health workers had earned through PBF. However, health workers tended to be more satisfied with PBF the better their knowledge of details of the intervention and the fairer they found the performance evaluation process and the process of distributing reward payments among staff members. To this extent, program managers underlined again the key function of health facility and district managers in creating transparency and assuring participation in PBF implementation.

Conclusions

Our study underlines that the focus on averages underlying most standard impact evaluation techniques masks substantial variation in reactions to PBF. Results show the importance of PBF knowledge and fairness perceptions associated with core elements of PBF and the key role of facility and district managers in building knowledge and shaping fairness perceptions. Both findings correspond to results of previous qualitative studies in other settings, substantiating the need for more intensive management training and engagement in the quest to reduce heterogeneity towards more positive PBF effects.

A Multi-Methods Study Evaluating the Heterogeneity of Effects Produced By a Performance-Based Incentives Program in Malawi

PRESENTER: **Manuela De Allegri**, Institute of Public Health, Heidelberg University, Germany
AUTHOR: Dr. Stephan Brenner

Background: While the literature on performance-based incentive (PBI) programs in low- and middle-income countries is growing, little evidence exists on how PBI effects differ across health facility types. We conducted a multi-method impact evaluation to compare the effects of a PBF program in Malawi on selected outcome measures and to further explore effect heterogeneity between hospitals and health centres.

Methods: The Support for Service Delivery Integration Performance-Based Incentives (SSDI-PBI) started in August 2014 incentivizing the quantity and quality of a range of primary health care service outputs from enrolled hospitals and health centres in three pilot districts. We conducted two complementary quasi-experiments comparing 17 intervention and 17 matched control facilities (each consisting of 12 health centres and 5 hospitals) over a 12-month period prior and 20-month period following implementation start: a) a controlled pre- and post-test study (relying on use of Service Provision Assessment and primary data) to estimate the SSDI-PBI effect of selected quality indicators related to service inputs; b) an interrupted time series analysis (relying on use of HMIS data) to estimate the effect on quantity indicators related to service utilization.

Results: Overall, effects were rather homogeneous across facility types pointing at a stronger effect on quantity compared to quality indicators. Effect heterogeneity was only observed for 4 (19%) out of a total of 21 outcome indicators. The observed pattern of heterogeneous effects on both quality indicators (availability of oxytocic drugs, measles vaccines, HIV test kits) and quantity indicators (number of postnatal care visits by women, one-year old children fully vaccinated, couples tested for HIV) showed a generally stronger positive effect on health centers as compared to hospitals. For those quantitative indicators, health center effects occurred generally much earlier after PBI implementation, while hospital effects were more delayed.

Discussion: While incentive structures were identical for both health centers and hospitals, effects on some performance indicators differed by facility type. The observed PBI-induced increase in the number of HIV counseling and child vaccinations at health centers might have resulted in incomplete stocks for HIV test kits and selected vaccines in these facilities. Oxytocic drug procurement appeared to be more challenging for health centers in general, as the PBI did not affect the number of facility-based deliveries.

Conclusion: Overall, SSDI-PBI effects were comparable between health facility types. Heterogeneities in effects for selected performance indicators might rather point at challenges in aligning input procurement with increased outputs for some incentivized services.

Performance-Based Financing in Zimbabwe: Demand-Side Heterogeneous Effects

PRESENTER: **Eleonora Fichera**, University of Bath

Motivation: There is an upward trend in the use of health care incentives globally. Performance based financing (PBF) has been promoted in low- and middle- income settings as a way to improve availability, accessibility and quality of health services. However, there is mixed evidence on how PBF incentives affect health care use and little evidence on how it affects outcomes or who benefits the most. We use data from Zimbabwe, where a large PBF scheme was rolled out across 60 districts, as a case study to investigate the demand-side heterogenous effects of supply-side interventions. Specifically, our focus is on whether PBF has pro-poor effects or not.

Background: PBF started in two districts of Zimbabwe in July 2011 and was gradually rolled out until July 2014. Contracts were agreed for service delivery focusing on reproductive maternal, new-born, child and adolescent health. The monetary incentive is a function of a unit price per each indicator, quantity and quality of services, and an equity bonus.

Data: We have combined two sources of data. Firstly, we have used data from three waves of the Zimbabwe Demographic and Health Survey (DHS 2005, 2011 and 2015) to measure health care indicators (institutional delivery, C-section, post- and ante-natal care visits, vaccinations, HIV test, family planning and drugs, blood and urine sample, use of prescribed or traditional medicine), and health outcomes such as birth weight. Using the date of delivery and of vaccinations, we were able to define exactly when outcomes are measured with respect to PBF introduction. DHS contains a rich set of demographic and socioeconomic characteristics such as the household wealth index and car ownership, mother's years of education and religion, and rural location. Secondly, we have used the list of all health facilities in the country from the Ministry of Health. We have linked these two datasets using geocoordinates of the DHS clusters and of health facilities. We have identified "treated" and "untreated" health facilities depending on their location in a PBF or non-PBF district.

Methods: We have used a difference-in-differences approach that exploits the gradual introduction of PBF across districts. Our identifying assumptions are that incentivised indicators and health outcomes follow a similar trend before the introduction of PBF and that there are no

spillovers across PBF and non-PBF districts which we have tested for in additional analyses.

Results: Preliminary results show that the introduction of PBF increased institutional delivery by five percentage points. This result is stronger for poorer households with an increase in institutional delivery by 12 percentage points. However, there is no statistically significant effect on other health care indicators or health outcomes.

Conclusion: This study highlights the importance of examining heterogeneous effects of PBF in low income settings. Although preliminary results show no significant effect on health outcomes, we do find an increase in institutional deliveries particularly for poorer households. Future work will examine how PBF affected a wider range of health outcomes along different dimensions of heterogeneities such as education and remoteness.

1:30 PM –3:00 PM TUESDAY [Supply Of Health Services]

Universität Basel | Kollegienhaus – Hörsaal 118

Organized Session: Physician Decision-Making and the Quality of Prescribing

SESSION CHAIR: **Adam Sacarny**, Columbia University

Dangerous Prescribing and Care Fragmentation

PRESENTER: **Dr. Adam Sacarny**, Columbia University

AUTHORS: R. Annetta Zhou, Keith M Marzilli Ericson

The quality of care that patients receive may depend on how effectively their clinicians coordinate and learn from one-another. In this study, we consider whether fragmented care leads to dangerous or low-value prescribing. When care is fragmented, no clinician has primary responsibility for the full scope of a patient's many prescriptions. For example, taking an opioid pain reliever alongside a benzodiazepine anti-anxiety drug puts a patient at greatly increased risk of overdose and death, and a patient receiving fragmented care across multiple providers could easily find herself with escalating prescriptions for both drugs without any single provider aware of the dangerous combination.

We seek to quantify the association between care fragmentation and prescribing quantity and quality, purged of patient selection. To this end, we exploit "mover" patients (c.f. Finkelstein et al. 2016, Agha et al. 2017) who move across regions with varying levels of care fragmentation. We track how patients' prescription drug use evolves when they move from, for example, a low fragmentation to a high fragmentation area. We also apply this research design to analyses at the provider group level by studying how care changes when patients change provider groups (c.f. Agha et al. 2018). In preliminary, cross-sectional results, we find that areas with fragmented care delivery tend to have fewer prescriptions, and fewer low-risk prescriptions. However, such findings may be the result of patient selection, highlighting the importance of research designs like the mover approach that are robust to non-random allocation of patients to areas.

Information Technology, Access, and Overuse of Prescription Drugs

PRESENTER: **Liisa Laine**

AUTHORS: Prof. Petri Böckerman, Mika Kortelainen, Mikko Nurminen, Tanja Saxell

We estimate the impacts of a health information technology designed to improve access to medication while simultaneously limiting overuse. Our identification strategy uses the rollout of a nationwide electronic prescribing system in Finland. We also use comprehensive administrative data from patients treated with benzodiazepines, which are globally popular and effective, but addictive psychotropic medications. We find no effect on benzodiazepine use on average, but among younger patients e-prescribing increases repeat medication use. Younger patients' health outcomes do not improve, but prescription drug abuse disorders and suicide attempts increase dramatically. Easier access through the technology may thus increase medication overuse.

A Randomized Trial of Peer Comparisons to Improve Guideline-Based Clinical Practice in Primary Care

PRESENTER: **Amelia Bond**, Weill Cornell Medicine

AUTHORS: Amol Navathe, Ezekiel Emanuel, Kristin Linn, Kristen Caldarella, Andrea Troxel, Jingsan Zhu, Shireen Matloubieh, Kevin Volpp

Background

Because of lackluster results in physician incentive programs, there has been a surge of interest in using behavioral science to guide the design of financial and non-financial interventions. One promising such strategy is providing feedback about their performance relative to that of peers – using social comparisons to invoke the relative social ranking behavioral principle. Peer comparisons had been tested in narrow settings such as increasing guideline-based medication prescribing (antibiotics and opioids), with more recent applications together with payment changes. However, there are no studies evaluating the effectiveness of peer comparison together with broad interventions such as payment system changes.

Methods

We conducted a cluster randomized trial with the Blue Cross Blue Shield of Hawaii to examine the impact of providing peer comparison feedback to its primary care practitioners (PCPs) on the quality of care . This study included patients who were attributed to one of 86 PCPs and assigned to an intervention group receiving peer comparisons plus individual feedback and a control group receiving individual feedback alone. Feedback was provided on quality, cost, and utilization performance. All PCPs were also simultaneously moved to a new population-based primary care payment system. The primary outcome was the probability of achieving guideline-based thresholds on thirteen primary care focused quality metrics that included guideline-concordant cancer screening, prescribing for chronic conditions, and other preventative and chronic disease measures. We analyzed the primary outcome using a generalized linear model, adjusting for patient characteristics, PCP characteristics, baseline proportion of measures achieved by the patient, and a quality measure fixed effect, clustering standard errors at the PCP.

Results

The RCT included 73,569 patients randomized via 86 physicians. Patients did not exhibit large differences across groups, with small differences in demographics and risk score. PCPs across groups similarly did not exhibit large differences across groups, with small differences in specialty and panel size. In primary analysis, the patients in the peer comparisons intervention group experienced an absolute 2.4% higher probability of achieving an eligible quality measure (95% CI 0.3% to 4.6%, p=0.03). Secondary analysis of individual measures indicated that Breast Cancer Screening (+3.9%, 95% CI 0.2% to 6.0%, p<0.001), Cervical Cancer Screening (+2.4%, 95% CI 0.01% to 4.8%, p=0.05), Colorectal Cancer Screening (+2.8%, 95% CI 0.3% to 5.2%, p=0.03), Diabetes Care – Eye Exam (+5.6%, 95% CI 1.6% to 9.5%, p = 0.006), Diabetes Care – Kidney Screening (+2.5%, 95% CI 0.4% to 4.6%, p=0.02) and Review of Chronic Conditions (+4.9%, 95% CI 0.0% to 9.8%, p=0.05) were likely the components accounting for the increased overall composite score. Many other measures demonstrated trends toward differential improvement, but associations were not significant. Cost and utilization did not demonstrate differences between arms.

Conclusions

A peer comparisons intervention that displayed quality information in a real-time dashboard in the setting of a broad payment system change improved quality scores by over 2 percentage points. This highlights the ability of peer comparisons to influence clinician practice in broad endpoints and is reassuring in light of new Medicare payment programs that have begun sharing comparative feedback.

1:30 PM –3:00 PM TUESDAY [Economic Evaluation Of Health And Care Interventions]

Universität Basel | Kollegienhaus – Hörsaal 119

Organized Session: Alternative Approaches to Valuing Air Pollution Reduction: Pricing Clean Air.

SESSION CHAIR: **Brian Ferguson**, Public Health England

PANELISTS: **Laura Webber**, UK Health Forum; **Laure de Preux**, Imperial College London; **Susan Griffin**, University of York; **Simon Walker**, Centre for Health Economics University of York

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1:30 PM –3:00 PM TUESDAY [Organization Of Health Care Markets]

Universität Basel | Kollegienhaus – Hörsaal 120

Spatial Competition in Health Care Markets

SESSION CHAIR: **Peter Sivey**, RMIT University

Hospital Ownership Type, Market Competitiveness and Treatment Choices

PRESENTER: **Dr. Esra Eren Bayindir**, Hamburg Center for Health Economics, University of Hamburg

AUTHOR: Jonas Schreyögg

Introduction: In this work, we examine how treatment choices of different hospital ownership types are affected by market competitiveness (for-profit, government and not-for-profit competition) and patient insurance type.

Methods: We employ two datasets in our analysis. Patient records are obtained from Healthcare Cost and Utilization Project, State Inpatient Databases for 11 states from 2004-2005. Hospital characteristics are from American Hospital Association Annual Survey data. We use computer classification software procedural groups (231 groups) and define target patient records as the records with top three diagnosis-related groups (DRGs). We use a distance-weighted method to calculate the competition each hospital faces for each procedural group, which assigns weights by admissions and inversely by distance so that distant hospitals have less importance relative to close hospitals but may still have an effect. If the competition a hospital faces for a procedural group is in the top 25th percentile for the procedural group, the hospital is

classified as in a high competition market for that procedural group. We define high competition markets for for-profit, government and not-for-profit hospitals separately since we expect the effects of high for-profit competition to be different from high government competition.

We use a logit model accounting for patient characteristics such as insurance type, age, race, gender, Charlson index, hospital characteristics such as teaching status, number of beds, number of nurses per bed, and we control for the interactions of target procedural group and DRGs to estimate the probability of receiving the procedure by hospital ownership type and market competitiveness.

Results: Treatment choices of hospitals differ considerably by market competitiveness; all ownership types are more likely to accord the procedure at high for-profit competition markets than low for-profit competition markets. Government hospitals are most responsive to not-for-profit competition; they are the most likely to accord the procedure in high not-for-profit competition markets. For-profit hospitals are more aggressive in high not-for-profit competition markets then high for-profit competition markets. Not-for-profit and for-profit hospitals react differently to government competition; while not-for-profit hospitals are more likely to accord the procedure in high government competition markets, for-profit hospitals are more likely to accord the procedure in low government competition markets.

When we consider treatment choices by insurance type and market competitiveness, we observe that not-for-profit hospitals are much more likely to accord the procedure to profitable patients (Medicare and privately insured) in high for-profit competition markets than low for-profit competition markets. For-profit hospitals are more likely to accord the procedure to profitable patients in general.

Conclusions: Market competitiveness (for-profit, government and not-for-profit competition) has significant effects on treatment choices of all hospital types. Preliminary results show that hospitals are least responsive to competition they face from their ownership types. While not-for-profit hospitals are not very responsive to government competition, government hospitals and for-profit hospitals are more likely to accord the procedure in high not-for-profit competition markets than low not-for-profit competition markets suggesting that not-for-profit hospitals view for-profit hospitals as their main competitor while both for-profit and government hospitals view not-for-profit hospitals as their main competitor.

Will Quality Matter in Defining Relevant Markets for Hospital Mergers?

PRESENTER: **Stella Quimbo**, University of the Philippines

In this paper, I evaluate the usefulness of an alternative or supplement to a ‘small but significant and non-transitory increase in price’ (SSNIP) test for defining hospital markets for purposes of implementing anti-trust laws. Because quality is an important consideration in the demand for and supply of hospital care, I ask whether the determination of relevant markets for hospital care must also consider consumer and supply responses to a given change in quality.

A unique data set from a randomized policy experiment conducted from 2003 to 2008 in the Philippines provides an opportunity to test the feasibility of an alternative ‘small but significant and non-transitory decrease in quality’ (SSNDQ) test. I apply this to 23 government-owned district hospitals as initial candidate relevant markets. The quality measure is a composite index of clinical vignette scores, hospital load, and patient satisfaction. I conduct profit simulations given a 5 percentage point reduction in this quality measure. For comparison, I begin the analysis with standard SSNIP tests.

I find that in all 23 district hospitals used in the analysis, a SSNIP can be profitable. In most of these hospitals, however, an SSNDQ will be unprofitable. Only in 5 of these hospitals (22 percent) will an SSNDQ also be profitable. These results imply that a traditional SSNIP test applied to our study hospitals will point to narrowly defined hospital markets. An SSNDQ, on the other hand, could potentially indicate wider markets. It would appear that the SSNIP and the SSNDQ tests are consistent only where quality levels are low, given that the relationship between quality levels and hospital charges is U-shaped. For sufficiently low quality levels, further reductions in quality can mean higher revenues for hospitals and thus, an SSNDQ can be profitable.

Overall, my results suggest that competition by way of quality improvements could be profoundly different from competition via the lowering of prices, at least in the provision of hospital services. The results indicate that when quality reductions are used as the basis for a hypothetical monopolist test, the hospital market could be broader than when a traditional SSNIP test is conducted. Only where initial quality levels are sufficiently low that both tests have consistent implications on market definition.

Hence, where quality is an important consideration in both demand and supply of a product, a supplemental SSNDQ is warranted. An SSNDQ test appears useful for Philippine hospital markets where a non-linear relationship between quality and charges had been found. Moreover, as hospital mergers are increasing in number, though few of these have become subject to compulsory notification, the competition authority could consider public-owned facilities as possible sources of competitive constraints to merging private hospitals in the future. As government policies may have the effect of fixing prices in some types of hospitals, competition dynamics could involve mostly quality rather price responses by competitors.

The Effect of the Freedom of Choice on Health System Responsiveness. Evidence from Spain

PRESENTER: **Dolores Jiménez Sr**, UNIVERSITY OF GRANADA

AUTHORS: Silvana Robone, Angel Fernández-Pérez

From a theoretical viewpoint, freedom of choice policies in the healthcare field aim at boosting patient empowerment and improving the quality and responsiveness of care provided, while reducing waiting times and inequities in access. Although policies which aim at increasing freedom of choice have been gradually implemented in many European countries, there is not enough empirical evidence on their

consequences yet. In this paper we use the Community of Madrid as a case study. In 2009 in this region a law transformed the healthcare organisation system by allowing individuals to choose freely among any of the General Practitioners and Specialists of any healthcare centre and hospital of the region. This law was enacted only in the Community of Madrid, one of the seventeen Spanish regions with devolved powers over healthcare. We use the cross-section microdata from the Spanish Healthcare Barometer survey (2002-2016) to analyse the impact of this reform on the responsiveness of the public health system. Responsiveness can be defined as a system's ability to respond to the legitimate expectations of potential users regarding non-health enhancing aspects of care.

We perform our empirical analysis by using synthetic control estimation techniques, a method which builds on Difference in Difference estimation, but uses a data driven approach to selecting the control group comparisons to get causal effects. The main results show that the reform has had a slight negative impact during the first years after the reform on the Communication and Dignity domains in primary care, and a strong positive long-lasting impact on the Prompt attention domain in specialised care. In particular, the average waiting times fell by around 22% while satisfaction with the Prompt Attention domain increased by around 7% compared to the pre-treatment period.

The results of this study provide policy-makers with empirical evidence about the impact of health policies which are increasingly implemented in many countries worldwide, such as the policies giving the citizens free choice of the health professionals.

Bypassing for High-Quality Healthcare: Relationship between Distance and Delivery Facility Quality Among Pregnant Women in Peri-Urban Nairobi

PRESENTER: **Dorit T Stein**, Palladium
AUTHORS: Jessica Cohen, Margaret McConnell

Background. A key strategy to improve maternal health outcomes is to encourage women to deliver at health facilities with trained medical personnel. Increased facility-based births have not resulted in a corresponding decrease in maternal mortality in countries with high maternal death rates including Kenya. In a major metropole like Nairobi there are hundreds of maternity facilities of widely varying quality. Poor women living in informal settlements outside Nairobi deliver in low-quality health facilities despite the availability of high-quality facilities. The reasons for utilization of low-quality facilities in urban areas are not well understood.

Objectives. Our main objective was to describe the relationship between distance to delivery facility and delivery facility quality to inform interventions aimed at reducing barriers to accessing high-quality care in urban areas.

Methods. Our sample included 358 women who delivered in 59 facilities. We created a technical quality index comprised of the fraction of routine and emergency obstetric and newborn signal functions performed by facilities. We calculated distance and travel time from women's neighborhood centroids to their delivery and nearest facilities. We compared delivery facility characteristics to the nearest facilities. We ran bivariate OLS regressions to examine associations between quality, women's characteristics, and distance to delivery facility.

Results. There is a positive relationship between distance to delivery facility and facility technical quality overall and among women who delivered in hospitals or tertiary hospitals. Women on average traveled farther and longer to deliver than the distance or time to travel to their nearest Comprehensive Emergency Obstetric and Newborn Care (CEmONC) capable hospital (where they would have received higher quality care on average) or nearest facility (where they would have received lower quality care on average). Women delivered in facilities with lower vaginal delivery costs and lower rates of reported disrespect and abuse compared to if they had delivered in their nearest facilities. 68% of a sub-sample of women ranked their most wanted delivery facility as the one they perceived as best able to handle obstetric emergencies, but only 7.7% of women ever considered delivering in their nearest CEmONC capable hospital. Women with indicators of a risky pregnancy traveled significantly farther than women without those risk factors. Availability of resources and delivery and transportation costs were also associated with traveling.

Conclusion. Although women living in peri-urban Nairobi state wanting to deliver in high-quality facilities and incur costs to travel to them, there are still women that do not deliver in facilities of the highest technical quality available to them. Women either cannot travel even the relatively short distances to high quality facilities due to financial barriers and resource constraints, do not know where they should go to receive the highest quality care due to the difficulty in perceiving technical quality, or prefer to deliver in a facility where they are less likely to be disrespected or humiliated. Health policies targeting poor pregnant women living in urban areas need to recognize these financial, informational, and interpersonal barriers to receiving high quality delivery care.

1:30 PM –3:00 PM TUESDAY [Organization Of Health Care Markets]

Universität Basel | Kollegienhaus – Seminarraum 208

Health Insurance Markets

SESSION CHAIR: **Kees van Gool**, CHERE, UTS

Adverse Selection and Switching Costs in Health Insurance Marketplaces: Using Nudges to Fight the Death Spiral

PRESENTER: **Ms. Krisztina Horvath**, Boston College

High uninsured rates are a historical problem in the United States. To address this concern and make private health insurance markets more accessible for individuals, a key provision of the Affordable Care Act (ACA) health care reform was the introduction of the Health Insurance Marketplaces. However, data from the early years of the Marketplaces reveal several features consistent with the symptoms of an adverse selection death spiral, questioning the long run sustainability of these new health insurance markets.

Motivated by the intense health care debate in the US and recent advances in Behavioral Economics, the goal of this paper is to examine alternative behavioral solutions for the problem of adverse selection in the ACA Marketplaces. I study how simple nudging policies could expand coverage among the healthier population by reducing the cognitive effort costs associated with enrollment, while not imposing any restriction on the freedom of choice. The results suggest that these behavioral policies would not only increase consumer welfare, but also reduce the severity of adverse selection in the long run.

To analyze the research question, the paper first introduces a new theoretical behavioral model that highlights the benefits of studying switching costs and sorting based on risk type in the same framework. The model shows the role of switching costs generated by the cognitive effort costs of the enrollment process in amplifying the problem of adverse selection, and also provides insights about the welfare effects of the nudging policies studied in the paper. Based on the predictions of the theoretical model, I estimate a structural model of health insurance demand and supply using techniques from empirical Industrial Organization and machine learning. The estimation is performed using newly available individual-level panel data on insurance plan enrollment and claims for 2014-2016 from the Colorado All Payer Claims Database.

I simulate changes in consumer enrollment, plan choice, premiums and welfare under the different counterfactual behavioral policies suggested by the theoretical model. The simulation results reveal an interesting welfare trade-off: a reduction in adverse selection and a more stable market at the cost of some locked-in consumers due to switching costs. However, the substantial increase in enrollment rates among lower cost individuals reduces the severity of adverse selection, leading to a significantly lower price level and a positive net effect on consumer welfare. In addition to quantifying the welfare effects of these practical policies, these exercises also shed light on the choice of the right defaults in order to understand which behavioral policy would be the most effective in terms of improving consumer welfare.

This paper shows that simple behavioral policies have the potential to increase enrollment rates and maintain the stability of the individual health insurance market in the long run. These results provide important new insights for health care policy design, especially given the recent repeal of the most important stabilizing tool of the ACA, the individual mandate.

Long-Term Health Insurance: Theory Meets Evidence

PRESENTER: **Dr. Nicolas Robert Ziebarth**, Cornell University

AUTHORS: Martin Karlsson, Hanming Fang, Juan Pablo Atal

For decades, academics and policymakers alike have been investigating options to regulate private health insurance markets. Such policy options strive to avoid outcomes that are considered undesirable, such as uninsurance or unaffordable premiums for sick individuals. However, standard regulatory tools to address these issues, such as community-rated premiums and guaranteed issue, involve cross-subsidization from the healthy towards the sick, and therefore typically imply a trade-off with other unintended consequences such as adverse selection (Akerlof, 1970).

A fundamental alternative to regulated cross-subsidization under individual mandates is an individual long-term health insurance contract. Instead of relying on transfers across individuals with different health statuses, long-term contracts leverage an individual's private intertemporal incentives. Under long-term contracts, sick individuals pay relatively low premiums by paying relatively high premiums in healthy times of their life. In theory, a carefully designed long-term contract can reduce the risk of premium fluctuations due to health shocks ("reclassification risk"), while ensuring participation and eliminating adverse selection .

In this paper, we study the private health insurance market of Germany, where 10 percent of the population (or 8.8 million individuals), hold an individual long-term health insurance policy sold by private insurance companies. After an initial risk-rating, the policies are guaranteed renewable until death (without an expiration date or enrollment period) and future premium changes have to be community rated; that is, premium changes over the lifecycle are independent of changes in the policyholder's health status. (Germany has no public insurance specifically for people above the age of 65, like Medicare in the U.S.)

The simple design of German long-term health insurance (henceforth GLTHI) differs substantially from the welfare-maximizing contract derived by Hendel, Handel and Whinston, 2017 (henceforth HHW). The German contract foresees the payment of constant premiums over the lifecycle, regardless of the evolution of an individual's income and health status. As a consequence, the GLTHI contract almost completely eliminates the reclassification risk---at the expense of high premiums during the early life years. In contrast, the optimal dynamic contract involves a premium path that is income-dependent, and that changes over the lifecycle after the realization of health shocks. The optimal contract considers the individual's lifecycle income profile to find the welfare-maximizing balance between insurance against reclassification risk and consumption smoothing over the lifecycle.

Our findings show that the simple GLTHI design generates only small welfare losses compared to the optimal contract. Under our preferred parametrization, replacing GLTHI contracts with the optimal contract would increase welfare by only 1 percent. Within a plausible range of parameter values, we find that the welfare gains are smaller than 4 percent. Overall, the welfare gains from higher consumption smoothing

are almost completely balanced with the higher reclassification risk in the optimal contract. Moreover, we show that a simple modification of the GLTHI contract could achieve almost the same welfare as the optimal contract.

Selection, Subsidies, and Welfare in Health Insurance: Employer sponsored Health Insurance Versus the ACA Marketplaces

PRESENTER: **Sebastian Fleitas**, University of Arizona

AUTHORS: Caitlyn Fleming, Gautam Gowrisankaran, Anthony Lo Sasso

The 2010 Affordable Care Act (ACA) ushered in some of the largest changes to U.S. healthcare policy over the past few decades. It expanded the sale of individual health insurance, with a set of policies that changed the incentives for the purchase of insurance by individuals: subsidies to encourage moderate-income people to purchase insurance, penalties to incentivize the healthy to purchase, and the establishment of marketplaces, called Health Insurance Exchanges (HIX), to make the purchase of health insurance easier. These incentives were added to the incentives already in place in other segments of the health insurance market, in particular employer-sponsored insurance. Importantly, the tax and subsidy scheme in both markets created incentives for specific types of selection. Higher income people are steered to employer-sponsored insurance by high marginal tax rates, while low and moderate-income people are steered to HIX plans by subsidies.

One of the sectors with the largest expected disruption from the ACA is the small group market (SGM), which generally insures employers with 2-50 covered lives and had 18 million subscribers and $100 billion in revenue in 2013. In this paper we examine the effects of health insurance reform on the SGM. Using simulation methods, we integrate a unique database on SGM choices and claims with other sources of information. We estimate preferences for health insurance plans among people working at small employers. Using the estimated heterogeneous preferences, we examine the impacts on welfare and selection of different counterfactual policies. First, we evaluate the benefits from the SGM relative to having this market eliminated and being faced with HIX plans. In this analysis, we study heterogeneity in choice, selection, and value from the small group market. Second, we consider the impact of counterfactual formulations of the ACA, based on subsidies, tax deductibility, and plan benefits. We find that heterogeneity is important in this setting, with some individuals facing larger gains from the SGM. We also show the extent of adverse selection generated in the SGM because of the creation of the HIX and under the existing policy and alternative policy formulations.

Do Private Medicare Insurers Have Lower Costs?

PRESENTER: **Dr. Keaton Miller**, University of Oregon

The Medicare Advantage (MA) program offers seniors the choice of privately-operated managed-care plans as a replacement for traditional fee-for-service benefits. Plans are compensated through premiums and lump-sum payments from the government. Proponents of the program claim that competition should lead to efficiency in the sense of lower costs. However, empirical work has consistently found significant switching costs in this market, and if firms pursue a dynamic pricing strategy in the presence of these costs, traditional cost estimation techniques may be biased. Using data from 2008 to 2015, I provide evidence that firms behave in this way -- those plans that experience larger increases in market share in a given year raise prices more in the following year. With this in mind, I estimate a dynamic model of oligopoly and find that costs are significantly higher than would be estimated by a static model. The result is driven by the presence of many low-price, low-share firms; a static model sees only the prices and infers low costs, the dynamic model sees the share as well and infers that firms are influenced by the dynamic incentive.

1:30 PM –3:00 PM TUESDAY [Health Care Financing & Expenditures]

Universität Basel | Kollegienhaus – Seminarraum 209

Strategic Purchasing of Health Services in Low and Middle-Income Countries

SESSION CHAIR: **Stephen Jan**, The George Institute for Global Health

Looking at the Bigger Picture: Effect of Performance-Based Contracting of District Health Services on Equity of Access to Maternal Health Services in Zambia

PRESENTER: **Mr. Collins Chansa**, World Bank Group

AUTHORS: Mulenga Mukanu, Chitalu Chama-Chiliba, Mpuma Kamanga, Nicholas Chikwenya, Ben Bellows, Naasegnibe Kuunibe

Introduction

For over two decades, Zambia has been using output-based approaches to finance whole or part of the public health system. The landmark was achieved in 1996 when an Act of Parliament led to establishment of the Central Board of Health (CBoH) as the provider of health services while the Ministry of Health became the purchaser of health services. To execute its work, the CBoH contracted all hospital and district health boards in the country to deliver health services through a system-wide performance-based contracting (PBC) arrangement. This paper reviews the contribution of PBC to improving equity of access to maternal health services in Zambia between 1996 and 2006 when the purchaser–provider split was in place.

Methodology

Firstly, a comprehensive review of policy documents, strategic plans, service contracts, annual plans and budgets was conducted in order to evaluate the contracting process. Secondly, data on antenatal care (ANC) and deliveries at health facilities was extracted from five (5) nationally representative Zambia Demographic and Health Surveys (1992, 1996, 2002, 2007, and 2014) and pooled to form a time series. A segmented regression analysis (SRA) was then used to analyse trends in ANC coverage and deliveries at health facilities before, during, and after the PBC period. SRA is useful in evaluating population-level effects in interrupted time series data; and it can control for secular trends and serial correlation (Wagner et al, 2002). In order to determine the level of funding during the period under review, trends in per capita funding at district level were also analysed.

Results

The results show a robust process of contracting and managing health services nationwide anchored by a strong political will and legal framework. Secondly, there was an increasing trend in ANC coverage (4 or more visits) in both the lower and upper wealth quintiles ($p<0.01$) during the PBC era and a declining trend after the intervention. Meanwhile, there was a positive increase in the level and trend in the percentage of women delivering at health facilities when the PBC was introduced, and this continued after the PBC era. Interestingly, the effect was greater among women residing in rural areas, and poor women ($p<0.01$). After the PBC era, the effect was greater in rural areas but similar for both lower and upper wealth quintiles ($p<0.01$). Lastly, there was a declining trend in per capita expenditure at district level during the PBC as compared to the pre-PBC era. Funding to districts worsened after the PBC era.

Conclusion

A national system-wide PBC approach can contribute to increased utilisation of maternal health services in rural areas, and amongst the poor. Abolition of the CBoH was a missed opportunity to further strengthen the health system in Zambia. However, impact sustainability was achieved given that some of the positive gains which were made when the CBoH was in place were sustained several years after PBC was abandoned. The study calls for policy makers and planners to comprehensively evaluate the impact of health system reforms before terminating them.

How Government Health Insurance Coverage Changed the Utilization and Affordability of Expensive Targeted Anti-Cancer Medicines in China: An Interrupted Time-Series Study

PRESENTER: **Dr. Jing SUN**, Chinese Academy of Medical Sciences & Peking Union Medical College
AUTHORS: Yifan Diao, Jie Qian, Yang Liu, Yanping Zhou, Yan Wang, Hong Ma, Xiaoyan Wang, Simon Ren Luo, Anita Wagner, Yuanli Liu

Background

Little evidence is available to demonstrate the effect of the emerging government insurance coverage on use and affordability of expensive anti-cancer medicines as well as insurance sustainability for patients in China. To support government health insurance policy design and evaluation, we present evidence on cancer medicine access and spending in Hangzhou city, the capital city of Zhejiang province. In recent years, the crude incidence of malignant tumors in Zhejiang province has been higher than the national average. Zhejiang is one of few provinces that included expensive medicines into the benefit package of the local catastrophic health insurance program in 2015, and hospitals procure the medicines at the provincially negotiated prices. We analyzed the impacts of coverage expansion on consumption of targeted anti-cancer medicines in Hangzhou from January 2013 through December 2016; on the financial burden of individuals paying for medicines; and on insurance spending.

Methods

We used longitudinal hospital medicines procurement data collected by IQVIA (IMS Health and Quintiles) Institutes for health-care informatics to assess trajectories in use of medicines in 69 hospitals with more than 100 beds from January, 2013, to December, 2016. We conducted segmented regression analyses of interrupted time series data to measure changes in use of medicines over time. WHO/Health Action International Project on Medicine Prices and Availability methodology was used to measure the affordability of medicines. Key informant interviews were done to document the pharmaceutical company patient assistance programme and insurance policies.

Results

In March 2015, the utilization of all study medicines increased by 15.58 (95%CI, 3.86 to 27.30, $p=0.01$) to 439.14 standard units (95%CI, 311.79 to 566.49, $p<0.001$) in one month. Before the government health insurance coverage, patients had to pay out-of-pocket 3.0-13.1 and 6.2-27.3 times of the provincial average disposable annual income per capita in urban and rural areas. After the government health insurance coverage, these numbers were reduced to 0.6-2.1 and 1.8-4.4 times. By the end of 2016, assuming a 60% reimbursement rate, the cumulative total insurance expenses on six study targeted anticancer medicines accounted for an estimated 46% of the total government catastrophic health insurance fund premiums in Hangzhou, and for 69% if the insurance reimbursement rate were increased to 90%.

Conclusion

Before inclusion of the government health insurance program, expensive targeted anti-cancer medicines were not affordable even with companies' patient assistance programs. Government price negotiation and coverage reduced prices, stipulated utilization, and relieved patients' financial burden to some extent. However, the burden is still large, especially for low income populations in rural areas. This calls

for further price negotiations, careful monitoring and facilitation of appropriate use of the included expensive medicines, and of strategies to reduce patient financial burden to ensure appropriate care and a sustainable government health insurance system in China.

A Systematic Review of the Cost and Cost-Effectiveness of Point-of-Care Testing and Treatment for Sexually Transmitted Infections in Pregnancy in Low- and Middle- Income Countries

PRESENTER: **Ms. Olga Saweri**, The University of New South Wales
AUTHORS: Neha Batura, Rabiah Adawiyah, Louise Causer, William S Pomat, Andrew Vallely, Virginia Wiseman

Background

Sexually transmitted infections (STIs) are common in low and middle-income countries (LMIC), are often asymptomatic and, left untreated, can lead to significant morbidity, particularly among pregnant women. However, their diagnosis and management has been complicated by the lack of simple, affordable diagnostic tests. Over the past decade many LMIC have sought to introduce point-of-care (POC) tests for STI screening among pregnant women. POC tests allow women to be diagnosed and treated during a single antenatal care (ANC) clinic visit. There are now a number of cost and cost-effectiveness studies of POC testing for STIs among pregnant women. This timely systematic review aims to synthesise findings from these studies, assess their quality, and identify key drivers of cost effectiveness.

Methods

A set of predefined search terms and exclusion criteria standardized the search conducted by two independent researchers across three databases. Data extracted from the final set of studies was analysed using a mixed methods approach. The quality of the included studies was appraised using the CHEERS checklist.

Results

The search identified 457 studies, of which 16 were eligible for appraisal. All 16 studies took a provider perspective and all evaluated syphilis screening at ANCs in LMICs (4 low-income, 7 middle-income countries). Of the included studies, 10 (62.5%) were cost-effectiveness analyses (CEA) and six (37.5%) were costing studies. Eight CEA studies found syphilis POC testing and treatment, under differing study setting constraints, cost-effective compared to alternative syphilis testing scenarios, such as laboratory-based syphilis testing using Rapid Plasma Reagin (RPR).

Two of the 6 costing studies found POC testing for syphilis more costly than established laboratory-based RPR screening. One study estimated the total costs of a pilot intervention were higher than costs at scale, despite lower average unit costs. Another study determined the total cost of ‘adverse pregnancy outcomes’ and the relative cost savings from syphilis screening.

Conclusion

These findings suggest that POC testing and treatment for syphilis among pregnant women is cost-effective compared to alternative screening scenarios and there are significant cost savings when implemented, at scale, in ANC clinics in LMIC. This review provides convincing evidence for further investment and scale-up of POC testing and treatment for STIs in high burden countries. More studies are needed to assess the benefits of POC testing for other STIs including chlamydia, gonorrhoea and HIV in pregnancy.

Variations in Out-of-Pocket Health Expenditure (OOPE) Among the Beneficiaries of Strategic Purchasing Clinics in Yangon, Myanmar

PRESENTER: **Dr. May Me Thet**, Population Services International Myanmar
AUTHORS: Dr. Si Thu Thein, Ye Kyaw Aung, Aung Naing Win, Han Win Latt

Introduction

In support of the Government of Myanmar’s long term universal health coverage goal, Population Services International (PSI)/Myanmar has established a pilot project in Yangon region to demonstrate the capacity of Strategic Purchasing Sun (SPS) Clinic to offer a basic package of primary care services to poor and vulnerable households. Under the pilot, a total of 2,506 low income households in Yangon region has been registered, and issued with health cards which entitle them to a defined benefit package for primary care provided by the SPS clinic. This study explored the variations in out-of-pocket health expenditure (OOPE) shared on household capacity to pay among the registered households and its changes during the pilot.

Method

We conducted a baseline household survey before the pilot and a subsequent household survey six months later. The surveys assessed detailed household expenditures including health expenses and health seeking behaviors among those who sought any health care within the previous month within the registered households. Final sample for analysis included a longitudinal data from 1231 households which sought any health care in both rounds. Percentage OOPE shared on household capacity to pay were explored according to WHO Health System Financing discussion paper. Multivariate linear mixed effect model with repeated measures design was applied to assess the variations in OOPE shared across two survey rounds.

Results

Across the rounds, the median household expenditure increased slightly from 212,500 MMK to 233,000 MMK, and the median capacity to pay from 111,00 MMK to 136,000 MMK, but median OOPE decreased slightly from 2,000 MMK to 1,600 MMK. Utilization of SPS clinics increased from 10.1% to 24.9%. Among those households which utilized SPS clinics, the median OOPE decreased from 4,000 to 2,000 MMK. The average percentage of OOPE share on household capacity to pay reduced from 4.7% to 3.5% among all households. On multivariate analysis, average percentage OOPE share decreased 20.3% relatively (p-value: 0.003). In addition, OOPE share was 50% lower among households with employed household head compared to those who did not (p-value < 0.001), and up to 51% lower among households on higher wealth quintiles compared to the lowest quintile (p-value: 0.005). The increases in total number of household members and per capita equivalent income were also associated with decreases in OOPE share (8% and 4% respectively, p-value < 0.001).

Conclusion

Average OOPE share on household capacity to pay reduced significantly from the baseline among the registered households of SPS clinics. Employment status and household wealth quintiles were associated with significant variations in OOPE share.

1:30 PM –3:00 PM TUESDAY [Health Care Financing & Expenditures]

Universität Basel | Kollegienhaus – Seminarraum 212

Public Health Expenditures/Investment

SESSION CHAIR: **Peter Berman**, University of British Columbia

Political Distortions in Public Investment Funding – the Case of German Hospital Care

PRESENTER: **Dr. Adam Pilny**, RWI - Leibniz-Institut fr Wirtschaftsforschung

AUTHOR: Dr. Felix Roesel

Objectives

We identify causal effects of political influences on the allocation of public capital funds in the German hospital market. In Germany, federal states are responsible for funding capital costs of hospitals. State governments can exclusively decide on the amount of funds to be allocated and which hospitals to fund. They are legally obligated not only to fund public but also private providers, i.e. equal treatment of all ownership types is required by law. We assess the effects of electoral cycles and the governments' ideology (i.e. left-wing versus right-wing) on the allocation of capital funds. Furthermore, we investigate whether private hospital providers are politically discriminated against in the granting procedure.

Methods

We exploit self-compiled historical data of the German hospital market between 1955 and 2017. We link these information with political data, budget accounts, and socioeconomics of German states. We estimate regression discontinuity design (RDD) models to identify ideology-induced effects on the volume of allocated capital funds. Thus, we investigate whether a left-wing government with a tight majority of seats in the state parliament exhibits a different pattern in capital funding than a right-wing government with a tight majority of seats in parliament. For examining the case of political discrimination against certain types of hospital owners, we rely on budget forecast errors in the RDD framework.

Results

Preliminary results show that the majority of states has shelved investment spending, even though a sufficient funding is obligatory by law. First results on budget forecast errors reveal a large variation at the state level. Hence, state governments do deviate from the scheduled amounts to be funded according to the state budget plans. Some states therefore cut the volume of actual funds, while other states expand this volume. By July further results will be shown.

Discussion

To provide high-quality health care a sufficient level of investments in the capital stock of hospitals is indispensable. However, the allocation of these capital funds may not only be affected by deterministic considerations (e.g. economic conditions or budget constraints), but also by political influences. Consequently, there is a risk of policy failures. Given the importance of public capital funds for hospital infrastructure, it is important to understand the determinants of these allocation decisions.

Impact of Publicly Funded Health Insurance on Women Labour Supply in India: A Case of Rashtriya Swasthya Bima Yojna

PRESENTER: **Dr. Anup Karan**, Public Health Foundation of India (PHFI)

AUTHOR: Ajay Mahal

Background: Studies of the economic impact of illness have highlighted adverse implications for labour supply and earnings. Accordingly, expanded healthcare coverage, through social health insurance, may be expected to have a positive impact on labour supply and earnings. In contrast to a large numbers of studies on impacts of employment linked health insurance schemes, particularly in the United States, on 'job-lock', retirement decisions and the labour supply of married couples, the literature on the impact of health insurance on labour force participation and labour markets is scanty in developing countries. The present study estimated the impact of the national level health insurance scheme for poor in India (Rashtriya Swasthya Bima Yojana – RSBY) on women labour supply and job-switching.

Methods: We use quasi-experimental methods to examine the impacts of Rashtriya Swasthya Bima Yojna (RSBY), a fully government sponsored health insurance scheme for poor, on labour force participation rate (LFPR) and the employment status of women in India. Our analysis used nationally representative data from 3 repeated cross-sectional 'employment and unemployment' surveys conducted by the National Sample Survey Organization in 1999-2000, 2004-05 and 2011-12, respectively and district level administrative records of the RSBY scheme. Each of the survey rounds collected information from roughly 100-120 thousand households. We used matched difference-in-difference methods to assess the impact of the scheme on LFPR and employment status of working women. Treatment and control groups were defined on the basis of the households living in the districts of RSBY intervention and no-intervention. Robustness checks were conducted by forming alternative treatment and control groups and only high enrolment districts.

Results: Our results show that RSBY contributed to a 6% increase in poor women LFPR during the period of 2005-2012. Majority part of the increase in the number of women workers was attributed to part-time workers (working for minor part of a reference year). There is also evidence of job-switching among women workers from poor households during the same period. More women workers joined labour market as self-employed in informal sector after the RSBY intervention.

Discussion: Access to health insurance by poor women had 'added worker effect' and 'income effect'. More number of women joined labour market mainly because women were less required for care taking if ailing persons. In addition a virtual income transfer to households through RSBY obviated the need to daily cash for poor women and they could opt for more secured jobs in self-employed and/or periodic wage earners categories.

Conclusions: A comprehensive social health insurance scheme may enhance women labour supply in a country like India where women labour supply has been typically low because of various social and cultural reasons.

Do Changes in Development Assistance for Health Crowd out Domestic Investment and What Are the Implications for Health Outcomes?

PRESENTER: **Bryan Nicholas Patenaude**, Johns Hopkins Bloomberg School of Public Health

Background:

Much of the previous research on the relationship between development assistance for health and domestic health spending utilizes standard panel data regression approaches or relatively weak instrumental variables. These methods have made handling simultaneity and omitted variable bias difficult. In this study I utilize advanced time series and panel techniques as well as a new data source to examine the interplay between development assistance and domestic health spending, both public and private. I then translate these dynamics into impacts on health outcomes including mortality, HIV prevalence, TB prevalence, and life expectancy.

Methods:

I merge data from the Institute for Health Metrics and Evaluation's (IHME) Development Assistance for Health dataset and Health Expenditure dataset with economic, demographic, and health outcomes data from the World Bank Databank and World Health Organization's Global Health Observatory from 2000 - 2015. The final dataset consists of 237,656 individual development assistance transactions over 15 years from 30 source countries through 42 bilateral, multilateral and private channels, to 174 distinct recipients. To address the shortcomings of previous research, I employ a fixed effects Arellano-Bond style system generalized methods of moments (GMM), designed for panels with many individuals and few time periods to assess the impact of changes in the level of development assistance for health on both domestic public health spending and domestic private health spending controlling for demographic covariates and utilizing a 5-year time history lag of the dependent variable as instruments. I also employ a multi-level systems approach to determine the impact of these dynamics in development assistance and domestic financing on total mortality, infant mortality, HIV prevalence, TB prevalence and life expectancy.

Results:

The results demonstrate that a 1% increase in Development Assistance for Health results in a 0.011% (SE: 0.002) increase in private health expenditure, a 0.009% (SE: 0.001) decrease in public health expenditure and a 0.004% (SE: 0.001) decrease in out-of-pocket expenditure. Additionally, a 1% increase in development assistance for health also has an impact on decreasing overall mortality by 0.002% (SE: 0.0005), decreasing infant mortality by 0.001% (SE: 0.0003), decreasing tuberculosis incidence by 0.8% (SE 0.24), decreasing HIV prevalence by 0.011% (SE: 001), and yielding very small increases in life expectancy at birth of 0.0002% (SE 0.00005).

Conclusions:

The results indicate that between 2000 and 2015 development assistance for health has mildly crowded out domestic public health investment as well as out-of-pocket expenditure while crowding-in domestic private health investment. These dynamics in development assistance, however, have significantly impacted health outcomes from 2000-2015 including reducing incidence of TB, HIV/AIDS prevalence, and both total and infant mortality.

1:30 PM –3:00 PM TUESDAY [New Developments In Methodology]

Universität Basel | Vesalianum – Grosser Hörsaal EO.16

Preferences and Decision-Making

SESSION CHAIR: **Reed Johnson**, Duke University

The Influence of Emotions on Patients' Treatment Decisions: Evidence from Prostate Cancer

PRESENTER: **Verity Watson**, University of Aberdeen - HERU

AUTHOR: Nicolas Krucien

Background: Clinical guidelines emphasise the importance of shared decision making that takes patients' preferences into account. Often patients face treatment decisions for which the clinical evidence does not indicate a 'best' treatment. In these cases, patients must balance the costs and benefits based on their own preferences. These risk-benefit trade-offs are difficult to make and patients are often asked to make these decisions at an emotional time. Past research shows that individuals' emotions can have a profound effect on decision making, particularly when the choice involves risk. Whilst it is recognised that emotions are likely to play a key role in patients' cancer treatment decisions, there is little empirical evidence about how the emotions would actually influence the medical decision making.

Objective: We develop a conceptual framework that describes the relationship between emotional response and medical decision making. We test this framework in the context of a discrete choice experiment (DCE) about men's preferences for treatment of prostate cancer (PCa). Our conceptual framework assumes that a medical-related event, such as a diagnosis of PCa, will elicit an emotional response. The strength of the emotional response depends on the objective severity of the event (i.e., slow-growing vs. aggressive PCa) and the individual's emotional sensitivity. This emotional response is ultimately expected to influence individuals' medical decisions, such as choice of PCa treatment.

Method: 634 men who had recently been diagnosed with prostate cancer, but who had yet to make their treatment decision, took part to the DCE. In addition to the choice tasks, the patients were also asked to complete a 17-item validated instrument measuring their emotional sensitivity (Emotional Intensity Scale (EIS)). Men in the sample were stratified by objective measures of diagnosis severity into two groups: Low-to-moderate risk of progression (n=468) and high risk of progression (n=166). We test the effect of men's emotional response on their treatment preferences in a hybrid choice model allowing emotional sensitivity (measured with EIS) to influence the degree of choices consistency (observed in the DCE). We tested different specifications of the choice model to detect potential non-linearities in the relationship between emotional intensity and choice consistency.

Results: As predicted by our conceptual framework, emotional intensity has a statistically significant effect on the consistency of PCa treatment decisions choices. The results indicate that men who react more intensively to negative emotions are less consistent in their choices.

Conclusion: Patients are unequal in their response to the diagnostic of a cancer. Our main study results show that the emotional effect of the diagnosis can have a noticeable impact on treatment decisions. In an era where patients are increasingly involved in the medical decision making, our results suggest that patients may need help to overcome the influence of temporary emotions on their preferences for treatments which can have long-lasting effects on their quality of life.

Trust Me; I Know What I Am Doing. Does Specialist Training Reduce Preference Reversals in Decision Making for Others?

PRESENTER: **Sebastian Neumann-Boehme**, Erasmus School of Health Policy & Management

AUTHORS: Mr. Stefan A. Lipman, Werner Brouwer, Arthur E. Attema

Introduction:

Preference reversals refer to the situation that people prefer A over B in one exercise or situation, but B over A in another. These reversals have been shown quite common, both for decisions for oneself and others. However, they pose multiple problems, also in the field of health care, for instance when dealing with treatment choices or with health state valuations. This paper examines if people with specialist training, e.g. in the field of medicine or finance, show fewer preferences reversals in their respective areas of expertise. Furthermore, we investigate different approaches to reduce the degree of preference reversals in the context of decision making for others.

Methods: We used a sample (N=245) of medical and business administration/economics students, asking about medical and financial decision making for others. Respondents had to choose between two risky options on how to treat a patient with a terminal condition in the medical domain and evaluated both options against a certainty equivalent later on. A similar set of questions was used in the financial domain

where respondents had to make investment decisions for others. Additionally, we investigated if describing risk in natural frequencies and the use of choice lists for the valuation task reduced the rate of preference reversals in both settings.

Results: Preliminary results indicate that people with specialist training show fewer preference reversals in their area of expertise. Preference reversals were 6.2 percentage points lower for medical students in the health care setting (59.4%), compared to the financial setting (65.6%). Economics and business students showed a rate of preference reversal that was 14.6 percentage points lower in the financial setting (44.4%) than in the health care setting (59.0%). The results further suggest that choice lists and natural frequencies reduced the degree of preference reversals in the financial setting and that choice lists reduced the degree of reversals in the health care setting.

The results from logistic mixed effects regressions substantiate these findings. We observe that preference reversals are more likely to occur: i) for medical students, ii) in the health care scenario, and iii) for open valuation questions. Describing risks in natural frequencies did not affect the degree of preference reversals. We also observe several significant interaction terms, which indicate that familiarity with the domain (i.e. medical or financial) reduced the likelihood of preference reversals.

Conclusion: Preference reversals are an important problem in estimating preferences. This problem seems to be more substantial when people are unfamiliar with the domain they are asked about. This highlights the importance and effects of specialist training. Using choice lists to simplify valuation tasks seems to help respondents to state more consistent preferences across procedures.

To Pay or Not to Pay? Investigating the Impact of a *Fake* Monetary Attribute on Stated Preferences

PRESENTER: **Nicolas Krucien**, University of Aberdeen
AUTHOR: Mandy Ryan

Context: Choice experiments (CEs) are used in health economics to investigate individuals' preferences for multi-attribute goods. Many study use the CE methodology to compute willingness-to-pay (WTP) values (e.g., how much patients are willing to pay for a 1% increase in treatment effectiveness), thus informing welfare analysis. It is therefore important to ensure that these WTP values are valid. However, in health care systems where individuals do not pay at the point of consumption, the inclusion of a monetary attribute (such as cost of treatment) may seem unrealistic. A limited number of studies have investigated the validity of monetary preferences, providing mixed evidence. Further, they all assume that a monetary attribute would impact preferences by making the choice tasks more difficult (*difficulty hypothesis*). We hypothesise that including a monetary attribute also impacts responses through a change in the credibility of the choice tasks (*credibility hypothesis*). In both cases, including a cost attribute should lead to less consistent choices and less precise WTP values. But changes in perceived difficulty and/or credibility could also trigger more fundamental shifts in respondents' choice behaviour which would then bias the WTP results.

Objective: To investigate the impact of inclusion of a cost attribute (or not) on responses to a CE.

Method: We designed a CE to elicit preferences for appointments with general practitioners (GPs). Following a between-subjects design, 120 participants recruited on the campus of the University of Aberdeen (UK) were randomly allocated between two versions of the CE questionnaire: a COST group (n=60) and NOCOST group (n=60). Each participant was presented with: 12 choice tasks (to estimate preferences for the attributes); two quality checks (testing stability and monotonicity); and a number of debriefing questions (e.g., difficulty; realism of choice tasks). We also used an eye-tracker to record eyes movements whilst respondents completed the tasks.

Analysis: We investigated a potential effect of including a monetary attribute on choices consistency with a multinomial logit (MNL) model allowing errors variance to differ between COST and NOCOST groups, and with a chi-2 test comparing % of stable choices between the two versions. We investigated a potential effect on determinants of choices (i.e., preferences) by comparing direct choice elasticities between the two versions.

Results: The strength of preferences for attributes was impacted: for example, when "*delay to obtain an appointment*" increases by 1 day, the probability of accepting the GP option decreased by 6.51% and increased by 0.83% in the NOCOST and COST groups respectively. Choices in the COST group were 17% less consistent and more likely to fail the stability test (COST=70% stable; NOCOST=92% stable; p=0.005). The debriefing questions support the difficulty hypothesis (perceived difficulty: COST=13%, NOCOST=3%, p=0.095) rather than the credibility hypothesis (perceived realism: COST=88%, NOCOST=93%, p=0.529). Future analyses will explore whether patterns of visual attention differ between the COST and NOCOST groups.

Conclusion: Including a monetary attribute in the CE changes the nature of respondents' choice behaviour. This has implications for the computation of WTP values in CEs and their subsequent use in welfare analysis.

3:00 PM –4:00 PM TUESDAY [New Developments In Methodology]

Universität Basel | Kollegienhaus – Aula 033

New Developments in Methodology Posters

M1 A Comparison of Matching Methods in Precision Oncology

PRESENTER: **Ms. Deirdre Weymann**, BC Cancer

AUTHOR: Dean Regier

Background: Precision oncology promises to improve health outcomes for patients diagnosed with cancer. The appropriate implementation of precision oncology is limited by a lack of robust randomized controlled trial (RCT) data. In the absence of RCTs, quasi-experimental matching methods and big data, in the form of population-based administrative data, are increasingly used to estimate the impacts of omics-guided care. Matching offers a solution to the challenge of non-randomized enrollment, but validity relies on strong assumptions about ignorability. If violated, covariates in the matched sample will be imbalanced leading to biased effect estimates. In this study, we introduce and compare two matching methods for estimating the effects of precision oncology in an illustrative case study.

Methods: Our case study focuses on the British Columbia (BC) Personalized OncoGenomics (POG) program, which applies whole-genome and transcriptome analysis (WGTA) to identify targeted treatments for patients with advanced cancers. Our cohort comprises patients who participated in POG between July 2014 and December 2015 and matched POG-naive controls. We generated our matched cohort using big data from the BC Cancer Registry database. We applied two matching techniques: 1:1 nearest neighbor matching on propensity scores and 1:1 genetic matching on propensity scores and baseline covariates. We selected final models and matching algorithms to maximize balance of baseline covariates, quadratic terms, and relevant interaction terms across cases and controls. To determine which matching method would produce the least biased effect estimates, we assessed each method's ability to generate well-balanced matched cohorts. We compared balance of entire covariate distributions across cases and matched controls using standardized mean differences, variance ratios, QQ plots, bootstrapped Kolmogorov-Smirnov tests and paired t-tests for a fixed sample size.

Results: During our study period, 230 patients participated in POG and 93,736 patients were identified as possible controls. Of these, 5,224 control patients were eligible for matching. Final matched cohorts each included 230 POG-naive controls after weighting. Prior to matching, nearly all demographic and clinical characteristics showed evidence of imbalance across cases and controls. After matching, covariate balance improved substantially for all characteristics. When examining standardized mean differences for first order terms, balance was similar across matched cohorts. Further assessment of entire covariate distributions revealed that genetic matching outperformed propensity score matching when achieving balance, particularly for higher order and interaction terms.

Conclusions: Matching methods combined with big data offer a solution to the challenges of non-randomized enrollment observed in many precision oncology applications but rely on strong assumptions about ignorability. Careful study design and balance assessment of entire covariate distributions is essential to ensure reliability of final effect estimates. We find that genetic matching outperforms propensity score matching when balancing baseline covariates and can be used to produce more reliable estimates of the effects of omics-guided care.

M2 Is Factor Analysis As Credible As Other Statistical Tests of Association and Difference for Assessing the Construct Validity of Quality of Life Measures?

PRESENTER: **Billingsley Kaambwa**, Flinders University

AUTHOR: Julie Ratcliffe

Introduction

Construct validation of quality of life (QoL) instruments examines the degree to which they measure what they are supposed to measure. Though most validation exercises are based on statistical tests of difference/association, confirmatory factor analysis (CFA) has also been proposed as an alternative validation method. However, little is known about whether validation using CFA alone is sufficient and/or whether CFA validation results are comparable to those of other statistical tests. This issue is addressed within the context of validating six QoL instruments: the Women's Health Questionnaire (WHQ-23), Fertility quality of life tool, (FertiQoL) the Adult Social Care Outcomes Toolkit (ASCOT), EuroQoL 5-Dimensions 5-Level (EQ5D-5L) and the Short-Form 6 Dimensions (SF6D).

Methods

Data on 1,565 respondents from the Australian general population were analysed. Statistical tests of differences used for evaluating discriminant validity were Kruskall Wallis (treating QoL dimension scores as continuous) and tests for trends (treating QoL dimension scores as categorical). Statistical tests of association for assessing convergent validity were spearman's correlation and Krippendorff's alpha. In CFA, discriminant validity was assessed by whether the amount of variation latent factors share with their own indicators (i.e. variance extracted estimates - AVE) was greater than that these factors shared with indicators of other latent factors (i.e. squared correlation – $Corr^2$). Indicators or QoL dimensions were assumed to load onto two broad constructs ('body functions' and 'activities and participation') defined using the International Classification of Functioning, Disability, and Health (ICF) framework. Convergent validity using CFA was evaluated by the strength of the average correlation, based on standardised loadings, between an instrument's dimensions and the factors they load onto. Though the base AVE threshold of ≥ 0.5 (implying an average correlation between the latent factors and its indicators or QoL dimensions of ≥ 0.7) was assumed for determining acceptable convergent validity, different AVE thresholds, ranging from 0.3 to 0.9, were also explored in sensitivity analyses. To accommodate the categorical nature of the instrument dimensions further, polychoric correlation matrices were incorporated in the CFA.

Resultsa

Between 60 and 95% of the Kruskall Wallis tests and between 70 and 97% of the tests of trends were statistically significant (lowest for WHQ-23 and FertiQoL dimensions) suggesting moderate to strong discriminant validity. Correspondingly in the CFA, the AVEs for all constructs loaded onto by the QoL instrument dimensions were greater than their respective $Corr^2$ estimates, except for the 'body functions' construct loaded onto by the WHQ-23 and FertiQoL dimensions. In terms of convergent validity, some instruments (WHQ-23, FertiQoL and SF6D) exhibited low (Rho < 0.3) to moderate (0.4 ≤ Rho < 0.6) correlations between dimensions hypothesised to measure similar constructs. The Krippendorfs alpha estimates also led to similar conclusions. The convergent validity results based on these two tests of association were confirmed by AVE estimates which were lower than the thresholds for acceptable convergent validity. Sensitivity analyses did not alter the results appreciably.

Conclusions

Our results suggest that CFA yields similar results as tests of difference/association and may therefore offer an appropriate alternative approach for the validation of QoL instruments.

M3 Job Preferences for Health Care Management Students in China: A Discrete Choice Experiment

PRESENTER: **Dr. Shunping Li**, Shandong University
AUTHORS: Shimeng Liu, Dr. Gang Chen

Background: There is a deficiency of health management workers in China as compared with other countries; furthermore, the distribution is unequal. To inform an effective policy intervention, it is crucial to understand health care management students' career decision-making. This study aims to investigate the undergraduate students' stated preferences when choosing a job.

Methods: A discrete choice experiment (DCE) was conducted among a population-based multistage sample of 668 final year undergraduate health care management students during April to June 2017 in eight universities of China to elicit their job preferences. Attributes include location, monthly income, *bianzhi* (which refers to the established posts and can be loosely regarded as state administrative staffing), training and career development opportunity, working environment and workload. A D-efficient (-error, i.e. zero priors assumed for all variables) design, for main effects only, was developed using Ngene 1.1.2 (Choice-Metrics, Sydney, Australia), which yielded 24 choice sets that were further divided into two blocks so as to minimise participants' cognitive burden. Within each version, a single choice set was duplicated to examine the internal consistency of participants. A pair wise binary two-stage response DCE design (opt-out) was used to maximise the information gained from the participants. All attributes were dummy coded and specified as having a random component, except for monthly income which was specified as a continuous variable in the models to facilitate the calculation of willingness to pay (WTP). Conditional and mixed logit models were used to analyze the relative importance of job attributes.

Results: The main findings are similar regardless of whether those participants who did not pass the consistency test are included or excluded. As such, the discussions of our study are based on those who passed the consistency test only. Meanwhile, a sensitivity analysis was conducted by including participants who failed the test. The AIC and BIC values further suggested that the mixed logit estimates were preferable to the conditional logit estimates for the analysis sample and the results from mixed logit model were not substantially different from the conditional logit model. All six attributes were statistically significant with the expected sign and demonstrated the existence of preference heterogeneity. Monthly income, workload and working environment were of most concern to health care management students when deciding their future. Among the presented attributes *bianzhi* was of the least concern. Sub-group analysis showed that students who have an urban background and/or with higher annual family incomes were willing to pay more for working in the city. In addition, students from western and middle universities valued *bianzhi* higher than students from eastern universities.

Conclusions: This is the first study focusing on the career decision-making of Chinese health care management students at a critical career decision-making point. Both monetary and non-monetary interventions could be considered by policy-makers to attract students to work in health institutions, especially in rural and remote health institutions in China. There exists preference heterogeneity on health care management students' job preferences, which should also be taken into account in developing more effective policy incentive packages.

M4 Non-Surgical Treatment in Low Back Pain: A Discrete Choice Experiment

PRESENTER: **Prof. Thomas G Poder**, CIUSSS de l'Estrie - CHUS
AUTHORS: Maria Benkhalti, Nathalie Carrier, Pierre Dagenais

Objectives: Low back pain patients face numerous alternatives to reduce their pain. However, their preferences towards treatments are not well known. In this study, we conducted a discrete choice experiment to elicit their preferences for different non-surgical treatments.

Methods: An online Survey was conducted in Quebec in 2018. Respondents had to suffer chronic pain in the low back to be included in the study. The Survey was conducted in French and English using the online survey platform provided by Sawtooth Software. Seven attributes with varying levels were used: treatment modality, pain reduction, onset of treatment efficacy, duration of efficacy, difficulty in daily living activities, sleep problem, and knowledge about their body and pain. The treatment modality was defined by 6 levels: corticosteroid injections, supervised body–mind physical activities, supervised sports physical activities, physical manipulations, self-management courses, and psychotherapy. Analyses were performed using a hierarchical Bayesian (HB) model, a latent class (LC) model and a logit model. The opt-out option was considered in the analyses.

Results: A total of 603 people started the Survey and 419 respondents were included in the analysis. The ranking of attributes was the same for each methods used except for the logit model were treatment modality was ranked second and pain reduction was ranked first. The two other models, the ranking was the following: 1) treatment modality, 2) pain reduction, 3) difficulty in daily living activities, 4) duration of efficacy, 5) sleep problem, 6) onset of treatment efficacy, and 7) knowledge about their body and pain. In the HC model, the relative importance of attributes was 35.18%, 18.53%, 11.66%, 10.32%, 9.64%, 8.33%, and 6.35%, whereas it was 36.73%, 20.33%, 11.27%, 9.74%, 9.47%, 6.74%, 5.73% in the LC model. In the best model (HC), rescaled utility values for treatment modality levels were: -52.41 (corticosteroid injections), 24.10 (supervised body–mind physical activities), 9.84 (supervised sports physical activities), 52.87 (physical manipulations), 18.84 (self-management courses), and -53.23 (psychotherapy). While corticosteroid injections and psychotherapy were largely rejected by respondents, a small proportion still expressed a preference for these modalities, 1/3 and 1/10, respectively. On average, respondents were ready to wait up to 6-12 months to benefit from a treatment having their preference.

Conclusion: This study is one of the few to compare different treatment modalities for low back pain and the only one to compare six different non-surgical treatments. It will help to consider patients' preferences for their treatment and specifically in our institution to contribute to the pathway organization of care.

M5 The Estimated Cost-Effectiveness of a *Shigella* Vaccine in Children Under Five in Ethiopia

PRESENTER: **Katherine Rosettie**, Institute for Health Metrics and Evaluation
AUTHORS: Matthew Thomas Schneider, Marcia Weaver

Shigella is the second leading cause of diarrhea mortality in children under five globally, and was responsible for approximately 8,500,000 disability-adjusted-life-years (DALYs) in 2017 in this age group. *Shigella* incidence peaks among children one to four years, and *Shigella* trials are being designed to test a vaccine with doses administered in the first and second year of life. We aim to estimate the cost-effectiveness of a *Shigella* vaccine in Ethiopia, given the country's mid-range diarrhea mortality and increasing vaccine coverage. Our objectives are to answer the following four questions in Ethiopia: (1) What is the effect of adding a primary *Shigella* vaccine series at 9 and 12 months to the routine immunization schedule?; (2) What is the effect of adding a booster dose at 15 months to the primary series?; (3) What is the effect of a booster dose at 18 versus 15 months?; and (4) What is the effect of starting the primary series at 6 months versus 9 months?

We used an open-source, individual-based predictive simulation framework developed at the Institute for Health Metrics and Evaluation called Vivarium to estimate the cost-effectiveness of a *Shigella* vaccine under different vaccine schedules. Vivarium leverages the most recent estimates from the Global Burden of Disease (GBD) study to model interactions between diarrhea risk factors, diarrhea incidence, and mortality by age, sex, year, and location. We used a time horizon of 10 years (2006-2016) with an initial population of 10,000 simulants ages 0-5 years and an open-cohort structure wherein newborns entered the model each time step (1 day). We conservatively assumed 50% vaccine efficacy. Cost estimates were based on summary estimates of routine immunizations in low-income countries. We used GBD-reported annual measles and DTP3 vaccines coverage in Ethiopia, which correspond to the timing of the *Shigella* vaccine in the routine immunization schedule, as a proxy for *Shigella* vaccine coverage. We quantified parameter uncertainty for our estimates by using the Monte Carlo method whereby we drew 500 values from the distributions of each input parameter.

The total number of simulants for each scenario was 62,000 children under 5 years. Compared to a baseline scenario with no *Shigella* vaccine, adding two doses of the vaccine at 9 and 12 months would avert 3,700 DALYs and would save over US$2.7 million. Compared to a primary series at 9 and 12 months, adding a booster dose at 15 months would avert 200 DALYs save US$66,700. Compared to booster at 15 months, a later booster at 18 months would be cost-saving (100 DALYs averted; US$33,800 saved). Finally, when comparing an earlier primary series at 6 and 9 months to a later primary series at 9 and 12 months, the earlier series would be cost-saving with 600 DALYs averted and US$209,600 saved. This suggests a primary series at 6 and 9 months with a booster 15 months is the most optimal *Shigella* vaccine schedule, yet we estimated that all four vaccine schedules would be cost-saving in Ethiopia and would result in a reduction in the *Shigella* burden.

3:00 PM –4:00 PM TUESDAY [Economic Evaluation Of Health And Care Interventions]

Universität Basel | Kollegienhaus – Aula 033

Economic Evaluation of Health and Care Interventions Posters

EE1 A Costing of Community Level HIV Services in Barbados for a Successful Donor's Transition

PRESENTER: **Sophie Pascaline Faye**, Abt Associates Inc.

Background and Objectives

Barbados is a small island nation in the Caribbean, with an HIV epidemic concentrated among key populations. A recent study has revealed an HIV prevalence rate of 11.8 percent among Men who have Sex with Men (MSM). To address the issue, in 2017, two Civil society organizations (EQUALS and CEED) funded by USAID through the Linkages Across the Continuum of HIV Services for Key Populations Affected by HIV (LINKAGES) project and the government of Barbados began offering community-level HIV services to key populations, including testing and social support.

Barbados is currently experiencing tight fiscal constraints due to the slowdown of economic growth coupled with the fact that as a high-income country, it now no longer qualifies for concessional loan arrangements and grants from development partners. Given the current funding environment, the Ministry of Health and Wellness (MHW) is looking for ways to continue financing the CSO program through improved efficiency and maintain the gains achieved in the fight against HIV in Barbados.

This study objective is then to assess the cost of HIV-related services provision at the CSO level and identify potential areas for efficiency gains.

Methods

This costing is from the CSO perspective. The costing uses a top-down approach which allows the ultimate total and unit costs to include all costs incurred in the provision of services including the relevant overheads costs. To better categorize costs and help decision-making related to realizing potential efficiency gains, we categorized the data into variable and fixed costs.

Results

The yearly total cost of providing services at EQUALS was 342,321 Barbados Dollars (BD), and for CEED it was 190,704 BD. Costs were overwhelmingly dominated by payroll for both (65 percent for EQUALS, and 63 percent for CEED), followed by overhead costs.

The level of beneficiaries (people tested/counseled) was relatively low in both CSOs, hence the high unit cost per beneficiary: 1,073 BD for testing at the EQUALS and 3,327 BD for testing at the CEED. Because fixed costs overwhelmingly dominate variable costs for the testing services, returns to scale could be achieved by increasing the number of beneficiaries of those services, which requires creating more demand for the offered services from key populations. If both CSOs want to offer ART treatment, to their current levels of patients, we estimated that an additional 48,305 BD and 47,843 BD will be needed yearly respectively for EQUALS and CEED.

Conclusion

The information generated from this study provides CEED and EQUALS with information for improved financial management but also for resource mobilization and grant/proposal submission to other donors. The information will also serve for planning and advocacy with MHW for social contracting, and for planning for subvention support and fundraising activities for HIV services. In the context of a donor transition, the government of Barbados can use this information to estimate the funding levels needed to ensure continuity of services for key populations.

EE2 Cost Effectiveness of Strategies for Cervical Cancer Screening in India

PRESENTER: **Dr. Shankar Prinja**, Post Graduate Institute of Medical Education & Research
AUTHORS: Akashdeep Singh Chauhan, Radhika Srinivasan, Bhavana Rai, Gaurav Jyani, Maninder Pal Singh, Sushmita Ghoshal

Background: The establishment of link between high-risk human papilloma virus (HPV) infection and occurrence of cervical cancer has resulted in recent development of HPV related control strategies for the prevention of the same. The present study was designed to assess the cost effectiveness of 3 screening strategies i.e., visual inspect with acetic acid (VIA), Papanicolaou test (Pap smear) and HPV DNA among the age group of 30-65 years old women at a frequency of every 3 years, 5 years and 10 years in the context of India.

Methodology: The present study based on a Markov model, societal perspective and discount rate of 3%, estimated the lifetime costs and consequences in a hypothetical cohort of 30 year old women screened with either of the screening strategy at various time intervals. Sensitivity and specificity of the screening strategies was based on the recently published meta-analysis of Indian studies. Similarly, data on transition probabilities was derived from a published international meta-analysis. Further, primary data collection was undertaken using bottom up micro-costing method for estimating per person cost of screening and cost of treatment for cervical cancer in a public sector facility. In addition, 237 and 223 cervical cancer patients were interviewed from a tertiary care public sector hospital for assessing OOP expenditure and quality of life respectively. To test the uncertainty in the parameter values, we undertook multivariate probabilistic sensitivity analysis (PSA) to account for joint parameter uncertainty.

Results: Introduction of screening led to reduction in occurrence of cervical cancer cases from 19% to 58% along with decrease in cancer deaths from 28% to 70% as compared to no screening in a lifetime cohort of 1 lakh women. This reduction in cancer cases and associated mortality translated into gain of 3,141 to 6,848 life years and 3,630 to 8,198 QALYs with implementing various screening strategies. The study concludes that VIA every 5 years is the most cost-effective option with an incremental cost of INR 21,196 (USD 320) per QALY gained in the context of India.

Conclusion

The study concludes that among various screening strategies, VIA every 5 year is both most cost effective and feasible screening strategy for India. Our estimates may be useful for policy-makers in the country for evidence-informed decision-making on deciding on screening strategies for cervical cancer in India.

EE3 Developing a Costing Framework to Comprehensively Measure Costs of HIV Services for Key Populations in Sub-Saharan Africa

PRESENTER: **Sergio Bautista**, National Institute of Public Health, Cuernavaca
AUTHORS: Mariana Morales, Juliet Nussbaum

Background

In order to allocate resources more efficiently, manage programs effectively, and sustain efforts to combat the burden of HIV/AIDS, funding agencies and program designers need accurate and timely data on costs of services in both clinical and community settings. Unfortunately, the literature on the economic costs of services for key populations (KP)—i.e., men who have sex with men, sex workers, and transgender people—remains remarkably scant. One of the main reasons for the paucity of KP program costing studies is that the complexity of services for KP requires a different costing study design than the typical approaches used to measure costs of clinical services.

Objectives

To produce robust estimates of the economic costs of HIV services for KPs in Kenya and Malawi delivered through USAID's LINKAGES (Linkages Across the Continuum of HIV Services for KPs Affected by HIV) program, conducted by FHI360.

Methods

We developed a framework to comprehensively capture the costs of HIV services for KPs. We first defined all relevant categories of program activities, and then identified inputs and outputs linked to those activities. Using these frameworks, we created data collection instruments that assess total costs, cost structure, and unit costs of services provided to KPs in both countries during fiscal year 2017 (October 2016 through September 2017). Data is collected on costs at the above-CSO (FHI360 headquarters, FHI360/LINKAGES in-country field offices), CSO, and CSO-led facility levels, and outputs at facility level. Importantly, we collected data of pre-service delivery activities in fiscal years 2015 and 2016, as well as all service delivery-related activities. We take a hybrid approach, combining retrospective micro-costing methods, ingredients-based costing, and activity-based costing. Our sample consists of all facilities providing services for LINKAGES in Kenya (n=30) and Malawi (n=17) during FY17.

Results

A key finding thus far is that above-CSO costs of LINKAGES are significantly greater than the costs of services at the CSO level. Staff costs formed the highest proportion of country office-level costs in both countries, and staff time was largely dedicated to program management, followed by KP engagement activities in Kenya and clinical service and monitoring efforts in Malawi. These results highlight the importance of pre-service delivery activities, such as technical assistance, size estimation and mapping of KPs, and outreach, in KP programs.

EE4 Developing an Instrument to Measure Maternal Time Use and the Indirect Cost of Participating in Behaviour Change Trials

PRESENTER: **Neha Batura**, University College London
AUTHORS: Hassan Haghparast-Bidgoli, Reetabrata Roy, Sarmad Aziz, Siham Sikander, Shamsa Rizwan, Gauri Divan, Bilal Avan, Zelee Hill, Nirmala Nair, Prasanta Tripathy, Atif Rahman, Audrey Prost, Betty Kirkwood, Jolene Skordis-Worrall

Medical innovation has led to vast improvements in global health. However, human behaviour remains a key factor in both communicable and non-communicable disease risk. Interventions aimed at modifying behaviour to improve population health are diverse, and include strategies targeting adherence to taking medications, attending screening or preventive health services, performing self-examinations, or refraining from high-risk activities or habits related to hygiene, diet, or exercise. Despite their diverse aims, all require a change in the way that participants and beneficiaries allocate their time. These high direct and indirect costs of participation are a commonly cited barrier to the uptake of such interventions by beneficiaries. While the literature on economic evaluation provides guidelines on how direct costs can be measured, the measurement of indirect costs and particularly time-use remains a challenge, especially in the framework of behaviour change interventions. In this paper, we describe a new method for the collection of time-use data, and reflect on lessons learned in developing and applying this instrument within behaviour change trials.

We designed a data collection method based on a narrative history, to collect time-use data within behaviour change interventions in two trials across three sites in South Asia. Both interventions aimed to improve early childhood nutrition and development, and were delivered to pregnant mothers. Mothers were provided with information on optimal health care behaviour for themselves and their babies, which required changes in the allocation of household resources and how time was spent on feeding and caregiving activities, including child interactions. When collecting time-use data, mothers were asked to identify the last normal day as a reference point. Field workers were trained to use a conversational, informal style when conducting the interviews. During these interviews, respondents were asked to talk through each activity or task performed on the last normal day, from the time they woke up until they went to bed at night. They were asked to describe each activity, along with the approximate time it started and ended. Responses were coded according to a predefined list, to which more categories could be added.

Following the validation of the instrument in field, time-use data were collected using this method from a sample of 1500 mothers across the three sites. The data enabled us to robustly explore whether mothers in the intervention arms spent more time on activities advocated by the intervention, compared with mothers in the control arm. Additionally, feedback from fieldworkers suggest that this method was easy to

administer and allowed them to build a close rapport with the respondent that supported the subsequent collection of other trial data. Respondent feedback indicated that they did not find this method cumbersome as they enjoyed having someone to talk to about their day.

EE5 Does It Pay to Pay Low-Income Smokers to Quit? Optimizing Financial Incentive Strategies to Engage Medicaid Smokers into Treatment with a Tobacco Quit Line

PRESENTER: **Dr. Marlon P Mundt**, UW Madison

AUTHORS: Larissa Zakletskaia, Timothy B Baker, Megan E Piper, Stevens S Smith, Michael C Fiore

Objective: To determine the optimal financial incentive strategy to engage low-income smokers into treatment with a tobacco quit line.

Study Design: Medicaid recipients were recruited from primary care clinics and callers to a tobacco quit line and randomized to Incentive (n=948) or Control (n=952).

Intervention: All participants were offered five quit line cessation calls. Incentive subjects received $30 per call for taking counseling calls and $40 for biochemically-verified abstinence at 6-month visit.

Main Outcome Measures: The proportion of smokers receiving from 0 up to 5 quit line counseling calls was computed for the Incentive and Control groups, resulting in a decision tree with 12 treatment path probabilities. Cumulative costs and cumulative probability of biochemically-verified 6-month smoking abstinence were determined by computing the weighted sum of the individual pathways for each study arm.

Analysis: Probabilistic Sensitivity Analysis (PSA) was employed to determine an optimal strategy for financial incentives. Parametric distributions (lognormal, gamma) were fit to the observed trial data to specify probability distributions for call acceptance, medication and quit rate outcome parameters. The financial incentive values were then varied with PSA to determine how incentive changes impact quit line call acceptance, medication use, and quit rate outcomes. The Incremental Net Benefit (INB) of each alternative payment strategy was calculated as a function of the incremental cost, the incremental effectiveness, and a willingness to pay coefficient. This analysis reports distributions and confidence intervals of the INB for each alternative financial incentive strategy and probability that a particular financial incentive strategy is most cost-effective.

Results: Incentive treatment in the original RCT produced higher 6-month biochemically-verified tobacco abstinence than Control treatment (21.6 vs. 13.8%; $p < .001$), with an ICER of $2,316 (95% CI $1602 to $4085) per smoker who quits at $30/call. Modeling suggests that the ICER per individual who quits smoking would decrease to $2,150 per smoker if the incentive for each WTQL call taken were set at $20 per call. This financial incentive would result in an estimated 20.1% effectiveness, which is 1.5% less than that observed in the RCT. In addition, a strategy of offering $20 per call for the first 4 WTQL calls and $70 for taking the final WTQL call would result in an ICER of $2,125 per additional smoker who quits, with 21.2% effectiveness, which is 0.4% lower than observed in the RCT. This optimized incentive strategy would produce the lowest ICER and would save $191 per smoker who quits, resulting in savings of $38,400 over the RCT results (201 RCT quitters*$191). If these savings were re-invested in the program, an additional 80 smokers (8.4%) would have access to, and incentives to engage in, evidence-based tobacco cessation treatment.

Conclusions: Alternative magnitudes of financial incentives could meaningfully affect the incremental cost-effectiveness of incentivizing Medicaid smokers to engage in cessation treatment. This study informs policy makers and stakeholders on how to maximize the return on investment of tobacco prevention efforts targeting low-income smokers in primary care.

EE6 Economic Analysis of Rotavirus, Pneumococcal and Human Papillomavirus Vaccination in the Pacific Region: Findings from Samoa, Tonga, Tuvalu and Vanuatu

PRESENTER: **Natalie Carvalho**, University of Melbourne

AUTHORS: Emma Watts, Andrew Clark, Siale Akauola, Lee Faiva Moresi, Take Naseri, George Taleo, Clare Whelan, Mark Jit, Fiona Russell

Background: Diarrhea and pneumonia-related illnesses are two leading causes of childhood mortality and morbidity globally, while cervical cancer is a leading cause of mortality among women. Effective vaccines against all three diseases and conditions exist and are being used for in high-income countries, as well as in some low- and middle-income countries supported by Gavi, the Vaccine Alliance. In middle-income countries ineligible for Gavi prices, and with declining mortality burden, understanding the economic implications of vaccine introduction is of critical importance for governments to aide in decision-making.

Methods: We conducted a cost-effectiveness analysis (CEA) of rotavirus (RV) vaccine, pneumococcal conjugate vaccine (PCV) and human papillomavirus (HPV) vaccine introduction in 4 Pacific Island countries: Samoa, Tonga, Tuvalu and Vanuatu, in the context of simultaneous roll-out with partner-funded a. The UNIVAC model was used, and a health systems perspective was taken, including both government and partner costs. A societal perspective was undertaken in a sensitivity analysis to account for household costs. A 10-year national vaccination program was modelled starting in 2019, with costs and benefits summed over a life-time horizon. Country-specific demographic data were used to populate the models. Epidemiological and cost parameter values were informed by country-level data where available, supplemented with data from countries in the region, or regional and global estimates where necessary. Costs and benefits were discounted at 3% in the base case. Sensitivity analyses were conducted to explore the impact of uncertainties in disease burden, costs and discount rate on findings.

Results: The incremental cost-effectiveness ratio (ICER) of introducing all three new vaccines compared to the status quo (no vaccine) was $1,400, $1,200, $1,200 and $1,000 USD per disability-adjusted life year (DALY) averted in Samoa, Tonga, Tuvalu and Vanuatu respectively. Given the lack of explicit country-specific or regional cost-effectiveness thresholds, ICERs were compared with 0.5x, 1x and 3x GDP/capita. A joint program ICER fell below half of GDP/capita in all countries. In sensitivity analyses, discount rate and disease incidence rates had the biggest impact on cost-effectiveness results. Including household costs for a societal perspective had little impact on ICERs. Project budget-based vaccine program costs were highly influential in the case of Tuvalu, with very small population size.

Conclusion and implications:

Many low-income countries have introduced newer vaccines through GAVI support, and with PAHO, middle-income countries have done the same in Latin America. In other regions, middle-income countries are lagging behind. The Pacific region faces additional challenges related to small population sizes and lack of bargaining power of individual countries to negotiate vaccine prices. According to our findings, introduction of RV, PCV and HPV vaccines in all four countries would reflect good value for money, if half of GDP/capita is a good measure of willingness-to-pay. Further clarity and guidance related to cost-effectiveness thresholds in the Asia-Pacific region is needed, as is better disease incidence data to inform the cost-effectiveness of these vaccines. This study offers lessons for non-GAVI eligible middle-income countries in the Pacific and elsewhere in considering implications of simultaneous roll-out of new vaccines**.**

EE7 Economic Evaluation of Delivering Integrated School-Based Health Programmes in Cambodia and Ghana

PRESENTER: **Guillaume Trotignon**, Sightsavers

AUTHORS: Thomas Engels, Imran Khan, James Amoo Addy, David Agyemang, Kann Puthy, Liesbeth Roolvink, Elena Schmidt

Background: The School Health Integrated Programming project was developed to demonstrate how schools can be an effective platform to deliver integrated health interventions, using deworming and vision screening as examples. The economic evaluation in Cambodia and Ghana compared the cost of implementing a similar programme in different settings. It also considered the affordability of scaling up integrated vision screening with other school-based interventions and delivering this at scale. The evaluation adds to the scarce existing evidence of school health economics and will support policy makers and planners to better assess the feasibility and affordability of including vision screening as part of an essential package of school health interventions.

Methodology: This analysis assessed the incremental costs and cost-effectiveness of vision screening and treating uncorrected refractive error as part of an integrated school-based health programme, as well as discuss budget implications for its scale up in Cambodia and Ghana. One-way and multi-way sensitivity analyses were used to test the robustness and identified parameters of the model that have the largest influence on the budget of the scale up.

Results: Cost analysis showed that in-country implementation expenditure amounted to $61,019 for 48 schools in Cambodia and $61,257 for 60 schools in Ghana (in USD 2016). Standard project expenditures were calculated to allow cross-country comparisons and model parameters.

Based on the budget impact estimates for implementing national school-based vision screening programmes, the overall cost of the programme over five academic years is projected to be $7,285,244 in Cambodia and $16,706,133 in Ghana for children and teachers in all public primary and lower secondary schools. The programme would screen over 5 million schoolchildren, 115,000 teachers, 31,703 children with refractive error in Cambodia. As in Ghana, estimates show that over 9 million children, 181,964 teachers, and 70,270 children with refractive error would be screened. In terms of affordability, the five-year programme would represent about 0.9% of the education and 1.5% of the health sector budget of 2018 in Cambodia, and 0.8% of the education sector and 1.7% of the health sector government budget of 2018 in Ghana.

Concerning cost-effectiveness of the programme, the average cost per child screened is estimated at $1.33 across all provinces of Cambodia and $1.84 across Ghana’s regions. The cost per child with corrected refracted error would amount to, respectively, $230 and $230.

Conclusions: There is a lack of quality evidence on the cost of school-based vision screening programme in resource-poor settings. This study had the ambition to, in part, filling the evidence gap in assessing the costs of the screening pilots in Ghana and Cambodia, and estimating the cost-effectiveness and budget impact for scaling-up such programmes. Results confirmed that vision screening of schoolchildren, as part of a school-based health package, is a cost-effective way to identify and provide spectacles to children with visual impairments. The analysis suggested that the scale up of the programmes in Cambodia and Ghana is affordable for the current health and education budgets, if there is sufficient in-country capacity to deliver such interventions at scale.

EE8 Economic Evaluations of Antimicrobial Resistant Bacteria Mitigation Strategies: Methodological Challenges and Considerations

PRESENTER: **Mr. Stephen Mac**, Institute of Health Policy, Management and Evaluation, University of Toronto

AUTHOR: Beate Sander

Introduction: Antimicrobial resistant (AMR) bacteria are a serious global threat to population health and healthcare settings. Public health decision-makers are increasingly considering economic evidence for infection prevention and control programs. Decision-analytic models can generate this type of economic evidence while incorporating health outcomes such as quality-adjusted life years (QALY), but model

conceptualization for AMR interventions present unique challenges. Using a cost-effectiveness analysis of a vancomycin-resistant enterococci (VRE) screening and isolation program as a case study, we will discuss key challenges and considerations.

Methods: We developed an individual-level microsimulation model for a 20-bed general medicine ward using local data and VRE literature. This analysis was conducted from a payer perspective and incorporated a dynamic population, which added new patients to the ward upon discharge or death, until a total of 1,000 hospital admissions, and dynamic VRE transmission using a two-state dynamic transmission component. We identified three key methodological issues: 1) selecting a time horizon for the intervention; 2) assessing parameter uncertainty when using a dynamic population model and; 3) generalizability to other hospitals.

Results: We estimated the program's cost-effectiveness over 1-year and 5-year periods. However, due to stochastic events, the number of patients admitted was different between strategies for the same time horizon, inadvertently accruing additional health outcomes in one strategy and over/underestimated the incremental cost-effectiveness ratio (ICER). We therefore simulated the number of admissions instead, with 1,000 simulations approximating a time horizon of 1 year (expert elicitation). Simulation of 1,000 general medicine admissions and 5,000 admissions resulted in ICERs of $7,850/QALY and $50,094/QALY, respectively. At commonly used thresholds of $50,000/QALY, the time horizon chosen becomes important in determining the value of the program.

Deterministic sensitivity analysis to assess uncertainty and identify influential model parameters was inappropriate given the non-linearity of the dynamic transmission. Probabilistic sensitivity analysis concluded that the likelihood of the program being cost-effective asymptotes at 51%, signifying the influence of stochasticity on cost-effectiveness. Probabilistic scenario analyses were conducted for important variables such as VRE prevalence. In our analyses, an outbreak scenario (i.e. VRE prevalence increased by 10-times) decreased the ICER from $7,850/QALY (51% cost-effective) to $2,340/QALY (56% cost-effective). When prevalence was reduced by half, the program became a dominated strategy. To generalize this type of model to other hospitals, multiple probabilistic scenario analyses would be required based on local input data.

Quantifying the benefit of preventing antibiotic resistance requires additional consideration. The intervention would need to be modeled over an extended time horizon, and the model would require micro-level healthcare costs and health-state utilities attributable to AMR bacterial infections, which is currently lacking in the literature.

Conclusions: Despite the methodological challenges of using cost-effectiveness analyses to evaluate the value of AMR bacteria mitigation strategies, they still provide better quality economic evidence for decision-makers compared to simple economic evaluations (e.g. cost-minimization analysis or cost analysis). This type of modeling can provide sufficient complexity to model the nature of nosocomial infections within hospital settings, while providing timely economic evidence to decision-makers.

EE9 Estimating the Impact of PCV Program on Reducing Catastrophic Health Spending and Impoverishment Among Nepali Children Under-Five Hospitalized with Pneumococcal-Associated Disease

PRESENTER: **Dr. Cristina Garcia**, Johns Hopkins School of Public Health

AUTHORS: Dr. Arun Sharma, Dr. Krishna Bista, Dr. Laxman Shrestha, Dagna Constenla

Background: Childhood disease can have substantial economic impact on families Out-of-pocket (OOP) payments to treat disease can be catastrophic to families and can push families into poverty. Vaccination can substantially prevent disease-related hospitalizations, health-related impoverishment, and bring significant financial risk protection (FRP) to households. We performed an extended cost-effectiveness analysis (ECEA) to assess PCV impact on reducing hospitalized cases, catastrophic health expenditures (CHE) and medical impoverishment in Nepali children 1-59 months.

Methods: We applied an ECEA approach to assess consequences of PCV versus no PCV policy in two dimensions: i) health gains and ii) FRP benefits (CHE averted and medical impoverishment averted) for households by wealth quintile. We followed a hypothetical birth cohort through age 5-years using a static decision cohort model. Economic parameters of OOP payment per hospitalized pneumonia event and probability of CHE were derived from a cost-of-illness study in Nepal, the Pneumococcal Impact Economics Study. Vaccine program costs and disease burden parameters, vaccine efficacy, and serotype distribution were obtained from secondary sources. Household OOP expenditures were considered catastrophic if the OOP expense exceeded 40% of the household's capacity to pay. A household experienced medical impoverishment if the health expenditure from hospitalized pneumonia, meningitis, or sepsis pushed the routine household consumption below the national poverty line. Three scenarios were modeled where vaccine coverage was estimated at: 1) current levels (46% for 3 doses), 2) coverage for 3 doses increased 20% in each wealth quintile, and 3) target levels matching Penta/MR levels (90% for 3 doses). One-way and probabilistic sensitivity analyses varying vaccine and disease burden parameters and CHE thresholds were performed to test the robustness of the impact findings.

Results: PCV is estimated to avert 1,918 – 2,762 hospitalized cases of pneumococcal disease, including pneumonia, meningitis, and sepsis, over the 5-year time horizon, resulting in combined household OOP savings of $221,020 - $318,161 for all scenarios. Immunization also provides FRP to households by averting 148-219 cases of CHE and 75-115 cases of impoverishment for all scenarios, resulting in a 34-52% reduction in both CHE and impoverishment cases. The majority of CHE cases averted (85%) and impoverishment cases averted (97%) occur in the poorest 20% and poorest 40% of the population, respectively. Due to differences in access to care, the number of hospitalized cases averted increased with wealth, but the FRP benefits were concentrated among the poorest quintiles. When evaluating both health and FRP benefits, PCV is most cost-effective in the poorer populations. Parameters with the greatest impact on the model outcomes were the vaccine price per dose, pneumonia hospitalization rate, and health care seeking in the poorest two wealth quintiles.

Conclusion: Greater benefits occur among the poorest populations who often have higher risks of death, reduced access to effective care, and bear significant economic costs due to disease treatment, underscoring the importance of broadening vaccine economic evaluations to include the impact on FRP. PCV has the potential to significantly reduce catastrophic health spending and impoverishment from childhood disease in Nepal. ECEA should be considered to inform policy decisions.

EE10 Impact and Cost-Effectiveness of RSV Maternal Immunization in GAVI Countries

PRESENTER: **Mr. Frederic Debellut**, PATH
AUTHORS: Ranju Baral, Clint Pecenka

Background

Childhood immunization has been a cornerstone of cost-effective reductions in child mortality globally. As childhood mortality falls, a larger share of the global disease burden is centered among young infants and women. These trends have heightened interest in new interventions to address this burden, including maternal immunization. Maternal vaccines to protect young infants from respiratory syncytial virus (RSV) are in advanced stages of development and may be available as early as 2023. Gavi, the Vaccine Alliance is also considering RSV vaccines as part of the 2018 Vaccine Investment Strategy. RSV is estimated to result in approximately 120,000 deaths annually, mostly among young infants in low-resource settings. The purpose of this study is to evaluate the impact and cost-effectiveness of RSV maternal immunization across Gavi countries.

Methods

This analysis estimates the costs and benefits of RSV maternal immunization in 73 Gavi countries using a static population-based cohort model. We examine costs and impacts from 2023 to 2035 in comparison to no intervention, from government perspective. Disease burden inputs as well as cost inputs were primarily derived from recently published comprehensive systematic reviews. Costs are expressed in 2016 US$.

Results

Under baseline assumptions, across Gavi countries, RSV maternal immunization averts nearly 15 million cases, 3 million hospitalizations, and 150,000 deaths. At a vaccine cost of $2 per dose, the average annual cost of vaccination program across all countries for the duration of analysis was estimated to be about $211 million. The economic benefits expressed in terms of cost of care averted was about $10 million. The incremental cost-effectiveness ratio (ICER) per Disability Adjusted Life Years (DALYs) is estimated to be $185. Results are expressed by geographic regions, World Bank income groups and by country transition status from Gavi support.

Conclusions

RSV maternal immunization is projected to be an impactful and cost-effective intervention in Gavi countries and the African Region. As the infant vaccine schedule becomes increasingly crowded and disease burden shifts toward neonates, maternal immunization offers the opportunity to protect young infants from disease and may also enhance maternal health.

EE11 Measuring Direct Economic Disease Burden Attributable to Antimicrobial Resistant Healthcare-Associated Infections with Propensity Score Matching: Empirical Evidences and Implications in China

PRESENTER: **Dr. Jing SUN**, Chinese Academy of Medical Sciences & Peking Union Medical College
AUTHORS: Dan Cui, Dr. Xinliang Liu, Hao Li, Quan Wang, Zongfu Mao, Liang Fang, Furong Zhang, Ping Yang, Huiling Wu, Nili Ren, Jianyu He

Objective

China has already committed to fight against AMR in the G20 summit, however, gaps remained in terms of generation of evidence for interventions of HAIs and AMR. Quantifying the economic outcomes of HAIs with AMR can help Chinese policy-makers and healthcare professionals to set priorities. The purpose of this study is to fill in the above gaps in China with the evidence generated in Hubei province, to inform both the medical regulators and hospital managers of the potential cost savings form better control of HAIs and containment of antimicrobial resistance.

Methods

This study applied the propensity score matching (PSM) method to conduct a retrospective case-control study of the direct disease burden attributable to HAIs with AMR. The study identified HAIs through the annual point of prevalence survey of HAI (2013-2015) in the study hospitals, retrieved the general and clinical information of inpatients from the hospital's Health Information Systems. and measured the expenditures and length of hospitalization of the HAIs-AMR and Non-HAIs inpatients. STATA 12.0 was used to conduct descriptive analysis, bivariate $\chi 2$ test, paired Z test, PSM (γ=0.25σ, nearest neighbor 1:1 matching). The statistically significant level was set at 0.05.

Findings

HAIs-AMR had statistically significant higher expenditures and longer hospitalization stay than that the Non-HAIs during 2013-2015 (P<0.001). The additional annual average total medical expenditure, medicines expenditure, and out-of-pocket expenditure and length of hospitalization caused by HAIs-AMR were US$ 15,853.39, 5,081.14, 8,248.70 (2015US$) and 35 days during 2013 to 2015. The results show a rapidly increase of the total expenditures, medicine expenditures and length of hospitalization during 2013 to 2015. The out-of-pocket expenditures show a decline in 2014 and a dramatic increase in 2015. Sensitivity analysis the nearest neighbor 1:2, 1:3 and 1:4 matching (with replacement) showed that, all methods achieved well balance of the covariates of gender, age and diagnosis code. The results of these tests were similar, which proved the robustness of the study results.

Conclusion

HAIs and AMR significantly extended the number of hospitalization days, caused additional medical expenses and affected the turnover rate of hospital beds. HAIs and AMR are usually associated with a weak healthcare system. Poor infection control is the key driver of HAIs. The disease burden of healthcare-associated infections in less well organized healthcare settings is higher. Most of the increased medical cost brought by HAIs with AMR fall to the patients. HAIs and AMR not only increase the economic burden of patients and their families, but also bring financial pressure and risk to medical insurance funds, which calls for more effective control of HAIs and containment of AMR.

EE12 Methods for Estimating Productivity Loss Averted Due to Vaccination in 94 Low- and Middle-Income Countries

PRESENTER: **Ms. Elizabeth Ellen Watts**, Johns Hopkins Bloomberg School of Public Health
AUTHORS: So Yoon Sim, Dr. Logan Brenzel, Dagna Constenla

Background: Understanding the value of vaccination is necessary for sustained investment in preventative healthcare services. The Decade of Vaccine Economics (DOVE) models estimate the cost of illness averted by vaccines for ten antigens from 2001 to 2030 for 94 low- and middle-income countries. Past estimates of the economic benefits of vaccines attributed over 90% of the benefits of vaccination to long-term productivity loss averted. Methods used in past estimates assumed constant value of productivity, which may have underestimated the true value of vaccination. Updating assumptions and data inputs from previous models may better reflect the true economic value of vaccines.

Methods: The DOVE models were used to estimate productivity loss averted by vaccines using two different methods. The first method valued one year of productivity at one times the gross domestic product (GDP) per capita and assumed constant value of productivity over the time period. Productive years were counted from age 15 until the end of life. The second method aligned with standard economic practice and used minimum wage to value annual productivity. This method applied a wage growth rate of one-half the rate of real GDP growth, which was varied in sensitivity analysis. The growth rate was applied such that the starting wage for individuals vaccinated in later years was higher than for early years. At the individual level, wage grew over the course of a lifetime. Productivity loss was estimated for ages 15 to 64, rather than until end of life, based on the OECD definition of the working age population. Both methods applied a 3% discount rate to economic benefits.

Results: At 0% wage growth, the model using minimum wage yielded estimates of averted productivity loss that were nearly 50% lower than the estimates generated by the GDP per capita model. Applying a growth rate to minimum wage reduced this disparity, and at higher growth rates, the estimates using minimum wage exceeded the estimates using the GDP per capita model. The economic benefits of vaccines in the next decade (2021-2030) may be greater than past models have projected, as the minimum wage model values future productivity more heavily. Results of wage growth model outweighed the constraints placed on number of productive years of life lost for childhood diseases when wage growth exceeded 2% annually. Updating these methods brings about several challenges including, but not limited to, data availability and losing comparability to previous DOVE model estimates.

Conclusion: When accounting for wage growth, the estimated value of vaccination may be larger than estimates that place a higher value on annual productivity in the present but do not apply a growth rate. Using minimum wage to value productivity loss reflects common practice in the field of economic evaluation. This analysis underscores the importance of considering different approaches for estimating productivity loss averted due to vaccination.

EE13 Methods for the Economic Evaluation of Health Systems Strengthening Interventions: A Review of the Literature

PRESENTER: **Susan Cleary**, Health Economics Unit, University of Cape Town

Background and aim

Strengthening health systems is firmly on the global health and development agenda. Experiences related to achievement of the Millenium Development Goals foregrounded the importance of strong health systems in supporting disease-specific targets and led to an increased focus on horizontal health systems strengthening (HSS) interventions that enable multiple disease-specific intervention outcomes. HSS interventions can be defined as system-level interventions that seek to strengthen one or more of the six health systems building blocks, as defined by the World Health Organization (WHO) framework. However, to date, there has been little evidence of the economics of HSS. Without evidence on cost-effectiveness, it is hard to argue that HSS represents value for money and the level of investment needed to strengthen aspects of the health system cannot be quantified.

Through a review of the literature, this paper seeks to contribute towards the development of methods for the economic evaluation of HSS interventions.

Methods

A systematic search for literature was conducted in Pubmed and Scopus. MESH terms (Costs and Cost Analysis) and key words (cost(s); costing; health technology assessment) related to economic evaluation were combined with key words related to the concept of HSS (health system(s) strengthening; health system(s) development). In Pubmed this generated 143 hits, while in Scopus this generated 51 hits. After abstract screening and removal of duplicates, 27 papers were retained for full text review. Screening of bibliographies and relevant research websites generated 14 additional papers for potential inclusion.

English language papers were included if they:

- Undertook an empirical economic evaluation of an HSS intervention
- Developed a conceptual model to inform economic analyses of HSS interventions
- Considered how HSS constraints could be included within value for money decision making

Key aspects of included papers were extracted into a purpose built excel template, including details about the health systems building block(s) targeted by the intervention following the World Health Organization framework.

Results and discussion

Analysis of papers for inclusion is ongoing. Early findings suggest that the majority of included papers have taken a 'tracer' approach to their evaluation - analysing HSS interventions through their impact on a particular patient population or disease. For example, in the UK and Tanzania, the cost-effectiveness of pay for performance is analysed by focusing on key indicators that relate to disease-specific outcomes. However, there is a small group of papers that seeks to analyse HSS in a more 'systemic' way for example through assessing the cost-effectiveness of alternative health worker retainment strategies, generating an incremental cost per rural nurse year (in South Africa). In addition, conceptual studies have illustrated modelling approaches that would enable HSS interventions to be traded off against disease specific interventions and others have shown how mathematical programming models can be adapted to include the health system as a constraint in addition to the more common budget constraint.

This review has identified a small body of work seeking to understand the economics of HSS. This is an area that can benefit from additional methodological and conceptual development.

EE14 Modelling Cost-Effectiveness of Pharmacological Interventions for Weight Loss When Weight Regain Is Likely: A Case Study Using Orlistat

PRESENTER: **Dr. Thomas Lung**, The George Institute for Global Health
AUTHOR: Alison Hayes

Introduction

Currently, several pharmacological interventions have been shown to effectively reduce weight in people with obesity. Critics of these interventions highlight the achieved weight reduction is not clinically meaningful as individuals tend to regain weight back to baseline levels after a period of time. Health economic models have seldom taken into account weight regain when investigating whether a pharmacological weight loss intervention is cost-effective.

We investigate the long-term cost-effectiveness of orlistat versus no treatment for severely obese Australian adults, taking into account weight regain following the initial phase of treatment.

Methods

We used a nationally representative, validated individual discrete-time microsimulation model of weight gain in Australia that integrates annual change in BMI based on age and sex, with Australian life-table data and published relative risk of all-cause mortality for different BMI categories. The effects of a 12-month prescription of orlistat (versus placebo) on weight loss was based on a published meta-analysis (-2.63 kilograms, 95% CI -2.94 to -2.32). We considered different scenarios of weight regain: no weight regain; regain after 1/2/5 years.

The model incorporated weight-dependent direct healthcare costs, quality adjusted life years (QALYs) by weight status (healthy, overweight, obese class 1, obese class 2 and obese class 3) and costs of orlistat from published sources. The economic evaluation was modelled over a lifetime for severely obese adults in separate age groups (20-29, 30-39, 40-49, 50-59 and 60-69 years), using a health system perspective. One-way sensitivity analyses considering upper and lower 95% confidence interval limits of weight loss and medication prices were conducted. Costs and effects were discounted at 5% per annum, and bootstrapping with replacement was conducted to account for individual-level uncertainty.

Results

Overall, Orlistat is a highly cost-effective intervention across all age groups, irrespective of weight regain. The incremental cost-effectiveness ratio (ICER) is most sensitive to whether weight is regained after the initial weight loss period. In the 20-29 and 30-39 year age groups, the most cost-effective scenario is when weight is regained after a 5-year period ($1,270 and $4,044 per QALY gained, respectively). This is due to weight regaining at a slower rate than the expected weight gain in the same individuals over a 5-year period. In the 50-59 and 60-69 year old age groups, the scenario of no weight gain is most cost-effective ($7,644 and $5,645 per QALY gained, respectively), whilst weight regain after 12 12 months of medication is the least cost-effective ($12,655 and $9,363 per QALY gained, respectively). ICERs were moderately sensitive to the weight loss variable, but insensitive to medication prices.

Conclusions

Weight regain needs to be factored into pharmacological interventions for people with obesity to properly assess their cost-effectiveness. We show that for Orlistat, the ICER is sensitive to the period of time that weight is regained, however preventing weight gain for a short period of time has flow-on effects, in terms of QALYs gained and additional healthcare costs. It is important to consider additional interventions to slow the progression of weight regain following pharmacological treatment for individuals with severe obesity.

EE15 The Long-Term Cost-Effectiveness of Stratified Care for Management of Low Back Pain

PRESENTER: **James Hall**, University of Birmingham & Keele University

AUTHORS: Sue Jowett, Kika Konstantinou, Martyn Lewis, Raymond Oppong

Background

Low back pain (LBP) is a ‘global health problem’, causing individual suffering and significant societal burden due to healthcare usage and workplace absence. High-quality economic evidence is required to determine the most cost-effective approaches for managing LBP.
The STarT Back approach comprises subgrouping LBP patients according to risk of future persistent LBP-related disability, and matches patients to appropriate treatments early in their presentation. In a randomised controlled trial and implementation study, this stratified approach was demonstrated to be clinically and cost-effective compared to usual, non-stratified care. Indeed, this innovative approach for the treatment of LBP has been named as one of the UK’s 100 'Best Breakthroughs' by MadeAtUni.org.uk, with respect to the impact of the approach upon people’s lives. However, its long-term cost- effectiveness is currently unknown, and this could be addressed with decision modelling.

In our systematic review of published studies with decision model-based economic evaluations in LBP, we found that these models have several shortcomings. These include failing to adequately characterise the condition in health states and the absence of modelling the long-term pathway due to absence of data and difficulty of modelling symptom flare-ups. Moreover, there are currently no decision-analytic models of a stratified care approach to managing LBP. This paper therefore aims to conceptualise the first decision model of a stratified care approach for LBP management.

Methods

The economic evaluation estimates the long-term cost-effectiveness of stratified care compared with usual care, in patients consulting in primary care with non-specific LBP, from a health care perspective. A Markov state-transition model, with three monthly cycles and ten-year time horizon was constructed, whereby long-term patient prognosis was dependent upon function achieved after the first year. To populate the model, data on utilities, costs and transitions came from the STarT Back trial in the first year. Subsequent parameters were derived from similar patients in the eight-year BaRNS cohort study.
To propose methodological solutions to the issues associated with modelling LBP, consultation with clinicians and LBP researchers helped define condition health states, inform the assumptions underpinning the long-term modelling, as well as guiding sensitivity analyses. Specifically, the sensitivity analyses examined using different assumptions around long-term treatment effect, different treatment effects, as well as a probabilistic analysis of combined parameter uncertainty. A societal perspective, taking into account time off work was also explored, as were sub-group analyses on each risk-group.

Results

Preliminary base-case results indicate the STarT Back approach is cost-effective over ten-years, delivering 0.15 additional QALYs at a cost-saving of £117.73 per patient. Probabilistic and structural sensitivity analyses indicate that the approach is likely to be cost-effective in all scenarios, and cost-saving in most. Analysis from the societal perspective improved the cost-savings associated with the approach.

Discussion

These results are important given that it is likely that implementation of stratified care will help reduce unnecessary healthcare usage, whilst improving quality of life for patients. Moreover, given the paucity of modelling studies in low back pain, these results show that such models are possible, and sensitivity analyses can help handle data constraints.

EE16 Understanding the Costs of Surgery: A Bottom-up Cost Analysis of Both a Hybrid and ‘Normal’ Operating Room.

PRESENTER: **Melanie Lindenberg**, Netherlands Cancer Institute

AUTHORS: Sejal Patel, Maroeska Rovers, Wim van Harten, Valesca Retel, Janneke Grutters

Background: The world of surgery is embarking on a time of innovation and change that promises to bring huge benefits to patients. However, as resources are limited, these innovations have to prove themselves in adding value for patients, and in adding value for money. So

far, the exact cost of modern operating rooms are not clear, whereas these cost are crucial in assessing the potential cost-effectiveness of surgical innovations. In this study we aim to assess the costs and the cost drivers for both a normal and a hybrid OR by a bottom-up cost analysis.

Methods: A cost analysis in four Dutch hospitals was conducted for both a hybrid and conventional OR taking into account: construction, inventory, personnel and overhead costs. The cost analysis was based on square meters of the ORs, standard square meter costs, recent invoices, collective labor agreements and the Dutch guideline for cost-analyses. Based on the results per hospital a mean annual value, with a range, was established for all cost components. By using the mean utilization rate from the participating hospitals of a conventional OR, costs per minute for both ORs were estimated. The results were incorporated in a tool to enable adjustment of the input parameters to a specific hospital or country setting. A deterministic sensitivity analysis (DSA) was conducted to evaluate the effect of the minimum and maximum values of the main input parameters on the costs per minute of both ORs. In addition, scenario analyses were conducted to show the effect of various utilization rates of the hybrid OR and the utilization of the advanced medical technology on the costs per minute of the hybrid OR.

Preliminary results: Based on the analysis in the first two academic hospitals, the costs per minute for the 'normal' OR and the hybrid OR were €10.47 and €16.45, respectively. The 'normal' OR costs consisted for 7% of construction costs, 11% of inventory costs, 60% of personnel costs and 22% of overhead. The hybrid OR costs consisted for 9% of construction costs, 24% of inventory costs, 48% of personnel costs, and 9% of overhead. Final results, and the results from DSA and scenario analyses will be available by April 2019.

Conclusions: This study provided insight in the costs of both a 'normal' OR and a hybrid OR. Although advanced imaging technology is expensive, personnel costs seem to remain the biggest cost driver for the hybrid OR. However, as the hybrid OR is substantially more expensive, performing an intervention in the hybrid OR should result in clinically relevant improvements. Before building a hybrid OR, decision makers should be aware of the extra costs and investigate the potential added value of its use. To inform these decisions, future intervention specific cost-effectiveness analyses should be conducted. These analyses will guide the cost-effective use of this promising innovative OR.

EE17 Using Multi-State Modeling to Estimate Transition Probabilities for Microsimulation Models

PRESENTER: **Ms. Patricia Rodriguez**, The Comparative Health Outcomes, Policy, and Economics (CHOICE) Institute, University of Washington

AUTHORS: Zachary Ward, Michael Long, S. Bryn Austin, Davene Wright

Background: Electronic medical record (EMR) data can be used to estimate microsimulation model transition probabilities, the likelihood of moving between any two health states over time. However, no guidelines exist for using EMR data to estimate transition probabilities. We aimed to compare two potential approaches for estimating transition probabilities from EMR data for eating disorders (ED).

Data: We used EMR data from PEDSnet, a U.S.-based pediatric clinical data research network. Data included utilization within 365 days of the patient's first diagnosis for all patients with an ED. We mapped SNOMED condition codes to ED health states corresponding to our microsimulation model: anorexia nervosa (AN), bulimia nervosa (BN), binge eating disorder (BED), other ED (OSFED), and remission.

Methods: We first considered a simple descriptive approach of summarizing the observed proportion moving between health states between their first and last visit (model 1). This approach does not account for movements between health states other than first and last, differences in speed of transitions, or censoring. Secondly, we estimated transition probabilities with a multi-state Markov model (MSM) using the *msm* package in R (model 2). The *msm* package estimates transition intensities for Markov models, allowing for dependence on time and other covariates and accounting for censoring. MSM assumes exact transition times are unobserved and observed sampling times are uninformative. We fit a time-homogenous MSM, allowing for all possible transitions between states. Gender was the only covariate included due to sparse data.

Results: Transition probabilities were estimated from 84,909 observations on 9,713 individuals (8,568 females and 1,145 males). The median age at diagnosis was 15 (IQR = 3). Transition probability matrices obtained under the two models varied widely. The simple first-last approach resulted in higher likelihoods of staying in the same state, while the MSM approach estimated higher likelihood of intra-disorder transitions. For example, the observed proportion of females remaining in AN using a first-last approach is 75.8%, while MSM estimates a 38.5% probability over 365 days.

Discussion: A naïve first-last approach fails to account for the time-to-event nature of the outcome and is likely a biased estimator. The MSM approach addresses some features of EMR data but can be biased when assumptions are not met. Sampling times in ED are likely informative, as patients seek care when experiencing illness. Observed changes in diagnosis can reflect variability in coding practices rather than true changes in health state, which may overestimate intra-disorder transitions. Misclassification can be addressed in applications with a staged progressive disease or measures of misclassification. ED represents a challenging case where the natural course of disease does not follow a staged progression and all transitions between states are allowable.

Conclusion: A multi-state model can be implemented easily on EMR data to estimate transition probabilities, but researchers should be cognizant of underlying assumptions that can bias results. While MSM methods may be more appropriate for EMR data than a naïve first-last approach, future research is needed to compare the validity of these methods using simulation approaches.

EE18 Utility Prediction in Pragmatic Trials: A Case Study in Improving Prediction with Survey Variables

PRESENTER: **Dave Smith**, Kaiser Permanente NW

AUTHORS: Maureen O'Keeffe-Rosetti, Michael Leo, Meghan Mayhew, Connie Trinacty, Ashli Owen-Smith, Lynn DeBar

Background: Pragmatic trials are increasingly being recognized as important tools to compare treatments carried out under real-world scenarios. An important part of the pragmatic trial philosophy is that researchers, including those designing economic evaluations, employ methods that minimize the trial's intrusion into clinical care. Therefore, in our study we minimized data collection burden by not directly measuring health related quality of life (HRQL). Rather we obtained HRQL by predicting utility values (direct mapping) based on data collected during the trial, supplemented with a survey taken at the trial's conclusion.

Methods: The parent study was a pragmatic clinical trial aimed at improving functional status and reducing opioid use among chronic pain patients. The intervention integrated nursing, behavioral services, physical therapy and pharmacy into the primary care environment and consisted of 12 weekly sessions that focused on coping skills training and adapted movement practice. The study enrolled 850 patients from three sites and followed them for 12 months; patient reported outcomes (PRO) were measured quarterly and included the PEGS scale (a scale assessing pain intensity and interference) and the Roland Morris Questionnaire (RMQ). Comorbid conditions of anxiety and depression along with patient age and sex were also collected at baseline. At the trial's conclusion we also administered a survey to participants that collected additional information on a variety of social determinants, as well as the EQ-5D-5L, PEGS, and RMQ. Multiple linear regression was used to predict patient's EQ-5D utility using 4 cumulative models: Model 1) variables collected at baseline; Model 2) adding PEGS; Model 3) adding RMQ; Model 4) adding social determinant information. We evaluated apparent model performance with root mean square error (RMSE) and R-squared. We also internally validated the model using bootstrapping (n=1000) to estimate the expected model performance (i.e., shrinkage, optimism). Optimism was measured as the mean difference across the bootstrapped samples between the performance of the model developed in the bootstrapped sample (i.e., training) and the performance of using that model in the original sample (i.e., testing). Corrected values are obtained by subtracting optimism from the original model estimate.

Results: The EQ5D utility data did not appear multimodal nor were there any obvious utility "gaps". We modeled the square of the EQ5D utility. The apparent R-squared improved with successive models (0.057, 0.416, 0.527 and 0.544 for Models 1, 2, 3 and 4, respectively). Apparent RMSE also improved (0.187, 0.147, 0.132 and 0.130). Though the corrected values follow a similar pattern, we note that the addition of the social determinants explained only an additional 0.04% of the variance and improvement of 0.0004 in the RMSE.

Conclusion: We found that including social determinant variables from post-trial surveys did not meaningfully improve prediction beyond that achieved with PROs. A limitation was potential misclassification because the survey measured some variables that may vary with time. We only considered linear main effects for all predictor variables; there may be non-linear and/or interactions that may improve predictive accuracy. Next steps include adding individual items of the PEGS and RMQ to potentially improve model performance.

3:00 PM –4:00 PM TUESDAY [Supply Of Health Services]

Universität Basel | Kollegienhaus – Aula 033

Supply of Health Services Posters

S1 Advanced Therapy Medicinal Products Innovation, Pricing and Competition

PRESENTER: **Prof. Enrique Seoane-Vazquez**, Chapman University

AUTHOR: Rosa Rodriguez-Monguio

Advanced therapy medicinal products (ATMPs), including gene therapy, cell therapy and tissue engineering products, represent a paradigm shift in health care as they have great potential for preventing and treating many diseases. This study assessed ATMPs authorized by the United States (US) Food and Drug Administration (FDA) and the European Medicines Agency (EMA), evaluated ATMPs prices in US and Europe, and discussed the factors that may hinder the future development of the ATMPs market competition. Regulatory information was collected from the FDA and the EMA websites, price information was collected from the IBM Micromedex Red Book in the US and pubic sources in Europe. Descriptive statistics were used for the analysis. Prices we converted to US dollars and adjusted to the first semester of 2018 using the US consumer price index.

As of June 1, 2018, the FDA had authorized 15 ATMPs (10 cell therapies; 4 gene therapy products and 1 tissue engineering product), and the EMA had authorized 10 ATMPs (3 cell therapies, 3 gene therapy products and 4 tissue engineering products). Three products were authorized by both agencies. The FDA and EMA also granted orphan status to 4 and 5 ATMPs, respectively. These products address several disease areas including progenitor cell transplantation, cancer and cartilage defects. Sponsor companies withdrawn 4 ATMPs authorized by the EMA from the market citing commercial reasons.

The average manufacturer price for an ATMP treatment ranges from US$9,343 for a tissue-engineered product to US$1,737,834 for a gene therapy. On average, prices are higher for gene therapy (US$357,309 to US$1,737,834) than for cell therapy (US$141,005 to US$814,780) and tissue-engineered products (US$38,179 to US$93,432). Yet, these prices do not include purchasing, inventory and management costs that may significantly increase the overall treatment cost. By way of comparison, the treatment cost for the three ATMPs approved by both regulatory agencies was higher in the USA than in Europe.

The generic markets for drugs, medical devices and biologics improved affordability and access to medicinal products, the challenge to establish a similar market of generics makers of ATMPs is considerably higher. Generic competition for ATMP biosimilars will be limited by the complexity of ATMPs, fast technological evolution, difficulties in demonstrating clinical equivalence, the high cost of development and manufacturing, and the lack of a well-defined regulatory framework for review and authorization of biosimilar ATMPs.

The high cost of ATMP limits affordability for public and private payers and reduces patient access to treatment for what are often life-threatening conditions and diseases. Current regulatory and policy initiatives focus on encouraging innovation and expediting review of ATMPs rather than on enabling market competition and thereby ensuring affordability and availability of these new therapies.

S2 An Analysis of Public and Private Practice By Medical Specialists across Their Career Lifecycle

PRESENTER: **JIA Song**

Sustainability of efficient health care delivery concerns governments across OECD countries as the persistent shortage of medical workforce and overall health care requirements increased. Australia has a public and private mixed health care system, where medical doctors do not face much restriction on undertaking both public and private practice. Australian doctors can freely split their clinical practice time and determinants where to work and how much to work. Public and private sectors are associated with different work attributes. For example, private sectors can provide doctors better remunerations, better physical work conditions and flexible working time. Such advantages in the private sector draw medical workforce out from the public sector, which makes it difficult for public hospitals to retain doctors (Cheng et al, 2018) and crowds out health care provision in the public sector (Brekke and Sorgard, 2007). From the demand side, the proportion of population holding private insurance has declined over the past two decades in Australia, especially for those low-income families. As a result, the overall national increasing demands for health care services enhance pressures on the public health care sector (Hall, 2013; Van et al., 2008). Therefore, understanding how the workforce of medical specialists are distributed across sectors, and exploring the determines of work sector choice by specialists is expected to have significant implications on enhancing the efficiency of health care delivery for the national health care system.

The aims of this study are to investigate the practice patterns of medical specialists and explore how the patterns changed across their career lifecycle. In addition, this study examined roles of pecuniary factors and non-pecuniary factors on specialists' choices of work sectors from the gender angle. Thinking of the diverging labour supply behaviours between genders in labour economics, particular interest was put on examining impacts of education debt and family attributes on the choices of public/private work for female and male specialists separately.

This study uses 9 waves of panel data from the "Medicine in Australia: Balancing Employment and Life (MABEL)" survey to conduct the analysis. I use the multinomial logistic model with a Correlated Random Effect framework to account for unobserved heterogeneity in doctors' choice.

Female and male specialists similarly choose to work in the public sector at the early stage of career; whereas females are associated with higher likelihood of only working in the private sector and males are more likely to undertake dual-sectors jobs as they get ageing; both female and male specialists tend to work more in the public sector as they approaching to retirements. Education debt increases the probability of choosing dual-sectors jobs for female doctors but has no relation with male doctors' choice making. In term of family attributes, partners' employment status only affects work choices of male doctors, whereas females' choices are significantly affected by children. Finally, the practice patterns of specialists vary significantly across medical specialities, suggesting that it is necessary to control for specialities or using speciality-specific approach to assess the public and private allocation of specialist workforce in empirical analysis.

S3 Doing More with Less – Measuring Efficiency in the Primary Care Management of Chronic Diseases, Maternal and Child Care

PRESENTER: **Ms. Joana Pestana**, Nova School of Business and Economics
AUTHOR: Pedro Pita Barros

Purpose: This paper examines the variations in efficiency between three organizational models of primary health care in Portugal using an extensive set of indicators related to the quality of care of specific groups - patients with chronic diseases, mothers and children. Our special interest was to establish the extent to which mixed payment mechanisms with financial incentives and the autonomy of the teams to define the inputs, generate variations in efficiency.

Stimulus to efficiency improvements were attempted in several countries by means of organizational innovations and incentives. Amid these efforts was the reform introduced in Portugal in 2005. During the financial downturn the virtues of the new organizational models - administrative local clusters and Family Health Units (FHU) with more autonomous multidisciplinary teams and performance related payments - were praised in the adjustment program. After 2014, however, the creation of these units has stalled, and concerns about the financing of such schemes have been raised.

The health units are the main providers of primary health care services within their catchment area and are mainly tax financed. The FHU cover approximately 50% of the population and have two sequential phases, with different incentive schemes. The FHU teams have greater flexibility in managing their practices, i.e. can define the efficient dimension of the units, services provided, opening hours and the substitution between productive factors. The health ministry limits the opening of the new practices creating pressure to improve performance and cost containment. Nevertheless, despite presenting better outcomes with greater patient lists, we observe very low heterogeneity in the dimension and skill mix of FHU. The ratio of nurses to physicians is low (on average 1.1 per unit) and even lower in the FHU. The diversity

in clinical expertise is also low and the proportion of physicians above 55 years is the highest in Europe. These workforce characteristics and the limitations of the incentives schemes can impair improvements in patient care and lead to potential cost inefficiency.

Methodology: In this study 790 primary care units are analyzed. Using data from the National Health performance indicators from 2015 to 2018, we look at the relationships between the units' context, structure, remuneration methods and their outcomes.

We apply parametric production and cost frontier efficiency measurement to identify the most efficient units, which are set as a reference to recognize inefficiencies. We also use multivariate multilevel analysis to account for the combination of multiple objectives and the hierarchical nature of the system. Outputs in the first frontier are measured using 30 quality indicators of process and intermediary outcomes pooled into 5 indexes. The second frontier is based on costs, including human resources costs and prescription. We use different input scenarios combining the labor inputs and quality, and control for the underlying patient case-mix and socioeconomic conditions.

Contributions: Overall, we find that teams outside FHU present relative lower efficiency scores. The size of the team does not conduce to less inefficiencies. As expected, the FHU efficiency scores are less influenced by the administrative local cluster's performance.

S4 Healthcare Utilization of Patient with Breast Cancer Consulted Via Telemedical Care

PRESENTER: **Tzahit Simon-Tuval**, Ben-Gurion University of the Negev
AUTHORS: Gila Adler, Galit Kaufman

Objectives: The prevalence of breast cancer is high and associated with significant economic burden on healthcare systems worldwide. Little is known about patterns of healthcare utilization (HCU) of patients who received telephone-based consultation of oncology nurse navigator (ONN) via telemedical care (TMC). Our aim was to examine HCU of patients with breast cancer who received this service.

Methods: A retrospective study was conducted among Maccabi Healthcare Services enrollees that were newly diagnosed with breast cancer during January-September 2016 and used TMC (n=96). Control subjects who did not use TMC were randomly selected and matched by age, district, disease duration and eligibility to social benefit due to low income, disability or age, but not by disease severity or cancer treatment since this data was not available (n=187). HCU data as well as demographic characteristics and comorbidity burden were obtained from computerized database. Multivariable ordered logit models were specified for the determinants of HCU by quarters. Independent variables were: telephone-based consultations of ONN via TMC, age, socioeconomic status, comorbidities (heart disease, diabetes, hypertension), and entitlement to disability benefits.

Results: Mean±SD age of the study population was 55.9±10.5 years. The study groups were comparable with regard to prevalence of heart disease (P=0.916), diabetes (P=0.551), hypertension (P=0.969), socioeconomic status (P=0.975), and insurance coverage (P=0.834). The total average annual HCU of the TMC patients in the first year following the first TMC consultation was higher than that of non-TMC patients in almost all HCU components. This higher HCU stem predominantly from higher consumption of outpatient visits ($20792 vs. $11994, $p<0.001$) and higher medication costs ($20253 vs. $6258, $p<0.001$). The multivariable models revealed that patient who received telephone-based consultation of ONN via TMC had higher HCU ($\beta=1.60$, $p<0.001$). Specifically, these patients were 22.5 percentage points less likely to be in the lowest quarter of the HCU distribution ($p<0.001$), and 29.4 percentage points more likely to be in the upper quarter of the HCU distribution ($p<0.001$). In addition, among TMC patients, utilizing more telephone-based consultations of ONN via TMC increased HCU ($\beta=0.08$, $p<0.05$). Specifically, additional consultation decreased the likelihood to be in the lowest quarter of the HCU distribution by 1.4 percentage points ($p<0.05$), and increased the likelihood to be in the upper quarter of the HCU distribution by 1.3 percentage points ($p<0.05$).

Conclusions: Patients who received telephone-based consultation of ONN via TMC had higher outpatient care and medications usage. This result may stem from difference in disease severity and treatment between groups and from the proactive nature of the TMC service. Further research on long-term HCU and health outcomes of breast cancer patients who receive TMC services will enable to examine the effectiveness of this technology in this particular disease.

S5 Hospital Ownership Type and Service Provision

PRESENTER: **Dr. Esra Eren Bayindir**, Hamburg Center for Health Economics, University of Hamburg

Not-for-profit hospitals are argued to differ little from their for-profit counterparts in the provision of care yet they enjoy tax-exempt status and face almost no requirements. Previous research on ownership of hospitals has largely focused on financial measures such as costs, profits and responsiveness to financial pressure however there is very little literature on differences between hospitals on dimensions other than financial measures such as service provision.

In this work, I estimate the valuations hospitals assign to service provision relative to the value they assign to profits by hospital ownership, (for-profit, not-for-profit or government owned) in a structural way and present evidence that valuations differ significantly by ownership type. The estimates are obtained by comparing the profits hospitals would have made had they provided the service and the costs had they not provided the service to what was actually done, which is calculated using demand models. Hence, the analysis is conducted in two steps. First, I estimate a discrete choice model of demand for hospitals, taking into account patient and hospital characteristics. The second step is to use the estimated parameters from this demand system to find hospital demand and profits had they provided an additional service or had they not provided a service that is currently provided and estimate the values hospitals assign to service provision relative to profits using the fact that hospital's service availability choice should be the one that maximizes its objective function.

The analysis employs two data sets from 2004-2005. Patient characteristics are obtained from State Inpatient Dataset of 9 states (Arkansas, Arizona, Florida, Iowa, New Jersey, New York, Rhose Island, Washington, Wisconsin), which covers 58 hospital referral regions, 1146 hospital-years in the sample, includes major diagnostic categories, insurance type, admission type, location, age, gender and race of the patient. Hospital characteristics are obtained from American Hospital Association Survey. Hospital characteristics include service availability dummies, control type, teaching status, bed size, number of nurses per bed and location.

Preliminary results show that not-for-profits value providing services, especially unprofitable services significantly more than for-profits. Results show that not-for-profit hospitals have different objectives from their for-profit counterparts.

S6 How Do Clinicians Respond to Feedback on Competing Outcomes? Evidence from a Prostate Cancer Clinical Quality Registry

PRESENTER: **Nicola Jane Huxley**, Monash University Centre for Health Economics

AUTHORS: Dennis Petrie, Arul Earnest, Susan Evans, Melanie Evans, Jeremy Millar, Anthony Harris

Background: Unexplained variation in surgical practice is potentially of clinical and economic significance. Most studies of clinical variations focus on differences in indicators of use and perhaps some outcome measures of quality (complications, mortality and costs). Few studies directly examine the quality of surgery itself. The Prostate Cancer Outcomes Registry Victoria (PCOR-Vic) aims to improve surgical outcomes for men with localised prostate cancer, through individual and peer comparative feedback to hospitals and clinicians.

This study examines the effect of feedback on positive surgical margins (PSMs) and adverse events (AEs), indicators of the quality of surgical outcomes in prostate cancer. PSMs, remaining cancer tissue following prostate cancer surgery, are associated with poorer prognosis and increases in further treatments for patients. AEs are associated with poorer quality of life.

Methods: We use de-identified individual patient data from the PCOR-Vic collected between August 2008 and June 2016. We use linear probability regression analyses to estimate the impact of clinician and hospital feedback on the probability of PSMs and AEs (worsening urinary, bowel and sexual functioning following treatment) for patients receiving surgery. We control for patient characteristics and time invariant clinician and hospital characteristics, and a time dummy to reflect underlying time trends related to evidence and national policy.

Results: Preliminary results are presented in Table 1. We find that feedback itself has had little impact on the probability of PSMs following surgery, with small and uncertain reductions in PSMs associated with clinician level feedback (-1.2%; 95%CI: -8.3, 5.8%) and increases in PSMs for hospital level feedback (5.7%; 95%CI: -0.2, 11.6%).

For AEs, we see the probability of worse sexual function reduced with both clinician (-8.7%; 95%CI: -17.9, 0.5%) and hospital (-2.2%; 95%CI: -9.2, 4.5%) feedback. Probability of worse urinary function decreased with hospital level feedback (-8.1%; 95%CI: -17.9, 1.6%) and uncertainly increased with clinician feedback (8.5%; 95%CI: -4.2, 21.2%).

Discussion: It is important to be able to quantify the impact of peer comparative feedback on multiple competing outcomes that reflect surgical quality, especially where improving one outcome may lead to a worsening of another. We found no statistically significant reductions in PSM rates as a result of feedback, but some limited evidence of a reduction in worsening sexual function for patients whose clinician or hospital received feedback. This may suggest AE feedback is more valuable than PSM feedback, perhaps providing new information that is easier to respond to. Changes in behaviour may have occurred by being on the registry rather than through the impact of feedback. Future analyses should explore what feedback might be more effective at changing behaviours.

Table 1: Summary results, by outcome and level of feedback

	Level of feedback			
	Clinician		Hospital	
Change in probability of	Mean (95% CI)	p	Mean (95% CI)	p
PSM rate	-1.2% (-8.3, 5.8%)	0.730	5.7% (-0.2, 11.6%)	0.057
Worse urinary function	8.5% (-4.2, 21.2%)	0.190	-8.1% (-17.9, 1.6%)	0.100
Worse bowel function	-2.4% (-10.3, 5.5%)	0.551	0.3% (-5.7, 6.4%)	0.920
Worse sexual function	-8.7%* (-17.9, 0.5%)	0.064	-2.2% (-9.2, 4.5%)	0.545

* p<0.10

S7 The Effect of Medicare Fee Increase on Physicians' Supply of Services

PRESENTER: **Dr. Xinliang Liu**, University of Central Florida

AUTHOR: Dr. Lynn Unruh

The Sustainable Growth Rate (SGR) formula has been used to adjust payment rates for physicians and other providers participating in Medicare Part B since the passage of Balanced Budget Act of 1997. The SGR rate and corresponding conversion factor have been under intense scrutiny and policy debate on a yearly basis. The theoretical framework offered by McGuire and Pauly (1991) has been widely used by a growing literature on Medicare fee changes and physicians' responses. Researchers have found mixed effects on service volume and intensity. This study is motivated by an unusual 5.2% annual increase of the conversion factor in 2014. A panel of 739,206 physicians and other providers is constructed and tracked from 2012 to 2016 using Medicare Part B payment data. The change of the conversion factor from the prior year is used to measure Medicare payment rate change and the change in the total Medicare allowed amount is used to measure the income effect. Three outcome variables at the individual physician or provider level are examined: total number of services, total number of unique Medicare fee-for-service beneficiaries, and service intensity (total Medicare allowed amount per beneficiary). Fixed effects panel data regression models are estimated. We find that change in the conversion factor is negatively related to the total number of services rendered by a physician or provider but positively related to service intensity. Change in total Medicare allowed amount is positively related to all three outcome variables. This study is the first to empirically evaluate the Medicare-related income effect. Results indicate that physicians and other providers respond to Medicare fee changes in forms of both service volume and intensity changes. This study also suggests that the supply of services by physicians and providers in Medicare Part B has not reached the "backward bending" stage.

S8 The Healthcare Industry's Competition for Low-Wage Labor

PRESENTER: **Bianca Frogner**, University of Washington

Background: Healthcare has been a job engine for the U.S. economy with over 15 million entrants to healthcare over the past decade. Healthcare is projected to continue being a job producer into the next decade. Particularly, low-wage healthcare jobs, many in long-term care, dominate the top ten list of fast-growing jobs into the next decade. Supply may not be meeting demand given recent findings that healthcare job leavers has outpaced entrants over the last decade. The reasons for this trend are unclear. That same study suggested that healthcare competes for labor, particularly low-wage labor which tend to have few barriers to entry, with sectors such as retail, leisure, and education. Relatively unstudied is the extent to which wage competition is a factor for attracting labor to healthcare versus other industries, particularly those in low-wage jobs.

Objective: To determine the extent to which wage growth in other non-healthcare sectors is associated with exit out of and entry into healthcare jobs.

Methods: We used 10 years of recent data from the Current Population Survey's Annual Social and Economic Supplement, a nationally representative household survey collected monthly by the U.S. Bureau of Labor Statistics. We examined employed individuals age 18 to 75 years old. We defined sectors using the North American Industry Classification System and occupations using the Standard Occupational Classification System. We defined leavers as those that worked in healthcare in the prior year but not the current year; entrants worked in healthcare in the current year but not the prior; stayers worked in the prior and current year in healthcare; never in did not work in healthcare in either the prior or current year. We examined trends in average annual individual wage earnings ("wages") for leavers and entrants with wages in other sectors. We predict both the likelihood of entering and leaving healthcare as a function of relative wages of other sectors controlling for sociodemographic (e.g., age, sex, race, education, metro, self-reported health) and other local market characteristics (e.g., employment rates in metro area, density of healthcare workers), year dummies, and lags.

Results: Healthcare entry rates remained steady at about 1.3% among workers not otherwise in healthcare. Healthcare leaver rates fluctuated between 6 to 8% among current healthcare workers over the time period with notably lower leaver rates during the U.S. Great Recession. Average wages of healthcare stayers were highest on average followed by leavers and followed by entrants. Entrant wages followed similar fluctuating patterns as other competing sectors (e.g., retail, education, leisure). When leaver rates were high, average annual wages in healthcare was declining while wages in other sectors were increasing. Full regression results will also be presented.

Conclusions: The healthcare sector needs to ensure that wages are competitive to other sectors in order to attract workers to high demand, but low paying healthcare jobs. Given that wages are often limited by insurance reimbursement schemes, understanding the size of the compensating differential and other non-compensating differential factors to attract workers into healthcare over other sectors warrants further investigation.

S9 Using Test Results to Compare the Efficiency of Physicians in Identifying Cancer Recurrence

PRESENTER: **Dr. Woohyeon Kim**, Korea Institute of Public Finance

Physicians use colonoscopy to detect recurrent colorectal cancer for patients who have had colorectal cancer surgery. Although there exist evidence-based guidelines for follow-up colonoscopy, clinical studies show both underuse and overuse of this test among survivors of colorectal cancer. Patient-level sociodemographic and clinical factors have been studied to investigate the variation in use of follow-up

colonoscopy, but less attention has been paid to factors at the physician level. In particular, no studies have analyzed physicians' referral patterns to explain the variation in test use, even though referral is the main way most survivors receive this test.

This paper studies referral patterns for colonoscopies and applies cost-benefit analysis to examine whether this test has been overused or underused among patients with a cancer history. Following previous literature, I assume that a physician refers a patient for a colonoscopy if her perceived probability of cancer recurrence is greater than a physician-specific probability threshold. The variation in thresholds across physicians shows physicians' hetergeneous reactions to perceived cancer risk. Moreover, I use an alternative assumption that a physician refers a patient for a colonoscopy if the net benefit of the test exceeds a physicians-specific dollar-value threshold. The sign of this dollar-value threshold indicates which physicians are overusers or underusers.

There may exist other physician-level unobserved factors which may confound the estimation of the thresholds of each physician. In this paper, I consider two common physician-level factors: differences in patients' risk across physicians, and differences in physicians' diagnostic skills. A key aspect of the analysis is that the ex post value of colonoscopy is partially observable based on whether the test identifies recurrent cancer. The ex post test result is used to control for these unobserved physician-level confounders to obtain consistent estimates of thresholds of each physician.

Using Texas cancer registry-Medicare linked data for the years from 2000 to 2009, I find that referral patterns exhibit physician-level heterogeneity. Physician specialty is the main determinant in explaining the variation in thresholds. The percentage of physicians who overuse colonoscopy also varies with physician specialty. A significant portion of gastroenterologists overuse colonoscopy, whereas a much lower portion of oncologists and primary care physicians overuse it. Finally, physicians with a high threshold, i.e. physicians who are less aggressive in utilizing the test, tend to make more guideline-adherent referrals.

These findings suggest that health policy interventions targeting all medical providers may be suboptimal because they do not provide well-targeted incentives for physicians who overuse or underuse medical resources. Rigorous individual-level measures, such as a physician's testing threshold, may help stratify medical providers in terms of their relative efficiency. These measures can enhance the efficiency of health care provision in accountable care organizations and optimize the Medicare physicians' reimbursement scheme.

3:00 PM –4:00 PM TUESDAY [Evaluation Of Policy, Programs And Health System Performance]

Universität Basel | Kollegienhaus – Aula 033

Evaluation of Policy, Programs and Health System Performance Posters

PP1 Access to Medicines for Cardiovascular Disease and Hypertension Control: A Cross-Country Analysis of Prices, Availability, and Affordability

PRESENTER: **Dr. Muhammad Jami Husain**, Centers for Disease Control and Prevention (CDC)

AUTHORS: Dr. Biplab Datta, Deliana Kostova

Introduction: Access to medicine is critical for long-term care of cardiovascular diseases (CVDs) and hypertension. In many countries, essential medicines may not be available, accessible, or affordable. This study provides a cross-country assessment of prices, availability and affordability of CVD and hypertension medicines to identify areas for improvement in access to medication treatment.

Methods: We used survey data from the World Health Organization Health Action International database on 58 countries from 2001-2015 to analyze the following indicators: (a) availability, measured as the percentage of healthcare facilities where the medicine is offered; (b) price, expressed as the median price ratio (MPR) to international reference prices, adjusted for inflation and purchasing power; and (c) affordability, measured as the number of day's wages needed to purchase one month of treatment. We aggregated the indicators across lowest-price generic and originator brand medicines and by country income group, distinguishing between low and middle-income countries (LMICs) and high and upper middle-income countries (HUMICs).

Results: The average availability for the select medicines was 54% in LMICs and 60% in HUMICs, and was higher for generic (61%) compared to brand medicines (41%). The government procurement prices, on average, were 18.3 times and 4.4 times international reference price for OB and LPG, respectively. The procurement MPRs for brand medicines were 22.6 and 14.3 in LMICs and HUMICs, respectively; procurement MPRs for generic medicines were just above 4 for both country income-groups. Average patient MPR was 80.3 for brand and 16.7 for generic medicines and was higher for patients in LMICs compared to HUMICs across all medicine categories. The affordability index for brand medicines was 7.7 in LMICs and 4.2 in HUMICs. The affordability index for generic medicines was 2.3 in LMICs and 1.5 in HUMICs.

Conclusions: The cross-country variations in price, availability, and affordability of CVD and hypertension medicines are considerable. Patients in LMICs face higher prices and lower affordability than patients in HUMICs for both brand and generic medicines, though generic medicines are more affordable in all countries. Actions that increase access to medicines can include use of effective generics and efficient procurement mechanisms.

PP3 Economic Analysis of Hong Kong's Efforts to Enhance Primary Care Management of Diabetes

PRESENTER: **Jianchao Quan**, University of Hong Kong

AUTHORS: Sarah Tsz Yui Yau, Janet Tin Kei Lam, Gabriel M Leung

Primary care is the regular point of contact for chronic disease management and is easily accessible to the majority of the population. A Working Group on Primary Care chaired by the Secretary for Food and Health issued a strategic policy framework to enhance and develop primary care in Hong Kong. The strategy recommends a conceptual model for the management of chronic disease using a population life-course approach. This "population approach" sets specific targets on body weight, smoking cessation, glucose control, and blood pressure control to reduce the risks across the entire population. A small shift in the average population levels of several risk factors can lead to a large reduction in the disease burden and economic savings.

We analysed panel data of over 700,000 people with diabetes covering publicly provided health care services in Hong Kong. We studied the effects of achieving best clinical practice, ranging from no change to achieving "acceptable" and "ideal" scenarios under the Hong Kong policy framework. Using validated risk models for Chinese people with diabetes, we estimate that achieving the acceptable target range for diabetes leads to an average absolute risk reduction of 1.26% in mortality over five years. If the ideal primary care targets for diabetes management are achieved, the absolute risk reduction for mortality at five-years is 2.49%. Applying a value of a life-year at US$ 200,000 and a discount rate of 3%, corresponds to an economic value of US$ 5,905 (acceptable scenario) to US$ 11,650 (ideal scenario) per person with diabetes over a five-year period. Given the high prevalence of diabetes in the population, this translates into large economic benefits (millions of US dollars) from improved primary care management.

We also found reductions in the five-year incidence of ischaemic heart disease (1.24%-2.48%), and cerebrovascular disease (0.71%-1.11%), which results in an average reduction in direct medical treatments costs of US$ 75-199 per person with diabetes. Risk reductions and cost savings were greater for females compared to males, and among the older age groups. Enhancing primary care is a pressing concern as the population ages and develops a greater burden of chronic diseases such as diabetes. A strategic policy framework that results in small shifts in the average risk factor levels in the diabetes population can lead to large economic benefits.

PP4 Effect of Integrated Urban and Rural Residents Medical Insurance on the Utilisation of Medical Services By Residents in China: A Propensity Score Matching with Difference-in-Differences Regression Approach

PRESENTER: **Yingchun Chen**, School of Medicine and Health Management, Huazhong University of Science and Technology

AUTHORS: Mr. Su Dai, Haomiao LI, Dr. Jingjing Chang

Objectives: In this study, we aim to evaluate the effect of urban and rural resident medical insurance scheme (URRMI) on the utilisation of medical services by urban and rural residents in the four pilot provinces.

Setting and participants: This study selected the provinces that piloted the URRMI in 2011-2015 as the treatment group, includes Zhejiang, Shandong, Guangdong, and Chongqing in China. Otherwise, as the control group. The final populations used in this paper used in this study are 13,305 individuals, including 2,620 in the treatment group and 10,685 in the control group, from the 2011 and 2015 surveys of China Health and Retirement Longitudinal Study (CHARLS).

Outcome measures: Propensity score matching and difference-in-differences regression approach (PSM-DID) is used in the study. Firstly, we match the baseline data by using kernel matching. Then, the average treatment effect of the four outcome variables are analysed by using the DID model. Finally, the robustness of the PSM-DID estimation is tested by simple model and radius matching.

Results: Kernel matching have improved the overall balance between the treatment and control group after matching (statistically insignificant at 5%). Our study found that, as the year of 2015, the URRMI policy has not significantly affected the utilisation of medical services by all residents in the four pilot provinces, as depicted by the need-but-not outpatient care (NOC) (DID value = -0.191, p-value = 0.756), outpatient care cost (OCC) (DID value = 0.075, p-value = 0.603), need-but-not inpatient care (NIC) (DID value = 0.165, p-value = 0.408) and inpatient care cost (ICC) (DID value = 0.110, p-value = 0.805). However, the URRMI policy has significantly reduced the NOC (DID value = -0.271, p-value = 0.043), and significantly increased OCC (DID value = 0.090, p-value = 0.026) and ICC (DID value = 0.256, p-value = 0.032) for rural residents. After robustness test coming from fixed-effect model and simple model, kernel matching method radius matching method, the DID competing results of four outcome variables are also consistent.

Conclusions: URRMI has a limited effect on the utilisation of medical and health services by all residents, but has a significant impact on the medical service utilisation of rural residents, and it has positive affected the promotion of urban and rural equality in terms of outpatient utilisation. The government should establish a unified or income-matching payment standard to prevent, control the use of medical insurance funds and increase its efforts to implement URRMI integration in more regions to improve overall fundraising levels.

PP5 Engaging New Policymakers Using Subnational and Dynamic ECEA to Support Increases in Tobacco Taxes

PRESENTER: **Dr. Norman Maldonado**, Jorge Tadeo Lozano University

AUTHOR: Blanca Llorente

Background. Tobacco taxes are the single most effective public health intervention in tobacco control. However, many Low and Middle Income Countries (LMIC), including Colombia, still lag behind FCTC recommendations in adopting this measure, causing significant losses

of human capital derived from tobacco consumption. Previous research such as the one on price and income elasticities and expected tax revenues, impact on health outcomes and health expenditures, illicit cigarette trade and equity has contributed to engage the Ministry of Health and Ministry of Finance in tobacco tax policy. However, sub-national authorities that benefit from revenues, many policymakers and actors from other sectors are not committed to further increases on tobacco taxes. New local evidence is necessary to raise awareness of the issue and encourage engagement from these actors.

Purpose. This paper presents new evidence on economic evaluation of tobacco taxes in Colombia, using Extended Cost-Effectiveness Analysis (ECEA). In addition, in order to engage more institutions and policymakers in tobacco tax policy, the paper will present evidence at the subnational level, evidence at the country level including dynamic mechanisms and intertemporal effects of the policy and knowledge translation strategies for engagement of policymakers using these results.

Materials and methods. The core method is ECEA. Previous work using ECEA in Colombia has provided evidence on the expected effects of tobacco tax increases on health outcomes (morbidity and mortality), equity and catastrophic health expenditures. We broaden the scope of this work in three ways. First, the model is extended to incorporate results at the subnational level, to provide relevant evidence to governors and congresspeople. Second, we develop a new methodology for inclusion of dynamic mechanisms in the ECEA to account for intertemporal effects of the policy, to oversee the action or inaction of policymakers during political cycles. Third, we developed tailor-made knowledge translation strategies to communicate results from the subnational and dynamic ECEA, aiming to increase policymakers, political actors and other stakeholders' commitment to further tobacco tax increases.

Results. Preliminary results suggest that an increase in the specific component of the excise tax from Colombian Pesos COP$2,100 to $6,000 is feasible and would produce a twofold increase in tax revenues and would make a significant contribution to the country's targets on Sustainable Development Goals related to reduction in premature deaths. The policy would also contribute to reductions of regional inequalities. Knowledge translation strategies have had a positive impact on congresspeople and policymakers, increasing the possibilities of including the tax in the current proposal for tax reform as well as in the National Development Plan.

Conclusions. Generation of evidence through rigorous health economics modeling is crucial to support public health policy development. ECEA is a useful tool to make the case for tobacco taxes, and provides evidence that is deemed useful and relevant to policymakers and other policy actors.

PP6 How Does the Introduction of the Oral Chemotherapy Drug Parity Laws Affect the Health Outcomes Among Cancer Patients in the United States?

PRESENTER: **Mr. Yichen Shen**, Waseda University
AUTHOR: Dr. Haruko Noguchi

An estimated of 25% to 30% of cancer drugs in development are oral chemotherapy. Oral chemotherapy drugs have numerous advantages over intravenous chemotherapy, such as patient convenience and reduced hospitalization cost as a whole. However, each patient faces with higher cost of utilization for oral than intravenous chemotherapy drugs because of a difference in co-payment schemes between oral and intravenous chemotherapy drugs. As a result, the demand for oral chemotherapy drugs has been limited. “Equal coverage of oral chemotherapy” were advocated by cancer patient groups and therefore, some states began to enact oral chemotherapy drug parity laws as of 2008. In light of the advantages of oral chemotherapy drugs, the oral chemotherapy drug parity laws could have potential health impacts over the cancer patients population in the United States. To investigate this relationship, we use state-level aggregated data from 1999 to 2014. We aggregate the state panel data from multiple public-available sources (such as National Vital Statistics System, Census Bureau, Annual Social and Economic Supplement, US Small Business Council and Kaiser Family Foundation). Moreover, we implement the difference-in-difference model while accounting for heterogeneity of the oral chemotherapy drugs parity laws. We categorize the heterogeneity of parity laws in accordance to their statutes’ characteristics. There are three types of parity laws: cost-sharing laws, reclassify laws, and full parity laws. Cost-sharing laws place an upper-limit on out-of-pocket payment by the insured for their oral chemotherapy drugs. Reclassify laws offer the insured the oral drugs at parity with intravenous drugs but does not indicate how to achieve the price parity which may lead to increase in price for the insured from reclassification of intravenous drugs. Full parity laws require insurers to cover the oral drugs at parity with intravenous drugs without any increase in price for intravenous drugs. Since the data is panel, we apply fixed-effect and first-difference and weight the regression by yearly-state population. For our results, we show that cost-sharing laws have no statistically insignificant effect ($p > 0.10$) on state cancer mortality rate. Reclassify laws have statistically significant effect ($p < 0.05$) and reduce cancer mortality rate by approximately 1.3% to 1.5% points. Full parity laws raise the cancer mortality by approximately 0.6% points, which is statistically significant ($p < 0.10$). Our estimates are robust to the addition of state-specific nonlinear trends and the falsification tests. Our results imply that the accessibility of cancer patients to oral chemotherapy drugs is improved by parity laws but mortality ratio could not necessarily be decreasing. A decrease in mortality would depend on the type of the implemented parity laws. Reclassify laws improve health outcome among cancer patients, while the cost-sharing laws would not have beneficial effect. Finally, full parity laws have unexpected deteriorating effect on health outcome among cancer patients. The states implementing full parity laws need to deal with potential insurance displacement as a result of increasing cost-burden by the insurers.

PP9 Impact of the Brazilian Family Health Strategy on Reproductive Health Outcomes: An Analysis at Individual and Population Levels

PRESENTER: **Franciele Hellwig**, International Center for Equity in Health
AUTHORS: Rafael Parfitt, Gabriel Weber

Introduction: Brazilian Government has launched the Family Health Strategy (FHS) in the mid-1990, aiming to provide universal access to primary healthcare through community health workers. Despite the massive investment on the FHS over the past decades, there is limited quality evidence about its effectiveness, especially about adolescents. In relation to sexual and reproductive health, adolescents are commonly referred as a harder-to-reach group given their special demands, especially in low- and middle-income settings. This paper aimed to access effects of the policy on adolescents' reproductive health outcomes.

Methods: We analyzed effects of the Brazilian FHS at both individual and municipality levels. Effects of FHS on contraception were estimated using data from a publicly available national health survey carried out in 2013 and applying Propensity Score Matching and Propensity Score Weighting combined with the complex survey weights. We estimated effects of the Brazilian FHS on adolescent fertility rates at municipality level using difference-in-differences strategy with panel data collected by the Brazilian Ministry of Health between 1996 and 2016 in 5,509 of the 5,570 Brazilian municipalities.

Results: The program has robust positive effects on the use of contraceptive methods for adolescents. The highest effect was over the concomitant use of contraceptive pills and male condom (increase of 12.4 percentage points), while use of only male condom increase and contraceptive pills had increases of 9.5 and 4.2 percentage points, respectively. Effect was even higher for households with female adolescents (increase of 25.6 percentage points on the use of both male condom and contraceptive pills). At municipality level, we found reductions in adolescents fertility rate with the implementation of the program.

Conclusion: Even being an initiative not focused on reproductive health, the Brazilian FHS had increased contraception and decreased adolescent fertility rate. It is an important advancement since the country has one of the highest adolescent fertility rates in Latin America. Our results indicated that the strategy is more effective over adolescent girls than over boys. It is consistent with cultural norms of the country, where more responsibility regarding contraception remains on women. Despite the general nature of the policy, the contact with health workers is a crucial opportunity to promote health and development. An approach that considers the specificities of different population subgroups may contribute to increase FHS effects and reduce gender inequalities in Brazil.

PP10 Implementing Pro-Poor Universal Health Coverage: Lessons from an Equity Analysis of Health Care Utilisation in Indonesia

PRESENTER: **Manon Haemmerli**, LSHTM (London School of Hygiene and Tropical Medicine)
AUTHORS: Augustine Asante, Nicola Man, Hasbullah Thabrany, Virginia Wiseman

Background

Universal Health Care Coverage (UHC) is a key indicator of progress towards achieving the health-related Sustainable Development Goals. An important measure of UHC is the utilisation of health services by different socioeconomic groups. Many countries are implementing pro-poor reforms to expand subsidised health care and in particular to promote access by the poor to health services. In 2014, Indonesia introduced its national health insurance scheme, known as the JKN. This scheme is designed to make health care available to its entire population of 260 million by 2019. If successful, the JKN will be the biggest single payer system in the world. To date, evidence has shown that despite considerable progress, around a third of the population remain uncovered and that many of these people are amongst the poorest population groups. This paper reports on the rates of utilisation of different types of health services utilised by the rich and poor in Indonesia and considers implications for pro-poor UHC in the country.

Methods

A nationally representative sample of 7552 households was surveyed in 10 provinces of Indonesia in 2018. Household members were asked about their rates of utilisation of health services, defined as the average number of outpatient visits per person per month or hospital admissions per person per year. Socio-demographic information including asset ownership and household consumption expenditure was also collected. Households were ranked by their total monthly expenditure. Concentration curves and concentration indexes (CI) were derived to assess progressivity in the utilisation of health services among the Indonesian population. Separate analyses were performed for outpatient and inpatient, as well as for private and public providers.

Results

Results suggest that the distribution of both outpatient and inpatient health care utilisation were pro-rich, as both concentration curves lie below the line of equality and the concentration indexes were both significant at the 5% level. Concentration indexes suggest that inpatient services (0.095) were more pro-rich than outpatient services (0.048). We found that only the distribution of outpatient public primary care was pro-poor (CI=-0.040). The distribution of private primary, public hospital and private hospital outpatient care were pro-rich (CI=0.053, CI=0.10 and CI=0.25 respectively). Inpatient care in private hospitals was more unequal (CI=0.21) than in public hospitals (CI=0.021).

Discussion

Inequities in utilisation of services persist within the Indonesian health system. As many low and middle income countries are implementing reforms to support UHC, it is critically important to ensure that the poor and vulnerable - who are often the most difficult to reach – are not left behind. Results of this research will help track Indonesia's progress towards UHC.

PP11 Implementing RBF in Conflict Affected Environments: Lessons from North East Nigeria

PRESENTER: **Azara Agidani**, Health Strategy and Delivery Foundation
AUTHORS: Dr. Marjanah Mijinyawa, Kelechi Ohiri, Priye Igali, Godwin Onebunne, Yewande Ogundeji

Background

Result based financing (RBF) has been implemented in many African countries, and the impact of these interventions is rapidly being reported in the literature. RBF was introduced in Nigeria in 2011 in 3 pilot states to strengthen the capacity of health facilities to improve quality and delivery of services. In 2016, RBF was scaled up to 5 states in North Eastern Nigeria, an insurgency-ridden region with weaker health systems and worsehealthindicators in comparison to the country's average. The principle behind the initiative was to provide additional funding to rehabilitate health facilities and concentrate on high impact maternal and child health interventions in these fragile areas. Globally, implementing RBF in humanitarian settings has been shown to require a pragmatic and flexible approach which adapts to the contextual components of the situation. This paper reports findings and lessons learnt from the implementation of RBF in fragile environments using Taraba State as a case study. Methods

Data was collected and analysed using both quantitative and qualitative approaches. Analysed quantitative data were extracted from routine datasets from the selected facilities. Analysed qualitative data were gathered from client satisfaction surveys and focus group discussions with key stakeholders at both state and national levels. Results

Whilst impact evaluation of RBF approach in North East Nigeria is currently ongoing, our analysis of routine data showed that implementation of RBF in Taraba State has led to an increase in the uptake of PBF services in the selected facilities. Furthermore, improved quality of these services in most of the districts has been recorded as evidenced by increasing quality scores. However, security challenges related to terrorism, communal and herdsmen clashes have led to major barriers to implementation of the fundamental principles of RBF, which may have impeded improvements in the state. These include inadequate human resources and capacity to cope with increased demand at health facilities resulting from inability to recruit and retain front line staff; restriction in conducting supportive supervisory visits, coaching and mentoring, and community outreach activities.

Frequent displacement and migration of persons from the community have created difficulty in tracing clients during the client satisfaction survey, leading to a negative effect on the quality scores across some facilities. Conclusion

This study highlights the need to apply local norms and values when deciding the most appropriate way to implement PBF. There is a need to repeatedly modify the initial approach and principles of PBF to fit the reality of the settings in which it is to be implemented. Failure to do so is likely to lead to increased social, human, security and financial costs. Lessons from these donor funded pilots can influence the appropriate leadership and contextual approach for planned scale up to other areas affected by the insurgency.

PP2 Does the Women, Infant, and Children (WIC) Program Participation Reduce Breastfeeding? Evidence from the 2009 WIC Revision

PRESENTER: **Dr. Qi Zhang**, Old Dominion University
AUTHORS: Kelin Li, Dr. Chun Chen, Ming Wen, Hong Xue

The Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) is a national food assistance program in the U.S. targeting low-income pregnant and postpartum women, infants, and children younger than 5 years. Almost half of all newborn infants in the U.S. were enrolled in the WIC program in 2015.

One primary goal of WIC is to support breastfeeding among participants, while the program provides free formula for non-breastfed infants. These conflicting goals and practices create continuing interest in the relationship between WIC participation and breastfeeding. Literature consistently suggests lower breastfeeding rates among WIC participants compared to non-participants, although there was no control of the "selection bias", i.e. mothers who are less likely to breastfeed may be more likely to participate in WIC for the free formula. In 2009, WIC implemented the first comprehensive benefit package revision in four decades, which included incentives for fully breastfeeding mother-infant dyads and limited the formula for partially breastfed infants. Therefore, it is highly policy relevant to evaluate whether the 2009 WIC revision improved breastfeeding outcomes.

This study aims to provide new evidence on the 2009 WIC revision's impact on breastfeeding outcomes. We used two nationally representative sets of data, the National Health and Nutrition Examination Survey (NHANES) and the National Immunization Survey (NIS). The analytical sample included low-income children younger than 5 years old who were eligible for WIC, which included 4,308 children from NHANES and 250,989 children from NIS. We used ever-breastfeeding as the breastfeeding outcome. To control the selection bias, we applied two methods, namely the propensity score (PS) and the instrumental variable (IV) methods, to the linear probability model. Variables used to estimate propensity scores included age, gender, race, marital and educational status, and the poverty income ratio. The instrumental variable was the state's Supplemental Nutrition Assistance Program (SNAP) participation rate. Birth cohorts were created before and after the 2009 WIC revision.

The ordinary least square (OLS) regression indicated a negative relationship between WIC participation and ever-breastfeeding across time ($P < 0.001$). We compared the average treatment effect on the treated (ATT) before and after the 2009 WIC revision with propensity score matching. Before the revision, WIC-participating children were significantly less likely than eligible non-participating children to ever receiving breastfeeding ($P < 0.05$). However, after the revision, the disparity on ever-breastfeeding was no longer statistically significant ($P >$

0.05). The IV estimation indicated a positive relationship between WIC participation and ever-breastfeeding before the 2009 WIC revision but a negative relationship after that with both coefficients being not significant ((b = 2.033, P > 0.05, b = -0.604, P > 0.05, respectively).

In summary, after two estimation strategies were applied to two national datasets, consistent evidence suggests that WIC participation may not be significantly related to lower probability of ever-breastfeeding after the 2009 WIC revision, although discrepancies exist about that relationship before that point. The results support the continuous commitment to breastfeeding in the WIC program.

PP12 Measuring the Efficiency and Productivity Changes of Public Hospitals in China: A Bootstrap-Malmquist-DEA Approach

PRESENTER: **Dr. Siping Dong**, The National Institute of Hospital Administration
AUTHORS: Meng Li, Shuyan Guo, Chaojie Liu, Hao Li

Objective: This study aimed to measure the relative efficiency and the Total Factor Productivity Changes (TFPC) of public hospitals in China by applying an improved model of Data Envelopment Analysis(DEA) for more scientific estimation, so as to provide more reliable results for policy making.
Methods: Two input indicators (Numbers of active beds and full-time employees) and two output indicators (Number of outpatient& emergency visits and hospital separations) were selected based on extensive literature review. Panel data was collected from 86 tertiary general public hospitals in three provincial regions (Tianjin, Jiangsu and Henan) of China in the 2011-2013 period. The Bootstrap-Malmquist-DEA was employed to estimate the relative efficiency and productivity: First, the Bootstrapping-DEA was applied to calculate technical efficiency, as well as its decomposed indices (pure technical efficiency, and scale efficiency); Second, the Bootstrapping-MPI (Malmquist Productivity Index) was applied to measure the TFPC. Longitudinal analysis was imployed to track the changing trends of TFPC and cross-sectional analysis was applied to explore the contributors of TFPC in different provincial regions.
Results: The longitudinal analysis shows that the TFPC of the sample hospitals had on average an annual decline of 3.32% in total, which mainly resulted from the recession in technological change (-2.84%). Although the pure technical efficiency was increased by 0.33%, the technical efficiency had decreased by 0.05%, resulted from the decreasing of scale efficiency (-0.82%). On average, all the three provincial regions had experienced annual deteriorations in TFPC of their hospitals, which are -3.80%, -2.47% and -4.92%, respectively.
Conclusions: In our study, we found slight decline of TFPC and obvious recession in technological changes in selected public hospitals in the 2011-2013 period. Our findings were opposite to the results of most researches in that Chinese public hospitals have made great progress both in TFPC and technological changes. The explanations for the difference are two folds. One is that we employed the Bootstrapping technique to correct the bias of efficiency scores with Malmquist-DEA whereas most of the other studies applied traditional DEA models without bias correction of effciency scores. Another is that hospitals were restricted to insurance reimbursement policy. It is suggested that the Bootstrap-Malmquist-DEA approach can be applied in large scale to measure the relative efficiency and productivity of health care sectors for more reliable results.

PP13 Measuring the Efficiency of Health Systems in Asia: A Data Envelopment Analysis

PRESENTER: **Sayem Ahmed**, International Centre for Diarrhoeal Disease Research, Bangladesh
AUTHORS: Ms. Mary MacLennan, Mr. Md. Zahid Hasan, Farzana Dorin, Wahid Hasan, Mr. Md. Mehedi Hasan, Shaikh Mehdi Hasan, Mohammad Touhidul Islam, Dr. Jahangir A. M. Khan

Objective: This study aims to estimate the technical efficiency of health systems in Asia.

Methods: We applied an output-oriented data envelopment analysis (DEA) approach to estimate the technical efficiency of the health systems in Asian countries. The DEA model used as input per-capita health expenditure (all healthcare resources as a proxy) and as output cross-country comparable health outcome indicators (e.g. HALE at birth and infant mortality per 1,000 live births). Censored Tobit regression and smoothed bootstrap models were used to observe the associated factors with the efficiency scores. A sensitivity analysis was performed to assess the consistency of these scores.

Results: The main findings of this paper demonstrate that about 87% of the studied Asian countries were inefficient with respect to using healthcare system resources. Most of the efficient countries belonged to the high-income group (Cyprus, Japan, and Singapore) and only one country belonged to the lower middle-income group (Bangladesh). In Asia, through efficiency gains, the high-, upper middle-, lower and lower- middle-income countries can improve health system outcomes by 6.6%, 8.6%, and 8.7% respectively using the existing level of resources. Population density, bed density, and primary education completion rate significantly influenced the efficiency score.

Conclusion: The results of this analysis show inefficiency of the health systems in most of the Asian countries and imply that many countries may improve their health system efficiency using the current level of resources. The identified inefficient countries could pay attention to benchmarking their health systems within their income group or other similar type of health systems.

Strengths and limitations of this study:

- Data envelopment analysis was used to determine the extent of inefficiency in health systems across Asia.
- We extracted health systems level indicators from the widely used World Development Indicators database and the World Health Organization open data repository
- Due to data availability, we used health system outcomes in addressing the health systems efficiency rather than true health system output

PP14 Quality and Transparency in the Swiss Hospital Services after the Introduction of a DRG-Based Reimbursement System

PRESENTER: **Christoph Napierala**, Universit Luzern

AUTHOR: Dr. Stefan Boes

Among other factors, the Swiss healthcare policy change in 2012 introduced a diagnosis-related group (DRG) inpatient payment system. This crucial step created significant momentum toward influencing transparency and efficiency in the delivery of acute inpatient services; however, very little is known about its effects on quality and transparency within the health care system.

We used inpatient hospital administrative data from Swiss university hospitals, qualitative indicators like case mortality, transparency measures, e.g., number of diagnostic codes per case, and coded and real emergencies to demonstrate the system change from various retrospective reimbursement systems to the new prospective DRG system.

We provide evidence that quality has not suffered from the system change while transparency has increased, leading to an overall qualitative improvement of the health care system.

PP15 Questioning the Regressivity of Tobacco Taxes: Assessing the Distributional Impact of Increased Tobacco Taxes Using Mathematical Modeling

PRESENTER: **Prof. Stephane Verguet**, Harvard T.H. Chan School of Public Health

AUTHORS: Patrick Kearns, Vaughan Rees

Introduction

Globally, an estimated 7 million people died prematurely from smoking tobacco in 2015, in spite of existing comprehensive and effective tobacco control strategies (e.g. enforcement of smoke-free zones, taxation of tobacco products).

Taxation is one of the most effective interventions to reduce smoking prevalence. Yet, few countries have enforced effective tax policies such as large excise tax rates as the World Health Organization (WHO) recommends.

The delay in implementing large excise taxes on tobacco products can be explained by the difficulties in political and public acceptability as tobacco taxes are often considered regressive. That is to say, with increased taxes, poorer smokers would face proportionately greater expenditures on tobacco than their richer counterparts.

Few studies to date have revisited this assumption of regressivity at the population level, while accounting for differential tobacco consumption and price responsiveness across socioeconomic groups.

Methods

We first derived a simple mathematical model to study the distributional impact of increased tobacco taxes. Specifically, we examined the impact of tobacco tax hikes on the burden of both additional cigarette taxes and additional cigarette expenditures borne by individuals across income groups.

Second, we assigned in our model plausible values for a range of key parameters including: the relative price change in cigarettes, the price elasticity of demand for tobacco products (assumed to be varying with income), the prevalence of smoking and consumption of cigarettes (varying with income), and individual income.

Lastly, we determined under which possible set of parameter values (e.g. price increase, price elasticity), tobacco tax hikes might be either regressive or progressive at the population level.

Results

We show that increased tobacco taxes are not necessarily regressive in consumption. When price elasticity of demand for tobacco (price elasticities < -0.50) and tobacco price increases (relative price increases > 50%) are large, the distributions of both net tax revenues and net cigarette expenditures would become progressive: at the population level, the poorer individuals (former and continuing smokers) would face proportionately smaller expenditures on tobacco than their richer counterparts, with increased taxes.

Conclusions

Tobacco tax increases need not be inherently regressive: price elasticities of demand for tobacco around -1.00 were observed in many countries, and substantial tobacco price increases of 50% and above have been enacted in a number of countries, and would be necessary to bring taxation levels up to WHO recommendations.

Our study points to the specific features of tax policy essential for evaluating whether tobacco taxes are regressive or progressive.

PP16 Tax Policies for Sugar-Sweetened Beverages: Consumer and Producer Responses in Mexico and Implications for Private and Public Costs

PRESENTER: **Justin Trogdon**, University of North Carolina-Chapel Hill

AUTHORS: Mr. Juan Carlos Salgado Hernandez, Shu Wen Ng, Brian McManus

In 2014, the Mexican government implemented a national fiscal policy to address the high prevalence of overweight and obesity. This fiscal policy includes a specific tax of one Mexican peso (MP) per liter of sugar-sweetened beverage (SSB), equivalent to a 10 percent price increase. After the tax implementation, quasi-experimental studies showed drops in SSB purchases between 6% and 10% and average price increases by at least one MP. However, studies to date have neither isolated the tax effect on purchases and prices nor assessed the tax effect on private consumer surplus, producer profit, and tax revenue. This study seeks to estimate the tax effect on these outcomes in 2014 and 2015, and simulate the tax effect of a two MP specific tax, in line with the recommendation by the World Health Organization and public health researchers. I implement a structural model composed of a random coefficients logit demand model and a Bertrand-oligopoly model for differentiated goods. This structural model accounts for the interaction between consumers (who maximize utility through substitution of taxed and untaxed beverages) and producers (who set the prices that maximize profit) in the face of the tax implementation. For the empirical application, I use household purchase data from the Nielsen Mexico Consumer Panel Service for Jan 2012 – Dec 2015, which is representative of Mexican urban settings with a population of more than 50,000 inhabitants.

Compared to a simulated counterfactual with no SSB tax, the current SSB tax was over-shifted to consumer prices, and purchases of taxed beverages decreased by 12% in 2014 and 2015; however, these effects were heterogeneous across producers and products. In contrast, untaxed beverage purchases (mainly plain water and diet soft drinks) increased by around 1%. Overall, reductions in private consumer surplus and producer profits were 2.3% and 5.3%, respectively. The latter reduction was, in part, mitigated by increases in untaxed beverage purchases. As expected, the reductions in private consumer surplus and producer profit exceeded the tax revenue. The simulated effect of the 2 MP specific SSB tax showed that the tax was also over-shifted to consumer prices; however, the tax effect on other outcomes was not twice as large as the effect under the current SSB tax.

This study contributes to the literature on SSB taxes by estimating the tax effect on a set of consumer and producer outcomes, and tax revenue. Additional work that translates these changes in consumption into health outcomes and resultant economic costs is underway to show how the loss in consumer and producer surplus might be mitigated by healthcare and other economic cost savings. This evidence will be of policy significance due to ongoing discussions in Mexico about doubling the specific tax on SBB (i.e., two MP) to more effectively address the prevalence of obesity and non-communicable diseases.

PP17 Trend of Government Subsidies and Effects on Equity of Benefits: Empirical Evidence from NCMS of China, 2009-2015

PRESENTER: **Min Hu**, Fudan University

AUTHORS: Wenhui Mao, Ruyan Xu, Wen Chen

INTRODUCTION

The New Rural Cooperative Medical Scheme (NCMS) has been established for rural residents since 2003 with strong commitment from Chinese government. After the 2009 Health Care Reform, more resources were allocated to health system than any time in the history whereas NCMS increased government subsidies (GS) from 80 CNY in 2009 to 380CNY per capita in 2015 and its benefit package expanded from inpatient services to outpatient services. We aimed to examine whether the increased GS has affected the benefit especially to the poor through the expanded and refined health insurance scheme.

METHODS

We conducted two waves of longitudinal household survey (N=29,551 in 2009 and 27,909, respectively) and collected the annual claims report of NCMS in Ningxia Region. We applied benefit incidence analysis (BIA) using Concentration Index (CI) to evaluate the degree of income-related inequity in GS received from outpatient and inpatient services in different levels of health providers. We employed wealth index (WI) to represent the living standard of households in the survey areas. Benefit, i.e. GS received, was the individual utilization of each type of service multiplied by the unit GS of that service. The unit GS was calculated based on the claims report by dividing the total GS by the total number of outpatient visits or inpatient days at each level of health care facility. At last, dominance test was performed to assess changes in the distribution of benefits in relation to living standards between 2009 and 2015.

RESULTS

From 2009 to 2015, we observed an obvious trend of reporting more NCDs but less sickness in past two weeks in the study population. In addition, more utilization of hospitalization but less outpatient services was seen in the cohort. The results of BIA indicated that the distribution of GS for outpatient services overall significantly favored the less wealthy groups in 2009 but was less so in 2015, especially for outpatient visits at village stations. However, the equity of benefit for inpatient services from GS was significantly improved. Additionally, the distribution of GS for hospitalization remained pro-poor at township in both 2009 and 2015 and turned to pro-poor at county and higher hospitals in 2015. Comparing to 2009, the less wealthy groups used more inpatient services at all levels of providers than the wealthier groups in 2015, which can be regarded as one of the main contributors to the pro-poor distribution of GS for hospitalization.

CONCLUSIONS

The increased government subsidies for NCMS mostly attributed to hospitalization rather than outpatient services and allowed the poor to use more inpatient services at different hospital levels. The distribution of benefit for hospital admissions made more improvement towards equity than that of outpatient visits from 2009 to 2015. Our findings also indicated that OP services need more coverage from NCMS to improve the equity.

Keywords: China, NCMS, equity, government subsidies, benefit incidence analysis, wealth index, CI, dominance test

3:00 PM –4:00 PM TUESDAY [Demand & Utilization Of Health Services]

Universität Basel | Kollegienhaus – Aula 033

Demand & Utilization of Health Services Posters

D1 Expanding Health Insurance in Resource Constrained Settings; The Possibilities, Impediments and Opportunities

PRESENTER: **Frances Ilika**, HP+

AUTHORS: Mainasara Bello, Elaine Baruwa

Background:

Nigeria is increasing its efforts towards Universal Health Coverage (UHC) through expansion of health insurance to all citizens. To increase coverage at sub-national level, health insurance has been decentralized and states are tasked with providing their residents with universal access to quality health care. Sokoto is a state in North West Nigeria with 80% rural population, very young population (47.5%< 15years) and 60% indigent population. The state is largely dependent on federal statutory allocations (which presents financial difficulties with fluctuations in oil prices) and has low internally generated revenue (IGR). The State Government is committed to UHC and has passed a law on compulsory State Health Insurance Scheme (SHIS), however concerns arise on its financial feasibility in the present fiscal environment.

Methods

To provide evidence on financial feasibility, a state survey was conducted in 2018 which estimated household spending on health, willingness and ability to pay for health insurance using a cross-sectional household survey. The Nigeria Demographic and Health Survey (NDHS) and the Harmonized Nigerian Living Standard Surveys (HNLSS) 2009-2010 sampling strategy was used and stratified random sampling was done to select statistically representative households (754 households ,86.7% rural households 4,471 individuals). Data collection employed high quality assurance and security standards. Data was analyzed using STATA and Microsoft Excel and basic probability sampling weights were applied.

Results:

Annual per-capita Out of pocket (OOP) health expenditure is NGN14, 367 ($47.1). 49% of households are at risk of catastrophic health expenditures (CHE) (using 10% of total household income) and 31.6% (using 40% of non-food expenditure), with rural households at increased risk of CHE. Insurance coverage in the state is very low (0.2%), however 80.5% of households are willing to buy health insurance. The average Willingness to Pay (WTP) per annum is NGN5556($18.22). At the actuarial determined annual premium of NGN8,930($29.3) per enrollee, only 29% of households are able to pay for health insurance without suffering catastrophe; (1% of Q1, 37% of Q3 and 51% of Q5). Considering a premium of NGN5556 (average WTP amount) the percentage of households able to pay increased to 47%, (8% of Q1, 52% of Q3 and 73% of Q5)

Conclusions

There is a high burden of OOP spending with resultant high risk of CHE; SHIS implementation will aid in reducing this effect. Majority of households are willing to enroll into SHIS and will spend less on average through the SHIS, however a large percentage of the poor cannot afford the premium; a major equity concern. To expand health insurance coverage, key policy decisions are needed including strategies aimed at targeting and government subsidization of the poor. Opportunities for expanding fiscal space through mechanisms like earmarking; financing innovations; and fiscal reforms aimed at improving IGR, need to form part of implementation strategies. In the face of present fiscal constraints; the state may explore commencing with a smaller benefit package and plan for subsequent scale up. A financial sustainability plan is highly imperative as part of health insurance expansion efforts as countries progress on the journey towards UHC.

D2 Linking Household and Service Provisioning Assessment Surveys to Estimate Effective Coverage: A Metric for Monitoring Universal Health Coverage in Difficult Setting.

PRESENTER: **Veenapani Rajeev Verma**, Indian Institute of Technology

AUTHOR: Umakant Dash

CONTEXT: While basic definition of *effective coverage* is conceptually straightforward; translating it to *feasible metric* is intractable. Coverage metric obtained from household survey alone is not succinct as it only captures service contact which can't be construed as actual service delivery and ignores comprehensive assessment of *provider-client* interaction. Estimation of metric linking need, access, utilization and service quality is imperative in measuring progress towards UHC. This study is embedded in *Tanahashi and Donabedian* model to arrive at desired metric.

SETTING: The study is conducted in *Poonch* district of *Jammu and Kashmir*. It is *remote* and *rural* district with unprecedented *topographical barriers*. It is also a *fragile area* as it is bounded by *Line of Control* with Pakistan and bearing the brunt of cease fire violations, military skirmishes and sporadic militant attacks. The population is marginalized as conflict, impoverishment and strenuous geographical conditions are causing triple whammy.

OBJECTIVES: *Primary objective* entails to examine the effective coverage of services in such setting and develop comprehensive metric integrating demand and supply side factors. *Secondary objective* explores the determinants explaining variation in effective coverage and utilization.

METHODOLOGY: District representative *household survey* employing *2 stage stratified random sampling* was conducted to elicit information on *utilization and expenditure* for four dimensions of care i.e. *ambulatory care, inpatient care, MCH* and *immunization* culminating into sample size of 1600 households. Concomitantly, *facility survey* of 138 public facilities was conducted to ascertain supply side readiness. Tool was modelled using *WHO's SARA Guidelines* in conjunction with *Indian Public Health Standards* underscoring *structural quality* components. *Patient exit surveys* were conducted to unravel *process quality. Quality scores* were estimated using *Polychoric Principal Component Analysis*. Linkage of household and facility survey was done using *ecological linking* with *Euclidean buffer link* of 5 kms taken to define catchment area. Median *structural* and *process* quality scores of all facilities within catchment area of household was assigned to each case. Linking was also done via *nearest travel distance* adjusting for roads and terrain. Use of healthcare for four packages was multiplied by average quality to yield *effective coverage*. Further, *Instrumental variable random-effects logistic regression* model was estimated to investigate supply and demand side determinants of effective coverage.

RESULTS: Effective coverage estimates were 20%-48% lesser than crude coverage. This divergence is more exacerbated for ambulatory care where supply doesn't commensurate with need. Results indicated facility readiness as significant predictor of healthcare utilization. Reducing structural quality score by half decreased odds of seeking ambulatory care by 55%. Use of public facility for immunization and MCH is positively associated with living within catchment area of public facility and negatively associated with residing in shelling and firing prone range. Process adjusted measures for inpatient care were lower than structure adjusted measures.

CONCLUSIONS/POLICY IMPLICATIONS: Coverage is impeded by *geographical inaccessibility* coupled with *poor* supply side readiness. Efforts to be directed by policymakers to bolster health service quality, particularly for services that have achieved relatively high utilization. The study didn't incorporate private and informal providers underestimating coverage and *limiting* its generalizability.

D3 Spatial Pattern of Ageing and Household Health Spending in India.

PRESENTER: **Mr. Basant Kumar Panda**, IIPS, Mumbai

Population ageing and increasing health spending are poised to be significant public health challenge in developing country like India. The number of elderly in India is found to be highest in the world and its accelerating share have consequences like chronic disease, disability, multimorbidity, poor health, utilization of health care and rising health expenditure. With the lower health financing system, the healthcare financing through out of pocket payments put the elderly in poverty. We intend to understand the association of share of population aged with household health spending in the districts of India. Data for the analysis will be from NSSO (66^{th} and 68^{th} round) conducted in 2009-10 and 2011-12 and census of India 2011. For the sufficiency of the sample size at districts level, we merged two round of NSSO (66^{th} and 68^{th} round) conducted in 2009-10 and 2011-12.We use the price deflectors to adjust the price for both the period. The share ageing population aged 60+ are calculated from the census 2011 at the district level. To observe the clustering impact of ageing with household health spending we use me Moran I statistics, Univariate and bivariate LISA map. To observe the association of the two variable we use OLS regression as well spatial lag and spatial error model.

The study found the annual per capita health expenditure (APHE) and catastrophic health spending (CHS) among the districts increases with the increase in share of elderly among the districts. Both the ageing and APCE are clusters among the districts of India with Moran I value 0.43 and 0.56 respectively. The bivariate Moran I of share of ageing and health expenditure found positive shows that positive association of share of ageing with the higher health expenditure among the districts of India. The Bivariate LISA map shows that around 153 districts are as hotspots , i.e. higher share of population ageing clustered with higher APHE and 120 districts as cold spots i.e. higher share of population ageing clustered with higher APHE. Similar results are also found among the share of ageing and share of household incur CHS. The spatial regression analysis shows that the share of ageing have the significant role in rising health expenditure. Apart from that disability among the elderly, annual per capita consumption expenditure, and percent urban have impact in higher health expenditure among the districts in India. Apart from the study found that increasing share of ageing increases the percentage of household suffer from the catastrophic heal spending.

The study provides a robust estimate to understand the spatial clustering of share of ageing and household health spending in minimum geographical territory in India. The study confirm the high share of ageing have an impact in higher health speeding, shows that the rising burden of elderly will be a crunch for India's financial mechanism. Though the global literature shows the increasing share of ageing have the minimal impact in rising the health expenditure, but the government and policy maker should aware about the adverse impact of it.

D4 The Impact of Premium Subsidies on Health Plan Choices and Health Care Demand: Evidence from a System Change in Switzerland

PRESENTER: **Dr. Stefan Boes**, University of Lucerne
AUTHORS: Cornel Kaufmann, Ms. Shalvaree Vaidya

Until 2014, two types of premium subsidy systems co-existed in the mandatory health insurance system in Switzerland that differed in their payment modalities: cash vs. in-kind transfers. These two types of systems provided different incentives for individuals to make health insurance decisions. In general, individuals weakly prefer cash over in-kind transfers because the former offer more freedom of choice. However, in-kind transfers incentivize a higher health insurance coverage to fully exhaust the premium subsidy.

The objective of this study is to identify the impact of in-kind vs. cash transfers on health plan choices and health care demand. The empirical strategy explores two features of the Swiss health insurance system: i) regional variation in types of premium subsidies, and ii) a national policy intervention that unified subsidy payments to in-kind in 2014. The two features are explored separately and together within a difference-in-differences framework. For the regional variation, we compare eligible individuals in cantons with an in-kind transfer scheme with eligible individuals in cantons with a cash transfer scheme. To control for cantonal differences other than the subsidy payment modality, we use individuals who are ineligible for premium subsidies as a comparison group and apply regression and propensity score matching methods to control for common eligibility determinants. For the second feature, we will compare trends in health plan choices and health care demand of eligible individuals in cantons that switched from a cash to an in-kind transfer scheme with those in cantons with an in-kind transfer scheme already before 2014. Preliminary results suggest that in-kind premium subsidies indeed tend to increase health care coverage, but the effect is relatively small and does not lead to a higher health care demand.

The study has implications regarding the design of premium subsidy systems, in terms of payment modalities but also in terms health plan choices and health care expenditures for the low-income individuals, which may be distorted by incentives set by the system.

3:00 PM –4:00 PM TUESDAY [Specific Populations]

Universität Basel | Kollegienhaus – Aula 033

Specific Populations Posters

SP1 Comparing the Economic Burden of Diabetes Mellitus in Children with and without Medical Insurance: A Cross-Section Study in Shandong Province

PRESENTER: **Yawei Guo**, Center for Health Economics Experiment and Public Policy, School of Public Health, Shandong University
AUTHORS: Sun Jingjie, Dr. Jian Wang

Objective:The incidence of diabetes mellitus in children is rising in all countries.This apparent epidemic is mainly due to the increased rates of obesity in children,carrying enormous long-term public health implications,including the economic burden.However,previous studies focused on the composition and influencing factors of hospitalization costs,or the economic burden of diabetes mellitus among the whole population. This study aims to compare the economic burden of diabetic patients with and without medical insurance (MI) in children, from the aspects of types of medical costs and diabetic comorbidities in Shandong province.

Methods:The data was obtained from the hospitalization information system of 32 general hospitals in 6 urban districts of Shandong Province. We identified 48662 patients with diabetes mellitus,including 794 children.The information on demographics, comorbidities, types of diabetes, age of patients, type of health insurance, reimbursement, and hospitalization costs were extracted and checked.Differences between groups were analyzed by Mann-Whitney U test. STATA14 software was used for analysis.

Results:The mean age of diabetes mellitus in children was 12.7±4.5 years.The highest prevalence was type 1 diabetes mellitus(62.1%), followed by type 2 diabetes mellitus(13.4%).The children with MI has the average total hospitalization expenditure of 6092.8 RMB and hospitalization days of 8.2, compared with the children without MI of 4878.8 RMB and 4.9 days.Meanwhile,the insured children's mean out-of-pocket (OOP) cost(3503.5 RMB) was lower than the those of the children without MI(3881.9 RMB) ,significant at 0.01 level.The insured children's mean total hospitalization expenditure was 6092.8 RMB, and they incurred more costs for drug , treatment, and inspection ($p<0.01$). Insured children had higher costs when associated with ketoacidosis diseases, diabetic nephropathy, and upper respiratory tract infection ($p<0.05$).

Conclusion:Diabetic mellitus in children with MI have higher hospitalization costs and longer hospitalization days than those without MI,but uninsured patients carry a heavier OOP burden . As a result,the MI system in China needs further improvement to reduce the economic burden of diabetes,especially targeting children without MI and the diabetes mellitus patients with Comorbidity.

SP2 Evaluation of the Effectiveness of Influenza Vaccination for Elderly People with Disabilities in Taiwan - A Population-Based Study

PRESENTER: **Dr. Nicole Huang**, National Yang-Ming University

AUTHORS: Dr. Yu-Chia Chang, Ho-Jui Tung, Te-Feng Yeh

Background: Influenza, an acute respiratory infectious disease caused by influenza virus, has become an international public health concern. Nowadays, annual influenza vaccination is considered as the most effective way in the prevention of influenza among high-risk groups such as the elderly, children, and patients with chronic diseases. Studies have confirmed that people receiving influenza vaccination is associated with lower influenza-related mortality and morbidity. However, most of the studies have focused on the general populations only and few studies have examined the effectiveness of influenza vaccination on the health status of the disabled populations with poorer accessibility to health care. This study aimed to assess the effectiveness of influenza vaccination for elderly people with disabilities on the risk of mortality and hospitalization in Taiwan.

Methods: This is a population-based, retrospective cohort study. By linking the National Disability Registration System and the National Health Insurance (NHI) Research Database, we were able to identify 394,511 disabilities aged 65 years or older in Taiwan in 2014. Study participants' influenza vaccination records were derived from the NHI claims data between October 1, 2014 and December 31, 2014, when the seasonal influenza vaccines were administered free to people aged 65 years and older in Taiwan. Multivariate logistic regression analyses were used to compare the vaccinated to the unvaccinated on their health outcomes measured between first of January to 31st of March in 2015.

Results: Only about one-third (34.6%) of the elderly people with disabilities had received influenza vaccination in 2014. After adjusting for confounders including age, gender, income, urbanization, comorbid conditions, and health care utilization, the vaccinated was associated with a significantly lower all-cause mortality (relative risk [RR]: 0.65; 95% confidence interval [CI]: 0.62-0.67) and hospitalization for pneumonia and influenza (RR: 0.93; 95% CI: 0.90-0.96), respiratory diseases (RR: 0.90; 95% CI: 0.88-0.93), respiratory failure (RR: 0.79; 95% CI: 0.75-0.83), and heart disease (RR: 0.91; 95% CI: 0.88-0.95) when compared to the unvaccinated.

Conclusion: Although free influenza vaccinations have been provided since 2001 in Taiwan, influenza immunization rates among elderly people with disabilities remain low. This study indicated that influenza vaccination could reduce the risk of all-cause mortality and hospitalization of influenza-related complications during the influenza season among elderly people with disabilities in Taiwan.

SP3 How Much Additional Funding Should Countries Spend on Primary Health Care? Guide Posts for Investment in Primary Health Care to Advance Towards the Health SDG Targets in Low and Middle Income Countries

PRESENTER: **Karin Stenberg**, World Health Organization

AUTHORS: Odd Hanssen, Melanie Bertram, Tessa Tan-Torres Edejer

Introduction: Primary Health Care is sometimes described as a panacea for countries' advancement towards UHC and the SDGs. Yet PHC is not a low-cost solution. Investing in quality, accessible health systems that provide a comprehensive set of services to all those in need can bring enormous benefits – but will require significant financial investments. We estimated how much additional funding is needed to advance PHC to a quality standard across low and middle income countries.

Methods: We first determined boundaries for what investments can be considered PHC. In recognition of the variation in definitions of PHC across countries, we propose three measures which represent a successive expansion of scope. Agreement on boundaries was reached through an expert meeting and country validation process. To estimate costs, we drew on WHO's SDG price tag for 67 low and middle income countries, which calculates the cost, by country and year, for expanding coverage of WHO recommended health interventions and progressively strengthening systems to provide comprehensive care through a primary health care centred approach. We extracted PHC related projected costs by country and year. Estimates on health workforce needs, additional commodity costs, and total per capita costs - are presented as *PHC Investment Guide Posts*. Estimates are presented for different country groups. We also estimated the projected health impact associated with making investments in PHC, again using three different measures for PHC.

Results: The resources required for PHC and the financial implications of these vary across countries, depending on the current and future health burden, and the strength and structure of the health system. Preliminary findings suggest that low income countries and lower middle income countries would need to at least double the current spending on PHC, if they wish to achieve the SDGs. Increasing coverage of PHC interventions 2019-2030 could avert at least 50 million deaths. The presentation will show detailed results per country income group regarding the investments needed, and the associated modelled health outcomes.

Discussion: The global PHC investment guide posts represent a conceptual framework to advance discussions around what are the budgetary implications of strengthening PHC and the health outcomes that can be achieved. At country level, there is a need to explicitly plan, cost and implement PHC to advance towards the SDGs.

SP4 Occupational, Sectoral and Firm Level Sorting Among Overweight and Obese Individuals in the UK Labour Market

PRESENTER: **Viktorija Kesaite**

AUTHORS: Ruben E Mujica Mota, Obioha Chukwunyere Ukoumunne

Individuals sort across various occupations (professional vs. manual work), sectors of the economy (private vs. public), and firms (large vs. small). This sorting is driven by individual worker productivity and the labour demand for the corresponding skills. Earlier studies on the impact of obesity on employment outcomes have neither accounted for occupation, sector or firm size-specific obesity penalties nor whether obese persons are more likely to be employed in certain occupations, firms and economic sectors. In a seminal contribution, Rooth (2008) observes that restaurant work has the highest share of obese employees and also the highest obesity penalties. We build on this result and explore occupational, sectoral and firm level sorting in the UK labour market using the British Household Panel Survey (BHPS). More specifically, we aim to shed light on the question of whether higher weight men and women are by and large relegated to different occupations, firms and economic sectors than lower weight counterparts.

Occupational, sectoral and firm size sorting is analysed using multinomial logit and probit regressions. Given the possibility of a reverse causal relationship between occupation, firm size, economic sector and obesity, we use child's BMI as an instrument for individual's body weight. We estimate the model using the control function approach. To investigate the non-linear relationship between BMI and wages, we use a semi-parametric instrumental variable approach using the Robinson's double residual method whereby we estimate wage differences relative to wages at a BMI of 23 for women and 27 for men.

There are 6,248 men and 7,563 women in the sample with an average age of 42 for both men and women. The test of endogeneity indicates that respondent's BMI is exogenous in the occupation equation. Results using multinomial logit regression suggest that compared to normal weight men, obese men are less likely to choose a semi-skilled occupation compared to a skilled occupation (RRR: 0.66; CI: 0.55 and 0.80), while the average marginal effects from the IV regression suggest that it is unclear whether higher weight would increase or decrease the predicted probability of working in a skilled occupation for men (AME: -0.09; CI: -0.45 and 0.28). For women, the results of the multinomial logit regression suggest that as body mass index increases, women are more likely to be employed in skilled jobs compared to semi-skilled (RRR: 0.97; CI: 0.95 and 0.99). Similarly, the IV results suggest that, a one unit increase in a woman's BMI results in an increase in the probability of being employed in a skilled occupation (AME: 0.13; CI: 0.05 and 0.22). These findings suggest that overweight/obese men and women are more likely to be in jobs which have been previously observed in the literature to be most adversely affected in terms of obesity penalties.

SP5 Stakeholder Engagement to Overcome the Challenges in the Collection of Cost of Illness Data in Healthcare Facilities in Uganda

PRESENTER: **Mr. Gatien de Broucker**, Johns Hopkins Bloomberg School of Public Health

AUTHORS: Dr. Anthony Ssebagereka, Aloysius Mutebi, Rebecca Racheal Apolot, Elizabeth Ekirapa Kiracho, Dagna Constenla

Background: As part of the Decade of Vaccine Economics (DOVE) project, we collected data on the cost of pneumonia, diarrhea and measles in Uganda. We documented key challenges that we encountered during data collection for cost of treating children under 5 years old attending public, private for-profit and private not-for-profit healthcare facilities and pharmacies. DOVE took place in the four regions of Uganda i.e. Northern, western, Eastern and Central for a period of one year.

Methods: Data for this study was collected through facility records review from 48 facilities and face-to-face interviews (at the time of discharge) with the caretakers of 1590 children under 5 years old suffering from pneumonia, diarrhea or measles. In addition, a follow-up telephone survey is also being conducted within 7-14 days after discharge in order to obtain data on extra costs incurred after discharge from healthcare facility. Throughout the data collection period and in the different settings where it took place, the research team engaged local stakeholders at all levels to face the challenges and take on opportunities for a greater impact for the study.

Results: We found several barriers that affect our capacity to collect economic data. For healthcare facilities, at different facility level, administrative records were missing. The definition of a case of pneumonia and measles (based on clinical assessment only in the study) is largely not standardized. There was strong institutional resistance, particularly from private for-profit healthcare facilities, to release facility expenditure and income data. In addition, the inconsistent and widely varying documentation practices among the different categories of healthcare facilities (with differences between urban and semi-urban/rural facilities) was a key factor in the challenges found to collect data in facilities. During the face-to-face interviews with the caretakers, data collectors were faced with the problem of illiteracy (caretakers could not read or write), difficulties to recall money spent and commodities utilized while at home before coming to the healthcare facility, and lack of knowledge of the income brought to the household by the other wage-earners. The follow-up rate of caretakers remained high in Jinja, Mbarara and Wakiso (90%), it was lower in Gulu (70%) where the cellular coverage is not as strong. In response to these challenges, the research team organized recurrent visits to the districts, offering basic economic training on cost of illness and health economics to involved stakeholders – physicians, administrators and program managers from the public and private facilities. A monthly newsletter was sent out and more workshops have been organized as the preliminary results were released.

Conclusions and recommendations: The healthcare facility management team and the other local stakeholders are central to the success of the costing study and thus should be actively engaged throughout the study. There is need for orientation of health workers participating in the study on a standard definition of pneumonia and measles.

SP6 The Causal Direct and Chronic Condition-Mediated Effects of Obesity on Retirement

PRESENTER: **Antonieta Medina-Lara**, University of Exeter

AUTHOR: Ruben E Mujica Mota

Background: Overweight and obesity may lead to earlier retirement by precipitating long term health conditions, which negatively affect productivity and the utility of work and leisure. The decision of early retirement in obese/overweight individuals may be influenced by work incentives or disincentives arising from markets that reward paid work by people with excess body weight less than that by similar people of lower weight.

Objective: To estimate the effect of obesity on retirement, distinguishing between the indirect effect that operates through chronic conditions and the direct effect that is independent of chronic conditions.

Methods: Data on retirement status, chronic conditions and bodyweight from the Health and Retirement Survey, a representative sample of the older US population (age 50+), were used to estimate a causal model of retirement as a function of bodyweight, partly mediated by chronic conditions. Individual information on genetic variants predisposing to higher body weight and coronary artery disease, myocardial infarction, and type-II diabetes were used as instruments for Body Mass Index and the presence of these conditions. The model was estimated using a recursive simultaneous equation system by maximum simulated likelihood. Here we present results for the analysis of type-II diabetes as the only mediator.

Results: The sample for analysis included 3,348 women and 2,457 men aged less than 70 years. The overall causal effect of obesity on the probability of retirement is -0.8 (95% CI: -10.7, 9.1) and 14.8 (2.6, 27.1) percentage points difference relative to non-obese women and men, respectively. The indirect effect through type II diabetes accounts for the small effect in women and contributes with 17% of the overall effect in men, so that the remaining non-diabetes mediated effect on the probability of retirement is, respectively, 11.4 (0.03, 22.9) and 12.3 (-5.3, 30.0) percentage points.

Discussion: We found that obesity increases the probability of retirement in men, whereas no overall effect was found in women. The latter result is explained by the finding that obesity reduces the probability of retirement in women through its effect on Type 2 diabetes, thus offsetting the increase in the probability of retirement operated through other channels. In fact, the estimated effect on retirement that is not mediated by Type-2 diabetes is very similar across genders. Given the extensive evidence of larger wage penalties for excess bodyweight in women than men, our results suggest that the lifetime income effect, which in women is driven by the incidence of diabetes, is dominant over the substitution and disutility-of-ill-health effects in women, whereas the opposite is the case for men.

SP7 The Costs of Anxiety Disorders: A Systematic Review and Meta-Analysis

PRESENTER: **Dr. Alexander Konnopka**, Hamburg Center for Health Economics

AUTHOR: Hannah König

Background: Anxiety disorders (AD) are a common mental disorder, for which a couple of cost-of-illness studies (COI) studies have been conducted in the past. The aim this study is to provide a systematic overview of these studies and a meta-analytic aggregation of their results.

Methods: A systematic literature search was conducted in Pubmed-Medline. We included top-down studies reporting costs for AD and bottom-up studies reporting costs for AD and a non-diseased control group. Results of top-down studies were aggregated by calculating the mean percentage of costs on GDP and health expenditure. Results of bottom-up studies were meta-analytically analyzed using the “ratio-of-means method” and inverse-variance pooling. Using this method the logarithm of the relative difference in a continuous outcome between two groups is calculated and aggregated over studies, which allows the aggregation of cost data whose absolute values may differ by magnitudes between studies. The result can be interpreted as the relative change in costs imposed by a specific disease compared to “baseline costs”.

Results: We identified 12 top-down COI and 10 bottom-up COI. All top-down COI and two bottom-up COI reported costs for AD as diagnostic group whereas four bottom-up COI reported costs for social anxiety disorder (SAD), three for generalized anxiety disorder (GAD), and one for panic disorder as single disorders. In top-down COI direct costs of AD on average corresponded to 1.78% of health care costs and 0.18% of GDP, whereas indirect costs on average corresponded to 0.24% of GDP. In bottom-up COI direct costs of persons with AD were increased by factor 2.22 (1.26-3.91, p=0.006) and indirect costs were increased by factor 1.92 (1.05-3.53, p=0.04), whereas total costs were increased by factor 2.52 (1.73-3.68, p<0.001). Subgroup analysis revealed an increase of total costs by factor 1.60 (1.16-2.22, p=0.005) for SAD and 2.95 (2.38-3.65, p<0.001) for GAD. Measures of heterogeneity indicated high heterogeneity between studies when aggregating direct costs, indirect costs and total costs, but low heterogeneity when aggregating studies reporting costs for PD or GAD.

Discussion: Using methods that focused on relative rather than absolute costs, we were able to aggregate costs reported in different COI for anxiety disorders. We found that anxiety disorders are associated with to a low but relevant proportion of health care costs and significantly increase health care costs when measured on individual level. Our disorder-specific subgroup analysis showed that study findings are most homogeneous within specific anxiety disorders. Therefore, more for a more detailed picture of the costs of anxiety disorders, more studies for now underrepresented anxiety disorders like e.g. panic disorder are needed.

SP8 The Economic Burden of Mental Illness Patients with Comorbidity in China

PRESENTER: **Dr. Kuixu Lan**, The Affiliated Hospital of Qingdao University

AUTHORS: Ms. Lizheng Xu, Sun Jingjie, Dr. Jian Wang

Background: The prevalence rate of mental illness is as high as 17.5% in China, which causes its economic burden ranks first in the total burden of disease, accounting for about 20%. And for the patients with other diseases, their medical expenditure is heavier. However, there is no literature about the role of medical insurance in alleviating the medical burden of patients with mental health and other comorbidity.

Objective：This study aims to analyze the economic burden of patients with mental health and other comorbidity and examine the role of Urban Employee Medical Insurance (UEMI) in medical burden reduction.

Methods: The data was obtained from the information system of two municipal mental illness hospitals in eastern and western Shandong province in China, and cardio-cerebrovascular disease, which has the highest prevalence of chronic diseases in China, was selected as a comorbidity to analyze the medical burden of mental illness patients. Other variables, e.g., age, gender, types of mental illness, hospital expenditure and reimbursement data, were included for analysis.

Results: There were 9593 patients with mental illness included in the study, 30.0% of whom were schizophrenia and 16.8% were bipolar affective disorder. In terms of hospital expenditure distribution, the kind of mental illness with the highest medical expenditure was schizophrenia (with expenditure of $ 3238.1and hospitalization days of 65.8). After reimbursement of UEMI, the type with highest out-of-pocket expenditure was schizophrenia, with an average amount of $1104.3. Among all the patients with mental illness, 2,101 (21.9%) patients were combined with cardio-cerebrovascular disease, including hypertension, heart disease and cerebrovascular disease. All the patients were divided into two groups, where group one included mental illness patients with cerebrovascular disease and in group two were those without any comorbidity. The group one has the average hospitalization expenditure of $2115.7 and hospitalization days of 48.8, compared with the group two of $2450.7 and 41.2 days. The total expenditure reimbursement ratio of group one(55.6%) was lower than group two (58.5%)（$p<0.001$). The average daily out-of-pocket expenditure was $26.7 of group one, less than that in group two ($29.2), $p<0.001$.

Conclusion: For mental illness patients with UEMI, when combined with cardio-cerebrovascular disease, their hospitalization expenditure increases but reimbursement ratio is lower, and daily out-of-pocket expenditure is higher. That means this medical insurance, as the highest reimbursement ratio basic medical insurance type in China, fails to fully compensate patients for economic losses caused by mental illness. We speculate that, for other types of medical insurance, the economic burden and risk of falling into disease poverty would be higher for patients with mental health and other comorbidity. Medical insurance should increase the degree of preference to this vulnerable group, and let medical insurance fully play protective role in preventing poverty caused by disease.

SP9 The Hospital Burden of Obesity Among Community-Dwelling Adults with Type 2 Diabetes in a Context of Universal Health Coverage: A National Cohort Study Using Linked Survey and Hospital Data

PRESENTER: **Dr. Neeru Gupta**, University of New Brunswick

AUTHOR: Zihao Sheng

BACKGROUND: Data from the Canadian Community Health Survey (CCHS) reveal that one-fifth (19.9%) of Canadian adults aged 20 and over are obese. Obesity is somewhat more common among men (21.3%) than women (18.4%). It has been widely suggested that obesity could overtake smoking as the leading cause of health problems in Canada. Obesity is known to play a key role in the development of type 2 diabetes and other chronic diseases. However, obesity does not always entail increased risk of cardiometabolic complications. In this study, we describe epidemiological patterns of diabetes and obesity, and estimate hospitalization risks and costs among the community-dwelling adult population with diabetes by obesity status.

OBJECTIVE: The objectives of this national study are to estimate the costs of an index hospitalization for diabetes by patients' obesity status, and to evaluate how hospital costs change longitudinally during a five-year period of observation.

DATA AND METHODS: We take advantage of a new data resource: the CCHS linked to multiple years of standardized data on inpatient care from the Discharge Abstract Database (DAD). Linked data sets offer many novel research paths, since the information from administrative health data alone is limited in terms of patient characteristics, while that from cross-sectional population surveys is limited in terms of prospective healthcare utilization variables. We access the confidential microdata in the secure environment of the Statistics Canada Research Data Centre. Thanks to Canada's universal healthcare system, the data on hospital stays are considered complete. Hospital costs are derived from the resource intensity weights assigned by the Canadian Institute for Health Information to each inpatient case in the DAD. These values represent estimated relative resource consumption accounting for patients' age group and health status. In addition to obesity, predictors of interest include patient demographics, income adequacy and social vulnerability. Regression models will be used to determine the importance of obesity in predicting hospital costs, and stratified by gender.

RESULTS: Preliminary evidence indicates that 41.5% of Canadian adults living with diabetes are obese. The rate varies by gender, but not in the same direction as the general population: higher among women (44.7%) than men (39.0%). Multivariate analyses will further understanding of how diabetes hospitalizations, which are typically seen as a measure the capacity of the healthcare system to manage chronic conditions in primary care, are fueled by gendered differences in weight status.

CONCLUSIONS: Evaluating how obesity-related morbidity and hospital costs evolve for women and men with diabetes can help inform policy and practice to reach equitable outcomes and cost efficiencies.

3:00 PM –4:00 PM TUESDAY [Health Care Financing & Expenditures]

Universität Basel | Kollegienhaus – Aula 033

Health Care Financing & Expenditures Posters

FE1 Aligning Out-of-Pocket Health Care Expenditures with Income: The Effect on Health Insurance Premiums and Types of Risk

PRESENTER: **Mr. Michal Horný**, Emory University
AUTHORS: Daniel Joon Chang, B. Pablo Montagnes, Zachary F. Peskowitz

Background: Health plans with a deductible are increasingly prevalent in health insurance markets in many developed countries across the world. Given the relatively high prices of health care, plan beneficiaries are at risk of spending the entire deductible amount in just one encounter with the health care system. Many individuals, especially those of low socioeconomic status, are often unable to afford to pay for the entire deductible amount promptly. Consequently, the prospect of a sizeable out-of-pocket payment makes some individuals forgo essential medical care. To reduce this risk, while maintaining beneficiary accountability for the type and amount of care they use, we propose a concept of a short-term deductible – a lower nominal value than a typical annual deductible that applies to health expenses within a time interval shorter than one year.

Objective: The objective of this study was to quantify the trade-off between the nominal deductible amount, the length of the interval over which the deductible applies (from now on, "deductible interval"), and the actuarially fair premium.

Methods: We simulate person-level health expenditures throughout a year as a compound stochastic process consisting of health episode occurrence – modeled as a Poisson process with a constant rate – and a log-normally distributed payment per health episode. We express the community-rated actuarially fair premium for an individual plan as a function of the nominal deductible amount and the deductible interval. Finally, we compare the annual premiums and the risk of aggregate out-of-pocket spending for various combinations of the deductible amount and the length of the deductible interval.

Results: Compared to a plan with 0% coinsurance and a positive annual deductible, the annual actuarially fair premium for a health plan with a linearly scaled deductible that resets every 6, 3, 2, and 1 months (the maximum annual aggregate out-of-pocket spending remains constant) would be 11.3%, 15.1%, 23.5%, and 34.0% higher, respectively. Analogously, if the annual actuarially fair premium were required to remain constant, the nominal amount of a short-term deductible that resets every 6, 3, 2, and 1 months would have to be 69.8%, 51.8%, 45.9%, and 42.7% of the annual deductible amount, respectively.

Conclusion: There is a trade-off between the nominal deductible amount, the deductible interval, and the actuarially fair premium. By shortening the deductible interval and reducing the nominal deductible amount, health plan beneficiaries would become shielded from a very high expense at any given moment, but simultaneously, they would be at risk of higher annual out-of-pocket spending in aggregate. However, that risk could be offset by an increased premium. Consumers may find value in this trade-off. Policymakers should encourage cost-sharing mechanisms that align out-of-pocket health care spending with the typical rate of income to make health care more affordable.

FE2 Challenges in the Design and Implementation of Coverage with Development Schemes for Medical Devices

PRESENTER: **Ms. Vivian Reckers-Droog**, Erasmus School of Health Policy & Management, Erasmus University Rotterdam
AUTHORS: Carlo Federici, Werner Brouwer, Michael Drummond

Background: Coverage with evidence development (CED) represents a policy option for healthcare decision-makers when there is uncertainty about the costs or benefits of new health technologies. Under CED, funding for new technologies is granted on the condition that additional data are collected to establish its cost-effectiveness. In principle, these schemes are particularly relevant for medical devices since it is often the case that limited clinical data are available at launch. In addition, better estimates of cost-effectiveness can be obtained when more experience is gained in routine clinical use of the device. However, as compared with pharmaceuticals, there are relatively few CED schemes for medical devices.

Objectives: The aim of this study was to determine the challenges in the design and implementation of CED schemes for medical devices, with the objective of facilitating their implementation in the future.

Methods: A systematic review of the literature was conducted to identify existing CED schemes for devices and to identify challenges in their design and implementation. Databases searched were Cochrane, Embase, and Web of Science. Based on the preliminary findings of the systematic review an interview schedule was developed and interviews conducted with the decision makers responsible for the health technology assessment (HTA) of medical devices in European countries, in order to obtain their perspectives on the challenges in designing and implementing schemes. In addition, data were collected on CED schemes not in the published literature, with a view to developing a taxonomy of existing schemes in the EU.

Results: After removing duplicates, 4,282 records were identified, and 61 records were eventually included in the review. Challenges in conducting CED schemes were reported by the majority of the studies (n=41), and included issues with designing, implementing and evaluating schemes. However, mostly all published schemes were on pharmaceuticals, with only 6 studies specifically addressing medical devices.

Based on the results of the review, the challenges explored in the interviews with decision makers were: determining the eligibility of medical devices as candidates for schemes; getting stakeholder agreement; arranging funding of the schemes; determining appropriate study design and relevant outcome measures; dealing with data collection, monitoring and analysis; determining the decision rule based on the outcome of the scheme, reaching an agreement on price and reimbursement; withdrawing devices that are found to be not cost-effective; agreeing the length of the scheme; adapting the scheme to deal with product modifications, and similar devices entering the market during the scheme.

Conclusions: Several CED schemes for medical devices exist in EU member states and experience with designing and implementing them is being accumulated. However, if CED schemes for medical devices are to be more widely used, several of the challenges identified need to be overcome.

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FE3 Changes in the Annual Health Insurance Treatment Cost of Colorectal Cancer in Hungary: A Nationwide, Real-World Cost of Illness Study

PRESENTER: **Prof. Imre Boncz**, University of Pécs
AUTHORS: Zsuzsanna Kívés, Andor Sebestyén

Objective:

Colorectal cancer represents a significant social and economic burden both for the health care system and the society and can be considered among the leading cause of death in developed countries. The aim of our study is to calculate the changes of the annual health insurance treatment cost of colorectal cancer (CRC) in Hungary between 2001-2014.

Data and methods:

The data derive from the financial database of the Hungarian National Health Insurance Fund Administration (NHIFA), the only health care financing agency in Hungary. We analyzed the health insurance treatment cost and the number of patients for the year 2014. The following cost categories were included into the study: out-patient care (including CT-MRI, PET, home care, transportation, laboratory services), acute and chronic in-patient care and pharmaceutical expenditures. Colorectal cancer was identified with the following codes of the International Classification of Diseases 10th revision: C18-C21 (malignant cancer), D01.0-01.4 (in situ) and D12 (benign).

Results:

The Hungarian National Health Insurance Fund Administration spent 37.428 million EUR (9.6 billion Hungarian Forint, HUF) for the treatment of colorectal cancer patients in 2001 which increased by 81.8 % to 68.029 million EUR (20.997 billion HUF) in 2014. Major cost driver of health insurance expenditures was the acute inpatient care accounting for 77.5 % and 76.9 % of total health insurance expenditures in 2001 and 2014 respectively.

The Hungarian National Health Insurance Fund Administration spent 29.018 million EUR (7.4 billion HUF) for the acute inpatient care treatment of colorectal cancer patients in 2001 which increased by 80.3 % to 52.318 million EUR (16.148 billion HUF) in 2014.

The NHIFA spent 2.1 million EUR (0.541 billion HUF) for the out-patient care treatment of colorectal cancer patients in 2001 which increased by 359.6 % to 9.6 million EUR (2.99 billion HUF) in 2014. The NHIFA spent 4.8 million EUR (1.246 billion HUF) for the out-patient care treatment of colorectal cancer patients in 2001 which increased by 13.9 % to 5.5 million EUR (1.707 billion HUF) in 2014. The health insurance expenditures of the NHIFA for chronic inpatient care decreased from 1.4 million EUR (0.370 billion HUF) in 2001 by 66.4 % to 0.485 million EUR (0.149 billion HUF) in 2014.

Conclusions:

The annual health insurance treatment cost of colorectal cancer increased significantly in Hungary between 2001-2014. Acute inpatient care proved to be the major cost driver both in 2001 and 2014. Health insurance expenditures for outpatient care, acute inpatient care and drugs increased while chronic inpatient care expenditures decreased between 2001-2014.

FE4 Examining Purchasing Reforms Towards Universal Health Coverage By the National Hospital Insurance Fund in Kenya.

PRESENTER: **Dr. Rahab Mbau**, KEMRI Wellcome Trust Research Programme
AUTHORS: Evelyn Kabia, Ayako Honda, Kara Hanson, Edwine Barasa

Introduction

Kenya has prioritized the attainment of universal health coverage through the expansion of health insurance coverage by the National Hospital Insurance Fund (NHIF). In 2015, the NHIF introduced reforms in premium contribution rates, benefit package, and provider payment mechanisms. We examined the influence of the NHIF reforms on NHIF's purchasing practices and their implications for strategic purchasing and health system goals of equity, efficiency and quality.

Methods

We conducted an embedded case study with the NHIF as the case and the reforms as embedded units of analysis. We collected data at the national level and in two purposively selected counties through in-depth interviews with health financing stakeholders and, public and private health facility managers and frontline providers (n=41); focus group discussions (n=4); and documents review. We analyzed the data using a framework approach.

Results

Equity was compromised by: 1) limited awareness of the new benefits and unaffordability of the new premiums for certain population groups (rural, poor, elderly, people living with disabilities, unemployed and informal sector workers), 2) Differences in the benefit package between the national scheme and civil servants scheme whereby members of national scheme lacked preventive services and other curative services, 3) Pro-urban and pro-private distribution of contracted health facilities which hindered access for those in rural and marginalised areas and lastly, 4) Delayed reimbursements and lower capitation rates for the outpatient services for the national scheme which led to discrimination against national scheme members in favour of other patients (civil servants, privately insured and/ or uninsured cash-paying patients) particularly in private hospitals. Efficiency was compromised by weak accountability mechanisms that led to resource loss through unnecessary treatment procedures and fraudulent claims. Quality of care was compromised by poor monitoring of quality of services, poor infrastructural capacity of public hospitals, and rationing of services due to perceived low reimbursement rates.

Conclusion

Despite the new reforms, our study shows that the NHIF remains a passive purchaser due to weaknesses in the design and implementation of the reforms with potential negative implications for the health system goals of equity, efficiency and quality. For the reforms to accelerate the country's progress towards UHC, policy makers from the government and the NHIF should make deliberate efforts to align such reforms with strategic purchasing actions that are aimed at improving health system goals.

FE5 Financing Universal Health Coverage for Maternal Health in the Gambia: Lessons from the PRECISE Project

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The Gambia is one of the poorest countries in the world, with a GDP per capita of $740. Despite improvements in the health of its population, The Gambia did not meet Millennium Development Goal targets on maternal health. Indeed, maternal mortality remains unacceptably high with a ratio of 433 per 100,000 live births in 2017. In an effort to alleviate the health burden of its population, The Gambian government has committed to providing universal health coverage as part of its current health strategy (2012-2020). In addition, the government has introduced two financing policies aimed directly at improving maternal health: in 2007 it removed user fees for maternal and child health services, and in 2014 it introduced a pay-for-performance maternal and child health and nutrition scheme. During the period of implementation of these policies, utilisation of maternal health services has increased (the proportion of pregnant women attending 4+ antenatal visits increased from 73% to 78% between 2005 and 2013 and facility delivery from 52% to 57% between 2006 and 2013).

There have been no studies to date exploring the effect of government financing policies on maternal health service use in The Gambia, on the role financing plays on women's willingness and ability to access care, or on the financial burden of antenatal, delivery and postnatal care for women and their families. Further, little evidence exists on how financing for maternal health is allocated at the central level and distributed and accounted for to the regions, districts and below.

This research deploys a mix of qualitative and quantitative methods to explore the financing for maternal health in The Gambia, and whether and how recent health financing policies operate to help The Gambia achieve universal health coverage of maternal health services. We explore financing policies in the past ten years and explore how these influence the demand for and supply of maternal health services. We conduct research at the national, regional, district and village levels in one region, two districts and four villages. Methods include a policy review, semi-structured interviews with health managers and health workers, health worker diaries, in-depth interviews and focus group discussions with women, structured facility-based questionnaires and analysis of the Health Demographic Surveillance System.

The results will shed light on the design of health financing policies and their effect on maternal health service provision and use. The results will be important for national and global policymakers involved in decision making for universal health coverage of specific population groups (such as pregnant women). They will also be important for researchers working on universal health coverage in low-income settings, where the challenges of achieving this are most acute.

FE6 Health Capability: Questionnaire and Measurement

PRESENTER: **Ms. Ruochen Sun**, Yale University

AUTHOR: Dr. Jennifer Prah Ruger

Traditional health economics seldom captures the reality that people seek both good health and the ability to pursue good health. Health Capability Economics expands the evaluation space to include not only what individuals actually do, but what they are able to do. Health capability theory advances that individual's health capability can be identified as a combination of health functioning and health agency. The interactive, iterative, and multidimensional paradigm provides a guiding principle to further operationalize health capability in empirical research.

This paper developed a questionnaire based on the health capability paradigm. Further operationalizing health capability, an individual's health capability is comprised of several structural factors including health functioning, health agency, health wisdom, health intelligence, and health leadership. First, health capability consists of health functioning— currently visible functioning, and health agency—the freedom and ability to achieve the health goals that individuals value. Then, health agency, the core of the health capability approach, is measured by external factors and internal health wisdom. External factors include social norms, social networks, material circumstances, economic, political and social security, utilization and access to health services, etc. Then health wisdom refers not only to health intelligence, the ability for cognition and reflection about individual's personal health, but also the realization of the common good in health— health equity in society. Thus, the measurement of virtue ethics in health is a key part of health wisdom. Finally, health leadership, which is a part of health intelligence, refers to cognitive strengths entailing the acquisition and use of knowledge to achieve good health. It includes seven specific and measurable components: health values and goals, health seeking skills, beliefs, and self-efficacy, self-governance and self-regulation skills and expectations, effective decision-making, intrinsic motivation, positive expectation and growth health mindset. The combination of health knowledge and health leadership determines an individual's health intelligence.

There are several innovative features of the questionnaire which distinguish it from other existing measurement approaches, such as health literacy, health preferences and health knowledge. First, it measures not only the current functioning status of an individual's wellbeing but also the potential ability to employ resources and expertise to pursue good health. Second, it measures not only individuals' ability to achieve their own good health, but also the presence of willingness and ability to promote other's health and achieve health equity in society. Individual's virtue ethics towards health equity is incorporated into the questionnaire under the assumption that well-being involves awareness of significant moral values towards public health. Third, this questionnaire considers health capability as a dynamic and incremental feature of individuals, which is measured by a growth health mindset.

FE7 Improving Government Financing of Priority Health Interventions; The Effect of Evidence Based Advocacy and Multi-Sectorial Action

PRESENTER: **Frances Ilika**, HP+

AUTHORS: Onoriode Ezire, Peter Oshaji

Background: Nigeria is highly dependent on donor funding for its Family planning (FP) interventions, a cause of great concern considering increasing donor fatigue. Bauchi State, in North East (NE) Nigeria has very high fertility rate of 8.1% much higher than the national average of 5.5%. Its estimated population of 6.5 million is projected to double by 2030 and of the 51% of the population in the reproductive age; family planning coverage rate is very low at 2.2%. Low FP rates contributes to high maternal mortality and the NE zone has a very mortality rate of 1,549/100,000 live births as compared to 165/100,000 live births in the South West Zone. A key challenge to scaling up FP is paucity of government funding with no budget line allocated to FP in the state's financial budget.

Methods: A strategy was needed to address the urgent need to scale up domestic financing for FP in the state. A FP Advocacy Working Group (FPAWG) was established as an institutional structure made up of multi-sectorial representation from ministries of finance, parliamentarians, health, information, private sector, CSOs, women leaders and other key stakeholders. To generate evidence, a FP financing analysis was conducted to determine funding sources and magnitude, and a "Resources for the Awareness of Population Impacts on Development" (RAPID) assessment was done to project the social and economic consequences of rapid population growth on the state. Data was sourced from government budget documents, financial statements, National Health Accounts, public financial management documents, and previous expenditure analysis at the federal level in the past 5 years and as well as key informant interviews.

Results: The FP financing assessment showed a dependence on donor funding and paucity of government funding; with funding of FP commodities 91% donor, 9% federal government and no state government spending on FP in the past three years. RAPID showed that 22,000 maternal and 101,000 child deaths could be saved by 2020 by meeting the Nigerian FP expansion goals. Additionally, economic and development gains will include NGN235 billion ($770 million) saved in primary education costs, and 2 million less unemployed individuals. Using this evidence the FPAWG developed and implemented a strategic advocacy plan which targeted key policy and decision makers making a case for improved government funding of family planning; an exercise which was made successful by the wide reach of the multi-sectorial actors. As a result of these interventions, a budget line was created for family planning for the first time; and government funding of NGN190 million ($622,951) was allocated for FP control in the state's 2018 budget. Furthermore, continued advocacy efforts of the FPAWG secured government's approval for the release of NGN107 million ($350,820) to expand access to FP in the state.

Conclusions: Evidence based advocacy using multi-sectorial action, while utilizing strategic action planning is vital for improving government financing of priority programs. Health actors can utilize similar strategies in stimulating increased government funding for key health interventions.

FE8 Incentivizing Quality in LMIC Private Healthcare Provision

PRESENTER: **Dr. Lauren Suchman**, University of California San Francisco
AUTHOR: Dominic Montagu

Background

Private clinics and hospitals provide a high proportion of care in Low- and Middle-Income Countries (LMICs), representing up to 80% of inpatient care and facilities in some countries. However, the quality of these facilities is highly heterogenous and quality remains a well-documented challenge. New Institutional Economic theory suggests that private institutions will be more responsive to changing client and population needs, and also more efficient. While there is conflicting evidence to support this in OECD countries (e.g. Tiemann et al. 2011), the LMIC evidence is largely non-existent. How quality is potentially increased or decreased in the context of expanding National Health Insurance (NHI) purchasing from private healthcare providers is a matter of interest now and, as Universal Health Coverage efforts expand across the globe, will be increasingly important in the future. However, the results of new incentive systems for quality private care provision are not well documented.

This paper contributes to the evidence base around incentivizing quality through NHI funding among private providers in Kenya. It draws on semi-structured interviews with private providers and uses the concept of "street-level bureaucracy" (Lipsky 1980), the idea that low-level bureaucrats often shape and re-formulate policies as they are implemented on the ground, to examine the extent to which private providers are incentivized to provide quality services under NHI schemes.

Methods

This paper draws from a dataset of 173 interviews conducted with small private providers in Kenya, a country where NHI accreditation contracts have only recently expanded to include private primary care. Data were collected as part of the qualitative evaluation of the African Health Markets for Equity (AHME) program; an initiative that aims to increase access to quality private providers for low-income clients in Kenya and Ghana. Semi-structured interviews were conducted with providers, both NHI- and non-NHI accredited, in 2013, 2015, 2017, and 2018. Interview data was supplemented with informal conversations with implementing partners and document review throughout the course of the data collection period.

Results

While NHI accreditation is meant to incentivize quality among providers, we found that providers often lacked information on the accreditation process, which made it seem daunting and discouraged them from applying. Some providers received direct accreditation assistance from AHME and some participated in a quality improvement intervention through the AHME program (SafeCare). Providers felt these interventions helped them both prepare for and navigate the complex accreditation process. However, once accredited, some providers said they reduced services to NHI-covered clients for reasons attributable to misunderstanding the system; a notable decrease in quality service provision.

Conclusions

Our findings demonstrate the pitfalls of "street-level bureaucracy" insofar as local administrators can become a bottleneck to the private sector engagement they are meant to advance, inhibiting the impact of theoretical incentive structures. An external actor mediating between government and private sector can create more transparency. However, ensuring quality once providers are accredited requires additional human resources at the NHI offices to educate and monitor private sector providers, who have little interaction with government otherwise. Incentives require ongoing effort.

FE9 Inequalities in China's resident Basic Medical Insurance: Disparities in Insurance Benefits between the NCMS and URBMI

PRESENTER: **Dr. Sha Lai**, Xi'an Jiaotong University
AUTHORS: Dr. Xiaowei Yang, Chi Shen, Xiaolong Zhang

Background:In China, the New Cooperative Medical Scheme (NCMS) were established for rural residents in 2003, and the Urban Resident Basic Medical Insurance (URBMI) were established for non-employed urban residents in 2007. As voluntary and governmentally organized schemes, they are largely financed through government subsidization (about 60%-80%) and to a lesser extent through flat-rate household contributions.Under the urban-rural dualistic pattern of basic medical insurance, the NCMS enrollees (i.e., rural residents)and URBMI enrollees (i.e., urban residents) fail to enjoy the unified medical insurance, although the two schemesare of high similarity in financing and benefit package. This study, therefore,aimed to compare the insurance benefits of NCMS and URBMI, and analyze the reasons for such disparities.

Methods: The benefits from the medical insurance are measured in two ways: via the probability ofreceiving reimbursements and via the absolute amount of the obtained reimbursements.We exploitedlarge-scale cross-sectional householdhealth survey datasets conducted in Shaanxi Province in 2013 and observed a representative sample of 40,499NCMS and URBMI enrollees.In addition to crude estimates, two-part models were used to adjust insurance benefits forhealth care needs, demographic characteristics, treatment-seeking behavior and other potential confounding.

Results:Our results indicated thatthere were significantdisparities in the probability ofreceiving reimbursements and the absolute amount of the obtained reimbursementscomparing NCMS to URBMI after controllingpotential confounding. We also found thatthe disparities ininsurance benefits of NCMS and URBMI were related to the urban-rural dualistic pattern of medical insurance, the differences in treatment-seekingpreferences, and the inequalities in access to healthcare services amongurban and rural residents.The results of counterfactual analysissuggested that inequality mighthave been reducedif the NCMS and URBMIhad been integrated into a unified system.

Conclusions:The urban-rural dualistic pattern of medical insurance in China not onlyunderminedthe equality of opportunitybut also led to inequalitiesin benefits resultsamong rural and urban residents.The government shouldacceleratethe process on dualistic rural-urban integration ofChina'sresident basic medical insuranceto reduce inequalities.

FE10 Main Drivers of Catastrophic Health Expenditure: A Comparative Analysis of Three Provinces in China

PRESENTER: **Dr. Tiemin Zhai**, China National Health Development Research Centre
AUTHORS: Jim Butler, John Goss

Background

Although out-of-pocket payments as a share of total health expenditure in China decreased to less than 30% recently, significant disparity can be seen among different regions. The aim of this study is to illustrate the difference of financial protection of health system in different regions, and identify the drivers of incidence of catastrophic health expenditure (CHE) in health function and disease level. So as to provide evidence-based information to better develop health financing policies.

Methods

Baseline incidences of CHE by function and disease was calculated based on the WHO's approach, then "what if" scenarios were applied to calculate the incidence of CHE by health function and disease level. A "what if" scenario is to calculate the incidence of CHE if there is no a certain type of service used in a family or there is no family members suffer from a certain kind of disease. The difference of the results between the baseline and "what if" scenario can be seen as the incidence caused by a certain type of service or a certain kind of disease. Household non-food subsistence spending approach were used to calculate capacity to pay (CTP), a fixed 40% threshold (T1) and variable thresholds (Tn) were applied respectively. The fifth provincial Household Health Survey data conducted in 2013 for Tianjin, Jilin and Gansu province from eastern, central and western China respectively was used.

Results

23.4%, 16.4% and 11.1% of household in Tianjin, Jilin and Gansu province experienced CHE when T1 was used, while incidence of CHE was 27.1%, 22.0% and 15.0% in those three provinces respectively if the threshold for middle-income quintile was set at 40%. The incidences of CHE were narrowed if Tn were applied. Household outpatient and pharmaceutical OOP drove 19.4%, 14.1%, and 8.0% of households experienced CHE, and circulatory disease was the major driver of incidence of CHE, which caused 4.0%, 1.7% and 1.0% of household occurring CHE in Tianjin, Jilin and Gansu province respectively when T1 was used. Endocrine, neoplasms, respiratory and digestive disease were other significant diseases that cause CHE, but the contribution of each disease to the incidence of CHE vary from province to province.

Discussion

Results indicate that the incidence of CHE in the developed region was higher than that of the developing region. Compared with same thresholds for all income groups, results generated at variable thresholds show that the poorest quintile experienced CHE proportionately more than the richest households. Outpatient and pharmaceutical OOP was the major cause of incidence of CHE. Circulatory, endocrine, neoplasms, respiratory and digestive diseases were identified as major effecting factors of CHE. To reduce the incidence of CHE, health insurance schemes should develop an appropriate reimbursement policy for outpatient visits of non-communicable disease (NCD) patients and cover pharmacy pharmaceuticals, and effective interventions should be taken to curb risk factors of major NCDs.

FE11 Out-of-Pocket Payment Expenditure and Impoverishment Among Type 2 Diabetes Mellitus Patients in Shandong Province, China

PRESENTER: **Jingjing Yao**, School of Health Care Management, Shandong University
AUTHORS: Dr. Qiang Sun, Chaofan LI, Dr. Haipeng Wang

Objective Type 2 diabetes mellitus (T2DM) has become a growing global concern and poses significant economic burden to both households and society. The prevalence of diabetes is 9.4% in China, which is the highest number of population (aged 20–79 years) with diabetes in the world. The purpose of this article is to analyze out-of-pocket payment (OOP) for diabetes, its impoverishing effects and the influence factors among T2MD patients in Shandong province, China.

Method A multi-stratified sampling was used to select T2MD patients from both rural and urban areas in Shandong province and a face-to-face questionnaire survey was carried out on these patients. The response rate was 85.95% and 2166 respondents were included to analyze. Out-of-pocket medical expenditure was the sum of out-of-pocket payments for outpatient visits, inpatient visits and drug expenditure. Impoverishment happens when patients become poor after paying for diabetes medical expenditure, in which the poverty line is set as

USD333.33 by China's government in 2011. Impoverishing effects was measured by proportion of non-poor patients who occurs impoverishment. Independent variables include region of resident (urban/rural), gender, age, marital status, education level, presence of complication, types of treatment, duration of diabetes, health insurance schemes and per capita household income. Multivariate logistic regress was applied to analyze the factors that influences the impoverishment of T2MD diabetes.

Results The average out-of-pocket payment for medical expenditure of diabetes patient was USD344 per year. The incidence of impoverishment for T2MD was 30. 5%, and the mean poverty gap was USD728. Longer duration of disease (OR=2.38; CI: 1.57, 3.61), presence of complications (OR=1.93; CI: 1.40, 2.67) and using insulin for treatment (OR=4.50; CI: 2.47, 8.20) were significantly positively associated with impoverishment of diabetes, while the high income (OR=2.38; CI: 1.57, 3.61) and not using drugs for treatment (OR=0.36; CI: 0.22, 0.60) had significantly negative association with impoverishment of diabetes.

Conclusion The out-of-pocket payment for diabetes expenditure and incidence of impoverishment of diabetes in Shandong Province were considerably high. More attention should pay to the T2MD patients for affordability of treatment care and financial protection.

Key words Type 2 Diabetes Mellitus, Out-of-pocket Payment, Financial protection, Impoverishment

FE12 The Catastrophic Economic Burden of Visceral Leishmaniasis in Bangladesh, India, Ethiopia and Sudan: Financial Risk Protection Is Not Enough

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AUTHORS: Lydia Boudarene, Mark Pearson, Merce Herrero, Vikas Aggarwal, Tansy Edwards, Atia Abdalla Alatiaby, Dinesh Mondal, Kingsuk Misra, Cherinet Adera, M Prakash, Shewaye Belay, Toby Leslie, Jose Ruiz Postigo, Daniel Argaw Dagne, Margriet den Boer, Sakib Burza, Jayne Webster

Neglected tropical diseases (NTDs) impact the lives of over 1 billion people in low- and middle-income countries. These are often the poorest populations in countries with limited public health infrastructure and therefore at high risk of catastrophic health expenditure. Visceral leishmaniasis (VL) is one of the more neglected of the NTDs and its characteristics make VL patients and their households particularly vulnerable to catastrophic costs: VL is characterised by prolonged fever, substantial weight loss and anaemia disabling patients from continuing with usual activities and requiring substantial caring support; without treatment it has a fatality rate of up to 100% within two years. An estimated 50,000 to 90,000 new cases of VL occur worldwide each year. Financial protection strategies consisting of the provision of free VL diagnosis and treatment are policy in Bangladesh, India, Ethiopia and Sudan. In addition a social protection strategy of cash transfers for patients completing treatment has recently been rolled out for VL patients in India.

Cross sectional surveys with a total of 909 VL patients treated at 46 VL treatment facilities in endemic areas of Bangladesh, India, Ethiopia and Sudan were conducted between February and September 2016. These cross-sectional surveys were repeated in the same 29 VL treatment facilities in India, Ethiopia and Sudan between March and October 2018 (survey not repeated in Bangladesh due to very low patient numbers) with a total of 777 VL patients. A structured questionnaire was used to collect data on patient and household characteristics, the treatment pathway and the financial and economic cost to the household of the recent VL illness episode, including financial coping strategies. These surveys provide opportunity to evaluate the impact of financial protection strategies for VL patients.

For most VL patients, the pathway from onset of symptoms to VL diagnosis and treatment was long and involved multiple providers; this was particularly the case in South Asia. In all countries, once patients reached a provider with the capacity to manage their VL illness, diagnosis and treatment costs were minimal/zero supporting that VL-specific financial protection strategies were adhered to. However, diagnostic procedures and treatments received before a correct VL diagnosis incurred substantial financial loss for the patient's household. In addition, economic costs of illness, including reported loss of earnings for the patient and caretakers, were approximately double the financial costs. Full economic costs were catastrophic to around 40-50% of VL patients and their households (in relation to average annual household expenditure). The social protection strategy of a fixed-sum cash transfer payment of USD 100 for VL patients in India reduced the proportion of households facing catastrophic costs to approximately 20%.

In conclusion, VL illness resulted in substantial economic burden for patients and their households, largely due to medical and non-medical out-of-pocket costs incurred before receiving a VL diagnosis and loss of income to patients and/or their caretakers. VL-specific financial risk protection is insufficient to prevent catastrophic health costs for VL patients; broader comprehensive social protection strategies are needed.

FE13 The Challenges and Opportunities of Piloting Global Budget As Alternative Hospital Payment System in Indonesia's National Health Security Program

PRESENTER: **Mundiharno Sumarno Hizboel**

AUTHORS: Andi Afdal Abdullah, Citra Jaya, Mrs. Wan Aisyiah Baros, Welly Gadistina Anita, Dedy Revelino Siregar, Erzan Dhanalvin

Background: When it comes to provider payment system, no one shoe fits all. Every payment system has its specific pitfalls. Therefore, countries such as Thailand, Germany, Spain, France, Netherland, and Poland chose to combine two or more payment systems, perhaps to minimize each weakness. Indonesia is no different. Since the implementation of the National Health Security (JKN) program in 2014, the country has experienced the downside of INA-CBGs payment system (a form of Diagnosis Related Groups/DRG) such as increased readmissions, cream-skimming, and up-coding. Initiatives to modify INA-CBGs to improve its efficiency and effectiveness have been approved by the latest Presidential Regulation.

Methods: BPJS Kesehatan attempts to pilot the feasibility of combining INA-CBGs and global budget in two hospitals in West Sumatra. We aim to test the accuracy of the projected global budget which is calculated based on case-mix and hospital base rate derived from INA-CBGs data. We adjusted the projection with bed occupation rate, number of beds at each inpatient class, tariff regions, projected growth of JKN membership, and hospital setting (public/private). On a side note, the study was nearly canceled as both hospitals strongly rejected the budget projection. We decided to postpone the study for nearly a year as both parties agree to build capacity to bridge the gap of knowledge on global budget. This decision proves to be crucial for the continuation of the study as we suggest future studies to follow similar path.

Results: After a full year of constant communication and capacity building, the global budget calculation was finally accepted by both hospitals for pilot study purposes. The only condition is that the global budget can be reviewed every semester to check for substantial changes that may affect utilization and unit costs (e.g. change in policy or local health care structure). This is the first step towards gaining evidence on alternative hospital payment system under the JKN scheme. Hopefully this pilot study will serve as a basis to improve the efficiency and effectiveness of INA-CBGs in the future.

Conclusion: Implementing global budget as an alternative payment system to the current INA-CBGs system is both a challenge and an opportunity for BPJS Kesehatan and hospitals. BPJS Kesehatan is challenged to calculate the budget accurately and to ensure budget availability, a huge task amid the current financial deficit. However, there is an opportunity to control and plan the budget more effectively and to lower the administrative costs. On the other hand, hospitals are challenged to manage the budget without reducing quality of care. However, there is an opportunity for more certainty and flexibility.

Keywords: Global Budget, INA-CBGs, National Health Security, Indonesia

FE14 The Determinants of Public Health Expenditure at Decentralised Level in Kenya: A Panel Data Analysis

PRESENTER: **Kenneth Munge**, KEMRI Wellcome Trust Research Programme
AUTHORS: Edwine Barasa, Kara Hanson, Dr. Jane Chuma

Introduction

Sufficient public expenditure on health (PHE) is critical to the attainment of universal health coverage (UHC). Fiscal space for health is the capability of a government to assign more resources to health without affecting its financial and economic position. Decentralisation arrangements have implications for PHE. In this paper, we present the findings of an assessment of the determinants of PHE at decentralised level in Kenya.

Methods

A quantitative analysis of panel data of PHE from all 47 county governments in Kenya spanning three financial years was performed. Data were obtained from secondary sources. The dependant variable was per capita PHE. Independent variables were informed by literature and from data from a qualitative study and included financial (e.g. equitable share of national revenue, total conditional grants), supply (e.g. health facility density), demand (e.g. female education status) and political (e.g. political party congruence between county-level executive and legislature) variables. Data analysis was using two fixed effects models, applying a two-stage estimation procedure for the model with all classes of variables included.

Findings

The fixed effects regression models explain 80% of the variation in per capita PHE. The elasticities of per capita equitable share of national revenue (14.98, 95% CI 12.79-17.12) and per capita total conditional grant (-0.58, 95% CI -0.73—0.42) were statistically significant at the $p<0.001$ level. Coefficients for the other variables are not statistically significant.

Discussion

The findings suggest that the share of equitable revenue is a positive and major determinant of public health expenditure at county level. On the other hand, conditional grants are a negative and minor determinant of public health expenditure at county level. This emphasises the impact that the design of vertical transfers has had on the working of decentralisation in Kenya. Final results will be available by February 2019

FE15 The Effect of Off-Site Health Insurance on Actual Use of and Forgone Medical Care: Evidence from a National Survey in China

PRESENTER: **Dr. Zhiyuan Hou**, Fudan University
AUTHORS: Fei Yan, Hong Gao, Wei Wang, Donglan Zhang, Yuting Zhang

Background:

Although social health insurances cover almost all Chinese population, they are designed to target different populations according to the permanent residence registration system and/or employment status. They are also pooled and administrated at the county or prefecture level, and each county or prefecture designs its own benefit package and policy. These features result to non-portability across geographic areas,

and the location of health insurance where people set up their insurance account becomes an important factor influencing health care utilization. This paper aims to estimate the relationship between the location of social health insurance and health care utilization in China.

Methods:

We used the 2011 national baseline survey of the China Health and Retirement Longitudinal Study (CHARLS). This survey included 15,762 insurance enrollees aged 45 and over. Our primary predictor was the location of social health insurance which can be grouped as the currently living county (local insurance) and other counties where they do not live (off-site insurance). Both the actual health care utilization and the forgone health care that was reported as needed but not realized health care are used as the outcome variables. Actual health care utilization was measured by the probability and number of out/in-patient visits, and the forgone health care was defined as whether one skipped outpatient care when ill or forego inpatient care when recommended by a physician.

We conducted multivariate regressions to identify the association between location of insurance enrollment and health care utilization. Specifically, fixed effect logistic regressions were used for the probability of health care utilization as well as the probability of forgone health care, and zero-inflated negative binomial model is used for the number of health care visits.

Results:

Among 15,762 health insurance enrollees, 5.19% hold off-site insurance accounts. Compared to local insurance, the odds ratios of off-site insurance on the probability of outpatient and inpatient visits were 0.71 (95% CI: 0.59 - 0.86) and 0.74 (95% CI: 0.56 - 0.99) respectively. Among subjects who reported an illness during the previous month, subjects with off-site insurance were significantly more likely to forgo outpatient care than those with local insurance (OR = 1.64, 95% CI: 1.26 - 2.15). The association between the location of insurance and forgoing inpatient care was not statistically significant (OR =1.05, 95% CI: 0.55 - 2.01). Furthermore, the effects of off-site insurance on healthcare use and foregone care are mainly driven among those with rural insurance in steady of urban insurance.

Discussion:

Having off-site health insurance, relative to having a local health insurance, is associated with lower health care utilization, and more importantly, with a higher probability of forgone health care, especially for outpatient care among those with rural health insurance. The localized administration and non-portability of the health insurance system limited the access to health care in China. Thus people should be encouraged to enroll in health insurance at their living city, and the insurance portability across regions should be promoted.

FE16 Using Synthetic Panel Methods to Measure Households' Movement into and out of Catastrophic Health Expenditure between 2003 and 2010: Evidences from Nepal.

PRESENTER: **Mr. Vishnu prasad Sapkota**, Institute of Medicine, Tribhuvan University
AUTHOR: Shiva Raj Adhikari

Catastrophic Health Expenditure (CHE) ─ defined as household's out-of-pocket payments (OOP) on health as a share of total household consumption greater than some threshold ─ is used to monitor country's progress towards financial protection: a goal which countries are striving to achieve by introducing several policies. In this context, it is relevant to measure the prevalence of households moving into and out of CHE over a period of time: the proportion of the households that are always catastrophic, HHs that move into or out of CHE threshold, and HHs that are never catastrophic between two periods. Estimation of such a dynamic statistics ideally requires panel data which is unavailable or of poor quality in developing countries. Faced with the policy interest and data problems, '*synthetic panel'* methods have been developed. These methods have been applied successfully to measure movements into and out of poverty in developing countries using cross sectional surveys. This paper aims to estimate dynamics of CHE over two periods using Nepal Living Standard Survey (NLSS) of 2003 and 2010 that covers 3,912 and 5,988 households respectively. In these surveys, 1,000 households were covered for rotated panel. The two surveys covered health expenditure, demographic and morbidity characteristics required for the analysis.

This analysis applied The World Bank working paper (Dang and Lanjouw, 2013) methodology of synthetic panel. Firstly, age cohort of 0-5 years and 50-80+ years were used to prepare pseudo-panel data to estimate correlation coefficient (*roh*) between health expenditure of both survey rounds. The unbiased estimate of *roh* requires that age cohorts must satisfy the relevance and exclusion restriction assumptions required for pseudo panel data. Secondly, a model was estimated for health expenditure using household demographic and morbidity characteristics for each period using *two part model*. Given a consistent estimates in two stages, and assuming bivariate normality of health expenditure model residuals, statistics for CHE dynamics were estimated. The standard errors were calculated using bootstrapping technique. Data from rotated panel subset is used to validate the *roh* obtained from pseudo panel methodology.

The paper found that the *roh* estimated from age cohort based pseudo-panel (0.21) is very close to the one estimated from true panel data (0.18). Regarding CHE dynamics, 1.2 percent (CI: 0.75-1.77) households had been catastrophic in both periods, and 2.9 percent (CI: 2.3-3.5) escaped from the CHE in 2011. On the other hand, 10 percent (CI: 8.7-11.1) households moved into CHE that were not catastrophic in previous period, and 86 percent (CI: 84.5-87.2) households were never catastrophic.

The conclusion from this paper are twofold. Firstly, this analysis found encouraging results from application of synthetic panel method to estimate dynamics of CHE. However, more validation studies along with true panel data would provide robust results. Secondly, in Nepal over the seven year period, mobility from non-catastrophic to CHE is high which indicates that the CHE incidence is likely to increase in

future. It suggests that current policy measures may not have worked well and additional measures are recommended to meet financial protection goals.

3:00 PM –4:00 PM TUESDAY [Organization Of Health Care Markets]

Universität Basel | Kollegienhaus – Aula 033

Organization of Health Care Markets Posters

OM1 Collaboration and Competition Policy in a Market-Based Hospital System: A Case-Study from the Netherlands

PRESENTER: **Wouter van der Schors**, Erasmus University Rotterdam

AUTHORS: Ron Kemp, Marco Varkevisser

In order to improve the quality of complex surgical procedures, many countries use minimum volume standards for hospitals. These standards follow from the empirical observation that high-volume hospitals achieve better outcomes. As a result, there is an international and increasing trend towards centralization and collaboration for high-complex low-volume hospital care. From a competition policy perspective, however, little is still known about how these collaborations contribute to total patient welfare in market-based hospital systems. Our study provides a first exploratory investigation on three important patient welfare effects of hospital collaboration: quality of care, hospital-payer negotiated prices and differences in patient travel time. This paper examines an interesting case study from the Dutch health care system with managed competition in which hospitals are expected to compete. It involves the collaboration between three neighbouring hospitals on the surgical procedures for stomach, pancreas, esophageal and liver cancer. This collaboration may be deemed as an anticompetitive cartel agreement.

Our study is based on the argumentation of both the three involved hospitals and the Dutch competition authority, and is complemented with own empirical research. The (potential) post-collaboration price and travel time effects are calculated based on the pre-collaboration case- and treatment mix for the procedures. Furthermore, the pre- and post-collaboration hospital-insurer negotiated prices are used. We also obtained information about each patient's place of residence. We found no clear evidence for an ex-post price increase through exhibition of anti-competitive behaviour by the combination of demanding higher prices from the health insurer (concentration effect) and the centralization of procedures on the location with the highest ex-ante prices (allocation effect). However, both effects were separately observed for some procedures. Additionally, in this highly particular case, the increase in patients' travel times was found to be very modest. Unfortunately, given the short time span after implementation, the ex-post quality effects could not yet be studied. As a proxy for potential quality effects, we assessed whether quality improvements are likely to occur in this particular case, based on the current state of volume-outcome literature. Although the volume-outcome relationship for the procedures are repeatedly confirmed in literature, potential quality gains associated with increased volume were complicated to assess through the complexity of contextual factors in the particular case.

Our findings, while preliminary, highlight two important challenges that competition authorities should consider when further developing competition policy aimed at hospital collaboration. First, the current lack of pragmatic methods to balance and measure the efficiencies and inefficiencies makes any collaboration assessment particularly challenging for antitrust bodies. Second, when hospitals would request an exemption from the cartel prohibition, it is important that the competition authority is provided with correct information. Especially when, as under the current Dutch legislation, the burden of proof lies with the hospitals themselves. We therefore recommend further research to focus on ex-post evaluation on the total patient welfare implications of collaboration, in order to support health care providers as well as antitrust authorities when deciding what types of collaboration should (not) be allowed in market-based hospital systems.

OM2 Factors Determining a Care Worker's Intention to Continue Working

PRESENTER: **Kensaku Kishida**

[Introduction] Japan is becoming the most aged country in the world. With the rapid increase in impaired elderly, the shortage of care workers has further intensified. To ensure that supply meets demand, the working conditions of care workers need to be improved. This paper aims to identify the factors that positively contribute to care workers' intention to continue working. Most previous studies that evaluate care workers' intention to cease working cannot discern their intentions to move to other care facilities or their intentions to cease working as a care worker altogether. However, even if care workers quit their jobs, it does not negatively impact the care of the aging population if they continue to work as care workers in other care facilities or environments. [Data and method]We used the Survey of Long-term Care Workers by the Care Work Foundation. This survey is the largest and most informative survey of care workers in Japan. The 2015 survey includes an item about the respondent's intention of quitting their job that can discern the intention of moving to other care facilities and the intention of ceasing to work as a care worker altogether. The number of observation is 2,160. We regressed intention to quit on the basis of individual attributes and job conditions. The breakdown of quitting intention is as follows: "I want to continue to work for as long as I can (62.5%)"; "I want to move to another care workplace (19.6%)"; and "I want to stop to working as a care worker (17.8%)." Like Shumacher (1997), we adopted internal and external relative wages as independent variables. Internal relative wage is the difference between the wage of a care worker and the average wage of other care workers who have attributes similar to those of the care worker, such as sex and education. External relative wage is the difference between the wage of a care worker and the average wage of non-care workers who have attributes similar to those of the care worker. [Result and Discussion]We found that high internal relative wages decrease the probability that care workers will want to move to other workplaces as care workers, whereas high external wages do not affect the probability that care workers will want to leave this line of work altogether. Our results demonstrate that, since the skills of care workers are not useful in other fields, they cannot easily move to other jobs. Further, we found that the presence of a counselor decreases the intention of quitting and that the inclusion

of care skill training in care service establishments decreases the intention to move to other care workplaces only. Our results indicate that including counselors in care workplaces is more effective for preventing care workers from quitting than increasing wages.

OM3 Paying for Patients – the Role and Implications of Kickbacks Among Private Facilities in Uttar Pradesh, India

PRESENTER: **Catherine Goodman**, LSHTM (London School of Hygiene and Tropical Medicine)
AUTHORS: Meenakshi Gautham, Katia Bruxvoort, Manish Subharwal, Sanjay Gupta

Private sector facility provision is expanding rapidly in low and middle income countries (LMICs), in most settings based primarily on out-of-pocket payments. Private healthcare is particularly dominant in India, accounting for over 70% of curative care and over 25% of deliveries. There is widespread concern about the performance of these providers in terms of quality, accessibility and also ethics. A key feature of the Indian market is payment of kickbacks, known locally as “cuts” or “commission”. Such payments are outlawed by the Indian Medical Council, and viewed by many as an important type of corruption within the health system.

In the medical and public health literature, kickbacks are almost universally seen as a negative, unethical phenomenon, encouraging providers to act as imperfect agents, distorting clinical judgement, driving up costs, and causing inefficiencies. By contrast, in the economics literature it has been argued that kickbacks or referral payments may increase efficiency under some conditions, for example where it is more efficient for a specialist than a generalist to treat certain conditions. It has also been argued that the task of organising referrals uses resources and so should be remunerated. To date, there is very little rigorous empirical research on the payments of such kickbacks in LMICs, in terms of the nature of payments made, and the consequences within the health system.

We explored the use of kickbacks by and to private facilities providing delivery care, in the context of a larger study on the nature of competition private facilities in Uttar Pradesh. This state has some of the poorest maternal health indicators in India. Data were collected in 5 contrasting districts in 2016, using both quantitative and qualitative methods in order to provide a rich understanding of the business practices and incentives faced by delivery providers. As no accurate sampling frame of delivery facilities existed, we first conducted a census of healthcare providers, followed by a quantitative survey of 265 private delivery facilities, and 90 in-depth interviews with delivery providers, allied service providers (e.g. diagnostic labs, ambulance providers), and key government and NGO stakeholders.

There was quite limited reporting of referrals and commission payments during the quantitative survey, but during the more relaxed in-depth interviews it became clear that these practices were extremely common. This included some referrals between facilities, and to and from facilities and diagnostic or imaging centres. However, the most common kickbacks were to brokers who brought new patients to facilities – particularly private ambulance drivers, ASHAs (community health workers), informal providers and Dai (traditional birth attendants). Kickbacks were often as high as 30% of the full patient fee (ranging from 10% to 50%). Many larger facilities employed marketing agents, termed “PROs”, whose main role was to encourage patient “referral” from these brokers.

We explore the potential positive and negative consequences of such widespread kickbacks from the perspectives of efficiency, costs to users, medical ethics and quality of maternal healthcare, and consider the implications for the design of private sector policies and interventions.

OM4 Private and Public Health Care Facilities in China: Complementary or Competitive Relationship?

PRESENTER: **Dr. Zhiyuan Hou**, Fudan University
AUTHORS: Qing Wang, Donglan Zhang, Fei Yan, Hong Gao, Wei Wang

Objective To examine the role of private sector through the associations between provider ownership and outpatient treatments and expenditures in China

Methods We used data from the 2013 China Health and Retirement Longitudinal Survey. Multivariate logistic regressions were conducted to estimate the associations between ownership and certain types of services (prescribed medications, intravenous infusion, injection, laboratory test, X-ray and other tests, outpatient procedure, and traditional Chinese treatment) in outpatient settings. Generalized linear regressions were performed to evaluate the associations between ownership and expenditures per visit. Province indicators, patient- and provider-level characteristics were adjusted.

Findings Among 3,532 outpatient observations, 31% were visits to private health care providers. Private providers were clustered at the primary-level and treat patients with less severe diseases than public providers. After adjusting for covariates, private providers were more likely to provide intravenous infusion (OR: 1.32, 95% CI: 1.06-1.65) but less likely to provide laboratory test (OR: 0.58, 95% CI: 0.39-0.88) than public providers. No significant relationship was observed between provider ownership and other types of services and total number of services. The total and out-of-pocket expenditures per visit in private facilities were 145.70 and 127.78 RMB higher than in public facilities respectively, whereas the coinsurance rates were not significantly different.

Conclusion Compared to public health care providers, private providers were more likely to use intravenous infusion but less likely to use medical test in outpatient services, but charged more per visit within the same level of facilities. Private providers played a complementary rather than competitive role to public providers in China.

OM5 The Impact of Reform of Drug Price Regulation on Drug Price Fluctuation– Evidence from Chinese Pharmaceutical Market

PRESENTER: **Jing Chen**, Peking University Health Science Center, Beijing

AUTHORS: Xiaoyan Nie, Dr. Xin Li, Chenchen Zhai, Luwen Shi

Background： Reform of drug price regulation is an important part of health system reform. Since June 1, 2015, the government has abolished setting maximum retail prices, permitting those prices to be set by the market. The shift from government-set drug prices to a market-driven system together with the proposed reforms in the procurement and reimbursement systems will have a significant impact on pharmaceutical market in China. Therefore, government should closely monitor how these changes will affect price fluctuation.

Objective:To analyze the characteristics and trends of drug price fluctuation and to investigate whether abolition of price control will result in price fluctuation.

Methods: We compared the change of price for 1675 different drugs from 3939 pharmaceutical manufacturers before and after the reform. Bimonthly drug price data from February 2014 to June 2017 were derived from Price Monitoring Center of the National Development and Reform Commission, a large database of drug price monitoring records covering 293 hospitals and retail pharmacies cross 26 provinces in mainland China.

Results: During the monitoring period, the price of 69% drugs did not fluctuate. Of the drugs with price fluctuation, the price of 66% drugs showed a continuous declination, 16% drugs showed a continuous increase in price. Prices have fallen by 9.05% on average since the beginning of the monitoring period. The fall of price for a few anticancer drugs such as Paclitaxel, Docetaxel, Oxaliplatin, Capecitabine was relatively larger. Price of 57% drugs increased by less than 30%, and 17% drug increased by more than 100%.The price of a few emergency drugs and low-price drugs fluctuate a great deal. Between 2014 and 2017, the price of Digoxin rose by 1418%. We also found that drug prices reported by hospitals mainly fell down while drug prices in retail pharmacies fluctuate up and down at the same time.

Conclusion: The results show the fluctuation of drug price is relatively stable after its reform in 2015. Of the drugs with price fluctuation, majority shows a downward trend. This result shows that the drug tendering procurement policy and zero mark-up policy taken by Chinese government still have some impact on the price of hospital medicine. We also found that drug companies take advantage of a shortage of medicines to boost their price. It is suggested that the government should bring their role in improving drug price mechanism, regulating drug marketing, monitoring drug price and maintaining the fluctuation of price in a reasonable range.

3:00 PM –4:00 PM TUESDAY [Production Of Health, Health Behaviors & Policy Interventions]

Universität Basel | Kollegienhaus – Aula 033

Production of Health, Health Behaviors & Policy Interventions Posters

P1 Air Pollution and Respiratory Health: Evidence from Health Administrative Data in China

PRESENTER: **Feng Huang**, Shanghai University of Finance and Economics

AUTHORS: Jin Feng, Hong Song

Air pollution imposes significant health risks in China where the levels of pollution are often relatively higher. However, most of the previous studies are derived from developed countries, rather than developing countries. Evidence from epidemiological journals establishes statistical associations between air pollution and morbidity and mortality. We try to provide a more precise estimate of the causal effect of pollution using rich administrative data on over 12 million medical records in Shanghai during the years 2013-2015. In the empirical analysis, we first employ a fixed-effect technique, controlling for a series of fixed effects. Second, we adopt an instrumental variable approach, where we use wind direction as an exogenous shock to local air pollution concentrations. Finally, we perform a range of robustness and placebo tests to further support our main analysis.

We use three years of patient-level data in Shanghai from the Annual Basic Medical Insurance Enrollees' Health Services Utilization Survey. For each year, the Ministry of Human Resource and Social Security extract 2% patients' medical records according to stratified random sampling by age for capital cities or Municipalities, 5% for prefecture-level cities and 10% for counties. Our data contain more than 12 million records from 803 hospitals and health care facilities across Shanghai. The records include detailed medical services utilization and expenses for both outpatient visits and hospitalization, such as uses and expenses of drugs, medical services and diagnostic tests/medical consumables.

Following the pollution-health literature, we treat respiratory diseases as the most potential outcome affected by air pollution. We define a respiratory disease if the patient: (1) was treated by respiratory department in the hospital; (2) took at least one respiratory prescription drug from pediatric department or internal medicine department. We also identify visits in the digestive department and orthopedics department, which are unlikely to be influenced by air pollution, to run the placebo tests. We aggregate the data into the hospital-department-date level in the analysis.

We measure air pollution as the levels of Air Quality Index, a composite measure of the overall quality of the air on a scale of 0 to 500, reported by the Chinese Ministry of Environmental Protection. The hourly readings for AQI and the six air pollutants ($PM_{2.5}$, PM_{10}, SO_2, NO_2, CO and ozone) are recoded at 10 outdoor monitoring sites in Shanghai. We control for the weather and climate data from the National Oceanic and Atmospheric Administration (NOAA).

We find that air pollution statistically significant increase respiratory diseases out-patient visits. The coefficients for mean AQIs over a longer period (last two weeks and last month) are positive and statistically significant, implying the impact of air pollution to be cumulative.

P2 Before the Lunch Line: Behavioral Economic Interventions for Pre-Commitment

PRESENTER: **Dr. Orgul Ozturk**, University of South Carolina

In this study, we intervened in elementary schools on lunch entrée selection using some of the behavioral economic methods shown to be effective in earlier food choice studies (Hanks, Just and Wansink 2013). By increasing salience and prominence of the healthy entrée of the day through visual and verbal tools, we nudged students in treatment schools. Using a difference-in-differences setup, comparing changes in consumption of nudged entrées during the treatment period relative to their consumption before the treatment period in treatment and comparison schools, we estimated the treatment effects. Unlike many earlier studies, which were mostly conducted in controlled laboratory environments studies, we conducted our interventions in an uncontrolled environment in multiple elementary schools in one mostly urban and suburban school district in South Carolina. Behavioral interventions, if effective, can be an important policy tool in the quest to change nutritional choices made and habits formed, as they are easy and, in most cases, inexpensive to implement (Kessler, 2016). Taking laboratory findings to uncontrolled environments is crucial for the policy relevance for this type of work and establishing effectiveness. We showed that nudges are only effective when present. They increase consumption of the healthy option by 10 to 20 percent on the day the entrée is treated. However, there is no evidence of spillover effects or habit formation.

P3 Contemporaneous Health Effects of Physical Activity – the Role of Education

PRESENTER: **Simon Spika**

AUTHOR: Dr. Friedrich Breyer

Background: Physical activity has proven to be an important determinant for the prevention of numerous diseases, owing to a long-term effect of past behavior. But physical activity may also have an immediate impact on health, reflected in a temporary deviation from a given health state. And as for the long-term effect, education could be considered as a crucial factor in the short-term association between physical activity and health, for example because educated individuals may be better informed about adverse effects of physical activity and thus are more likely to take appropriate countermeasures. This study aims at analyzing the impact of physical activity on contemporaneous number of physician visits and how this impact varies with education.

Methods: Data were retrieved from waves 2016 and 2017 of the Konstanz Life-Study, a longitudinal cohort study conducted in Southern Germany. Individuals (n=2077) were grouped according to self-assessed physical activity into one of the three categories “high”, “moderate” and “low”. Education is measured by the binary variable with/without high school degree. The number of physician visits in the previous three months was regressed on physical activity, education and the corresponding interaction variables in negative binomial and hurdle models. Further covariates like self-assessed health, age, gender, smoking, drinking or current occupation were included in the models.

Results: Estimates of the negative binomial models indicated a significantly higher number of physician visits for physical active individuals compared with low active/inactive individuals among those without high school degree („moderate“ +29%, $p<0.1$), („high“ +47%, $p<0.01$). Among individuals with high school degree in contrast, the number of visits was not different between the three activity categories. Low active / inactive individuals with high school degree however had a higher number of visits compared with low active individuals in this educational group (+32%, $p<0.1$). The estimation of the hurdle models suggested that the positive association between physical activity and the number of physician visits among individuals without degree was due to an increased probability of a first visit as well as an increased number of following visits. Estimations on data stratified by gender yielded similar results for both genders, albeit less pronounced in magnitude and significance for women.

Conclusion: Among the participants of the Konstanz Life-Study, physical activity did not reduce the number of physician visits. Moreover, for individuals without high school degree, physical activity even increased the number of visits. The findings provide support for the hypothesis that more educated individuals are more likely to consider the immediate effects of physical activity on health. A limitation of the study is the fact that participation was not completely random.

P4 Decision-Making Model of Medical Institution Selection for Rural Residents in China: A Behavioral Experimental Study

PRESENTER: **Ms. Xueyan Cheng**, Huazhong University Of Science & Technology

AUTHORS: Dr. Zhang Yan, Liang Zhang

Background: Patients in China could select healthcare institutions freely, and they prefer to visit higher-level healthcare institutions than necessary when they seek medical help. This phenomenon has caused crowdedness in higher level healthcare institutions and weakness or bankruptcy among lower level healthcare institutions and consequently has led to the rapid increase of medical expenditures because of the unique three-tier (village-township-county) health service delivery system in China. So it is urgent for us to find out a universal rule for residents in rural China while selecting healthcare institutions.

Objective: To explore rural residents' preference on selecting healthcare institutions, and to formulate a decision-making model of medical institution selection for rural residents in China and verify the accuracy of the model.

Data and Methods: Multistage sampling was used to select samples. Convenient sampling was used to select three provinces (Hubei Province, Anhui Province and Henan Province) in central China. Three counties were selected from the first 1/3-economic-level counties of each provinces. Five villages were selected from each county, and 20 families in each village were investigated face-to-face. Brunswikian lens model was used as a basis to determine the specific process of the decision-making model. The accuracy of the model was verified by comparing the consistency between model results and the genuine willingness of residents to consult certain levels of healthcare institutions using discriminant analysis. Model results were obtained by weighing the residents' preference and evaluating the common factors that affect their decision using a 10-point questionnaire. The genuine willingness was acquired by asking about the level of the healthcare institution residents would select when faced with five symptoms and seven diseases.

Results: A total of 784 residents were investigated in the study. According to the Brunswikian lens model, the decision-making model determined the residents' decision-making process on the basis of ecological and functional validities. Discriminant analysis showed that the model can explain 64.7% of the rule when residents select healthcare institutions in rural China. According to the model, 26.0%, 30.7% and 43.2% of the residents prefer village clinics, township hospitals and county hospitals, and the empirical research showed the rates were 17.4%, 35.5%, and 47.1%.

Conclusions: The credibility of the established decision-making model was favourable, and we could make a prediction on the flow of residents when selecting healthcare institutions according to the model. Residents in rural China prefer county hospitals the most, and village clinics could not play a good role of health gatekeeper, it was contrary to the original intention of designing the three-tier healthcare institutions, health service delivery system have to be taken some new changes in China.

Keywords: health behaviours; model construction; healthcare institution; experimental study; rural China

P5 Depression, Risk Preferences and Risk-Taking Behavior

PRESENTER: **Dr. Sarah C. Dahmann**, The University of Sydney, School of Economics
AUTHORS: Deborah A. Cobb-Clark, Nathan Kettlewell

Depression affects the way that people process information and make decisions. Many decisions involve risk and uncertainty; however, little is known about whether the depressed are more (less) risk averse, or the circumstances under which they are more (less) likely to engage in risk-taking behavior. In this paper, we study the way that risk attitudes and behaviors are shaped by depressive episodes. The psychological evidence that people experiencing depression employ different decision-making strategies raises fundamental questions about whether this is the result of their risk attitudes. Specifically, do risk attitudes differ by people's mental wellbeing? Are any mental health related disparities in risk preferences domain-specific or more pervasive? What mechanisms drive the divergence in the risk-related behavior of those who do and do not experience depression? We investigate these questions theoretically and empirically, using large household panel data that includes a measure of depression-risk, behavioral and stated risk preference measures, extensive demographic and human capital information, measures of economic preferences and personality, and information on risk taking behavior across multiple domains. We find no differences in risk preferences between those at-risk of depression and not at-risk using a behavioral risk preference task. However, there are differences in stated risk preferences and risk-taking behaviors that vary across domains. For example, while the depressed report lower willingness to take risk in general, they are more willing for health decisions: they more likely smoke and less likely follow a healthy diet and exercise regularly. We explore these patterns within an intertemporal decision framework in which expectations are influenced by facets of personality and circumstances likely to be affected by depressive state. This motivates a mediation analysis in which we show that gaps in risk taking behavior are largely explained by discrepancies in behavioral traits like locus of control, optimism, and trust. The relative importance of these varies across behaviors. There is no common tendency towards more (less) risk-taking; gaps depend on covariances between behavioral traits, depression, and behavior, rather than differences in risk preferences per se.

P6 Disparities in Access to Medical Imaging in Rural and Critical Access Hospitals in the United States

PRESENTER: **Danny Hughes**, Georgia Institute of Technology
AUTHORS: Laura Chaves, Tarek Hanna

Emergency department imaging has grown dramatically over the past decade – particularly for advanced imaging procedures such as computed tomography and magnetic resonance imaging. Despite this rapid growth, there are concerns over access to these procedures in rural and critical access hospitals. Employing patient level data from a 5% national sample of U.S. Medicare beneficiaries in 2016, we identify a cohort of emergency department patients with no medical claims 30 days prior to the emergency department visit in rural hospitals, critical access hospitals, and urban hospitals. We then use multivariate logistic regression with propensity score matching to examine the likelihood of an emergency department patient receiving an advanced imaging procedure in rural and critical access hospitals that offer these services relative to urban hospitals, controlling for patient demographics, patients' prospective risk, and hospital characteristics. We find that patients visiting emergency departments in rural hospitals are 6.1% ($p<0.01$) less likely to receive an advanced imaging procedure relative to urban hospitals and patients in critical access hospitals were 13.3% ($p<0.01$) less likely to receive these procedures. We also find black emergency department patients are 31.4% ($p<0.001$) less likely to receive advanced imaging procedures than white emergency department patients raising broader concerns of health equity.

P7 Does Health Insurance Literacy Affect Health Plan Choice and Health Care Utilization? - Analysis of Swiss Data

PRESENTER: **Ms. Yanmei Liu**, University of Lucerne

Background: Numerous studies have applied utility maximization models to address the demand for health care and health insurance. However, none of them explicitly consider health insurance literacy (HIL). Health insurance literacy is defined as the extent to which individuals can find and process information, make wise insurance choices and use the plans. It plays a critical role in insurance decision making. Evidence suggests that individuals generally prefer low-deductible insurance policies over high-deductible plans. This phenomenon is mainly attribute to risk aversion. However, there is no evidence that whether HIL is associated with this phenomenon.

Objectives: Our study aims to examine the impact of HIL by incorporating it into the two-period utility model from Cameron et al. (1988), which involves utility maximization at the initial and future health status. Our main hypothesis is that a lower degree of HIL is associated with lower deductible levels and hence higher premiums. In other words, if subjects are less familiar with health insurance coverage, they tend to over insure under risk and uncertainty. Our second objective is thus to test this hypothesis with empirical evidence.

Methods: Data of the 2016-2017 Swiss Health Behaviour Survey were analysed, to test, whether deductibles were lower in subjects with lower HIL. HIL here was approximated by the respondents' awareness that all health insurers in Switzerland are obliged to offer the same health insurance package for every applicant.

Ordered probit models were applied, with deductible levels as the response variable, and HIL as the key explanatory variable. For adjustment, in the first step, age, gender and the canton were included. Subsequently, education, income and the presence of a chronical illness were added. For further sensitivity analysis, the deductible level was dichotomized (i.e. "low deductible").

Based on these empirical results we decided how to integrate HIL into the baseline model of Cameron et al.

Results: Without adjustment, the deductible was positively associated with a gap of HIL (beta=0.167; p=0.020). By adjusting for age, gender and canton, this association even increased (beta=0.348; p=0.002). By additionally adjusting for education, income and chronical illness, the effect of HIL remained significant (beta=0.178; p=0.023).

Also, when the binary response variable "low deductible" was used, similar results were achieved: no adjustment: beta=-0.167, p=0.001; adjustment for age, gender and canton: beta=-0.144, p<0.001; additional adjustment for education, income and chronical illness: beta=-0.117; p=0.001.

In terms of the utility model, HIL affects the choice of health insurance, and implicitly also the consumption of health services (moral hazards). In this context, HIL was included as a covariate in the demand function for health care services.

Conclusions: Based on the above results, the hypothesis that subjects with a gap of HIL have the tendency to choose lower deductibles could be confirmed. By assuming that risk aversion affects the utility function of individuals, it was therefore possible to integrate HIL into a utility maximization model. Future research including the standardized measurement of HIL is recommended.

P8 Food Expenditure Poverty of SNAP Participant: Total Cost (Money and Time) Perspective

PRESENTER: **Dr. Wen You**, Virginia Polytechnic Institute and State University
AUTHORS: George Davis, Ruoding Shi, Young Jo

It is well-known that food and nutrition production requires both money and time (labor), but most analyses of diet quality and Supplemental Nutrition Assistance Program (SNAP) benefit adequacy ignored time costs [1]. The main problem is that we know very little about how much time it actually takes to reach a healthy diet, since there is no single data set that has food expenditures, time expenditures, and nutrient information. As a consequence, SNAP benefit adequacy is overestimated due to underestimation of the "full cost" of food production [2, 3]. To better assess SNAP adequacy, this study merges different datasets that contain information on money and time expenditures and some diet-related measures. This enables us to provide a more comprehensive picture of the food expenditure, time expenditure, and nutrient profile of households by socioeconomic and demographic characteristics and a systematic assessment (i.e., prevalence, depth, and severity) of SNAP participants' food poverty situation will be assessed.

Three nationally representative datasets are used: The Food Acquisition and Purchase Survey (FoodAPS), the American Time Use Survey/Eating and Health Module (ATUS/EHM), and the National Health and Nutrition Examination Survey (NHANES). The FoodAPS contains expenditures on food-at-home (FAH) and food away from home (FAFH), macro and micro nutrient information from purchases to impute a Healthy Eating Index and other individual and household characteristics. The ATUS/EHM is used to predict the time spent on FAH and FAFH for individuals in FoodAPS, who share the same characteristics as the ATUS/EHM population. The 24-hour dietary recall in NHANES collects food and nutrient consumptions of households by different characteristics. After merging these data sets via the two-sample instrumental variables modeling, we assess data patterns and empirical regularities and then proceed to construct a "food poverty index" to assess the adequacy of SNAP benefits.

The depth, prevalence and severity of food expenditure poverty will be assessed that accounts the money and time costs of food production. As the SNAP policy is facing more budget uncertainty, it is vital to access SNAP benefit adequacy more accurately. Our study highlights the

important role of time costs in reaching a healthy diet. While it is difficult to affect time decisions directly through policy, numerous economic policies operate indirectly through monetary incentives that are ultimately designed to affect individual's allocation of time.

P9 Out-of-Pocket Health Spending and Trust of Physicians: The Role of Agency Problem

PRESENTER: **Young Kyung Do**, Seoul National University College of Medicine

Previous studies on out-of-pocket (OOP) health spending have largely focused on the household financial consequences and their implications for poverty and potential inequalities in access to and utilization of health care. Few studies have examined the implication of OOP health spending for doctor-patient relationship, particularly from the patient's perspective. This study investigated whether country-level OOP share in total health expenditure is associated with individuals' trust of doctors and the role of the agency problem perceived by individuals. Data came from the International Social Survey Programme (ISSP) Health and Health Care module (2011) and World Health Organization's Global Health Expenditure Database. Our final regression models included 44,989 observations in 30 countries. An operational definition of the agency problem was derived from the ISSP survey statement "Doctors care more about their earnings than about their patients." Results from random-effects regression models indicated that a higher share of country-level OOP in total health expenditure is associated with a lower level of overall trust of doctors, largely through the agency problem perceived by individuals. These results suggest that OOP health spending has important implications for the relational aspect of health care as a social institution.

P10 Prevalence and Income-Related Equity in Hypertension in Rural China from 1991 to 2011: Differences between Self-Reported and Tested Measures

PRESENTER: **Ms. Dan Cao**, Xi'an Jiaotong University
AUTHORS: Zhongliang Zhou, Ms. Yangling Ren

Background

Along with economic growth and living standard improvement, hypertension has become the most prevalent chronic disease in China. Access to some services such as chronic diseases screening is still far away from being equalized; regardless of significant improvement in coverage of basic public health services, more equalization needs to be improved. Self-reported measures and tested measures of hypertension may differ significantly due to the low awareness of prevalence, especially among the poor. The objective of this study is to figure out whether and how self-reported measures differ from tested measures in terms of prevalence and equity.

Method

We used data from the China Health and Nutrition Survey database from 1991 to 2011 and extracted the data of rural areas using *hukou* system. Hypertensions were categorized into two groups: self-reported hypertension and tested hypertension. We established the database of tested hypertensives whose SBP (systolic blood pressure) were higher than 140mmHg and/or their DBP (diastolic blood pressure) were higher than 90mmHg, and self-reported hypertensives was classified who knew they were suffering from high blood pressure or taking any anti-hypertension drug by answering the questions: "Have you ever been diagnosed with hypertension by a doctor?" or "Are you currently taking any anti-hypertensive medication?". To evaluate the equity of self-reported hypertension and tested hypertension, we calculated their Concentration Index (C) and decomposed C, based on which we obtained the horizontal-inequity index (HI) of each year. Probit Model was deployed to analyze the key determinants of hypertension prevalence.

Results

We find that the prevalence of both self-reported hypertension and tested hypertension have sharply increased from 1991 to 2011 in rural China and the population of tested hypertension was significantly larger than that of self-reported hypertension. For self-reported hypertension, prevalence rate increased from 2.72% to 13.2%, and for tested hypertension, it increased from 11.01% to 25.05%. Both of the concentration index (C) and horizontal-inequity index (HI) of self-reported hypertension and tested hypertension appeared to be contradictory. The C and HI of self-reported hypertension in 2011 were 0.032 and 0.060, respectively, while the C and HI of tested hypertension were -0.024 and -0.015, respectively. Moreover, our study indicates that age, BMI, region and marital status are all risk factors for hypertension, while a conflicting result is that education level can strikingly affect tested hypertension prevalence, but not self-reported hypertension.

Conclusion

Our study indicates that there are deviating results between self-reported hypertension and tested hypertension both in prevalence and equity. More efforts should be put into improving the poor's health, especially in equal access to health services. The government can combine education policy with health policy to improve health level of the rural residents. Symptom-based measures such as tested hypertension should be adopted more widely in empirical studies.

P11 Robustly Evaluating Meeting Integrated Movement Guidelines in Practice: Odds Solution for Population Level Efficiency Measures with Binary Effects

PRESENTER: **Simon Eckermann**, University of Wollongong
AUTHORS: Andrew Willan, Tony Okely, Mark Tremblay, Tim Coelli

International comparisons of population health measures relative to observed best practice are increasingly important for evaluating the relative efficiency of health systems in practice. Relative efficiency measures can be used to highlight best practice, identify the policies and practices associated with best practice, and determine the potential for, and factors associated with, improving performance across suboptimal jurisdictions. Such top-down population-level relative comparisons in practice are particularly important for evaluation in community public health settings given the inability of current conventional bottom-up evaluation methods to capture network multiplier effects of community level strategies.

A current example in public health settings is evaluation of integrated movement guidelines (IMGs), which combine previously separate physical activity, sleep and sedentary behaviour guidelines, to enable their more appropriate joint consideration. While bottom-up methods to enable consideration of multiple alternative public health promotion strategies allowing for their community-level impacts across multiple joint effects has yet to be developed, the International Study of Childhood Obesity, Lifestyle and the Environment (ISCOLE) enables comparing the proportion of school age children (9-11 years) meeting IMGs across 12 socio-economically and culturally diverse countries. These children met IMGs where over 24 hours they had ≥1 hour of moderate to vigorous physical activity, ≤2 hours of sedentary screen-time and 9 to 11 hours of sleep at night. The extent to which children meet or do not meet IMGs has been shown to be an important population and public health issue given these joint behaviours largely influence long-term habits, lifestyle and health. Indeed, alongside ISCOLE analyses, international evidence syntheses have shown child populations meeting IMGs have better body composition, cardiorespiratory and musculoskeletal fitness, cardiovascular and metabolic health – indicators that are key predictors of healthy growth and development more generally.

Nevertheless, top-down efficiency comparisons relative to best practice based on common binary effects population data in healthcare such as meeting or not meeting guidelines face problems if based on directly comparing population proportions. For robust comparison of binary effects, such as meeting or not meeting IMGs, efficiency measures need to be consistent with alternate framing of that binary effect. In other words, efficiency measures relative to best practice analysed with the same binary data framed as meeting a guideline or not meeting a guideline should be the same.

In this paper we identify and illustrate the distinct lack of consistency or failure to provide the desired property of invariance for relative risk efficiency measures with alternate conventional presentation of binary data such as the population proportion or probability of meeting, or not meeting, IMGs. More importantly we provide an odds solution that (i) consistently estimates efficiency scores relative to best practice with alternate framing of a binary effect, (ii) provides an intuitive interpretation of relative scores as odds ratios, and (iii) extends to consistent indirect comparison and evidence translation. Finally, we draw conclusions about robust top-down methods for efficiency measures relative to best practice and discuss multiplier, multiple domain of effects and multiple strategy evaluation methods required for robust bottom-up evaluation of strategies supporting IMGs.

P12 System Dynamics Modeling of the Effect of Raising the Minimum Age of Legal Access to Tobacco Products on Electronic Cigarette Use Among Youth in Virginia

PRESENTER: **Hong Xue**, Virginia Commonwealth University

AUTHORS: Andrew Barnes, Xiaoliu Cheng, Shuo-Yu Lin, Duanduan Yuan, John Koch

The prevalence of electronic cigarette (e-cigarette) use among youth in the United States has been increasing dramatically in recent years. In addition to federal regulations, individual states and localities can enact tobacco prevention and control policies including levying taxes, restricting where tobacco products can be advertised or used, and setting the minimum age of legal access (MLA). Raising the MLA from 18 to 21 years of age is likely to reduce e-cigarette use among youth. However, research on MLA and e-cigarette use remains limited, particularly at the state-level, making it difficult for policymakers to act on evidence. In this study, we built a system dynamics model to simulate the effect of raising MLA on e-cigarette use among youth in one US state – Virginia – where the MLA is 18 years of age.

We used empirical data from the Youth Risk Behavior Surveillance System, Behavioral Risk Factor Surveillance System, Virginia Department of Health, and American Community Survey to fit and calibrate our model. We simulated the population dynamics of e-cigarette users for different age bands, e.g., 15-17 years of age, 18-20, 21-25, etc. We assessed trends in the prevalence of e-cigarette use under MLA of 18 vs. 21 across age bands at 10, 20, and 30 years post policy implementation.

Our simulations indicated that raising MLA from 18 to 21 could lead to a decrease of 10% in the prevalence (N=212,883) of e-cigarette use among people under 21 years of age in Virginia in 10 years. The effect was more pronounced in the age group of 15-17 years old, with the largest decrease of 11.14% (N=33,379) in the e-cigarette use prevalence in this age group in 10 years. However, the decrease of e-cigarette use among youth may not necessarily lead to lower prevalence of e-cigarette use in adulthood. The prevalence of adult e-cigarette use was only 0.37% lower after increasing MLA from 18 to 21 in 10 years. In the long-term, the simulation results showed that raising MLA from 18 to 21 may lead to a total reduction of 6.0% and 5.6% in e-cigarette use in a population ≥15 years of age in Virginia in 20 years and 30 years, respectively.

Our findings suggest that raising the MLA is likely to reduce e-cigarette use among youth in Virginia, but the preventive effect might be offset in the long run. Potential explanations for these dynamics, how MLA policies affect other tobacco product use (e.g., conventional cigarettes) in conjunction with e-cigarettes, and the potential supportive role of other tobacco prevention and control policies that could be enacted in tandem with MLA laws will be discussed.

P13 The Contributions of Family Background and Job Displacement on the Use of Opioids

PRESENTER: **Dr. Terhi Maczulskij**

AUTHORS: Prof. Petri Böckerman, Dr. Mika Haapanen, Hannu Karhunen

Abstract

This paper examines the impacts of family background and unemployment shocks on opioid use in Finland. We seek to understand the potential roles of both socioeconomic factors and occupational restructuring in the global opioid epidemic. We measure involuntary job loss by using data on plant closures and mass lay-offs. We analyze these effects in the context of a Nordic welfare state where the access to opioid prescriptions has been restricted. The Finnish case is interesting more broadly because Finland is at the forefront of the global opioid epidemic. The clinical use of opioids has recently increased in Finland from a low base-level, and the use is now closer to the EU average level but is still at a much lower level than that of the US.
We combine various data sources. The core data from Statistics Finland include the universe of individuals who were born in Finland. Demographic and labor market information are available for the years 1975 and 1985, and then annually over the period 1987-2016. Parents are classified as: low educated if none of them have completed post-compulsory education; mid educated if either or both of the parents have completed a vocational degree but have not studied further; highly educated if at least one of the them has completed high school or a higher level of (tertiary) education. We have complete annual information on labour market outcomes (earnings and employment) that are used to identify labour market shocks. We maintain that a job loss can lead to opioid use, because prescription drugs are often used for self-medication. The data contain complete links between parents and children.

We use comprehensive information on all opioid prescriptions written by Finnish doctors. The data are based on the prescription register from the Social Insurance Institution of Finland. The register includes all opioid prescriptions dispensed at Finnish pharmacies and covered by the national health insurance scheme over the period 1969-2016 The register records patient and physician identifiers, the Anatomical Therapeutic Chemical (ATC) code of the prescription, the date of prescribing, the date the prescription was dispensed, e-prescribing status, the strength of the prescribed drug, the route of administration, and the dispensed number of defined daily doses (DDDs). ATC codes are used to identify opioids. Importantly, we are able to detect the opioids use of individuals and their parents.
Using combined data we estimate the impact of job loss on opioids use in Finland. We expect that individuals with poor socioeconomic background are particularly vulnerable to opioid use after facing a negative labour market shock. In particular, we are able to examine the interactions between parental substance use, family background and labour market shocks on opioid use. Our paper provides vital and policy-relevant information about the causes of the global opioid epidemic. We plant to present preliminary results during early spring 2019.

P14 The Cost of Food Consumption across Socioeconomic Groups in Switzerland.

PRESENTER: **Mr. Tiago Matos**, Institute of Social and Preventive Medicine (IUMSP)

AUTHOR: Mark Dusheiko

Background: The prevalence of non-communicable diseases has been described as a global pandemic and diet quality is identified as an important risk factor. Healthier diets have been associated with higher food costs, and that households from lower socioeconomic groups spend less on food, have poorer quality diets, and spend relatively more on less nutritious food.

Objective: To investigate the economic determinants of household food choices and in particular the relationship between the financial cost of food consumption and nutritional quality across socioeconomic groups in Switzerland. We will analyze the association between food expenditures and compliance with recommended nutritional guidelines. The implicit price of improved nutrient quality/intake will be estimated from hedonic pricing models that estimate the relative values of the nutritional components of food items consumed.

Data: Individually reported food from two 24 hour recall periods and attributed macro and micro nutrients for over 4,000 observations from the Menu-CH1 survey and Swiss Food Composition Database as well as characteristics of the individual's and household's socioeconomic position. We link food intake with food prices obtained from the Swiss Consumer Price Index Retail Scanner (CPI) for corresponding months and regions as well as the Swiss Household Budget Expenditure Survey (SHBES) for food item expenditures households.

Methods: Currently, we investigate compliance with Swiss national nutritional guidelines across socioeconomic groups. We focus on compliance with saturated fat, fiber and added sugar guidelines. Moreover, we analyze the contribution of sugar-sweetened beverages (SSB) for daily energy intake. We leverage on data from the SHBES to investigate food expenditure and SSB consumption across socioeconomic groups.

Preliminary results: Recommended fiber intake was worst amongst the poorest 20% of the population although compliance was low across socioeconomic groups. Excess saturated fat intake was highest for the poorest 20% but also the richest 10%, while excess added sugar consumption was lowest for the poorest 10%, but highest for the richest 10%. In absolute terms, calories from SSB were lowest in the poorest and richest 10% of households, but poorest households obtained the majority of sugar calories of SSB. Moreover, there was a significant difference in total calories with the richest 10% daily consuming nearly 120/Kcal more than the poorest households after adjusting for recommended energy expenditure. The richest households in the SHBES spend 31% more monthly on average relatively to poorest households.

Discussion: Results suggest that there exist socioeconomic differences in compliance with dietary guidelines, calorie intake and expenditures. The wealthiest 10% complied least with saturated fats, sugars and excess calories, while spending the most on food. Suggesting some scope to reduce food expenditures and improve nutritional quality of diets.

Linkage of price data and consumption data will allow to estimate the cost of daily food consumed and their nutritional components. The association between food expenditures, nutritional values and healthiness of diet will be estimated, controlling for a rich set of socioeconomic, demographic and lifestyle characteristics to better isolate the role of food costs in determining nutritional quality from dietary preferences as well as other economic costs such as time costs.

P15 The Effect of the Irish Recession on Health: A Longitudinal Study of Irish Mothers 2001-2011

PRESENTER: **Jonathan Briody**, University College Dublin
AUTHORS: Orla Doyle, Cecily Kelleher

The literature on the relationship between recessions and health is mixed, with evidence from the recent “Great Recession” suggesting that levels of mortality and morbidity may decrease during economic downturns. Using longitudinal data spanning the periods before, during and after the beginning of the Irish financial crisis of 2008, we examine the impact of this downturn on mothers physical and mental health, self-reported health, health behaviours, and risk factors such as exercise, tobacco and alcohol consumption. Three waves of data from the Irish Lifeways Survey for the period 2001-2011 are used to capture changes in health and health behaviours over the course of an economic expansion and contraction. Small Area Population Statistics from the Irish Census provide local area employment rates to capture exogenous recessionary effects experienced regardless of personal employment status. Fixed effect linear probability models are estimated to determine the impact of the local area unemployment rate on health outcomes and behaviours. Increases in the local unemployment rate are associated with significant increases in the probability of reporting poor self-rated health and mental well-being. Contrary to expectation, the association between local area unemployment and health compromising behaviours is mostly negative, with higher unemployment reducing the probability of being and obese and of tobacco consumption. The relationship with physical activity is more ambiguous, with local area unemployment increasing the probability of mild exercise but decreasing the probability of strenuous exercise. Simple correlation analysis provides preliminary evidence of potential pathways through which the crisis may have influenced health outcomes and behaviours in mothers. Placing these correlations in the context of mechanisms described in the literature suggests that mother’s health may be vulnerable to recessionary changes due to changes in own employment and being unmarried but may likewise be cushioned by the Irish provision of social protection through medical cards. Thus, a contribution is made to the literature in tracking the health outcomes and behaviours of an under analysed population group before, during and after the beginning of an unanticipated exogenous economic shock and in attempting to empirically elucidate specific pathways through which recessions may affect health behaviours and outcomes in this population group.

P16 The Impact of Financial Difficulties on Health Among Elderly

PRESENTER: **Magali Dumontet**, EconomiX
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Aging of baby boomers coupled with mixed evidence regarding trends in healthy life expectancy lead policy-makers to anticipate public health and economic issues in a growing proportion of elderly. Thus, it is particularly important to identify the socioeconomic determinants associated with the dynamic of health among elderly to better understand who are the elders at risk of becoming frail, in the perspective of health promotion strategies.

This paper studies the dynamics of health among elderly. We are particularly interesting by measuring the role of having major financial difficulties on health. We study this effect on several health indicators (self-assed health, number of health problems, depression, restriction in daily activities, mobility limitations, a disability index and mortality) to understand if having major financial difficulties affect the health of elderly. We also evaluate if this effect is similar for the different dimensions of health.

We use panel data coming from the Lausanne cohort 65+. Participants were community-dwelling older adults representative of the general population aged 65 to 70 years in 2004 and living in Lausanne (Switzerland). The Lausanne cohort 65+ is a longitudinal survey and was designed as an annual survey where same individuals (N=1564) are re-interviewed in successive waves. Because wave 1 and wave 2 are considered as baselines , we perform our analysis on the 2006-2016 period (11 waves). We estimate our models on balanced and unbalanced samples of respondents. By using our different health measures as dependent variables we consider the health dynamic by estimating dynamic probit and dynamic ordered probit with correlated random effect. We perform attrition test and run robustness check using the inverse probability weighted estimator to correct the health-related attrition in the data. Our explanatory variable of interest is a proxy of financial difficulties (“Have you been confronted to major financial difficulties in the last 12 months?”). We also control for several socioeconomic factors that have been identified as potential predictors of health care demand such as gender, age, living with a spouse or having a partner, education and also lag variables on the different dimension of health.

Not surprisingly, descriptive statistics indicate for each health indicators a health deterioration as the respondent become older. The proportion of elderly having a partner also decreases over the time.

The proportion of having financial difficulties is relatively stable over time between 5.9% and 7.6% each year. Our econometric analysis underline the importance of using dynamic approach because the health lag variable have significant effect . Our results also indicate a strong positive state dependence for all health indicators. Concerning our main interest variable, we find that the effect of having been confronted to major financial difficulties differs depending the dimension of health. It is a significant negative effect on the self-assessed health and on the number of health problems. However this effect is non-significant for other health indicators.

In terms of public policy, our results provide insight that policies allowing to limit financial difficulties could protect elderly on health deterioration but not for all dimensions of health.

P17 The Impact of Improving Access to Family Planning on Contraceptive Use: Evidence from a Field Experiment in Malawi

PRESENTER: **David Canning**, Harvard University

AUTHOR: Dr. Mahesh Karra

We conduct a randomized controlled trial that identifies the causal impact of a comprehensive intervention to improve access to family planning on postpartum contraceptive use in Lilongwe, Malawi. A sample of 2,055 married women aged 18-35 and who were either pregnant or had just given birth were randomly assigned to either an intervention arm or a control arm. Women who were assigned to the intervention arm received a package of services that included: 1) a family planning information brochure and six counseling visits; 2) free transportation to a family planning clinic; and 3) free family planning services and consultations with a doctor and referral for services in the case of side effects. Findings from the first-year follow-up indicate that women in the intervention group are between 3.6 and 5.1 percentage points more likely to be using a modern contraceptive method than women in the control group after a one-year exposure to the intervention.

P19 The Role of Men's Involvement and Peer Effect on Family Planning in Rural Burkina Faso

PRESENTER: **Aurelia Lepine**, UCL

AUTHORS: Ben d'Exelle, Richard Bakyono, Ludovic Tapsoba

Background: With an average of 6 children per woman, Burkina Faso has one of the highest fertility rate globally. The high fertility rate is explained by very low uptake of contraceptive since only a third of married women use a modern contraceptive. There is no evidence on effective strategies to increase attendance to family planning and contraceptive use in Burkina Faso.

Objective: We investigate the effect of concealability and peers on attendance to family planning and contraceptive use in rural Burkina Faso.

Method: We conducted two field experiments targeting 1,724 couples in rural Burkina in June 2018 in order to study the influence of men involvement and the influence of peer effect on the uptake of modern contraceptives in 30 villages located in the region of Hauts Bassins.

In experiment 1, women who were not using any contraceptive at the time of the experiment (n=1084) received a voucher that offered them a free family planning visit and a free contraceptive of their choice in the nearest local health centre. In this experiment we varied men's involvement: the voucher was either given to the woman in private or to her husband with her being present. Given that half of married women are in a polygamous union, we stratified the sample by the type of union (monogamous versus polygamous) to test whether the effect of men's involvement in family planning decision differed between those two types of union.

In experiment 2, monogamous households in which the woman was already using a modern contraceptive at the time of the experiment (n=640) received a voucher to transfer to a woman in their village who were not using any modem contraceptive. In this experiment we varied the gender of the recipient of the voucher and randomly gave the voucher either to the woman or to her husband in private in order to compare the effect of the gender of the peer on contraceptive use.

Results: Results from experiment 1 show that women in monogamous unions who receive the voucher alone were 66% more likely (13% versus 8%, p-value=0.03) to attend a family planning visit than women whose voucher was transferred to her husband. However, there was no effect of receiving the voucher in private for women in polygamous unions. Results from experiment 2 show that giving the voucher to a peer only increased attendance to family planning by 5% points and there was no difference depending on the gender of the peer who received the voucher to transfer.

Conclusion: Overall, our study highlights differences in fertility preferences between male and female spouses in rural Burkina Faso. While concealability of family planning visit was effective in increasing attendance to the visit in monogamous households, we showed that this had no effect among polygamous households. We attribute such finding to rivalry regarding fertility between co-wives in polygamous unions. In addition, we showed that using peer effect is not an effective strategy to increase attendance to family planning visit and contraceptive use of households in rural Burkina Faso.

P20 The Substitution of Recreational Substances: Marijuana, Alcohol, and Tobacco

PRESENTER: **Dr. Keaton Miller**, University of Oregon

AUTHOR: Boyoung Seo

Marijuana is or will soon be legal to over one quarter of the U.S. population, and is already legal nationwide in Canada. The degree to which this policy change affects public health depends not just on the effects of marijuana consumption, but also on the way in which demand for recreational marijuana interacts with demand for other substances. Using administrative data on the universe of Washington marijuana sales and Nielsen scanner data on alcohol and tobacco sales, we document a contemporaneous decline in demand for other substances at the time Washington's marijuana market opened. To study the relationships between the substances at the product level along both the extensive (legalization) and intensive (cross-price elasticities) margins, we estimate a model of demand for legal substances that allows for flexible patterns of substitution or complementarity. We find that substances are substitutes, and the legalization of marijuana itself leads to a 13% decrease in alcohol and a 11% decrease in tobacco demand. Liquor and cigarette products are affected most; wine, beer, and other tobacco products are less sensitive to changes in the marijuana market.

P21 What Lies behind the Educational Gradient in Health? A Multiple-Country Evidence from Share Data

PRESENTER: **Dr. Iryna Kyzyma**, Luxembourg Institute of SocioEconomic Research

AUTHOR: Maria Noel Pi Alperin

There is an extensive evidence that highly educated individuals, on average, have a better level of health than those who are low educated. This evidence, however, refers mainly to the differences in the average level of health across educational sub-groups whereas we know little about the educational gradient in health when the entire distribution of health is taken into account. In this paper, we aim to identify and explain the gap in health outcomes between low and highly educated individuals using the distributional approach. We start by constructing the distribution of health outcomes separately for the low and highly educated, and then compare the difference between these two sub-groups at each point of the distribution. By doing it, we are able to identify whether the educational gradient in health remains stable along the distribution or it varies depending on where individuals are located in this distribution. As a next step, we perform a distributional decomposition in order to identify which factors can be hold responsible for the differences in health outcomes of people holding various levels of education.

The analysis builds on data from wave 6 of the Survey of health, ageing and retirement in Europe (SHARE). The SHARE is a multidisciplinary cross-country survey, which gathers information on socio-economic characteristics, health, and life histories of individuals who reached at least 50 years of age. In wave 6 collected in 2015 it provides information for 17 European countries and Israel. The main advantage of the SHARE for our analysis is that it contains detailed information on health outcomes of individuals, including both objective and subjective health measures. We use this detailed information to construct three synthetic continuous health indicators, which measure individual's mental, physical and global health on the scale between 0 (absolutely healthy) and 1 (absolutely sick).

In line with the previous literature, the preliminary results indicate that, on average, highly educated people enjoy better health than those who are low educated. We show, however, that the difference in the levels of health between highly and low educated is not constant along the distribution of health outcomes: it is relatively small if we compare the healthiest 10 percent of the low and highly educated but multiplies in size for the sickest 10 percent. We also find that the main factors associated with the gap in the levels of health between low and highly educated are age, labor market attachment, the size of household income, and the frequency of sports activities. From the cross-country perspective, the results show that although the countries differ substantially by the level and distribution of health outcomes, the health gap between low and highly educated individuals can be explained by the same factors.

3:00 PM –4:00 PM TUESDAY [Special Sessions]

Universität Basel | Kollegienhaus – Aula 033

Poster Viewing

4:45 PM –6:15 PM TUESDAY [Special Sessions]

Congress Centre – San Francisco

Mid-Congress Plenary: Child Health and Human Capital

PANELISTS: **Janet Currie**, Princeton University

Wednesday

8:30 AM –10:00 AM WEDNESDAY [Economic Evaluation Of Health And Care Interventions]

Universitätsspital Basel | ZLF – Gross

Organized Session: Three Estimates of the Cost of Universal Health Coverage (UHC) Converge at a Global Level: A Review of Methods and Discussion of Their Applications at a Country Level.

SESSION CHAIR: **Marcia Weaver**, University of Washington

DISCUSSANT: **Neil Thalagala**, Ministry of Health; **Alemayehu Hailu**, Addis Ababa University, School of Public Health; **Sayem Ahmed**, International Centre for Diarrhoeal Disease Research, Bangladesh

World Health Organisation's (WHO) Global Price Tag for the Health Sustainable Development Goals (SDG): A Country-Tailored Model for Strengthening Health System Performance Towards the SDG Targets

PRESENTER: **Karin Stenberg**, World Health Organization

AUTHORS: Odd Hanssen, Tessa Tan-Torres Edejer, Melanie Bertram

Background: WHO provides member states with guidance on recommended health interventions and system investments to advance the Universal Health Coverage agenda and attain the Sustainable Development Goals (SDGs). While every country will need to make decisions on what set of services to prioritize and the system level investments required to expand coverage; a global analysis that uses standard benchmarks is useful to demonstrate the overall resource needs required for low-and middle income countries. This can be used to inform discussions at global level regarding affordability, and at country level as a starting point for discussions on the budgetary implications of meeting global health targets.

Methods: WHO has projected investment needs for 67 low- and middle income countries from 2016 to 2030, considering an ambitious scenario and a second, more capacity constrained scenario. The analysis uses a bottom-up approach that considers a comprehensive service package and health system investment benchmarks that would be required, by year, to advance towards the health SDGs. Each country is modeled individually, by year, with the scale-up trajectory taking into account current epidemiology and baseline health system. Associated costs are presented jointly with estimated health impact including lives saved and overall increases in life expectancy. We also estimated potential available funding for health by country and year, taking into account economic growth and health sector allocation, to inform analysis of affordability and financial sustainability.

Results: An additional US$371 billion is the estimated need per year by 2030 to reach health system targets in the ambitious scenario—the equivalent of an average additional US$58 (range 22–167) per person. Total health-care spending would then increase to a population-weighted mean of US$271 per person (range 74–984) across country contexts, and the share of gross domestic product spent on health would increase to a mean of 7·5% (2·1–20·5). Around 75% of costs are for health systems, with health workforce and infrastructure (including medical equipment) as main cost drivers. Results indicate however that low income and conflict affected countries would not have sufficient domestic financing to build the foundations of their health systems to reach global benchmarks by 2030. On average, low-income countries would need to spend an additional US$76 per capita which requires them to more than double current health spending. Vulnerable and conflict affected states would on average need to spend an additional US$93 per capita.

Conclusion: By using a bottom-up approach, the WHO model allows for explicit consideration of investment gaps across different health system building blocks and identifies packages of health services through which important gains in healthy lives can be achieved. This level of granularity allows for identification of cost drivers and has highlighted the crucial need to invest in health workers and infrastructure to expand access and quality of care. The same principles and methods can be applied in country planning processes for UHC. Through the OneHealth Tool, WHO supports countries to engage in scenario analysis to examine system investment needs, service packages, the related costs and projected health impact over time.

Costing Priority Interventions for Universal Health Coverage (UHC) Benefits Packages in Low- and Middle-Income Countries: The Disease Control Priorities (DCP)-3 Approach

PRESENTER: **Dr. David Watkins**, University of Washington

Background: Disease Control Priorities, 3rd Edition (DCP3) was a five-year international effort to identify priority interventions for low-income countries (LICs) and middle-income countries (MICs). Among other outputs, DCP3 produced a model health benefits package termed “essential UHC” (EUHC), which included 218 interventions that were cost-effective, feasible to implement in LICs and MICs, and addressed a significant disease burden. We developed a model to estimate the potential cost of EUHC in LIC and lower-MIC settings.

Methods: Costing tools were not available for many EUHC interventions, so we developed a costing approach that employed consistent methods within a common analytic framework. We sought to estimate, at steady state, *how much more* countries would be spending annually on EUHC if they had already achieved target coverage levels of EUHC interventions. The population-level cost of a given set of interventions was estimated as a function of (i) the population in need of the interventions, (ii) the unit costs of the interventions, (iii) investments in health systems to support service delivery, and (iv) the gaps in population coverage of the interventions. For our model, we drew on published epidemiological and demographic estimates, unit costs (primarily using microcosting methods), and estimates of service availability by health area from WHO and others. We used estimates of long-run average costs, standardized to 2016 US dollars.

Results: We estimated that, at 80% coverage of all interventions, the total annual cost of the EUHC package would be US$ 68 billion in LICs and US$ 320 billion in lower-MICs. Compared with current spending, an additional US$ 51 billion in LICs and US$ 200 billion in lower-MICs annually would be required. Most investments would be targeted at primary healthcare delivery platforms; long-term interventions for chronic health conditions like cardiovascular diseases would comprise the majority of costs. About a quarter of EUHC costs would be for the ”unfinished agenda” of infectious diseases and maternal and child health.

DCP3’s model is also able to analyze different combinations of EUHC interventions for one or more countries (or groups of countries) by substituting aggregate epidemiological, demographic, and economic inputs. For instance, the additional cost of EUHC in an average LIC (population 26 million, GNI per capita US$ 600) would be US$ 1.5 billion annually (9.3% of GNI, or US$ 57 per capita). The total annual cost of EUHC would be about four-fold higher than what we estimate is currently being spent on EUHC interventions in this country.

Discussion: Our estimates are comparable with the few published estimates of the cost of basic health benefits packages in LICs and MICs. Many countries will face gaps in financing EUHC, especially if they incorporate the interventions needed to meet the SDG3 targets for NCDs and injuries. DCP3’s model provides a flexible approach to estimating the economic cost of intervention packages. When employed alongside our EUHC health impact model (described elsewhere), our costs could be used to conduct *de novo* economic evaluations of alternative combinations of UHC interventions, e.g., as part of national priority setting exercises.

Funding and Services Needed to Achieve Universal Health Coverage

PRESENTER: **Marcia Weaver**, University of Washington
AUTHORS: Mark Moses, Paola Pedroza, Kelly Compton, Nancy Fullman, Vishnu Nandakumar, Katherine Rosettie, Theo Vos

Background We estimated additional services and funds needed to meet a Universal Health Coverage (UHC) standard for utilisation, using a metric of utilisation per disability-adjusted life-year (DALY), and global estimates of utilisation and unit cost of outpatient visits and inpatient admissions.

Methods The metric for services needed was the 2016 volume of services (visits or admissions) per DALY, using a counterfactual estimate of DALYs based on Global Burden of Diseases, Injuries, and Risk Factors Study (GBD) 2016 data. We standardised the burden of disease across countries by removing the effects of access and quality of services, using age-specific estimates of the GBD 2016 Healthcare Access and Quality (HAQ) index, estimated from mortality rates for 32 amenable causes of death. We regressed 2016 DALYs for each age and sex category on the HAQ index and Socio-demographic index - a summary development indicator of income per capita, years of schooling, and total fertility rate. Then we predicted counterfactual DALYs by setting the HAQ index to zero.

For each country, we calculated the additional units of service needed to meet the UHC standard and multiplied the national total by the unit cost of the service in that country. Units of service needed was the difference between the standard for each age-sex category and the country's 2016 volume of services per counterfactual DALY for that age-sex category; this was then multiplied by those DALYs to obtain an estimate given in units of service. The national total was the sum of units of service across age-sex categories.

To identify the UHC standard for utilisation, we set each country in turn as the standard and calculated the global cost to reach that standard. Several countries formed a frontier, with high value on the GBD 2016 UHC index and lowest global cost for their standard. Among countries on the frontier, we selected the Netherlands, ranked ninth on the 2016 UHC index, as the standard for the main analysis. Other countries on the frontier could serve as intermediate standards. The aggregate ratio of total volume to counterfactual DALYs for the Netherlands was 7·25 for visits and 0·17 for admissions.

Results The global gap in inpatient admissions was larger than in outpatient visits in 2016, with a 49·20% increase required in admissions and 26·57% increase required in visits to meet the UHC standard for utilisation. In 2016, 0·35 billion (95% uncertainty interval: 0·31–0·38) additional admissions per year were needed in 184 countries, and 10·42 billion (7·81–12·74) additional visits in 161 countries for a total additional cost of 2017 US$575.57 (413.34-739.59). In low-income countries, the annual cost of 0·06 billion (0·05–0·07) admissions and 1·96 billion (1·55–2·28) visits was US$16·20 billion (12·77–19·36). In lower-middle income countries, the annual cost of 0·21 billion (0·19–0·23) admissions and 6·22 billion (4·64–7·68) visits was US$141·90 billion (113·48–171·29).

Interpretation UHC plans can be guided by standards of utilisation of outpatient visits and inpatient admissions that achieve the highest coverage of personal health services at the lowest cost.

8:30 AM –10:00 AM WEDNESDAY [Specific Populations]

Universitätsspital Basel | ZLF – Klein

Organized Session: The Measurement and Valuation of Child and Adolescent Health and Wellbeing for Economic Evaluation: Where Are We Now and Where Are We Going?

SESSION CHAIR: **Julie Ratcliffe**, Flinders University

Comparing Adult and Adolescent Preferences to EQ-5D-Y States: An Application of Best-Worst Scaling in Australia and Spain

PRESENTER: **Kim Dalziel**, The University of Melbourne

Background: Valuation studies eliciting preferences to health states HRQOL measures typically rely on the views of adult population samples. HRQOL instruments for young people are however gaining interest including the EQ-5D-Y, yet there is little research eliciting preferences to aid in its scoring in different countries. Instruments for children pose the additional research question of whose preferences to value.

Objectives: The main objective of this study was to apply profile case best worst scaling (BWS) methods to compare preferences to states from the EQ-5D youth questionnaire in an Australian and Spanish population. A secondary objective was to test the impact of eliciting preferences from a 1) adolescent, 2) adult, or 3) adult imagining the perspective of a 10-year-old.

Methods: An online survey using a full factorial design of EQ-5D-Y health states divided in 20 blocks was administered to a representative population sample of adolescents and to two samples of adults in both Australia and Spain. Respondents were presented with a series of EQ-5D health states and were asked to indicate the best and worse attributes for each health state. Profiles for the BWS exercise were identified using a full factorial design (35) of the 243 health states divided into 20 blocks. Each block consisted of an even number of mild, moderate and severe states. Marginal choice frequencies were derived for each perspective and setting.

Results: 1,014 adults, 1,120 adults answering from a child perspective (range 18 to >65 years) and 1,010 adolescents (range 11 to 17 years) completed the online survey in Australia. 1,006 adults, 1001 adults answering from a child perspective (range 18-over 55 years) and 1,000 adolescents (range 11-17 years) completed the online survey in Spain.

For Australian respondents when each of the health state pairs were presented in the survey the domain most consistently rated as 'best' by adolescents was no problems walking about (Mobility, rated best 48.2% of times presented). For adults no Pain and Discomfort was most consistently rated best (47.2%) and for adults answering from a child perspective no problems with Usual Activities was most consistently rated best (49.3%). For Spanish respondents, the domain most consistently rated as 'best' for adolescents (50.8%), adult (50.6%) and adults answering from a child perspective (54.8%) was no Pain and Discomfort.

The EQ5D-Y domain most consistently rated as 'worst' by Australian adolescents was being very Worried, Sad or Unhappy (rated worst 43.8% of times presented). This compared to 'worst' by Australian adults and adults answering from child perspective of a lot of Pain and Discomfort (49.5% and 56.5% respectively). For Spanish respondents, the domain most consistently rated as 'worst' for adolescents (43%), adult (44.1%) and adults answering from a child perspective (53%) was a lot of Pain and Discomfort.

Conclusions: This study is the first to elicit adolescent preferences for the EQ5D-Y in an Australian setting. The results suggest that age-related differences in elicitation values for paediatric HRQOL measures. Differences were also observed between Australian and Spanish results for adolescent valuations highlighting the importance of country specific scoring.

The Influence of Experience: Using Best-Worst Scaling to Investigate Health State Preferences in Paediatric Populations with and without Long-Term Health Conditions or Disabilities

PRESENTER: **Christine Mpundu-Kaambwa**, University of South Australia

Background: Adolescence represents a critical transitional stage within the life course of human development. Adolescence is also an important period where the introduction of targeted educational and preventative interventions has the potential to impact HRQOL outcomes. Presently, very little is known about the preferences of young people with a long-term health condition or disability in relation to their mental, social, emotional and physical health. However, such information is an essential prerequisite for the planning and development of preventive strategies and clinical treatment programs designed to improve adolescent health.

Objectives: To investigate the impact of a long-term health condition or disability on preferences for a series of health states generated from the CHU9D descriptive system and to compare and contrast the resulting health state values with those of adolescents without a health condition or disability.

Methods: A profile best-worst scaling (BWS) method was conducted to assess preferences for health states generated by the CHU9D descriptive system comprised of nine dimensions: worry, sadness, pain, tiredness, annoyance, school, sleep, daily routine and activities. An online survey was completed by adolescents in Australia aged 11-17 years (total N=2,051) of which N = 1,771 (84%) reported themselves as living without a long-term disability or health condition and 280 (16%) reported themselves as living with a long term disability or health condition. A conditional logit regression model was used to analyse data from the best choices.

Results: In choosing the best health states, individuals without a disability placed importance on eight ('worry', 'sad', 'pain', 'tiredness', 'annoyance', 'school', 'sleep', and 'activities') of the nine dimensions of the CHU9D (except daily routine). On the other hand, those with a long-term disability or health condition placed importance on a smaller subset of 6 CHU9D dimensions (excluding tiredness, annoyance and sleep). Further data analysis and results taking into account preference heterogeneity will be presented.

Conclusions: This study provides insights into the influence of experience in the valuation of paediatric measures of HRQOL and highlights that scoring algorithms generated in different populations of young people may not be identical. Our findings in relation to the CHU9D instrument indicate important differences with potential implications for economic evaluation and resource allocation decisions for adolescent health and preventive programmes.

The Relative Importance of Health to Overall Wellbeing and Life Satisfaction in Children and Adolescents

PRESENTER: **Dr. Gang Chen**, Monash University Centre for Health Economics

Background: Subjective wellbeing (SWB) is increasingly being recognised as of central importance to public policy and economics in many nations. Within the health sector there is also an argument to use SWB to facilitate resource allocation since it enables the measurement of the benefit of interventions beyond health and captures a broader effect. To date most empirical studies in this area have focused on overall life satisfaction, with relatively few focused on the influence of individual life "domains" and mainly in adult populations.

Objectives: This empirical study contributes to the literature in three main ways. Firstly, it aims to investigate the relative importance of life domains (e.g. health vs safety) for children and adolescents, who are in the crucial stage of the life course. Secondly, by studying young people from countries in different development stages (e.g. developing vs developed countries), it aims to reveal the potential patterns on life domain importance evolved through different development stages. Thirdly, by comparing the derived relative life domain importance between young people and adults, it aims to highlight the heterogeneity of life domain importance across the life course.

Methods: Following a well-documented "bottom-up" explanation of SWB, overall life satisfaction is considered to be the aggregated outcomes of various levels of satisfaction on life domains. The Personal Wellbeing Index (PWI), which consists of 7 specific life domains,

were studied. Cross-sectional data collected from 16 developed and developing countries were analysed. A sub-sample of three developed countries were further investigated, in which data for both young people and adults were available. Country-level objective wellbeing indicators particularly relevant for young people were collected from the UNICEF, the World Bank, and the WHO. Linear regression and threshold regression models were applied.

Results: Respondents were aged 8-14 years old (N=34,747; 50% girls). The linear regression analysis based on the pooled sample found that all seven life domains significantly contributed to overall life satisfaction, with 'Personal safety' ranked at top, followed by 'Personal Health', 'Achievement in Life', 'Standard of Living', 'Future Security', 'Personal Relationships', and 'Feeling Part of the Community'. Further threshold regression analyses considering objective wellbeing indicated that the relative importance of life domain satisfactions evolved alongside the improvement of objective wellbeing. Comparing the relative life domain importance between young people and adults in 3 developed countries, consistent results found that the same 7 life satisfaction domains explained more overall life satisfaction of adults than youth regardless of which country been studied. Among adults, 'Standard of Living' and 'Achieving in Life' were consistently found as the top two important life domains, whilst for youth the 'Personal Safety' ranked the top.

Conclusions: Health, as well as other life domains play an important role in explaining overall life satisfaction, yet their relative importance varied in each country. Heterogeneity also exists across the life course in that what matters the most among youth differ from adults. Understanding the multi-dimensional construct of SWB will provide more valuable information and specific guidance for public policy to meet the needs of different sub-populations over time.

Outcomes in Paediatric Economic Evaluation: Health Related Quality of Life or Wellbeing?

PRESENTER: **Emma Frew**, University of Birmingham

Background: Wellbeing has been highlighted as a potential alternative to HRQOL in economic evaluation. The Middle Years Development Instrument (MDI) originally developed in Canada, is a self-report measure assessing children's physical health, wellbeing and social and emotional development. Not previously used in the UK, the MDI was included alongside a preference-based measure (CHU-9D), in a large UK school-based randomised control trial evaluating the effectiveness and cost-effectiveness of a physical activity intervention (the Daily Mile).

Objectives: To assess the relationship between the children's HRQL (CHU9D) and their wellbeing (MDI) using data from the Birmingham Daily Mile trial

Methods: The Birmingham Daily Mile trial was a 12-month cluster-RCT conducted in 40 primary schools in England. Schools were randomised to either usual activities or the Daily Mile. Anthropometric outcomes included body mass index z-score (BMIz) and bodyfat. HRQL and wellbeing were measured using the CHU-9D, MDI and Satisfaction with Life Scale – Child (SWLS-C, embedded in the MDI). Data on the children's fitness levels and academic attainment was also collected. Now complete, this detailed dataset provides the opportunity to examine the association between these outcomes, their construct validity in this population and their responsiveness.

Results: Using data from 2,280 children aged between 7 and 10 years, the analysis will generate descriptive statistics from both baseline and 12-month follow-up points. Correlation coefficients between the clinical, HRQOL and wellbeing outcomes will be presented and responsiveness statistics generated. The analysis will examine the construct validity of the CHU9D and the MDI in relation to the clinical and socio-economic covariates.

Conclusions: This study will be the first comparison of wellbeing measured using the MDI and HRQOL measured using the CHU9D. The potential use of the MDI in cost-effectiveness analysis of public health interventions targeted at children will be discussed.

8:30 AM –10:00 AM WEDNESDAY [New Developments In Methodology]

Universitätsspital Basel | Klinikum 1 – Hörsaal 1

Organized Session: Methods Harmonisation in Multi-Sectoral, Multi-National Economic Evaluations: The PECUNIA Project

SESSION CHAIR: **Adrian Towse**, Office of Health Economics

Multi-Sectoral Costs and Benefits of Mental Care in Europe: European Research Project PECUNIA ("ProgrammE in Costing, resource use measurement and outcome valuation for Use in multi-sectoral National and International health economic evaluAtions")

PRESENTER: **Judit Simon**, Medical University of Vienna, Center for Public Health, Department of Health Economics

AUTHORS: Dr. Hans-Helmut Koenig, Dr. Valentin Brodszky, Silvia M. A. A. Evers, Leona Hakkaart-van Roijen, Pedro Serrano-Aguilar, Luis Salvador-Carulla, A-La Park, William Hollingworth

Judit Simon, Hans-Helmut König, Valentin Brodszky, Silvia MAA Evers, Leona Hakkaart-van Roijen, Pedro G Serrano Aguilar, Luis Salvador-Carulla, A-La Park, William Hollingworth on behalf of the PECUNIA Group

Background: PECUNIA (ProgrammE in Costing, resource use measurement and outcome valuation for Use in multi-sectoral National and International health economic evaluAtions) aims to establish standardised costing and outcome assessment measures for optimised healthcare provision in national healthcare systems in the European Union. The consortium brings together ten partners from six countries with complementary methodological expertise. It represents differing health care systems with varying feasibility and acceptability of economic evaluations in evidence-informed decision making. Some countries have established national unit cost programmes (DE, NL, UK), some early stage initiatives (AT, ES, HU). Availability of health utility value sets for outcome evaluations and requirements in terms of the primary analytical perspective of economic evaluations (health & social care vs. societal) also differ.

Aims: Between 2018 and 2020, the PECUNIA project develops standardized, harmonized and validated multi-sectoral, multi-national and multi-person methods, tools and information for 1) self-reported resource use measurement, 2) reference unit cost valuation, 3) cross-country health utility assessment, and 4) broader wellbeing measurement.

Methods: To achieve this, PECUNIA works alongside four cross-sectoral horizontal activities (Has) around the harmonised identification, definition, measurement and valuation of costs in multiple sectors (health care, social care, criminal justice, education, employment, patient and family). Considering feasibility and relevant societal challenges in the European health systems, selected mental disorders (depression, schizophrenia, PTSD) are used as illustrative examples for cost assessment.

Results: The project has developed its concept paper including a framework for the multi-sectoral 'PECUNIA service atom'. Several scoping reviews highlighting the status quo of the different horizontal activities have been conducted. The identification of services for comparative country reports from six European countries are currently in progress and will be available at the time of the conference. Relevant conceptual and methodological aspects, results and a roadmap to the overall work plan with specific focus on the harmonisation aspects of cost valuation will be discussed in this presentation.

Conclusions and Implications: The PECUNIA project will lead to better understanding of the variations in costs and outcomes within and across countries, improve the quality, comparability and transferability of economic evaluations in Europe, and support the feasibility of broader economic and societal impacts measurement and valuation in multi-sectoral economic evaluations for HTA.

Funding acknowledgement: The PECUNIA project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 779292.

Conflict of interest: None.

Standardized Identification of Services for Mental Disorders in PECUNIA

PRESENTER: **Dr. Alexander Konnopka**, Hamburg Center for Health Economics
AUTHORS: Christine Duval, Dr. Hans-Helmut Koenig

Alexander Konnopka, Christine Duval, Hans-Helmut König on behalf of the PECUNIA Group

Background: Economic evaluations of identical interventions are often subject to substantial heterogeneity. One major source of this heterogeneity are cross-study differences in the measurement of health care utilization and the calculation of unit costs resulting from a lack of internationally comparable standards. PECUNIA aims to overcome these problems for three essential mental disorders, depression, schizophrenia and post-traumatic stress disorder, by developing standardized and internationally comparable definitions of measurable units, unit costs and measurement instruments for use in economic evaluations.

Aims: To develop a standardized transnational process to systematically identify relevant costing items to be included into standardized costing and outcome assessment measures for optimized healthcare provision in national healthcare systems in the European Union, covering the cost areas "health and social care", "criminal justice and education", "employment and productivity" as well as "patient, family and informal care".

Methods: Based on previous research and general recommendations on systematic reviews, we developed a general framework for the identification of relevant costing items. The framework was circulated and discussed with the PECUNIA consortium until consensus was reached.

Results: The developed framework consists of a multistep approach. In the first step, all available data sources containing e.g. databases for published literature, medical guidelines or national psychiatric associations publications are screened for relevant costing items. This step focuses on high sensitivity, i.e. to detect all relevant items, even if this comes at the cost of identifying irrelevant items, which have to be excluded in subsequent steps. In a second step, information collected by different PECUNIA partners are combined, assigned to one of the cost areas, circulated, and discussed to reach consensus on a first list containing all identified items. In a third step, the resulting list is sent to cost area-specific experts who are asked to add items still missing and to judge the relevance of the items on a three step Likert-scale assessing the frequency of utilization by psychiatric patients. To be of practical use for the PECUNIA consortium, the framework was worked out in detail within the PECUNIA concept paper and made available to all PECUNIA partners.

Conclusion and implications: We developed a general framework for the transnational identification of costing items that can also be used in multi-national projects beyond PECUNIA.

Funding acknowledgement: The PECUNIA project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 779292.

Conflict of interest: None.

Resource Use Measurement in Multi-Sectoral and Multi-National Economic Evaluations of Health Care Interventions: A Scoping Review

PRESENTER: **Luca Janssen**

AUTHORS: Carmen D. Dirksen, Aggie T. G. Paulus, Ruben Drost, William Hollingworth, Sian Noble, Kirsty Garfield, Joanna Thorn, Silvia M. A. A. Evers

Luca M.M. Janssen, Carmen D. Dirksen, Aggie T.G. Paulus, Ruben M.W.A. Drost, William Hollingworth, Sian Noble, K. Garfield, J.C. Thorn, S.M.A.A. Evers

Background: Resource use measurement is known to be a challenging and time-consuming, but essential step in economic evaluations of health care interventions. Measuring true quantities of resources utilized is of major importance for generating valid costing estimates. A wide variety of measurement methods exists; however, little is known about the methods for the appropriate measurement methodology of resource use data compared to the amount of research done on the appropriate measurement of outcomes within economic evaluations. As consequence of the absence of a gold standard and of acknowledged guidelines, the choice of a measurement method is more often based on practicality instead of methodological evidence. An overview of all resource use measurement issues is currently lacking. An overview could enhance clearance in the quality of resource use measurement methods in economic evaluations and may facilitate to opt for evidence based measurement methods in the future. This topic becomes even more important in mental health economic evaluations, as cognitive deficits may affect the ability to recaal resource use.

Objectives: To provide a complete overview of methodological issues regarding the measurement of resource use in economic evaluations.

Methods: Literature was searched by three different methods. First, a search strategy was used in six different databases. Second, the database 'DIRUM' was hand-searched. Third, experts from 6 different EU countries within the field of health economics were asked to provide relevant studies. Data was analysed according to the Resource Use Measurement Issues (RUMI-) framework, which was developed for this study.

Results: Of the 3,478 articles provided in the initial search, 77 were fully analysed. Overall, a difference in attention paid to different measurement issues was noticed. Most research focused around the issue 'how to measure', in particular the effect of self-reported data versus administrative data. On the contrary, little to no research has been done on issues 'what to measure' and 'to which purpose to measure'. Furthermore, studies provide conflicting results.

Discussion: The results of this study provides insight in the effect of a chosen measurement method. The results stress the importance of measuring the true quantities of resources utilized for generating valid costing estimates. Furthermore, this article highlights the lack of evidence in appropriate resource use measurement methods.

Implications for Health Policy and for Future Research: Results of this study provide insight in the effect in estimated resource use of different measurement methods. These results can be used to indicate the quality of chosen resource use measurement methods within economic evaluations. For future economic evaluations, the results can guide the choice for appropriate resource use measurement methodologies. Furthermore, for future research, we advise to focus on the measurement issues 'what to measure' and 'to which purpose to measure', as currently little to no evidence is available.

Standardized Description of Mental Health Service Provision for Unit Cost Assessment

PRESENTER: **Judit Simon**, Medical University of Vienna, Center for Public Health, Department of Health Economics

AUTHORS: Luis Salvador-Carulla, Carlos Garcia-Alonso, Mencia R Gutiérrez-Colosía, Cristina Romero López-Alberca, Pilar Campoy-Muñoz, Nerea Almeda, Dr. Susanne Mayer, Claudia Fischer, Natasa Peric

Luis Salvador-Carulla, Carlos Garcia-Alonso, Mencia R Gutiérrez-Colosía, Cristina Romero López-Alberca, Pilar Campoy-Muñoz, Nerea Almeda, Natasa Peric, Claudia Fischer, Susanne Mayer, Judit Simon on behalf of the PECUNIA Group

Background: To carry out international comparisons, cost assessment requires the identification of standard and transferable units of analysis of resource utilisation. For this purpose, a mapping algorithm of interventions and services must incorporate the following aspects. Firstly, a list of core services and interventions has to be identified. Secondly, services have to be defined in a hierarchical way that standardised units of measurement (Basic Stable Inputs of Care). In addition, the cost units are considered units of process or throughputs. "Care" (or service) atoms consists of different units of analysis of the use of BSICs (labour, capital, overheads and consumables) that are of functional nature represented by these BSICs. These can then be developed further into a multi-sectoral RUM questionnaire. Thirdly, the endpoints of the taxonomy should be homogeneous according to the costs of the services and resources described to allow the valuation of monetary unit costs corresponding to these components of the service atom. Regarding to the standardization process, international classifications of health care such as ESMS/DESDE, ICHI, ICMHC and SHA 2.0 have been taken into account for classifying health service and health interventions respectively.

Aims: To use international classifications (mainly ESMS/DESDE and ICHI) for identifying and classifying units of analysis for costing economic evaluation across Europe.

Methods: DESDE-LTC and ICHI instruments will be employed for the identification and classification of cost units across several European countries.

Results: We will identify common elements in the classification and coding of throughputs of care useful for setting international units of costs.

Discussion: DESDE-LTC has been applied worldwide for standardization of mental health services and making international comparison. Nevertheless, as far as we are concerned, this is the first time that DESDE-LTC is being used in combination with ICHI.

Funding acknowledgement: The PECUNIA project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 779292.

Conflict of interest: None.

8:30 AM –10:00 AM WEDNESDAY [Economic Evaluation Of Health And Care Interventions]

Universitätsspital Basel | Klinikum 1 – Hörsaal 2

Public Health Economics

SESSION CHAIR: **Natalie Carvalho**, University of Melbourne

Economic Evaluation of *Right@Home*: Findings from an Australian Randomized Controlled Trial of Nurse Home Visiting on Child and Maternal Outcomes and Costs at Child Age 3 Years

PRESENTER: **Lisa Gold**, Deakin University

AUTHORS: Shalika Bohingamu Mudiyanselage, Anneke Grobler, Hannah Bryson, Susan Perlen, Sharon Goldfeld

Background: Nurse home visiting (NHV) offers a potential platform to help redress developmental inequities for children experiencing social adversity. "right@home" is the largest Australian multi-site randomized controlled trial (RCT) of NHV. It was offered to pregnant women experiencing adversity and delivered via the universal, nurse-led child and family health (CFH) service (the comparator). When the program ended at child age 2 years it had significantly improved aspects of parenting and the home learning environment.

Objective: Evaluate the impact of the right@home NHV intervention at child age 3 years on: (1) child (a) physical health, (b) mental health, and (c) learning and language; (2) maternal (a) parenting practice and (b) mental health; and (3) service use and costs over the first 3 years.

Methods: 722 pregnant, English-speaking women experiencing adversity (≥2 of 10 risk factors) were recruited from antenatal clinics at 10 hospitals across the states of Victoria and Tasmania, Australia. Intervention women were offered 25 scheduled structured home visits focusing on parenting and the home learning environment. 3-year main outcome measures included parent-reported or direct assessment of (1)(a) Pediatric Quality of Life Inventory (PedsQL); overweight status (body mass index); dental caries, (b) Strengths and Difficulties Questionnaire (SDQ), (c) Clinical Evaluation of Language Fundamentals (CELF), (2)(a) Child-Parent Relationship Scale (CPRS), warm/hostile parenting, efficacy and care (b) Depression, Anxiety, Stress Scales (DASS), Personal Wellbeing Index (PWI), Assessment of Quality of Life (AQoL-8D) and global health. Analyses were conducted using multiple imputation including all variables included in the analysis models, baseline variables and outcomes from earlier time points using multivariate normal regression including all 722 mothers initially randomised (intention to treat). Cost consequences analysis from a government perspective compared intervention costs and costs of health service use over 3 years to all outcomes. Service use was parent-reported every six months and valued with national unit costs. Costs are discounted at 5% and reported in 2018 Australian dollars.

Results: 722 women were randomised (363 intervention, 359 control). 558/722 (77%) women consented to participate from 3-5 years. At child age 3 years, intervention mothers reported improved mental health, quality of life (mean difference 0.03 on AQoL-8D (95% CI 0.01; 0.06)) and wellbeing. No impact was shown on child development outcomes. Costs were $5,715 higher in the intervention group (95% CI $2,031; $9,400), with no significant difference in health service use to 3 years.

Conclusion: This robust RCT of NHV demonstrated beneficial impacts for maternal outcomes to 3 years. Ongoing follow-up will demonstrate whether, like some NHV programs, benefits to children's development (with their associated cost savings) emerge at later ages. These results have significant implications for early childhood policy and service delivery, especially in Australia.

A High-Intensity Smoking Cessation Programme Is Even More Cost-Effective Than a Low-Intensity Programme in Long-Term. A Cost-Effectiveness Analysis of a Smoking Cessation Study

PRESENTER: **Inna Feldman**, Uppsala University

AUTHORS: Asgeir R Helgason, Pia Johansson, Åke Tegelberg, Eva Nohlert

Background. There is strong evidence on the effectiveness of tobacco control programmes. Previously, we performed a randomised control trial (RCT) of a high- and a low-intensity treatment programme (HIT and LIT) for smoking cessation in a dental setting in Sweden, where effectiveness was assessed after 1 and 5–8 years. Our previous economic evaluation of HIT and LIT for smoking cessation was based on the reported number of quitters at one-year follow-up (point prevalence).

Objectives. To perform a cost-effectiveness analysis of HIT and LIT using long-term (5–8 years) follow-up data and compare the results with the previous study based on short-term (1-year) follow-up.

Methods. Two economic evaluations, performed from a societal perspective, were based on treatment costs and number of abstinent participants after 1 and 5–8 years respectively. Future disease-related costs (in Euro 2014) and health effects (in quality-adjusted life-years, QALYs) were estimated using a Markov model simulated the societal effects of quitting smoking on three disease groups: lung cancer, COPD and cardiovascular disease. Treatments were explicitly compared in an incremental analysis, and the results were presented as an incremental cost-effectiveness ratio (ICER).

Results. The more costly HIT led to higher number of point prevalence abstinent participants after 1 year and higher number of sustained abstinent participants after 5–8 years, which translates into larger health gains and costs avoided than LIT. The incremental cost/QALY of HIT compared to LIT amounted to €2,431 and €1,020, using short- and long-term effectiveness respectively, which is considered to be very cost-effective in Sweden.

Conclusion. To our knowledge, this is the first study that utilises a unique possibility to compare a previously conducted cost-effectiveness analyses based on 1-year follow-up point prevalence abstinence with a new evaluation, based on sustained abstinence since the planned smoking cessation date up to 5–8 years. The HIT programme was even more cost-effective than the LIT programme using the long-term follow up data. . Cost-effectiveness analysis favours the more costly HIT if decision-makers are willing to spend at least €3,092/QALY for tobacco cessation treatment.

A Cost-Effectiveness Analysis of Population Level Screening Strategies for Type 2 Diabetes Mellitus Targeted at Intermediate Risk Population Segments

PRESENTER: **Ritika Kapoor**, Saw Swee Hock School of Public Health, National University of Singapore
AUTHORS: Kelvin Bryan Tan, Deanette Pang, Kee-Seng Chia, Qian Yang, Hwee Lin Wee

OBJECTIVE

Diabetes is a serious, expensive, yet manageable disease. Globally, 629 million adults are expected to be diabetics by 2045 if current trends continue. As the disease may remain undiagnosed and untreated for years, screening and early detection is critical to improve prognosis. Conventionally, fasting plasma glucose (FPG) and oral glucose tolerance test (OGTT) have been used as screening strategies but they require overnight fasting and/or have tedious testing procedure. However, recent years have witnessed many countries to adopt use of glycated hemoglobin (HbA1c) test to improve screening uptake as it is a simple test and does not require fasting. This study, aims to compare two screening strategies based on either FPG or HbA1c test, and identify the cost-effective strategy for the population level screening program in Singapore.

METHODS

A lifetime markov decision model was developed to compare the cost and health benefits of implementing screening strategies for T2DM for target group of 40-year old Singaporean residents not diagnosed with diabetes, referred as the intermediate risk group in the study. The strategies compared were 1) HbA1c test as the preferred screening test for all with a subsequent FPG if HbA1c is between 6.1-6.9%; 2) FPG test as the preferred screening test for all followed by a subsequent OGTT if the FPG is between 6.1-6.9 mmol/l. Undiagnosed individuals were screened every 3-yearly till they were either clinically diagnosed in-between screening, diagnosed by subsequent screenings, or die because of other reasons. Local screening uptake rate was taken for FPG-based screening with an assumed 20% increase in relative uptake by HbA1c-based screening. Microsimulation analysis was performed on a hypothetical cohort which represented the actual population segment (using National Health Survey 2010 data), and HbA1c and FPG values were modelled over time for each individual. The study assumed no complications at DM onset with a risk of developing complications in future. At T2DM diagnosis, patients may or may not have complications. Local data were used for key variables and model outcomes included ICER and values reporting number of diabetics diagnosed, mean age at diagnosis, proportion of diabetics developing complications and mean age at complication diagnosis. Sensitivity analysis was performed to assess the robustness of the results.

RESULTS

At base-case, HbA1c-based screening was found cheaper with more health benefits (i.e. dominant strategy). Along with diagnosing more diabetics, it was found to diagnose diabetic patients 1-year earlier and also reduced the relative complication risk by 11%, leading to a cost savings of US$300 /person. The results were found robust in sensitivity analysis across different screening uptake rates, risk of DM related complications and cost parameters.

CONCLUSIONS

Though, both the screening strategies were comparably effective at similar uptake rates, HbA1c-based screening becomes the dominant strategy at higher uptake rates. Hence, real values of HbA1c based screening lies in its simple testing procedure which is expected to improve screening uptake and also encourage opportunistic screening.

Impact of the Adolescent and Youth Sexual and Reproductive Health Strategy on Service Utilisation and Outcomes in Zimbabwe

PRESENTER: **Lazarus Muchabaiwa**, Bindura University

AUTHOR: Josue Mbonigaba

Poor reproductive health among youth and adolescents threatens their future health and economic wellbeing in Zimbabwe amidst a high HIV/AIDS prevalence. This study evaluates the impact of a multi-pronged adolescence sexual and reproductive health (ASRH) strategy implemented by government of Zimbabwe between 2010 and 2015 to improve ASRH in terms of the uptake of condoms and HIV testing as well as outcomes in terms of sexually transmitted infection (STI) prevalence and HIV prevalence. We combine the difference in difference and propensity score matching methods to analyse repeated Zimbabwe demographic health survey cross-sectional datasets. Young people aged 15-19 years at baseline in 2010, who were exposed for the entire five-year strategy are designated as the treatment group and young adults aged 25-29 at baseline as the control. We find that the ASRH strategy increased HIV testing amongst youth by 36.6 percent, whilst treatment of STIs also increased by 30.4 percent. We also find that the HIV prevalence trajectory was reduced by 0.7 percent. We do not find evidence of the impact on condom use and STI prevalence. The findings also suggest that although HIV testing increased for all socio-economic groups that were investigated, the impact was not the same. Lastly, we do not find evidence supporting that more resources translate to better ASRH outcomes. We recommend better design and coordination of complementary interventions and meaningful engagement and proper targeting of young people for better effects of ASRH interventions.

Measuring the Effect of Donor Registration on Organ Donation Rates

PRESENTER: **James Harold Cardon**, Brigham Young University

AUTHOR: Mark Showalter

Organ transplants are among the most remarkable innovations produced by modern medicine. Improvements over the past 20 years in organ preservation, surgical techniques, and post-operative care have increased both the survival rates and the quality of life for recipients. These improvements have increased the pool of individuals for whom a transplant is a viable option. But this increase in demand for organs has not been matched by a similar increase in supply. Laws in most countries prohibit market transactions in organs and therefore transplanted organs come from donations, either from live donors or cadavers. Median waiting times for a donor organ vary from several months (hearts and lungs) to several years (kidneys).

Much of the effort to increase supply focuses on donor registration drives. Donation is more likely for registered donors, but the families of non-registered potential donors often grant consent as well. In fact, we document that in most states non-registrants are over-represented among donors because the probability of becoming a donor (which implies death, eligibility and consent) conditional on being registered is lower than the unconditional probability. This is almost certainly because the demographics of registered as organ donors are significantly different from those who have not registered.

The chain of events and decisions leading to organ donation involves conditional probabilities that vary significantly by state, sex, race and income category. We use micro data from the United Network for Organ Sharing (UNOS) listing all eligible deaths, registration status and organ donations for the years 2010-2017.

In order to inform policy makers in allocating resources, we decompose donation probabilities by state and various demographics (sex, race, income, etc.) to estimate the value of a new donor registration. We find that there is significant variation in the value of a new registrant groups. In some states with low registration rates, for example, it may be more cost-effective to try to raise the consent rates among the non-registered population.

Zink and Wertlieb (2006) describe a “presumptive approach” to counseling with families, while Truog (2008) expresses concern about this approach. Going further, Thaler and Sunstein (2008) suggest replacing the requirements for explicit informed consent with mandated choice, perhaps by requiring organ donor registration as a condition of obtaining a driver’s license. Our model provides estimates of the value of adopting various policies to increase the supply of organs.

8:30 AM –10:00 AM WEDNESDAY [Economic Evaluation Of Health And Care Interventions]

Universitätsspital Basel | Klinikum 1 – Hörsaal 3

Organized Session: Cost-Effectiveness Modelling of Testing Strategies: Methods to Appropriately Capture Uncertainty

SESSION CHAIR: **Alison Florence Smith**, University of Leeds

DISCUSSANT: **Simon Walker**, University of York; **Neil Hawkins**, University of Glasgow

Methods to Capture and Explore the Impact of Test Measurement Uncertainty within Economic Decision Models

PRESENTER: **Alison Florence Smith**, University of Leeds

All clinical test measurements are subject to uncertainty. A multitude of factors along the testing pathway (relating to how the test sample is collected, stored and analysed) can affect the performance of test methods, resulting in systematic variation (i.e. bias) and/or random variation (i.e. imprecision) in observed values. If, as a result, test measurements are incorrectly observed as lying above or below key test decision thresholds, then patient management – and subsequently, clinical outcomes and healthcare costs – may be affected.

Whilst the impact of measurement uncertainty has long been appreciated by laboratory scientists, it has not typically been considered within health technology assessments (HTAs) and rarely explored within economic evaluations. Under the "linked evidence" approach to health-economic modelling, any modelled estimates of net benefit will necessarily relate to the particular pre-analytical and analytical (i.e. laboratory) conditions under which the associated clinical accuracy study (or studies) were conducted. If these conditions may be expected to vary were the test to be adopted into routine clinical practice, then the clinical accuracy estimates and subsequent model outcomes may no longer be valid. Exploring the potential impact of varying measurement performance on downstream test outcomes is therefore vital to the appropriate assessment and adoption of testing strategies.

In this session I will present a novel framework for including data on test measurement uncertainty within clinical accuracy (e.g. clinical sensitivity and specificity) assessments, based on findings from a recent methodology review. I will illustrate how this framework can be extended to economic evaluations via a clinical case study of faecal calprotectin for the diagnosis of Inflammatory Bowel Disease (IBD) in primary care. In particular I will explore how economic model analyses incorporating data on measurement uncertainty may be utilised to identify and inform optimal laboratory procedures in clinical practice.

Meta-Analysis of Test Accuracy across Multiple Thresholds for Decision Making

PRESENTER: **Hayley E Jones**, University of Bristol

Tests for disease classification often produce a continuous measure, such as the concentration of a particular biomarker in a blood sample. The optimum threshold at which to operate a test (such that results, say, above the threshold are treated as ‘positive’ and those below the threshold are treated as ‘negative’) is a key question for clinical practice.

If estimates of the clinical sensitivity and specificity of the test are available across the full range of possible thresholds, then the optimal threshold can be selected - this may be based, for example, on estimation of the expected net benefit of the testing strategy via decision model analysis. However, standard methods for meta-analysis of test accuracy produce only a ‘summary’ estimate of sensitivity and specificity and/or a ‘summary receiver operating characteristic’ (SROC) curve. Although the SROC curve is designed to represent the trade-off between sensitivity and specificity as the threshold is varied, the actual numerical value of the threshold that each point on the curve relates to is lost, and thus the usefulness of this metric is limited. In addition, these standard methods can only synthesise a single pair of sensitivity and specificity from each study, despite studies often reporting data at more than one threshold. Intuitively, uncertainty can be reduced by modelling all of the available data in a single model.

In this session I will describe a new model that can: (i) take any number of data points from each study; and (ii) estimate the clinical sensitivity and specificity of the test at each explicit, numerical threshold, with 95% credible intervals. Prediction intervals for a new study can also be produced. I will demonstrate the model using a case study meta-analysis, quantifying the accuracy of B-type natriuretic peptide for the diagnosis of acute heart failure. Using a simulations-based approach, I will demonstrate how the optimal threshold can be selected based on the value that maximises the expected net benefit from a linked decision model, accounting for relevant estimation uncertainty.

Value and Uncertainties in Identifying the Cost-Effective Sequence of Tests

PRESENTER: **Rita Faria**, Centre for Health Economics at the University of York

The aim of cost-effectiveness analysis in diagnosis is to identify the most cost-effective way of testing and managing patients given the available information, their costs and health outcomes. Using decision modelling, we can compare the various ways of using the tests and their implications to management. Multiple challenges arise in such analyses however, relating to mapping out the various diagnosis and management pathways, as well as structuring, parameterising and evaluating the decision model. In this session I will use two case studies to illustrate each of these challenges and suggest possible approaches to address them.

The first case study relates to a cost-effectiveness analysis of imaging and biopsy tests to diagnose clinically significant prostate cancer. From 3 tests and 6 diagnostic cut-offs, we identified a total of 383 testing strategies. Based on our analysis, the most cost-effective strategy was an intensive testing strategy with 3 tests used in a sequence, with a sensitivity of 95%. Threshold sensitivity analysis found that the results were most sensitive to the relationship between the tests’ accuracy and their position in the sequence; and to structural assumptions relating to the consequences of delays in treatment initiation.

The second case study relates to a cost-effectiveness analysis of cascade testing in familial hypercholesterolaemia. Familial hypercholesterolaemia is a genetic disease in which first relatives of patients have 50% probability of having the disease. The complexity of the cascade is such that we identified 292 cascade protocols to evaluate. Given that the cascade may change the management of patients without familial hypercholesterolaemia, the cost-effectiveness analysis includes two models: one to address the cost-effectiveness of

treatment of patients with the disease, and another to address the cost-effectiveness of treatment decisions prompted by the information obtained from cascade testing.

8:30 AM –10:00 AM WEDNESDAY [New Developments In Methodology]

Universitätsspital Basel | Klinikum 1 – Hörsaal 4

Organized Session: Pathogens, Preferences and Predictions — Understanding the Economics of Infectious Diseases

SESSION CHAIR: **Lesong Conteh**, School of Public Health, Imperial College London

Value-Based Pricing Analysis and Quantification of Uncertainty to Guide the Development of Incentives That Encourage R&D Investments in Infectious Diseases

PRESENTER: **Gabriela B Gomez**, London School of Hygiene & Tropical Medicine

AUTHORS: Nimalan Arinaminpathy, Lotte Steuten, Anna Vassall

Background

To incentivise future R&D investments, stakeholders will evaluate manufacturing costs, maximum achievable prices (through reference pricing and value-based pricing (VBP), for example), and potential revenues. When using health technology assessment to estimate the potential VBP in the context of R&D, we focus on the expected value created for a potential payer (e.g. government) in an uncertain future as well as the potential revenue a market will represent to the manufacturer. In infectious diseases, uncertainty will arise from epidemiological trends and the inclusion of externalities in value assessments, amongst others. Using the example of tuberculosis (TB), we quantify the importance of these uncertainty sources in determining maximum achievable prices and revenues.

Methods

Most cases of TB are curable with first-line drugs. These are inexpensive and usually well-tolerated; however, the standard regimen lasts for 6 months and delivery costs can be high. An emergent challenge is drug-resistant TB, where second-line treatment can cost a hundred times as much, with treatment side effects contributing to much poorer outcomes. We investigated the potential value of a universal drug regimen (UDR) that is as effective as current first line treatment, for both drug-sensitive and drug-resistant TB, of 2 months duration, and that has no need for clinical/lab monitoring during treatment. We present results for two contrasting settings: India (low levels of drug resistant TB, high levels of private sector involvement) and Russia (high levels of drug resistant TB and hospitalisation). The impact of epidemiological uncertainty on maximum achievable prices and revenues was analysed in two groups: 1) uncertainty related to future comparators, including changes to the health system and other alternative technologies entering the market prior to UDR; and 2) structural uncertainty. We estimate the maximum achievable price and potential revenue over 10 years including all parameter uncertainty in probabilistic sensitivity analysis.

Results

The maximum regimen price estimated (>USD300 in India, >USD7000 in Russia) is significantly higher than the next equivalent drug price for first line treatment in these settings (<USD100). Improvements in the comparator performance reduces the maximum price per regimen across all settings. Omitting transmission-related externalities in the models underestimates benefits by up to a third. The introduction of an alternative technology before the UDR, e.g. vaccine, can reduce the epidemic size, and while the maximum value-based regimen price is comparable to other scenarios, the potential revenue is significantly reduced.

Conclusions

Future uncertainty in health systems investments is the main driver of the maximum value-based price achievable by manufacturers. Structural uncertainty (as reflected by the inclusion of externalities) will significantly bias estimated potential revenues, especially if new prevention products come to the market before the UDR. However, the resulting maximum prices, estimated conservatively without externalities, are already substantially higher than those of current TB regimens, which will provide a reference for future pricing if new technology has an equivalent efficacy. The sources of uncertainty will translate into future risks for investors. The quantification of these uncertainties can guide the development of incentives to encourage and inform R&D investments.

Social Norms and Free-Riding in Influenza Vaccine Decisions: An Online Experiment

PRESENTER: **Ms. Krystal Wei Lau**, Imperial College Business School

AUTHORS: Marisa Miraldo, Matteo M Galizzi, Katharina Hauck

Background: ‘Nudges’ based on social norm messages impact decision-making in an assortment of economic and health contexts. Whether and how this impact differs at various social norm intensities, however, remains unclear. Furthermore, in public good games, free-riding behaviour may misalign with social norm adherence after certain social norm intensities. Perceived social norms and perceived free-riding threshold can potentially affect behaviours, which in turn will affect epidemic trends and our capacity to control them. We aim to identify the

causal impact of different social norm intensities on stated and revealed preferences for a classical health public good game: influenza vaccination. This will allow us to understand how perceived social norms and perceived herd immunity, the threshold where free-riding should occur, impact the relationship between social norms and prevention preferences.

Methods: Online experiment was performed using the UK-based Prolific Academic platform with n=1,216 participants randomly assigned to a control group (no explicit social norm) or to one of seven social norm treatment groups, where participants were asked to imagine that a certain proportion (i.e. 10%, 25%, 50%, 65%, 75%, 85%, or 95%) of people in their environment normally get the flu vaccine. Stated preferences were measured as self-reported vaccination likelihood. Directly revealed preferences were measured as (a) opening an online map showing nearby private flu jab providers' locations; (b) time spent looking at this map; and (c) downloading a calendar reminder to vaccinate. Perceived social norm, perceived herd immunity thresholds, attitudes, preferences, behavioural and socio-economic characteristics were also measured. We used linear regressions, logistic and double hurdle models to analyse the impact of social norms on stated flu vaccination likelihood; revealed online map and calendar reminder interest; and map viewing time.

Results: Social norms significantly monotonically increased stated vaccination likelihood from the 50% treatment level after controlling for perceived social norms and perceived herd immunity. Social norms positively impacted map interest and map viewing time at all treatment levels. This effect increased until the 75% treatment level; individuals treated with greater social norm intensities exhibited free-riding behaviour. Similar behaviour was demonstrated for calendar reminder interest, with positive social norm impact peaking at 85%, followed by free-riding behaviour. Participants who received higher social norm treatment than their perceived social norm had significantly lower stated vaccination likelihood. Those who received higher social norm treatment than their perceived herd immunity threshold had significantly lower stated and revealed vaccination preferences.

Conclusion: Social norms impact revealed preferences for influenza vaccination in a non-monotonic manner. People significantly follow the social norm of getting vaccinated only when it is below 75% equivalent to the herd immunity threshold. Free-riding begins beyond this social norm intensity. Perceived social norms and perceived herd immunity play important roles in explaining the heterogeneity of vaccination decisions: an induced social norm higher than the perceived social norm and/or perceived herd immunity threshold signal a lower infection risk and could lead individuals to free-ride and forego vaccination. These findings suggest that policymakers should exercise caution when designing behavioural interventions using social norm messages to 'nudge' vaccination.

Economic Theory to Establish the Burden of Antibiotic Resistance and Evaluate Resistance-Related Interventions: Determining Scope, Scale & Subsequent Outcomes

PRESENTER: **Nichola Naylor**, London Schol of Hygiene & Tropical Medicine
AUTHORS: Julie Robotham, Rifat Atun, Jeff Waage, Jo Lines, Gwen Knight

Background: Antibiotic resistance (AbR) is both a global health risk and an economic issue. Antibiotic resistant infections threaten to severely reduce the effectiveness of antibiotics in treating and preventing infections within humans and animals. In order to evaluate AbR-related policy, we need to understand the costs and outcomes associated with different scenarios. However, AbR burden estimation can lead to highly variant associated cost and outcome estimates dependent on whether a microeconomic or macroeconomic perspective is utilised to frame the approach and the extent to which these costs are aligned to epidemiological models. AbR is also a One Health (OH) issue, in which emergence factors and transmission determinants of AbR-related infections are spread over humans, environments and animals. Therefore, evaluating interventions utilised to prevent or halt the emergence and/or spread of AbR is complex. Previous evaluations ranged from cost-benefit analyses in individual sectors to multi-criteria decision analyses involving a wide range of stakeholders.

Methods: Methods for burden estimation in the AbR context were framed through the lens of microeconomics and macroeconomics respectively. A systematic literature review of the AbR burden evidence-base was conducted, detailing potential methods of burden estimation in this context. Such methods were then utilised on a case study, in which the burden of AbR in *Escherichia coli* cases was estimated. To outline how economic evaluations of AbR-related interventions should be conducted, taking into account the potential OH implications, a narrative literature review was then conducted. This literature review detailed methods used, and subsequent outcomes reported, in previous intervention evaluations related to OH issues, such as climate change. This evidence helped construct a framework outlining how to conduct an economic evaluation in the context of AbR across public health and agriculture.

Results: AbR's potential wide-reaching effect would suggest that macroeconomic estimations of AbR burden are necessary to highlight the true impact of this issue. However, in order to parameterise such models, one must first have a robust estimation of the (i) excess health and healthcare system burden associated with current AbR and existing policies and (ii) excess burden associated with the potential 'future' under different scenarios. Microeconomic methods, including survival analyses and decision trees, were shown to estimate the incremental impact of resistant infections well for (i) and (ii). The selection of appropriate survival analyses accounting for time-dependency bias was found to be important due to the nature of healthcare-associated infection epidemiology.

However, to evaluate antibiotic stewardship interventions across the OH space, it was found that multiple models (varying in perspective, inputs and outcomes) should be used to ensure relevant decision makers have the information needed to incentivise investment. Our framework highlights the importance of linking transmission factors to micro- and macroeconomic modelling approaches and maps the potential modelling process in evaluating AbR-related policy.

Conclusions: Economic theory is appropriate for framing economic evaluations relating to AbR. However, the complexity of AbR means such theory must be broadened to include wider macroeconomic concepts and a broader epidemiological scope (including human-animal

interfaces) in order to appropriately evaluate AbR-related policy.

8:30 AM –10:00 AM WEDNESDAY [Evaluation Of Policy, Programs And Health System Performance]

Universität Basel | Kollegienhaus – Hörsaal 001

Multi-faceted Approaches to Obesity

SESSION CHAIR: **Bruce Hollingsworth**, Lancaster University

Bariatric Surgery Is a Cost-Saving Treatment for Obesity – a Comprehensive Meta-Analysis and Updated Systematic Review of the Health Economic Evaluation of Bariatric Surgery.

PRESENTER: **Ms. Qing Xia**, Menzies Institute for Medical Research, University of Tasmania
AUTHORS: Julie Campbell, Hasnat Ahmad, Barbara de Graaff, Lei Si, Andrew J Palmer

Background: Obesity is a health problem with major economic consequences. The prevalence of severe obesity (BMI ≥35kg/m^2) is increasing at a faster rate than obesity (BMI ≥30 kg/m^2). Demand for bariatric (weight-loss, metabolic) surgery to treat severe and resistant obesity far outstrips supply and public/private insurance coverage is limited. Additionally, the public provision of bariatric surgery is not meeting the demands of people with severe obesity and super obesity (BMI ≥ 50 kg/m^2) in lower socioeconomic groups.

Objectives: (1) Perform a quantitative meta-analysis of health economic evidence regarding bariatric surgery from 1995, and (2) update our narrative synthesis and quality appraisal regarding the health economics reporting of bariatric surgery since September 2015.

Data and Methods: Validated guidelines informed systematic screening, data extraction, content and meta-analyses. A narrative review and quality appraisal that summarized full and partial health economic evaluations regarding bariatric surgery was conducted to update our previous review from 1995. Four bio-medical databases and four economic databases were searched. Study screening was performed using the Covidence online program. Quality appraisal of included studies was performed based on the Consolidated Health Economic Evaluation Reporting Standards statement. These studies, combined with studies that were included in our previous review, were further screened for the comprehensive meta-analysis. Meta-analyses were conducted regarding annual cost changes 'before' versus 'after' surgery, and cumulative cost differences between surgical and non-surgical groups. Primary outcomes of interest included the proportion of annual cost changes before versus after surgery, and the proportion of cumulative cost differences between surgical and non-surgical groups in each reported year. Sensitivity and subgroup analyses were also conducted.

Results: N=101 studies were eligible for the qualitative analyses of health economic evaluations in bariatric surgery since 1995, with n=24 studies published after September 2015. Quality of health economic reporting increased to high from our previous review and the inclusion of complications/reoperations were predominantly contained in the full health economic evaluations that rated as high quality. Health economics studies also reflected technical changes in bariatric surgery in which the number of studies of sleeve gastrectomy increased while adjustable gastric banding and vertical banded gastroplasty decreased over the last decades. Sixty-one out of N=101 studies were eligible for the quantitative meta-analyses. Bariatric surgery was cost-saving over a lifetime scenario (inclusive of the costs of complications/reoperations from 84% of studies eligible for our novel meta-analytical model). Additionally, consideration of indirect costs through sensitivity analyses increased cost savings. Medication cost savings were predominant in the before versus after meta-analysis. Although the inclusion of complications/reoperations could eliminate the cost-savings in the before versus after meta-analyses, these results were informed by the partial health economic analyses that were of relatively lower quality compared to full health economic evaluations.

Conclusions: Bariatric surgery is cost-saving over a lifetime course. A broader perspective inclusive of indirect costs would drive further evidence of cost-savings. Health economists are hearing the call to present higher quality studies and include the costs of complications/reoperations; however, indirect costs and body contouring surgery are still not appropriately considered.

A Multilevel Approach to Model Obesity and Overweight in OECD Countries

PRESENTER: **Ivan Tzintzun**

This paper contributes to the current literature by combining national indicators together with individual characteristics to explain the evolution of obesity and overweight rate. It is possible to find multilevel model analysis to estimate obesity and overweight which combines regional and individual-level data (Sundquist, 1999; Ewing, 2008; Croft et al, 2013; Congdon, 2010; Boonpleg et al, 2013; Currie et al, 2012). According to the data analyzed by the different studies, these articles can be classified either as cross-regional or longitudinal single-country studies. On the one hand, cross-regional studies do not allow capturing causality and the dynamics of obesity and, thus, cannot be used to predict future trends. On the other, longitudinal studies which analyze obesity and overweight rates within a single country cannot capture country-specific differences, such as changes in policy and regulatory environment or the characteristics of the food market (e.g. prices, availability of calories, etc.). From a methodological point of view, this paper makes an original contribution by employing a multilevel model (hierarchical model) that combines individual characteristics -such as age, gender, socioeconomic status- with macro-level determinants (e.g. GDP, Gini Index, Taxation policies, prices and availability of calories, diet quality/composition) to explain the evolution of

obesity rates in the past years (1990-2017) in 8 different countries. Its main purpose is to understand the effect of dietary composition national trends on levels of obesity.

This paper explores data from seven OECD countries: France, Italy, Spain, England, Canada, Mexico and the USA. The micro-level data is taken from the following surveys:

1. France: Enquête Santé Protection Sociale (ESPS), years 1990 to 2014
2. Italy: Aspetti della Vita Quotidiana (AVQ), years 2001 to 2015 (years 1998 to 2000 dropped due to missing height/weight and BMI values)
3. Spain: Encuesta Nacional de Salud (ENS), years 2001 to 2015
4. England: Health Survey for England (HSE), years 1991 to 2015
5. Canada: Canadian Community Health Survey (CCHS), years 1994 to 2015
6. The USA: National Health and Nutrition Examination Survey (NHANES), years 1973 to 2015
7. Mexico: Encuesta Nacional de Salud y Nutrición years 1994-2016
8. Chile: Encuesta Nacional de Salud, 2003-2010-2017.
9. Australia: National Health Survey

In particular, this research employs a novel dataset developed by OECD which calculates macronutrients trends at the national level since 1990 that includes the following variables: total consumption of fat, carbohydrates and calories. These variables are defined by its origin (e.g. vegetable or animal), and by commodity (e.g. sugar, meat, vegetable oil).

Preliminary results indicate that macronutrients effect on obesity trends are highly significant and largely dependent on country-specific characteristics. High income countries show a decline in consumption of total calories while one can observe an increase in obesity rates. This means that the most appropiate model to be used is a model where the effect of such variables should allow different slopes for each country. Robustness test are perfomed by using a pesudo-panel approach which allows to capture the dynamics of obesity.

New Methods for Economic Evaluation of Early Childhood Obesity Prevention – the EPOCH Model.

PRESENTER: **Alison Hayes**, University of Sydney
AUTHORS: Dr. Eng Joo Tan, Dr. Thomas Lung, Vicki Brown, Marjory Moodie, Louise Baur

BACKGROUND:

One of the challenges in economic evaluation of obesity prevention in early childhood is predicting costs and outcomes over a policy relevant time-frame. Existing studies pertain to economic evaluations alongside randomized trials, with a short (generally less than 5 years) time horizon or modelled economic evaluations that mostly take a lifetime horizon and account only for adverse events, costs and quality of life outcomes in adulthood.

OBJECTIVE

To develop a model for cost-effectiveness and cost-utility of early childhood obesity prevention and treatment, that considers a policy relevant time-frame and hence accounts for health outcomes and direct healthcare costs during childhood and adolescence.

DATA AND METHODS:

We use individual–level (micro-simulation) modelling to project BMI, prevalence of overweight and obesity, QALYs and direct healthcare costs from early childhood to adolescence (4 to 15 years). The modeling of BMI trajectories is informed by Australian population representative data on children, the Longitudinal Study of Australian Children (LSAC). The model also incorporates data from systematic reviews and other published literature relating to the association of quality of life and direct health care costs with weight status. The EPOCH model has been designed as a 'multi-use' model and can project outcomes in terms of BMI/BMI-z units saved, or QALYs gained. In this presentation, we describe the model, present internal and external validation, and demonstrate use of the model for cost-utility and cost-effectiveness analysis. Examples will be given of running on individual level data from early intervention trials (using outcome data at 4 years), and running on population level Australian data, onto which intervention effects are overlaid through effects on BMI. We also demonstrate examples of modelling multiple interventions during childhood, and modelling highly targeted interventions.

RESULTS AND CONCLUSIONS:

The model showed good validation over a 10-year period. Projection of BMI throughout childhood and adolescence corresponded well to observed national data, giving confidence in model projections For example, starting with an input population of 4 and 5 year-olds from LSAC, simulated mean BMI at age 14/15 years was 22.4 kg/m^2 (95% CI 22.2 – 22.5) compared with 22.2 kg/m^2 units (95% CI 22.0 –22.3) observed in survey data. The model also projects the increasing right skew in the distribution of body mass index (BMI) in the modelled populations, and prevalence of weight status consistent with observed data. It is hoped the EPOCH model will be able to compare obesity interventions or combinations of interventions during childhood and will be useful for priority setting. The strengths of the model are: it is conceptually simple, has been validated prior to using for economic evaluation, and has simple requirements to run using trial data (age, sex, BMI and socio-economic status). Additionally, it accounts for individual heterogeneity and the full population distribution of body mass index (BMI) in the modelled populations, and as such, predicted outcomes are not restricted to healthy, overweight and obese categories. A

disadvantage is that the model is implemented in STATA and hence is more demanding in terms of software/coding skills than some other modelling platforms.

Heterogenous Peer Eects in Body Weight, Physical Activity and Dietary Choices: Does Type of Peers Matter?

PRESENTER: **Ivan Tzintzun**

This article explores peer eect heterogeneity in adolescent adjusted Body Mass Index (BMI), physical activity and dietary choices. In particular, this paper makes an original contribution by studying peers heterogenous effects based on friendship intensity. Adolescents ar assumed to interact through a social network, where they have strong and weak friendships.

To identify both types, I use Add-Health's wave II friendship roster questionnaire to calculate a friendship score for every friend listed by each student in the sample: friends with a high score were defined as part of the strong friendship network and the rest were placed in the weak friendship network. It is expected that strong friendships have a greater eect on individuals' observed outcomes. This article uses identification conditions discussed in Liu and Lee [2010] and Dieye et al. [2017], thus 2SLS and GMM strategies were used to estimate the econometric model.

Preliminary results provide evidence that supports the heterogenous peer effect hypothesis: strong friendships endogenous effects dominate on adjusted body mass index.

From an empirical perspective, this paper offers two main contributions: 1) It discusses the social mechanisms behind the endogenous effects. In concrete, this paper explore the role of effort, in the form of physical activity and dietary choices which affect directly BMI. Consistent with the previous results, physical activity and dietary choices are mainly affected by close friendships. 2) The paper uses three new control variables, such as diet quality, personal traits (impulsivity index) and a diet quality index. Such variables affect first stage results by increasing the strength of instruments.

Different robustness test are performed: 1) I assume different friendship score threshold values to define strong and weak friendships; 2) We test endogenous effects in directed and undirected networks; 3) Lastly, I use BMI from wave 4 to test the long-run effect of friendship. Following this approach offers the opportunity to control for contemporaneous reverse causality and, more importantly, it allows to test whether the 'quality' of a given friend has long-term implications. Lastly, we test for local aggregate or local average model.

8:30 AM –10:00 AM WEDNESDAY [Supply Of Health Services]

Universität Basel | Kollegienhaus – Hörsaal 102

Organized Session: Effective Coverage in Health: Measurement and Incentives to Improve It

SESSION CHAIR: **Jeffery Tanner**, The World Bank

The Availability of Quality Medical Care in Sub-Saharan Africa: A Cross-Sectional in-Person Vignette Study with 10,230 Health Care Providers in 9 Countries

PRESENTER: **Benjamin Daniels**

AUTHORS: Anna Konstantinova, Waly Wane, Christophe Rockmore, Matthew Collin, Jishnu Das

The World Health Organization defines a “critical shortage” of health workers as fewer than 2.28 health workers per 1,000 population — a standard that many African countries fall short of (Willcox et al. 2015). However, even if providers are *available*, there is no guarantee that their medical knowledge is sufficient to provide competent primary care. If that is the case, the true shortage of qualified health workers may be much worse than thought. Using the World Bank’s Service Delivery Initiative, we have assembled a new dataset of 10,230 healthcare providers, whose knowledge was assessed using medical vignettes through in-person visits in 5,158 facilities across 9 Sub-Saharan African countries.

We first confirm that these medical vignettes can be used to construct a measure of provider competence that is comparable across countries and predictive of providers’ clinical management decisions. Then, we present a “discount measure” of care availability accounting for clinical competence. Our estimate of the true availability of medically competent health workers is 59% of the number of practicing providers in Kenya (the highest in these countries) and 1% in Niger (the lowest).

We then draw three substantial conclusions about the medical knowledge of providers in Sub-Saharan Africa. First, there is massive variation in medical knowledge both within and across all countries. For example, 57% of doctors in Kenya are less medically competent than the top 25% of Kenyan *nurses*; so are 97% of the doctors in Madagascar. Therefore, in this context, qualifications alone do not necessarily imply a comparable level of medical competence, especially across countries. Second, we show that doctors are not becoming substantially more medically competent over time; the observed age range (from 20 to 60) suggests little progress in the quality of medical education over the last 40 years. Third, differences between rural and urban or public and private providers tend to be small, but vary by country. In Mozambique, for example, rural providers diagnose 51% of conditions correctly while urban providers diagnose 53% of the conditions correctly; in Tanzania, with the largest gap, urban providers are correct in 69% of cases while rural providers are correct in 59% of cases.

Overall, there is a broad need to improve the medical care available in these contexts, and the vignettes data suggests that improvements to the quality of medical education is a critically needed component.

Linking Coverage and Quality Data to Estimate Effective Coverage: Piecing Together the Evidence from Multiple Sources

PRESENTER: **Damien de Walque**, The World Bank
AUTHORS: Adam Wagstaff, Sven Neelsen

While many continue to argue that under-utilization of health services is the obstacle to better health outcomes in the developing world, others argue that the real obstacle is the low quality of health service in low- and middle-income countries. This presentation uses the concept of effective coverage (EC) to bring these viewpoints together on a metric that captures both concerns. It argues that EC can be computed as the product of (a) coverage (the percentage of individuals with a specific medical need who receive care) and (b) quality (the percentage of these individuals who receive the intervention(s) that produce the maximum feasible health improvement). If we have data on (a) and (b), we can plot (rectangular hyperbola) iso-EC curves showing combinations of (a) and (b) producing the same EC rate. We can then see, for specific countries, years and medical conditions, how large coverage, quality and EC are, and whether the obstacle to better health (i.e. better EC) is low coverage or low quality of care.

The presentation will put use this framework to empirically explore the issue. Coverage data for many indicators – especially those relating to maternal and child health (MCH) – are available, for the population as a whole as well as for different wealth quintiles, from the World Bank's recently released Health Equity and Financial Protection Indicators (HEFPI) dataset. To get empirically at quality, the presentation will draw on a parallel effort to assemble data on health service quality from several sources, including from efforts by the authors and their colleagues at the World Bank. These exercises include supply-side exercises involving vignettes, standardized patients, direct observation and exit interviews, as well as demand-side exercises involving the ex post analysis of household survey data on health service quality. For some countries, years and medical conditions, we end up with multiple estimates of quality, as multiple estimation methods have been (or can be) used to get at quality. By piecing together quality data from different sources, we can also accumulate more evidence on the so-called 'know-do' gap – the tendency for providers to promise in a vignette to do more than they actually do in practice in a standardized patient encounter.

Preliminary results suggest countries vary in whether the bottleneck to higher EC is low-coverage or low-quality. They also suggest some interesting results may emerge on the know-do gap.

Systematic Review and Meta-Analysis of Impacts of Supply- and Demand-Side Financial Incentives in Health in Low- and Middle-Income Countries

PRESENTER: **Sven Neelsen**, The World Bank
AUTHORS: Damien de Walque, Jed Friedman, Adam Wagstaff

Much of the world is in the midst of a push away from paying health providers through low-powered incentives like salaries and budgets to higher-powered incentives involving a mix of salaries / budgets and bonuses linked to performance. Performance-based financing (PBF) features prominently on the agenda of many donors, and some low and middle income countries are undertaking PBF reforms without donor support. The push toward PBF has proceeded apace despite the relative lack of hard evidence on its impacts, in particular in comparison with other, demand-side health financing interventions.

To address this knowledge gap, we carried out a systematic review of the impacts of PBF and of four demand-side health financing interventions – conditional cash transfers, health insurance and health voucher schemes, and user fee removal policies – on maternal and child health service utilization and health outcomes in low and middle income countries. The eligible evidence comes from either randomized controlled trials, or regression discontinuity, instrumental variables, or double difference designs, and the review is the first to use meta-analysis techniques to compare PBF effects with those of demand side health financing interventions. After an updated literature search in September 2018, the meta-analysis we present in this session comprises 53 publications and effect sizes for 13 maternal and child health outcomes.

Preliminary results indicate that demand-side interventions have larger impacts on indicators of MCH services uptake such as the number of antenatal care visits, child immunizations, and the use of modern family planning methods, while PBF performs better for indicators which are more sensitive to provider effort, such as maternal tetanus vaccination during antenatal care visits. As such, our early findings may suggest that improvements in the effective coverage of MCH services are best achieved by a combination of supply and demand side incentives.

Integrating Performance Based Financing in Public Financial Management

PRESENTER: **Ellen Van de Poel**, The World Bank

Performance Based Financing schemes have the potential to strengthen governments' capacity to strategically purchase a package of -mostly primary health care- services and increase efficiency of health care spending. Moving from donor-financed PBF schemes to mechanisms that are integrated in the government's purchasing function and budget has appeared challenging. In only a few countries such as Burundi and Zimbabwe, PBF pilots have been taken to scale and are financed from domestic resources. Even in settings where rigorous impact evaluations show positive results sustainability has been an issue. Key bottlenecks for taking PBF to scale go beyond the lack of sufficient resources and

are often related to public financial management (PFM): input-based budgeting system combined with lack of financial management autonomy/capacity at decentralized level complicate the scale up of PBF and integration into the government budget. This paper aims to identify (i) to which extent health financing systems in countries with PBF schemes/pilots are 'ready' to integrate the fee-for-service schedule that is implied by PBF, (ii) which PFM reforms are needed to ensure that PBF can be integrated in the domestic budget and (iii) how donors can better support such PFM reforms. Data is used from PFM assessments in a selected set of sub Saharan African countries that are experimenting with PBF at various scale. The findings are then used to draw concrete policy recommendations – both to improve the design of PBF pilot schemes and to take existing pilots to scale.

8:30 AM –10:00 AM WEDNESDAY [Supply Of Health Services]

Universität Basel | Kollegienhaus – Seminarraum 103

Hospital Quality and Performance

SESSION CHAIR: **Lucy Xiaolu Wang**, Cornell University

Hospital Quality, Ownership, and Competition: Evidence from the Hospital Readmissions Reduction Program

PRESENTER: **Kevin Staub**

AUTHORS: Dr. Johannes Sebastian Kunz, Carol Propper, Rainer Winkelmann

Hospital readmissions have been identified as a major driver of health care costs. If patients are discharged too early after hospitalisation, readmission rates will be higher than would otherwise be the case. For the US, the aggregate costs of "excessive" readmissions have been estimated to be in the order of $1 billion per year. While socially costly, early discharges can be rational from the point of view of an individual hospital when reimbursements are based on diagnosis-related groups (DRG) rather than actual costs. The Affordable Care Act aimed to reduce this incentive for under-servicing by introducing several pay-for-performance measures, such as the Hospital Readmission Reduction Program, which imposed financial penalties on hospitals with high readmissions rates in some key health conditions. Using longitudinal data to assess this policy, we derive new measures of condition-specific hospital quality that adjust for secular time trends and covariate variation. The measures are extracted from linear fixed effects models of readmission rates and nonlinear models of penalty status.

The new quality measures make it possible to answer questions such as whether hospitals which are good at treating one condition (low readmission rates) are also good at treating other conditions; that is, whether or not there are returns to specialisation. We find that our condition-specific quality measures are highly correlated within hospitals; thus, it appears that there is an overall-management hospital quality rather than a department-specific quality. We then use the new measures to investigate how aggregate hospital characteristics drive differences in quality. In particular, our focus is on hospitals' for-profit vs not-for-profit status. Strikingly, we find that hospital quality is much lower in for-profit hospitals - i.e., net of covariate and trend differences, they have higher readmissions and are penalised at a higher rate than not-for-profit hospitals. It has been argued that competitive market settings can crowd out quality differences between firms, and we test this in the context of for-profit and not-for-profit hospitals. Our findings support this hypothesis, showing that the higher readmissions of for-profit hospitals are completely wiped out in high-competition regions. These findings are invariant to whether we use quality measures extracted from the penalty status or quality measures extracted from the underlying readmission rates. Thus, the for-profit/not-for-profit readmission rates gap in low competition regions is not generated by the definition of the policy. More generally, the similarity between the quality measures suggests that the policy worked well, without distorting incentives around the discontinuous penalty threshold.

Complementarities in Hospital Quality Provision

PRESENTER: **Ms. Ines Lee**, University of Oxford

Many healthcare policies aim to increase quality by incentivizing providers to improve health outcomes of patients. These policies often target patients in specific insurance groups. Since providers often treat various patients with different sources of insurance coverage, these insurance group-specific policies result in providers facing a mix of incentives. This paper examines whether asymmetric incentives across insurance groups have effects on targeted as well as non-targeted patients treated by the same provider.

To do so, I study the impacts of the Hospitals Readmissions Reduction Program (HRRP), a pay-for-performance scheme implemented under the Affordable Care Act. The HRRP aims to improve quality by financially penalizing hospitals with excess 30-day risk adjusted readmission rates among Traditional Medicare (TM) patients admitted for heart attack (AMI), heart failure (HF), or pneumonia (PN). Crucially, the hospital's performance measure depends only on the readmission outcomes of TM patients admitted for monitored conditions; the readmission outcomes of non-TM patients (e.g. privately insured) do not affect the performance measure. The design of this program creates asymmetric incentives across patient groups: the hospital's incentive to improve quality for a patient depends on their insurer, reason for admission, and date of admission (pre/post policy). Drawing on this variation, I estimate the impacts of this policy on TM and non-TM patients by using a matched difference-in-differences strategy. For each TM and non-TM patient admitted for a monitored diagnosis (AMI/HF/PN), I match them with an observably similar patient who has the same insurer and is treated at the same hospital, but is admitted for a non-monitored condition.

The results indicate that the policy had beneficial effects for targeted and non-targeted AMI patients, with readmission rates falling by over 2 percentage points (pp) and 1.2 pp for each group respectively. There are different effects across diagnoses: among HF and PN patients, the policy had negligible effects on TM patients and correspondingly no effect on non-TM patients. Furthermore, the reductions in readmissions

among targeted and non-targeted AMI patients are not driven by various forms of hospital gaming, such as increased use of observation/emergency services and delayed readmissions outside the 30-day window. The results therefore suggest that hospitals improved quality of care for both targeted and non-targeted AMI patients.

Next, I examine the mechanisms driving these results by developing a simple model of hospital behavior. The model suggests that hospitals will respond to asymmetric incentives by improving quality for non-targeted patients if there are cost complementarities in the provision of quality across patient groups so that the marginal cost of providing quality to non-targeted patients is decreasing in the quality provided to targeted patients. Using the variation created by this program, I estimate the parameters of this model including the degree of cost-complementarities in quality provision. The results indicate that the fall in readmission rates among non-TM patients are driven by private non-profit hospitals, where cost complementarities in quality provision exist. In comparison, there are no cost complementarities in quality of provision in other types of hospitals (e.g. governmental, other non-profits).

Hospital Financial Performance and Quality of Care: Evidence from Portugal

PRESENTER: **Iryna Sabat**, Universidade Nova de Lisboa
AUTHOR: Pedro Pita Barros

Objective: Following the economic crisis, Portuguese hospitals experienced severe budget cuts and had to implement cost-containment strategies. It is ambiguous whether such measures led to changes in quality of services they provided. This paper aims at investigating the relationship between hospital financial performance and quality of hospital care using panel data on Portuguese public hospitals for the period of 2007-2017. Moreover, the economic literature on the association between hospital finances and quality of care is very scarce, hence this study aims at filling the existing void in the European health setting.

Methodology: We construct a set of financial indicators reflecting profitability and indebtedness of hospitals using information from hospital monthly financial reports. We utilize hospital-level diagnosis-related group (DRG) data to construct quality of care measures, including overall and disease-specific mortality rates and readmissions, while distinguishing between typically high and low mortality DRGs. We then combine these data with local municipality level variables reflecting market characteristics and hospital-level variables accounting for the case-mix of patients to develop a model of potential determinants of hospital care quality. Additionally, we construct patient safety indicators as hospital acquired infections obtained from procedure codes in the DRG data and use them as dependent variables thereby seeking to answer whether hospital financial conditions may compromise patient safety. We adopt the partial adjustment mechanism accounting for lags in the response of quality to changing financial conditions and address potential endogeneity by employing two estimation methods: system GMM approach and fixed effects estimation. Moreover, we perform the analysis using different time setting to pinpoint how fast the response occurs.

Results: Preliminary results show that there is a positive relationship between hospital's financial condition and quality of services it provides. However, the significance and magnitude of the impact depend on specific financial and quality indicators used, which suggests that some measures may not be sensitive enough to reflect the impact. Moreover, the partial adjustment mechanism turned out to be justified indicating that quality of care takes time to respond to financial changes and therefore needs to be accounted for when investigating this relationship. Furthermore, certain hospital and patient characteristics seem to have a consistent pattern of effect on the quality of hospital care. Meanwhile, no significant impact of hospital finances on patient safety has been identified.

Discussion: The findings suggest that financial hardship experienced by public hospitals imposes limits on hospital's ability to invest in quality improving measures but does not seem to compromise patient safety. Nevertheless, further investigation is needed to understand exact mechanisms through which the impact occurs, as well as alternative quality of care and patient safety indicators should be used for sensitivity checks.

Noteworthy, this is the first research that utilizes continuous financial data rather than a policy change or event occurrence and addresses the relationship between hospital finances and quality of their services in a European setting. It has direct implications for policy and practice, especially given the recent change of Portuguese law allowing patients to choose hospital thereby enhancing quality competition among hospitals.

Moving Towards the Virtual Consultant: What Are the Benefits for Rural Hospitals in Queensland? Return on Investment Comparing Patient Travel, Telehealth, and Virtual Consultant Service Models.

PRESENTER: **Centaine Snoswell**, Centre for Health Services Research, The University of Queensland
AUTHOR: Liam J. Caffery

Introduction: Video-conferencing is a disruptive modality that challenges the traditional model of having a clinician or patient physically present for an appointment. The novelty is that it offers the opportunity to redesign service models. For instance a virtual consultation can provide video-conference consultations while being located anywhere in the world that has internet. A virtual consultant also obviates the issues of attracting a specialist medical workforce to rural areas, and allow the rural health service to control the specialist services that they offer.

Aim: To evaluate the return on investment (ROI) for rural and metropolitan sites for three service models; patient travel, telehealth and the proposed virtual consultant model

Method: Using activity data from an orthopaedic outpatient specialty service the ROI was calculated for a rural and the metropolitan health service to compare three different models of care. The three comparative service delivery models were; patient travel from rural to metropolitan, telehealth using video-conferencing to a rural site from a metropolitan one, and a virtual consultant employed by the rural site. Hospital administrators were consulted during the analysis process to ensure that the proposed models were viable.

Activity data was obtained for the financial years of 14-15, 15-16, and 16-17 from the hospital data repository. Clinic attendance information was used to calculate the costs and incomes for the rural and metropolitan sites for the three different service models.

Using the calculated cost and income per clinic it was is possible to calculate ROI and a break-even point (minimum number of patients required per clinic to cover the cost of service provision).

Results: During the 2014-15, 2015-16, and 2016-17 financial year 31, 82, and 82 orathapaedic clinics were conducted, with an average of 10-15 patients booked for each clinic. The failure-to-attend rates were 17%, 26%, and 28% respectively.

The analysis demonstrated that the only service model that resulted in a positive ROI for the rural site over the three year period was the virtual consultant model. ROI for the rural site was -100% for the patient travel model where they derived not income, -12.5% for the telehealth model, and 258% for the virtual consultant model. Whereas the ROI for the metropolitan site was 93% for patient travel and 625% for telehealth, as the metropolitan site is not involved in the virtual consultant model it incurs neither cost nor income.

Break-even points for the rural site were not applicable for the patient travel model as they derived no income, 12 patients for the telehealth model and 3 patients for the virtual consultant model.

Conculsion: The virtual consultant model provides an alternative by which rural and remote hospitals can gain the service specialties without having to entice specialists to relocate. The analysis showed that the rural site received maximum ROI in the vitual consultant model and optimise their break-even point to three patients per appointment, indicating that further investigations regarding implementation potential for the virtual consultant model is warrented.

8:30 AM –10:00 AM WEDNESDAY [Production Of Health, Health Behaviors & Policy Interventions]

Universität Basel | Kollegienhaus – Seminarraum 104

Hospitals and Providers

SESSION CHAIR: **Carlos Riumallo Herl**, Erasmus University Rotterdam

Patients' Empowerment, Hospital Reputation and Quality in France

PRESENTER: **Ms. Myriam Lescher**, LIRAES

Objectives: In 2013, the French National Health Authority (HAS) has created a public information portal (Scope Santé) broadcasting objective notes of quality of care for French patients to make informed choices in the current patients' empowerment context. In this paper, we assume that patients are however more prone to rely on subjective appraisals, as facilities' reputation, to make their hospital choice, at least before public information's broadcasting. This paper investigates the influence of hospital quality measures' diffusion, on (i) patients hospital choices' behavior and (ii) on the content of the reputational channel in particular.

Methods: We combine four datasets: (i) the French health, healthcare and insurance survey (ESPS 2012-2014) providing nationally representative data on individual health, insurance and socio-economic attributes, (ii) the Hospitals national information system database (PMSI, 2011-2014) which records the type of care delivered to the patient, (iii) the Annual hospital establishments statistics (SAE, 2011-2014) describing main production features and (iv) a unique dataset provided by the French National Health Authority (HAS, 2013-2016) where hospital quality and security is assessed by five measures (global certification, Hospital-acquired infections (HAI) prevention, pain assessment, medical record, links with external care). We use a Heckman model to correct for a sample selection bias due to the shape of our data.

Results: The public dissemination of healthcare facilities' quality did impact healthcare consumption behavior, accelerating patients' empowerment: in 2014, a greater proportion of patients had chosen their hospital alone, without their doctors or relatives. People relied on reputation for specific surgical care ; then choosing private, small hospitals. During both years, choosing an hospital because of its reputation was strongly and positively correlated with hospitals' certification score, i.e. a global index that may have been transmitted even before quality measures' broadcasting. In 2014, the "link between hospital and ambulatory care" variable - assessing the fact that the letter indented to patients' GP and reporting all the things that happened during hospitalization has correctly be quoted and transmitted - was positively and statistically significant.

Discussion: Those results may give some insights on a public policy perspective. It suggests that patients, increasingly involved in their healthcare decisions, may discriminate hospitals by their global quality when referring to subjective appraisals, even if they may also rely on other characteristics when choosing hospitals, as healthcare responsiveness features. If true, this should enhance hospital global quality on the healthcare market.

Experience and Confidence in New Health Technologies: Evidence from a Household Cohort Study in Western Kenya

PRESENTER: **Dr. Indrani Saran**, Boston College

AUTHORS: Judith Mangeni, Andrew Obala, Wendy O'Meara

In both high and low-income countries, underuse of effective health technologies, such as vaccinations, insecticide-treated bednets and sunscreen, leads to high levels of avertable morbidity and mortality. However, little is known about how people learn about the effectiveness of new health technologies. In this study we follow a cohort of 38 households (268 individuals) in Western Kenya over 13 months to study how their subjective beliefs about a relatively new technology (malaria rapid diagnostic tests-mRDTs) change as they use the tool over multiple illness episodes. mRDTs use a drop of blood to provide a very accurate malaria diagnosis in 15 minutes. Although they have been widely available in Kenya since 2014, both health workers and patients often do not comply with the test result and continue to treat mRDT-negative patients for malaria, thus potentially delaying appropriate treatment for the illness. We conducted a baseline survey in 2017 with all enrolled households to collect demographic information, as well as monthly follow-up surveys to ask about malaria-like illnesses experienced by household members in the past month, their treatment decisions, including whether the individual was tested for malaria, and their beliefs about the accuracy of malaria testing. Beliefs were elicited on a 5-point Likert scale from “very unlikely” to “very likely.” At the beginning of the survey period, confidence in a malaria negative test result was relatively low- only 56% of people said a negative mRDT result for a hypothetical febrile illness was “very likely” to be correct. However, we find that, controlling for their baseline confidence in a negative mRDT, people who were ever tested for malaria during the survey period were 16 percentage points more likely to believe that a negative mRDT was “very likely” correct at the end of the 13-month survey period than those who had a malaria-like illness but were never tested (95% CI [0.01 0.32], P=0.042). To account for possible confounders, we included a fixed effect for each individual and found that being tested for malaria in the previous month was associated with an 11 percentage point higher probability of saying that a hypothetical negative mRDT was very likely to be correct (95% CI [-0.03 0.25], P=0.137). We also find that people’s confidence in testing is associated with their compliance with the test result: those who believed that a negative mRDT result was “very likely” correct in a prior monthly survey were approximately 21 percentage points more likely to comply with a negative test result than those who were less confident in a negative test result (95% CI [0.04 0.38], P=0.017). Our results suggest that greater experience with a new health technology can not only increase people’s confidence in its effectiveness but also lead to positive health behaviors.

Positive and Negative Incentives As Predictors of Provider Effort: Evidence from a Facility-Level Study in Lebanon

PRESENTER: **Zeina A Siam**

AUTHOR: Melani Cammett

Introduction. High-quality service delivery in primary healthcare (PHC) is of increasing importance with the rising incidence of chronic diseases. Sub-optimal provider effort remains a key challenge in promoting high quality PHC in developing countries. Even in the presence of accessible care, low provider effort promotes under-utilization of PHC, bypassing it, and consequently poorer health outcomes.

One suggested pathway for better provider effort is through incentives. There is mixed evidence on the effectiveness of reward-based incentives on provider effort such as pay-for-performance. In contrast, very little is known about the effectiveness of penalty-based incentives, particularly in the context of improving the effort of PHC providers in developing countries. This paper fills this gap in the literature by studying the effectiveness of reward and penalty mechanisms in predicting provider effort in PHC facilities in Lebanon, a country with a high need for effective primary care provision as a result of its aging population and the influx of Syrian refugees.

METHODS. Data were collected from 69 PHC facilities across Lebanon. Data included interviews with facilities' chief medical officers (CMO) and 220 providers, as well as direct observation of provider behavior with 1,575 patients. Use of reward- and penalty-mechanisms at the facility level were the primary independent variables of interest. Dependent variables included two dimensions of provider effort: technical quality – quantified as the number of routine examinations performed from the clinical guidelines; and interpersonal quality of care – quantified as the time spent with and number of questions asked to a patient. The relationship between the independent and dependent variables were analyzed using three-stage, multilevel Poisson models.

RESULTS. Around 68% and 61% of facilities implemented penalties and rewards respectively. Relative to not implementing either penalties or rewards, implementing penalties was associated with a 29% increase in the number of routine examinations performed (p=0.01). This association was driven primarily by the implementation of financial penalties; other penalties, such as contract suspension or termination, and negative evaluations were not significant predictors.

Implementing reward-based incentives were not associated with number of routine examinations; however, they were associated with more time spent with a patient (IRR=1.24, p=0.03) and more questions asked by provider (IRR=1.23, p=0.03). Financial rewards were significantly associated with both outcomes, but social recognition-based rewards were not. Penalty-based mechanisms did not significantly predict either outcome.

DISCUSSION. Penalty- and reward-based incentives have the potential to complement each other in improving provider effort. Our results suggest that penalties could promote higher compliance with clinical guidelines while rewards could enhance interpersonal interactions between providers and patients. The analysis has several advantages, including exploring both forms of incentives at the PHC level, in a Middle Eastern country for the first time. Results are robust to several sensitivity analyses we conduct. Some limitations are the use of self-

reported variables, and the non-representative nature of our sample. Future steps include using qualitative assessments to identify the potential mechanisms through which rewards and penalties work, and exploring the question in a causal form.

Surgeons' and Patients' Preferences for Undertaking Knee Replacement Surgery: Evidence from a Discrete Choice Experiment

PRESENTER: **Dr. Jinhu Li**, Deakin University
AUTHORS: Sandie Szawlowski, Anthony Scott, Peter Choong, Elizabeth Nelson, Mandana Nikpour, Vijaya Sundararajan, Michelle Dowsey

Background

Shared decision-making in undertaking medical procedures is widely recognized as an important component of providing patient-centred healthcare. This is to ensure that patients are fully informed and receive treatment options that reflect their personal preferences. If not, then sub-optimal decisions will be made that adversely impact on patient's health outcomes and cost. Evidence from previous choice experiments show that doctors' and patients' preferences and trade-offs are often different, but these have largely focused on the characteristics of care processes rather than health outcomes and risks. Evidence is needed to highlight those areas where preferences diverge, and interventions designed to reduce these differences. We study this research question in the context of total knee arthroplasty (TKA), which is one of the highest volume medical interventions globally, and where dissatisfaction with health outcomes is relatively high.

Objective

This research elicits patients' preferences on the acceptable level of post-operative risk of complications and improvements in pain and function after TKA, how these are traded-off, and how closely these preferences align with their treating clinicians'.

Methods

A discrete choice experiment (DCE) is used on a sample of patients, and repeated on a national sample of orthopaedic surgeons in Australia. The final DCE includes 12 choice scenarios from an experimental design, blocked into two versions. Each DCE scenario contains six attributes, each with three levels. The attributes are day-time and night-time pain, physical function in standing/walking, physical function in other movements, the risk of complications leading to re-admission, and the risk of complications leading to a visits to their GP. Levels for all attributes were derived from actual data on risk and outcomes approximately one year after surgery. Questionnaires were administered to patients before surgery.

Data for patients and surgeons are pooled and analysed using a mixed logit model that can account for unobservable preference heterogeneity by including random coefficients. These random coefficients capture how preferences for each attribute will vary over individuals. We also examine variation in preferences and trade-offs according to surgeon-specific and patient-specific characteristics, including risk attitudes, personality and other characteristics. The marginal rate of substitution (trade-offs) is calculated between one of the risk attributes and the pain and function attributes.

Results

Preliminary analysis has been conducted on 362 surgeons and 240 patients undergoing TKA. Preliminary results based on this data indicate that the marginal utilities for specific attributes are statistically significantly different between surgeons and patients. Surgeons value improvement in day-time pain and night-time pain more than patients. This is reflected in the marginal rates of substitution. For example, surgeons were willing to accept up to a 40% level of risk of complications leading to re-admission, in return for the elimination of severe night-time pain, whereas for patients this maximum acceptable risk is 30%. On the other hand, patients value improvement in moving function more than surgeons. Our study can contribute to the literature on shared decision-making in healthcare, and inform how to better align patients' and surgeons' expectations in undertaking medical procedures.

8:30 AM –10:00 AM WEDNESDAY [Demand & Utilization Of Health Services]

Universität Basel | Kollegienhaus – Seminarraum 105

Child and Maternal Healthcare

SESSION CHAIR: **Neha Batura**, University College London

Assessing the Impact of Indonesia's National Health Insurance on Maternal Health Care Utilization & Expenditures

PRESENTER: **Tiara Wariana Marthias**, Nossal Institute for Global Health, University of Melbourne
AUTHORS: Michael Palmer, Natalie Carvalho, Barbara McPake

Background: In January 2014, Indonesia started the largest single-pool national health insurance as part of its Universal Health Coverage program, aiming to cover all Indonesian population by 2019. The insurance program prioritizes coverage for poor and near-poor populations, with the objective of improving health care utilization and reducing out-of-pocket payments. Little is currently understood about the impact

of Indonesia's new national health insurance program on dual universal coverage goals, and how the impact of the program varies across the population. In this study we investigate the impact of the program on adult and child health care utilization.

Methods: Using three waves of the longitudinal Indonesian Family Life Survey (2000, 2007 and 2014) and a difference-in-difference approach, this study assesses impact of the insurance program on outpatient and inpatient health services and out of pocket spending. To the extent that significant inequalities exist in health care utilization outcomes across geographic regions and socio-economic characteristics of the population, the study will examine the heterogeneity of insurance effects across the population (poor versus non-poor, informal versus informal sector workers) and geographic regions. Descriptive statistics is used to present the difference in means of health care utilization (dependent variable) and socio-economic characteristics (independent variables) of the pooled panel sample in total and by insurance status. Regression analysis using panel techniques of random and fixed effects and the difference-in-difference is used to present national level results as well as across sub-samples as determined by personal and geographical characteristics.

Results: Increased insurance coverage was observed at the national and sub-national levels. Outpatient care utilization also increased, with no significant difference between well-developed regions and resource-limited regions in Indonesia. However, there is a decrease in inpatient utilization at the national level. The difference-in-difference analysis shows that there is a significant positive difference for outpatient utilization between those insured after the national health insurance implementation with those without insurance coverage. Higher percentage points for the poor and near-poor population in the sample imply that the insurance program has result in greater increase in the level of utilization among this group of population. However, based on geographical grouping, population living in resource-limited areas such as the Eastern Indonesia, experienced negative percentage points compared to well-developed region of Java-Bali. Poor population living in well-developed region of Sumatera experienced greater changes in outpatient utilization after the implementation of the insurance program, while those living in Eastern Indonesia had no significant changes. There was a decrease in inpatient care utilization across the country after the program implementation with those living in resource-poor setting experiencing greater decrease compared to well-developed region in Indonesia.

Discussion/Conclusions: Geographical inequality in health care utilization has increased after the implementation of the national health insurance program, particularly in areas with limited health resource. Policy design should reconsider and target the health systems preparedness in disadvantaged areas and revisit the design of the national health insurance program. Several initiative such as compensation fund that would allow disadvantaged areas to catch-up their service readiness, should be fully implemented.

Budget Allocation at the Commissioning Level: Does Child Mental Health Lose out?

PRESENTER: **Apostolos Tsiachristas Tsia**, University of Oxford
AUTHORS: Mr. Stephen Rocks, Mina Fazel

Background: Mental health conditions impose a significant burden on society and on individuals. Although the onset of a majority of lifetime mental health conditions occurs by adolescence, investment in child and adolescent mental health services appears a low priority in many health systems.

Aims of the Study: The aim of this paper was to investigate whether clinical commissioning groups in England give lower priority to spend on child and adolescent mental health than other areas of care.

Methods: Publically available data from NHS England and Public Health England were used in Generalised Linear Models to investigate the association between the rate of child and young person mental health spend and demand for adult mental health and for physical health, after adjusting for demand for child and adolescent mental health services and confounders including deprivation. To improve model fit, we used backward elimination to specify the model structure, performed the Modified Park Test and link test to select distribution family and link respectively, and consulted AICs and BICs.

Results: The rate of spend on child and young person mental health was negatively associated with the rate of physical health spend (0.89; CI95%: 0.83-0.96), meaning a £100 increase in spend on physical health is associated with an 11% fall in spend on child and young person mental health per person. By contrast, the rate of spend on adult mental health (1.02; 1.00, 1.03) and the rate of children in care (1.03; 1.00, 1.07) were positively associated. The results are robust to various sensitivity analyses.

Discussion and Limitations: Our analysis provides support for the hypothesis that child and young person mental health spend loses out to physical health conditions in local budget allocation decisions in England. Possible reasons include a tendency to allocate scarce resources towards immediate needs, the low quality of data relating to young person mental health, and low levels of awareness among commissioners. Limitations of this paper include available data, which highlights the need for additional and more timely data on local allocation decisions.

Implications for Health Policies: Local commissioners in England should consider whether decision making disadvantages child and young person mental health. To overcome this, commissioners need better evidence and a commissioning process that is more transparent, otherwise it may be necessary to ring-fence funds or to revise the formula for setting local budgets.

Implications for Further Research: More research is needed to understand and inform the local commissioning process. This analysis could be repeated in other countries with a similar structure of devolved budget allocation decisions.

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of the NHS, the NIHR or the Department of Health and Social Care.

Inequality in Quality? Correcting Inequality in Antenatal Care Visits for Quality in India

PRESENTER: **Dr. Leander R. Buisman**, Erasmus University Rotterdam
AUTHORS: Igna Bonfrer, Dr. Eddy Van Doorslaer

Background: Antenatal care (ANC) utilization shows a pro-rich gradient in most low- and middle-income countries (LMICs). While the degree of pro-rich inequality in ANC has been falling in most LMICs, it is unlikely that the quality of care received is equal across income groups. We examine whether degree and trends in socioeconomic inequality are different after correcting for the quality of ANC visits in India.

Methods: We use data from the two most recent Demographic Health Surveys (DHS) for India (2005 and 2015) containing information on determinants of ANC and the quality of such care. ANC is defined as the proportion of mothers aged 15 to 49 with a live birth in the past 5 years who reported at least 1 ANC visit during their most recent pregnancy from any provider. Quality ANC measures the proportion for ANC visits for the same mothers in which also the following three WHO recommended activities were reported: (i) blood pressure was measured, (ii) a blood sample was taken, and (iii) a urine sample was taken. We first measure the difference in inequality, measured using the Erreygers Concentration Index, before and after correcting for the quality of the ANC visit. We then use a decomposition analysis to establish the extent to which various potential determinants are associated with the difference in ANC coverage after correcting for quality. We also compare trends in the difference in socioeconomic inequality in ANC coverage when correcting for quality between 2005 and 2015.

Results: In India, quality ANC is 37 and 15 percentage points lower than uncorrected ANC in 2005 and 2015, respectively. In both years, the pro-rich inequality in quality ANC is (much) larger than in uncorrected ANC use. While both ANC and quality ANC increase over time with 6 and 28 percentage points, socioeconomic inequality in both is found to decrease over time, but remains pro-rich, and far more pro-rich in quality ANC. The decomposition analysis shows that, while there is a large contribution of household wealth to inequality in ANC in both years, after correcting ANC for quality, the contribution of wealth is three-fold greater in 2005 and two-fold greater in 2015. These larger contributions of wealth are primarily driven by the larger elasticities of the wealth quintiles. This implies that household wealth increases the probability of receiving ANC that meets the quality standard even more than the probability of receiving any ANC.

Conclusions: Pro-rich inequality in ANC severely underestimates the pro-rich inequality in quality-corrected use of ANC in India. And while inequality in both has fallen in India in the decade between 2005 and 2015, mainly because the use of quality ANC has improved for poorer socioeconomic groups, it remains very pro-rich. This evidence suggests that specific maternity programs targeted at the poor may be required to reduce inequalities in quality ANC services.

Worried about Children: Multi-Level Modelling of Supplier-Induced Demand for Urgent After-Hours Care

PRESENTER: **Kees van Gool**, CHERE, UTS
AUTHORS: Thomas Longden, Jane Hall

In Australia, there has been notable supplier-induced demand due to businesses entering the market to capitalise on higher Government remuneration for the provision of urgent after-hours services (Longden et. al 2018) . Rather than being a response to a decrease in income, this was a case of businesses positioning themselves to profit from more lucrative remuneration for urgent medical need, which is difficult to monitor and audit retrospectively. This remuneration is set by the Australian Government via the Medicare Benefits Schedule (MBS) and captures all of the services funded by Medicare, Australia's publicly funded system for medical services.

The MBS Review Taskforce noted that "many urgent after-hours services are claimed for matters which are not urgent and could be better and more cost-effectively dealt with by the patient's usual GP [i.e. General Practitioner] during normal business hours" (MBS Review Taskforce, 2017). This has raised questions about the management of Medical Deputising Services and whether their behaviour has changed over time.

In this paper, we use a multi-level difference-in-difference (DID) approach to estimate the amount of unwarranted (i.e. non-urgent) demand for urgent after-hours attendances by region and age group. The inclusion of these levels is important as the businesses that have entered the market have targeted a lot of their marketing material to parents who are concerned about their child's health. In addition, the level of infiltration across regions has also varied.

We focus on the period between January 2011 and July 2016 as it captures the establishment/expansion of several corporate entities after 2014. We estimate unwarranted demand by comparing the number of urgent GP attendances that occurred during different times of the day. We use the classification within the MBS that distinguishes between 'after-hours' (e.g. 6pm-11pm Monday to Friday) and 'unsociable-hours' (e.g. 11pm-7am Monday to Friday). Supplier induced demand is likely between 6pm and 11pm as people with a non-urgent health issue are likely to find a GP visit with no out of pocket cost convenient; however, after 11pm it is unlikely that a GP visit will be demanded unless it is related to an urgent health issue.

Note that in a previous study, we estimated aggregate induced demand by region. But we did not estimate induced demand by age group. As this paper shows, the age of patients was a major underlying factor in the inducement of this demand.

We propose that the Australian Government considers the creation of separate MBS items that differ based on: 1) whether they are for an urgent needs assessment or urgent treatment, 2) the time of the day that the service took place (i.e. it should have greater divisions for normal in-hours [9am-6pm], after-hours [6pm-9pm], late-hours [9pm-11pm] and unsocialable hours [11pm-9am]), and 3) whether the patient was under the age of 15 years. This will give primary care professionals more flexibility when conducting after-hours house-call triage decisions (either on the phone or at the home) and allow the Australian Government to compare the use of these items across multiple dimensions for each provider.

8:30 AM –10:00 AM WEDNESDAY [Specific Populations]

Universität Basel | Kollegienhaus – Seminarraum 106

Impact of Difficult Life Experiences on Wellbeing

SESSION CHAIR: **Aurélia Lépine**, London School of Hygiene and Tropical Medicine, Global Health and Development department

Burden and Preference-Based Quality of Life Associated with Bullying

PRESENTER: **Dr. Long Khanh-Dao Le**, Deakin University

AUTHORS: Mary Lou Chatterton, Ron Rapee, Sally Fitzpatrick, Kay Bussey, Jennie Hudson, Caroline Hunt, Donna Cross, Anne Magnus, Cathy Mihalopoulos

Background / Justification

The Quality-adjusted life year (QALY) is a single index that reflects morbidity and mortality outcomes in health by weighting life-years lived with preference-based quality of life scores (also called utility scores). It thus can quantify the overall burden of disease. Few studies have evaluated the association between bullying and utility scores for both children and their parents. This knowledge will be useful to enhance cost-effectiveness evidence for interventions designed to prevent bullying.

Aims

This analysis aimed to evaluate both children's and parents' utility scores among victims and perpetrators of bullying compared to children non-involved in bullying (excluding both victims and perpetrators) in Australia. This study will also assess the burden of disease due to bullying by estimating the QALY loss.

Method

The study used data collected from a randomised controlled trial (PAVe trial) evaluating the effectiveness of whole school and/or targeted interventions compared to usual practice in preventing bullying at school. Participants were a cohort of year 3-4 students (age 8-10 years – n=8,216) from 135 primary schools in Australia. Utility scores were measured for children with the CHU9D and for parents with the AQoL-8D at baseline, one-year follow up and two-year follow up. The Revised Olweus Bully / Victim Questionnaire was used to assess bullying victimisation and perpetrator. QALYs were calculated at each time point and reported according to children's bullying level: victim and/or perpetrator at one-time point only, two-time points, or all three time points. We estimated QALY loss due to all levels of bullying as the difference between victim and/or perpetrator and non-victims. Multiple regression analyses were conducted to adjust for individual-level background variables.

Results

Preliminary results showed that mean child utility scores at baseline were 0.60 and 0.76 for victims and those non-involved in bullying, respectively. The difference of 0.16 points was statistically significant ($p<0.001$ both adjusted and non-adjusted analysis). For bullying perpetrators, significantly lower utility scores of children were found in the non-adjusted analysis compared to those non-involved in bullying (0.67 vs. 0.76, $p<0.001$). Parents who had a child that was a victim or perpetrator of bullying had significantly lower utility scores compared to those who had a child non-involved in bullying (0.78 vs. 0.81, $p<0.001$).

There was an incremental decrease in QALYs with an increasing frequency of bullying. Specifically, the mean QALYs for children being bullied once, twice and three-times were 1.40, 1.21 and 1.11, respectively. Compared to non-victims of bullying, children that were victims and/or perpetrators of bullying at all time-points had fewer QALYs (1.57 vs. 1.11, Diff = 0.46), or a 30% loss.

Implications

This is the first study to show that bullying has a significant burden of disease due to bullying. Being bullied significantly affected preference-based quality of life for both children and their parents.

The Lasting Consequences of Childhood Sexual Abuse on Human Capital

PRESENTER: **Laura E. Henkhaus**, University of Southern California

Background: Childhood sexual abuse is a public health crisis. Meta-analyses collectively covering all continents show that childhood sexual abuse is a worldwide problem and suggest that the global prevalence is 15 to 20 percent among females and 8 percent among males. Meanwhile, scientists posit neurobiological mechanisms explaining effects of chronic childhood stress on physiological systems and cognitive development. While childhood sexual abuse directly impacts a great number of people, we know little about the causal impacts on survivors beyond the immediate trauma. A main barrier to research in this area has been a lack of longitudinal, individual-level data identifying survivors of sexual abuse and difficulty overcoming contamination from selection. Here, I examine whether there are durable effects of childhood sexual abuse on human capital—a largely neglected area of well-being of survivors of sexual trauma.

Data and methods: I use the National Longitudinal Study of Adolescent to Adult Health (Add Health), which followed a nationally representative sample of about 15,000 individuals from middle school through adulthood. Add Health includes self-interview questions on contact sexual abuse in childhood along with a rich set of information on childhood socioeconomic status, neighborhood factors, and school identifiers. To study the effects of childhood sexual abuse on education and labor market outcomes, I employ fixed effects strategies, implement partial identification methods for bounding treatment effects, and conduct direct tests of selection. I present main results from school fixed effects regression and from bounding methods developed by Oster (2017), Altonji, Elder, and Taber (2002) to examine robustness of results to varying assumptions about remaining selection on unobservables, using information on selection on observables. In ancillary analyses, I conduct sibling conditional fixed effect regression. I also test whether there were pre-existing difference in cognitive ability, using scores from a picture vocabulary test.

Results: In this nationally representative US sample, 21 percent of women and 8 percent of men noted history of contact sexual abuse in childhood. Results from the bounding exercise indicate that childhood sexual abuse causes 7 to 9 percent lower likelihood of high school diploma receipt, 20 to 28 percent lower likelihood of college degree attainment, 4 to 8 percent lower likelihood of full-time employment, and 11 to 18 percent lower earnings. Sibling fixed effects estimates fall within these bounds. Results suggest that the effect of childhood sexual abuse on likelihood of college degree attainment is smaller for Hispanics and Blacks than for Whites. I detect no pre-existing differences in cognitive ability across those who did not experience childhood sexual abuse and those who later reported childhood sexual abuse.

Conclusions and policy impact: Childhood sexual abuse causes lower educational attainment and worse labor market outcomes in adulthood. This study has important implications for public health and public policy, highlighting the importance of prevention of childhood sexual abuse as well as detection and quality treatment of trauma symptoms. In particular, results suggest that only treating the mental health symptoms of survivors of childhood sexual abuse is not enough to reduce disparities in well-being.

The Effect of Leaving Sex Work on Well-Being: A Causal Mediation Analysis

PRESENTER: **Ms. Carole Treibich**, GAEL

AUTHORS: Aurélia Lépine, Louise De Gaudemaris

Background: The existing literature linking sex work to poor well-being and mental health mainly focuses on high-income countries contexts and highlights the strong correlation between sex work and depression. However, existing studies are cross-sectional and fail to account for the fact that women could have low well-being before entering sex work. For instance, it is documented that women abuse during childhood are more likely to start sex work and to have low level of well-being. In addition to the unclear causal relationship between sex work and well-being, there is currently no evidence regarding the channels through which sex work may deteriorate well-being. Identifying those factors could allow developing effective interventions to improve well-being of sex workers. We investigate such question in Senegal, where sex work is regulated by a public health but where the majority of sex workers prefer to stay illegal since sex work is morally condemned by society members.

Objective: The main objective of the paper is to estimate the effect of leaving sex work on well-being and to identify transmission channels.

Method: We use a unique longitudinal data set from 441 sex workers surveyed in 2015 and 2017. Between those two waves, 15% of sex workers (n=62) left sex work. We use a matched difference-in-differences controlling for sex workers' fixed effects to estimate the effect of quitting sex work on well-being. We control for shocks that occurred in the last two years and that are likely to influence both the probability of quitting sex work and well-being. We then perform a causal mediation analysis to investigate the direct and indirect effects of quitting sex work on subjective well-being by using linear structural equation modeling. Given that the identification strategy is based on the sequential ignorability assumption, we further test the robustness of our results by implementing a sensitivity analysis.

Results: We find that quitting sex worker significantly increases subjective well-being. Sub-groups analysis shows that women who benefit the most from leaving sex work are those who have a longer experience in sex work, suffered from client violence, had a lot of clients, had occasional clients, were not registered and fear discrimination from relatives because of their sex work activity. Causal mediation analysis shows that the increase in well-being is mainly explained by an increase in self-esteem and not through a reduction in violence exposure.

Conclusion: Our study confirms the negative effect of sex work on well-being and highlights the importance to reduce time spent in sex work by developing interventions to quit sex work. It also suggests the need to provide psychological training to boost self-esteem to sex workers.

Financial Stress during Pregnancy—the Short and Long-Term Effects on Children's Health and Labour Market Outcomes

PRESENTER: **Nancy Weiyang Kong**

AUTHOR: Brenda Gannon

Recent research has established the negative impact of adversity during pregnancy on birth weight, but few studies focused on the subjective measure of financial stress. We use a 30-year panel dataset of 8,556 mother-child pairs from the Mater-University of Queensland Study of Pregnancy (MUSP) to investigate the effects of financial stress during pregnancy. We focus on wide range of children's outcomes, including cognitive and non-cognitive development, health and labour market outcomes. By employing local linear regression propensity score matching with double robustness regression, we match children who experienced financial stress in uteruses with those who didn't using a rich set of socioeconomic characteristics. After normalizing the outcomes, our preliminary results indicated boys who experience prenatal financial stress are having 10% s.d. lower weight at birth, 27% more likely to smoke, 27% s.d. less educational attainment, and 26% s.d. less earnings as adults. Girls are likely to have poor self-reported health during teenage years and scoring 19% higher in anxiety scale at the age of 30. Robustness checks are done using inverse probability weighting to account for sample attrition. We also explore the family pathways (e.g. maternal depression, family conflicts) to poorer outcomes in children. The macro level data such as GDP per capita, inflation, and unemployment rate by occupation are explored for exogenous variations on family financial stress. This paper shows prenatal environment has significant effects on the short, medium and long-term development of children. To our knowledge, it is the first paper that investigates the comprehensive long-term effects of financial stress during pregnancy. It adds Australian evidence to growing literature in the fetal-origins hypothesis.

8:30 AM –10:00 AM WEDNESDAY [Evaluation Of Policy, Programs And Health System Performance]

Universität Basel | Kollegienhaus – Regenzzimmer 111

Organized Session: Assessing Long-Term Care Policies to Control and Finance the Growth in Health Spending

SESSION CHAIR: **France Weaver**, Xavier University

DISCUSSANT: **Judite Goncalves**, Nova School of Business and Economics, Lisbon; **Marianne Tenand**, Erasmus University of Rotterdam; **Lauren Nicholas**, Johns Hopkins School of Public Health; **Kerstin Roeder**, School of Business and Economics, University of Augsburg

Does Free Home Care Keep the Elderly out of the Nursing Home?

PRESENTER: **Sara Rellstab**

AUTHORS: Pieter Bakx, Dr. Eddy Van Doorslaer, Pilar Garcia-Gomez

Population ageing and rising health care costs raise the question of how to contain the growth in of long-term care (LTC) expenditures. In response to these trends, the Dutch government has reformed its LTC system in 2015. Home care was shifted from the LTC insurance to the health insurance, which resulted in the abolishment of the income dependent co-payment for home care users. Already before the reform, LTC users reaching the income dependent copayment cap had a marginal cost of zero for an additional hour of home care, whereas users below the cap faced a marginal cost of 14 euros. We use this feature of the Dutch LTC reform as a natural experiment to evaluate the effect of a copayment for home care on home care use, nursing home admissions and curative care spending. The abolishment of the copayment for home care sets incentives for users to delay their nursing home entry and may thus be a policy instrument to contain long-term costs.

We link administrative data on health care expenditure, LTC use and eligibility, and demographic characteristics from Statistics Netherlands for 2014 and 2015. Using a difference-in-differences framework, we evaluate the effect of the abolishment of the copayment for home care users on care use. The treatment group consists of individuals facing a marginal cost of 14 euros for home care before the reform, and zero after. They are compared to a control group of individuals who incurred zero marginal cost for home care before and after the reform.

Although we find that free home care increases both the likelihood of staying in home care and conditional home care costs, it does not delay nursing home admission. However, once admitted, the treatment goup's nursing home costs are slightly lower than for controls. Free home care seems to substitute for curative care to some extent, but the costs for increased home care use is more than double than the savings in curative care. These results suggest that abolishing a home care copayment may not be sufficient as a policy instrument to delay nursing home entry.

Effects of States' Medicaid Home and Community-Based Service Policies on Healthcare Expenditures

PRESENTER: **Ms. France Weaver**, Xavier University

AUTHOR: April Temple

In the United States, despite large differences across states in their policies toward Medicaid home and community-based services (HCBS), there is little evidence on the effect of such policies on healthcare expenditures. This study examines the differential effects of two distinct states' Medicaid HCBS strategies on individual healthcare expenditures: changing HCBS participation (number of beneficiaries) and changing HCBS intensity, once participation is granted (quantities of services covered per beneficiary).

Taking advantage of variations across states over time, we estimate difference-in-difference generalized linear models. States are categorized into HCBS expansion and non-expansion states for each of the two policy strategies separately. The sensitivity of the results to the policy

indicators' construction is tested. We run the models separately for overall healthcare expenditures and by main payers, i.e. Medicare, Medicaid, private insurance, and out-of-pocket.

We combine data from the 2008-2013 Medicare Current Beneficiary Survey (MCBS) with state-level information on Medicaid HCBS. The sample includes 65,100 person-year observations residing in 46 different states; Alaska, Hawaii, Maine, and North Dakota are excluded. Over the study period, large variations in HCBS policy strategies are observed across states. State HCBS participation ranges from 1.2 to 19.4 beneficiaries per 10,000 residents and state HCBS use varies between $1,742 and $49,212 per beneficiary. Some 32 states expanded their HCBS participation; representing 65 percent of the observations and 42 states expanded their HCBS intensity or 89 percent of the observations.

Results suggest that neither of the two state Medicaid HCBS strategies has an impact on overall individual healthcare expenditures. However, residing in states that expanded HCBS participation leads to statistically significant reductions in publicly funded healthcare expenditures: Medicare expenditures are reduced by 7.8 percent and Medicaid expenditures by 27.2 percent. No statistical effect is found for the expansion in HCBS intensity. These findings indicate that the strategies adopted by states to change their Medicaid HCBS policy impact healthcare expenditures differently. While expanding state HCBS participation may reduce publicly funded healthcare expenditures, i.e. Medicare and Medicaid, more generous state HCBS intensity may not.

Estate Fiscal Policies, Long-Term Care Insurance and Informal Care

PRESENTER: **Guillem Montoliu-Montes**

AUTHOR: Christophe Courbage

Most industrialised countries are confronted with a rapid ageing of their population which creates increasing needs for long-term care (LTC) and questions the coverage of growing LTC expenditures mainly publicly financed (Colombo, 2012). In this context, many policy makers and scholars support the idea of linking LTC public budget to the taxation of estates (Cremer et al., 2016) as the share of inherited wealth in overall capital accumulation is increasing (Piketty and Zucman, 2014).

This paper studies, through a theoretical microeconomic model, the effects of estate recovery, inheritance tax and long-term care (LTC) subsidies on LTC financing. The main characteristic of these policy instruments is that they use, directly or indirectly, the proceeds of estate taxation to finance public LTC.

In particular, this article looks at how the three above mentioned fiscal policies theoretically affect the decisions both to buy LTC insurance and to bequeath wealth by elderly parents and to provide informal care by children. Estate recovery is found to be an efficient tool to finance public LTC provision as it provides incentives to LTC insurance purchase, bequests and informal care supply while impacting positively the government budget. Estate recovery is also found to be an attractive way to finance an increase in LTC subsidies in terms of social welfare.

Benefits and Costs of Improving Oral Health Care in Nursing Homes: Results of a Randomized Trial

PRESENTER: **Dr. Sally Clark Stearns**, The University of North Carolina at Chapel Hill

AUTHORS: Patrick Welsh, Jose Cabanas, Michael Bachman, Jefferson G. Williams

Unintentional falls are the leading cause of nonfatal injury for adults aged 65+ in the United States. In 2015, approximately $29 billion (6%) of Medicare expenditures were attributable to nonfatal falls. Costs may be unnecessarily increased by two considerations: some assisted living facilities (ALF) have policies of transport to the emergency department (ED) regardless of injury, and emergency medical service (EMS) teams are only reimbursed by Medicare if the person is transported. Since 70% of falls transported to hospital do not result in admission, an innovative program between EMS and a primary care physician (PCP) group in a North Carolina county trained EMS to triage ALF residents who fell into tiers: Tier 1-recommend transport; Tier 2-consult with PCP to determine whether to recommend transport; Tier 3-recommend treat in ALF. Williams et al. (2018) showed substantial reductions in transport and appropriate treatment for time-sensitive conditions. EMS was not reimbursed for residents who were not transported. This study provides an economic evaluation of the program accounting for program costs (training/implementation and PCP consultations) and reimbursement for EMS visits without transport.

We used deterministic decision analysis modeling to compare the program to standard of care (transport) from the Medicare perspective. Effect parameters estimates for the three triage pathways came from Williams et al. (2018); effect estimates included rates of hospitalization by tier under the program. Cost estimates came from the Medicare fee schedule and other sources. Incremental cost effectiveness ratios (ICERs) were calculated for the cost per ED transport avoided as well as the cost per quality adjusted life days (QALD) for the two weeks following the fall; the latter analysis assumed a three day reduction in utility from an unnecessary ED transport. Discounting was not used since all costs and utility decrements were assumed to occur within two weeks of the fall.

The program arm was dominant (less costly and higher QALD) compared to standard EMS transport for base case parameter estimates. Deterministic sensitivity analysis on three program cost components (training/implementation costs, PCP consultation, and payment for EMS visits without transport) were used to identify threshold values at which the program became cost-effective rather than cost-saving. Threshold values were identified for two costs: $500 versus base case $100 for training/implementation costs per fall; and $1400 versus base case $100 for PCP consultation of Tier 2 cases. The cost per ED visit (and accompanying discomfort/utility loss) avoided was less than $100 for both cases. The program remained dominant even if EMS visit without transport was reimbursed at the full cost of an EMS visit with transport. This deterministic analysis points to the potential for cost-savings and utility benefits from triaging care for ALF residents who have

unintentional falls that could be generalizable beyond the study population. Future modeling will add probabilistic sensitivity analysis and a utility penalty for protocol deviations (e.g., non-transport for time sensitive conditions).

Williams JG, Bachman MW, Lyons MD, et al. Improving decisions about transport to the emergency department for assisted living residents who fall. Ann Intern Med. 2018;168(3):179-186. doi:10.7326/M17-0969

8:30 AM –10:00 AM WEDNESDAY [Health Care Financing & Expenditures]

Universität Basel | Kollegienhaus – Fakultätenzimmer 112

Inpatient and Outpatient Care Costs

SESSION CHAIR: **Susan Sparkes**, World Health Organization

The Causal Effect of Body Mass Index on Inpatient Hospital Costs: Genetic Instrumental Variable (Mendelian Randomization) Analysis of the UK Biobank Cohort

PRESENTER: **Padraig Dixon**, University of Bristol

Background

High adiposity as measured by body mass index (BMI) is associated with increased healthcare costs. However, almost all evidence of this association is based on multivariable analysis conducted using observational research designs prone to endogeneity bias because of measurement error, simultaneity and omitted variables.

Methods

This paper exploits a novel identifying approach - germline genetic variation associated with BMI in an instrumental variable (IV) analysis. This approach has the advantage (in principle) of avoiding the limitations of both multivariable analysis and the use of other IV analyses such as those relying on the BMI a biological relative as an IV. At each point of variation in the genome, offspring typically inherit one allele (a variant form of a gene) from their mother, and one from their father. This random inheritance of alleles is a natural experiment, in which individuals in a population can be divided into groups based on the number and type of variants inherited. These variants – pieces of the genetic code that differ between individuals – are precisely measured, independent of omitted variables and are not affected by reverse causation. Using genetic variants as IVs in this way has become known as Mendelian Randomization (30). We estimated IV models of the marginal causal effect of BMI using 79 variants robustly associated with BMI in genome-wide association studies. The association of these variants with inpatient costs was modelled using data from UK Biobank, a large prospective cohort study linked to records of inpatient hospital care. We assessed potential violations of the instrumental variable assumptions, particularly the exclusion restriction via pleiotropy (i.e. variants affecting costs through paths other than BMI) using median-based IV methods (more precise IVs contribute more weight to the median IV estimate), and mode-based IV models (which clusters IVs into groups based on similarity of causal effects). We investigated potential non-linear effects by stratifying on the instrument-free BMI distribution. We also assessed whether any effect of BMI on costs was mediated by body fat percentage by instrumenting for both of these treatments. We controlled for dynastic effects in sensitivity analysis by using a novel within-family design.

Results

Data from 421,472 individuals was analysed. The marginal effect of an additional unit of BMI on costs in observational analysis was £13.65 and in inverse-variance weighted IV Mendelian Randomization analysis £19.21. There was evidence of violations of the exclusion restriction due to pleiotropy. The estimated effect size attenuated under median and mode-based IV approaches which are intended to be robust against particular types of violation of the exclusion restriction, but effect sizes remained larger than observational estimates. There was weak evidence of modest non-linear effects. There was no evidence that the effect of BMI was mediated by body fat percentage. Family fixed effects had little impact on point estimates.

Conclusions

This paper is the first to use genetic variants in a Mendelian Randomization framework to estimate the causal effect of BMI (or any other disease/trait) on healthcare costs. The novel methods and results are likely to be of wide interest.

Identifying Condition-Specific Factors Associated with the Change in Inpatient Care Costs in Switzerland: A Rate Decomposition Using Cost Data from the Canton of Zurich

PRESENTER: **Michael Stucki**, Zurich University of Applied Sciences

AUTHOR: Dr. Simon Wieser

Background: High and rising healthcare spending dominates the health policy debate in Switzerland. Total spending amounts to 12% of GDP and per capita spending is among the highest in the world with USD 10’000 per year. Potential cost drivers include population growth and ageing, increasing prevalence of chronic diseases, medical progress, and overtreatment. However, the contribution of these and other

potential factors is largely unknown. A better understanding of the relevant factors and their relative importance is essential for the design of health policies aiming at an affordable healthcare system.

Aim: This paper identifies the factors associated with the change in inpatient care costs between 2010 and 2016 in the Swiss canton of Zurich. It also estimates their contribution to the overall change in costs by disease, age and sex.

Data and Methodology: The dataset is provided by the health department of the Canton of Zurich and entails diagnostic and detailed cost information on all inpatient episodes between 2010 and 2016 in this region. Using cost instead of reimbursement data allows us to identify the changes regarding different types of healthcare costs, such as case-specific direct, fixed, and investment costs. The set of health conditions is defined based on the comprehensive and mutually exclusive Global Burden of Disease classification. We apply a Das Gupta Rate decomposition for aggregate costs by health condition and by age and sex groups. Five factors were included in the analysis: population size, population structure (age and sex distribution), treated prevalence (number of cases), utilization (number of stays and length of stay per prevalent case), and costs per case (further decomposed by cost types).

Results: The most important contributor to the change in aggregate condition-specific costs between 2010 and 2016 was a rise in average costs per case. This effect was partly counteracted for some conditions by a reduction in the number of treated patients. This is likely to be linked to a shift towards outpatient treatments. Preliminary results indicate great heterogeneity in the factors associated with the cost changes among different health conditions. Changes in population size and population structure generally had a positive but modest association with costs.

Implications: The identification of factors affecting total costs for single health conditions will contribute to the priority setting in health policies and budgetary planning. A better understanding of the epidemiological and demographic trends on healthcare spending may be particularly useful for a sound definition of global spending budgets currently discussed in Switzerland. Effective cost containment policies require reliable estimates of the key factors influencing costs on a granular level.

Direct Costs of Both In-Patient and Out-Patient Care for All Type Cancers: The Evidence from Beijing, China

PRESENTER: **Ms. Xuejun Yin**, Beijing University of Chinese Medicine

Background:

Cancer is a major public health issue worldwide. The cost of cancer care imposes a substantial economic burden on society and patient, but it has not been thoroughly studied in China. This study aimed to describe direct cost and cost elements of all cancer types by different beneficial characteristics.

Methods:

The research was a retrospective observational study based on inpatient and outpatient records with a primary diagnosis of cancer from 31 hospitals in 2016. Total cost and cost of per time were analyzed by cancer type, sources (prescription medicines, consumables fee for diagnosis and surgery, and other health services), beneficial characteristics (gender and age).

Results:

A total of 30224 eligible inpatients admissions and 485391 outpatient visitswere identified during study period. Inpatient care costs accounting for 58.6% cancer treatment costs. Nearly 70% of total expenditure spend on patients aged 50-79.Lung cancer had the highest economic cost (15% of overall cancer costs), followed by breast cancer (12%) and colorectal cancer (10%). Anticancer drug cost accounted a large proportion in both inpatient (37.7%) and outpatient care (64.6%). The average costs per inpatient admission was estimated as $4590.1 (5621.9) ranging from $1157.7 (1349.8) for testis cancer to $7975 (7343.9) for stomach cancer. The regression analyses revealed that length of hospitalization stay, cancer type, age, payment type and hospital level were highly correlated with expenditure per admission ($p<0.001$).

Conclusions:

The cancer care cost is substantial and varies by cancer type. Our findings provide important information for health services planning, allowing more efficient allocation of health resources for the care of people with cancer.

8:30 AM –10:00 AM WEDNESDAY [Economic Evaluation Of Health And Care Interventions]

Universität Basel | Kollegienhaus – Hörsaal 114

Preference Elicitation

SESSION CHAIR: **Lidia Engel**, Deakin University

Living up to Expectations - Experimental Tests of Subjective Life Expectancy As Reference-Point in Time Trade-Off and Standard Gamble

PRESENTER: **Mr. Stefan A. Lipman**, Erasmus School of Health Policy & Management, Erasmus University Rotterdam

AUTHORS: Werner Brouwer, Arthur E. Attema

Introduction: Time trade-off (TTO) and standard gamble (SG) are often used to elicit weights to calculate Quality Adjusted Life Years (QALYs). Both methods typically involve short gauge durations (i.e. 10 years), starting now and followed by death, i.e. life durations that diverge considerably from reality. Earlier work has suggested that expectations about life duration, i.e. subjective life expectancy (SLE), affect TTO answers, arguably because SLE functions as reference-point (RP) in TTO exercises. It is posited that because life years in TTO typically occur below individuals' SLE, loss aversion may bias their decision-making (i.e. they become reluctant to lose even more years). This explanation, based on insights from prospect theory, has not been tested explicitly. In this paper we extend earlier work by testing RP effects for TTO, and also report the first test of SLE effects for standard gamble (SG).

Method: We derive predictions from a theoretical model based on prospect theory with SLE as RP and test these empirically in a lab-experiment. Subjects ($N = 102$) first reported their SLE (e.g. living until 80), which was utilized to construct different versions of TTO and SG. Each version elicited QALY weights for 3 chronic health states, where TTO and SG were operationalized via choice lists. Subjects had to imagine living in each health state, where depending on version, their remaining 10 years of life occurred either completely above (e.g. from age 80 to 90) or completely below (e.g. from age 70 to 80) their SLE. If SLE functions as RP, the former involves gains in life duration while the latter involves losses in life duration.

Results: Subjects expected to live significantly longer than actual life expectancy based on census data. As is commonly observed, SG weights were consistently higher than TTO weights (Wilcoxon tests, all p's < 0.037). We confirm our theoretical predictions: both TTO and SG weights were affected by SLE. Moving gauge duration below SLE in both these methods increased subjects' health state valuation significantly (0.02-0.23 on the 0-1 QALY scale; Wilcoxon tests: all p's < 0.002), i.e. subjects gave up fewer years and were less risk-tolerant below SLE. As predicted by our theoretical model, this effect of SLE was stronger for TTO compared to SG.

Discussion: In this study, we provide the theoretical foundation and empirically confirm the earlier findings that TTO weights are affected by SLE, as predicted by prospect theory with SLE as RP. New to our approach is the test of SLE effects on SG. Both health state valuation exercises involving life years below SLE produce higher QALY weights when they involve durations shorter than expectation. We explore several other theoretical explanations, such as discounting, and show that it is very unlikely that they explain our findings. This study is relevant for work on economic evaluations and health state valuation, because it suggests that QALY weights elicited by TTO and SG depend on individual characteristics such as SLE, which are not accounted for in typical valuation procedures.

Are Results from Discrete Choice Experiments Similar to Time Trade-Off? Comparison of Health State Valuation Methods Using the EQ-5D-5L in an Australian General Population Sample.

PRESENTER: **Rosalie Viney**

AUTHORS: Brendan Mulhern, Richard Norman, Deborah Street, Yan Feng, Koonal Shah, Paula Lorgelly, Emily Lancsar, Julie Ratcliffe

Background:

Different approaches have been used to develop value sets for valuing quality of life using multi-attribute utility instruments. The Time-Trade Off (TTO) approach is most widely used, but discrete choice experiments are an emerging method. The preferred approach to valuation of the EQ-5D-5L is TTO using a standardised protocol known as the EQ-VT, which incorporates TTO tasks for better than dead and worse than dead health states and a number of DCE tasks that directly compare two health states without specifying the duration of the health state. The EQ-VT involves a face to face interview and is time intensive. An alternative approach known as DCE Duration asks respondents to choose between health states with specified varying durations and death. DCEs can be conducted online, and potentially require lower respondent burden. However the different methods may lead to differences in values for health states, which has implications for the results of economic evaluations that use these value sets. Therefore it is important to compare values generated across the different methods. To date direct comparisons of the EQ-VT protocol, and DCE methods using the same respondents have not been carried out. The aim of this study was to compare three different approaches to development of value sets using responses from the same sample and a number of different modelling methods.

Methods

300 respondents were recruited to undertake two valuation tasks, separated by between 3 and 7 days. Respondents were randomly allocated to complete the EQ-VT protocol, followed by the DCE Duration protocol (sample 1A), or vice versa (sample 1B). An additional 300 respondents undertook the DCE Duration alone (sample 2). Sample 1A and 1B completed the EQ-VT interview and 14 DCE tasks, as well as 12 DCE Duration tasks at a different time point. Sample 2 completed only the DCE Duration tasks.

Descriptive and modelling based analyses were undertaken to compare elicitation methods, comparing characteristics of the sample and value sets, including range, percentage of negatively valued states, value of particular states and dimension order. We further compared the DCE Duration estimates with the actual TTO values for particular states, and used the estimated TTO model to predict which DCE Duration states would be chosen. We assessed the proportion of respondents choosing immediate each option and the overall proportion of respondents choosing emmediate death. Poolability analysis assessed whether the underlying scale and/or preferences were the same across samples.

Results

The results identify key differences in value sets between methods. Comparing across TTO and DCE Duration value sets DCE duration produces value sets that are on a wider range than TTO alone and there are differences between the dimensions in terms of order of importance. All methods were considered acceptable by respondents.

Discussion

This is the first study to compare across TTO, DCE Duration and DCE within the same sample of respondents. The results suggest important differences between preferences and values elicited via the different methods. These results suggest the need to understand how differences in value sets impact upon resource allocation decisions.

Estimating an EQ-5D-5L Value Set for Portugal Using an Hybrid Modelling Approach

PRESENTER: **Pedro L Ferreira**, Centre for Health Studies and Research of the University of Coimbra
AUTHORS: Patricia Antunes, Lara Ferreira, Luis Pereira, Juan Ramos Goñi

Purpose: Previous research reported a ceiling effect, especially in healthy and/or young individuals. Therefore, a 5L version was designed with five levels of problems intensity for each dimension.

The purposes of this study were to elicit the EQ-5D-5L health states preferences from the general Portuguese population and to derive the Portuguese value set for the EQ-5D-5L.

Methods: A representative sample of the Portuguese general population aged above 18 years was stratified by age and gender (n=1,451). Data was collected between October 2015 and July 2016 following the EuroQol protocol. Twenty-eight interviewers performed 1-hour duration computer assisted personal interviews according to the EuroQol Valuation Technology protocol version 2. Each interview included the valuation of ten health states using the composite time trade-off (cTTO) and seven pairs of a discrete choice experiment (DCE). To model cTTO data, OLS and random-effects GLS models were used as well as tobit random effects models censoring at -1. DCE data were also modelled using logit and probit regression models. Data from both cTTO and DCE valuation tasks was modelled using a heteroskedastic hybrid model. All models were compared in terms of goodness of fit statistics and prediction ability of the Portuguese EQ-5D-5L value set.

Results:

Our sample revealed a smaller ceiling effect than experienced in the 3L version and the respondents showed a VAS mean score of 78.9 in a 0-100 scale from the worst and the best health the respondent can imagine.

All cTTO, DCE and hybrid econometric models had consistent and significant parameters. The heteroskedastic hybrid model was chosen to derive societal values for the Portuguese population. Values ranged from -0.510 to 1.000.

Conclusion: This study provided the Portuguese value set for the EQ-5D-5L based on a hybrid econometric model using cTTO and DCE data. These results are recommended to be used in economic evaluations conducted in Portugal.

Valuing EQ-5D-3L in a UK General Population Survey: Transforming Discrete Choice Experiment Latent Scale Values Using a Novel Methodology

PRESENTER: **Edward Webb**
AUTHORS: John O'Dwyer, David Meads, Paul Kind, Penny Wright

Background: Discrete choice experiments (DCEs) are widely used to elicit health state preferences. However, additional information is required to transform values to a scale with dead and full health valued at 0 and 1 respectively. This paper presents DCE-VAS, an understandable and easy anchoring method based on the visual analogue scale (VAS).

Methods: Responses to a discrete choice experiment (DCE) and simultaneous VAS valuation of three states including dead from 1450 members of the UK general public were analysed using mixed logit models. EQ-5D-3L value sets were calculated and their robustness was examined. This included a filtering procedure in which the influence each individual respondent had on valuation was calculated and those whose influence was more than two standard deviations away from the mean excluded.

Results: Coefficients in all models were in the expected direction and statistically significant. Excluding respondents who self-reported not understanding the VAS task did not significantly influence valuation, but excluding a small number who valued 33333 extremely low did. However, after eight respondents were removed via the filtering procedure, valuations were robust to removing other participants.

Conclusion: DCE-VAS is an effective way of anchoring DCE results to a 0-1 anchored scale with marginal additional respondent burden.

Assessing Community Preferences for Healthcare Priority Setting in Taiwan: An Integrated Citizens Jury and Discrete Choice Experiment

PRESENTER: **Dr. Rebecca Schoon**, Pacific University

AUTHORS: Chunhuei Chi, Tsai-Ching Liu

All health systems struggle with unlimited needs for health care, yet limited resources with which to address them. Under national health insurance systems, policymakers must make explicit and potentially contested decisions around resource allocation. Policymakers have recognized the need to include public values in decisions of how to distributing funding and other resources across competing health priorities. Given the complex nature of these decisions, however, research into how to effectively measure public preferences is underdeveloped. Measuring community values poses special challenges since they involve subjective judgments that can be interpreted differently across individuals and communities. A 2014 study proposed the integration of two methods currently used for soliciting and aggregating public preferences around health care services: i) an individual survey instrument, Discrete Choice Experiments (DCEs) and ii) a group-based model that incorporates informed opinions and deliberative dialogue, Citizen Juries (CJs).

The present study developed a framework for integrating a CJ and DCE, and empirically tested it in Taipei, Taiwan. Its primary objective was to evaluate differences in preferences when solicited through individual, quantitative surveys (DCEs) versus an informed, dialogue-based group setting (CJs) and whether ethically communitarian values from a CJ can be captured by an individualistic methodology. The study was structured as a two-part, mixed methods study. In Part I, participants completed a DCE, which served as a baseline pre-test. In Part II, participants took part in the integrated CJ-DCE method, which asked them to define an equity principle for the National Health Insurance (NHI) program and rank a set of attributes in terms of importance for future resource allocation under the NHI. During the CJ, experts on health policy presented background information and participants engaged in facilitated dialogue to choose a health equity principle and rank priorities through consensus. Participants then completed a post-test DCE and evaluation survey. The DCEs were analyzed using a mixed logit model. The results of the pre-test and post-test DCEs were compared to determine whether participation in the CJ changed preferences. The ranked list from the CJ was compared to the statistical rankings of the post-test DCE to assess whether the CJ ranking was reflected in the DCE.

Study results support the value of the CJ in developing a consensus decision and the validity of the DCE in capturing that consensus: participating in a CJ influenced juror preferences and the near consensus decision arrived at through the CJ was captured by the subsequent DCE. This provides preliminary evidence that the integrated method offers an innovative framework capable of meaningfully capturing community preferences. Further research is needed to investigate the reliability of these findings and how the integrated method may be implemented to maximize public acceptance. Advancing this work can provide an improved method for capturing public preferences to policymakers tasked with priority setting.

8:30 AM –10:00 AM WEDNESDAY [Demand & Utilization Of Health Services]

Universität Basel | Kollegienhaus – Hörsaal 115

Healthcare Service Use and Costs

SESSION CHAIR: **Charles Normand**, Centre for Health Policy & Management, Trinity College, Dublin

In the United States, Veterans Affairs Medical Care Expenditures Are Growing Too Rapidly to be Sustainable

PRESENTER: **Dr. William Weeks**, Microsoft Research

AUTHOR: James N Weinstein

Importance. While Veterans Health Administration (VA) medical care quality has been shown to be equivalent to non-VA care quality, VA's medical care cost growth has not been examined. This is particularly important to understand in light of concerns about the unsustainability of healthcare entitlements.

Objective. Between fiscal years 2007 and 2017, to examine VA medical care expenditure growth rates and compare them to the US per-capita healthcare expenditure growth rate, to examine geographic variation in VA medical care expenditures, to examine the relationship between VA medical care expenditures and each congressional district's political party and rural status, and to examine the relationship between VA medical care expenditures and VA compensation and pension (C&P) expenditures.

Design. Retrospective analysis of publicly available data.

Setting. 435 congressional districts in the 50 United States and the District of Columbia.

Participants. US veterans.

Main outcomes and measures. Percentage change and compound annual growth rate (CAGR) in per-veteran and per-VA-patient VA medical expenditures and per-capital national health expenditures; 3 measures of geographic variation; Anova comparison of per-VA-patient VA medical expenditures and the congressional district's representative's political party and rural status; and Pearson correlation coefficients comparing VA medical expenditures to VA C&P expenditures.

Results. Between 2007 and 2017, the number of veterans declined by 16%, the number of VA patients increased 16%, and the proportion of veterans who were VA patients increased by 38%. Annual national VA medical care spending increased by 119%, from $31.5 billion to $69.0 billion (CAGR=8.2%), annual VA medical expenditures per veteran increased by 133%, from $1,335 to $3,483 (CAGR=10.0%), and annual VA medical care expenditures per VA patient increased by 89%, from $6,103 to $11,504 (CAGR=6.5%). Over the same time period, annual per-capita total national health expenditures increased by 41%, from $7,627 to $10,724 (CAGR = 4.3%). VA expenditures per VA patient demonstrated substantial geographic variation, considerably more than does Medicare per-capita expenditures. Throughout the study period, congressional districts with Democratic representatives had 28% higher VA medical care expenditures per VA patient cost growth than those with Republican representatives. VA compensation and pension expenditures per veteran were generally not statistically significantly correlated with annual VA medical care expenditures per VA patient.

Conclusions and Relevance. The high growth rate of VA expenditures may be unsustainable; the high degree of geographic variation seen may present an opportunity to reduce wasteful healthcare spending. VA administrators should consider how best to provide veterans healthcare more efficiently and VA researchers should explore the reasons for high medical care cost growth. The influence of political party on VA expenditures should be explored.

Understanding Persistency in the High-Cost State Among Mental Health Patients

PRESENTER: **Claire de Oliveira**, Centre for Addiction and Mental Health
AUTHOR: Ms. Joyce Cheng

Background: High-cost patients place a substantial burden on the health care system. Most existing studies have examined high-cost patients as a homogenous group; however, previous work has shown that mental health high-cost patients are distinct from other high-cost patients. For example, they are younger, live in lower income neighbourhoods and typically have lifelong chronic conditions, such as psychosis and bipolar disorder. Moreover, there is little knowledge regarding whether/why they remain high-cost patients for long periods of time.

Objectives: The main objectives of this analysis were to a) describe high-cost patients with mental illness who persist in the high-cost state, b) determine the predictors of persistency and c) explore whether the dynamics of being in the high-cost category are heterogeneous.

Methods/Approach: Using administrative health care data from Ontario, Canada's most populous province, we selected all patients in the ninetieth percentile of the cost distribution (i.e., high-cost patients) in 2010. Among all high-cost patients, we defined mental health high-cost patients as those for whom costs related to mental health and addiction care accounted for 50% or more of their total health care costs. We followed these patients for a total of 7 years (i.e., until 2016), and modelled mobility in and out of the high-cost state using panel linear probability models, while controlling for relevant socio-demographic and clinical characteristics. Patients that remained in the high-cost state for all 7 years were defined as persistent high-cost patients. In addition, we examined whether persistency differed by age groups (young vs. old), neighbourhood income quintile (high vs. low) and administrative health region.

Results: In 2010, there were 52,162 mental health high-cost patients. Roughly 11.5% of these patients were lost to attrition over the 7-year period. Among those that were not lost to attrition, 5,204 remained in the high-cost state for all 7 years of our analysis. Persistent mental health high-cost patients were slightly younger (mean age = 42) and were made up of more males (55%) compared to other high-cost patients. Just under a third (30.1%) lived in a neighbourhood in the lowest income quintile and 29% lived in the city of Toronto administrative health region. Roughly two-thirds (66.1%) of these patients had a diagnosis of psychosis. Having a diagnosis of psychosis was identified as one of the main predictors of persistency in the high-cost state. Furthermore, persistency in the high-cost state differed by age group and administrative health region but not by neighbourhood income quintile.

Conclusion: Mental health high-cost patients make up a relatively small proportion of the overall patient population but have a very different profile compared to other high-cost patients. Roughly 10% of these patients tend to persist in the high-cost state for long periods of time. Moreover, persistency in the high-cost state differs by age groups and administrative health region. These findings will be important to inform the development of appropriate case management and care coordination interventions, and to improve the design of care pathways for this population.

Can the CIHI Canadian Health Risk Predictive Model be Used to Predict High-Cost Health System Users?

PRESENTER: **Dr. Sharada Weir**, OMA
AUTHORS: Mr. Mitch Steffler, Mr. Yin Li, Shaun Shaikh, Jim Wright, Jasmin Kantarevic

Background/objectives

Numerous studies across health systems have established that a small proportion of users account for a disproportionate share of the public costs of healthcare. We evaluated the ability of a new health risk predictive model produced by the Canadian Institute for Health Information (CIHI) to discriminate in predicting future high cost cases.

Methods

The CIHI model was run to predict the relative risk of the next year's cost for each individual in the study population, and their actual costs for the prediction period were estimated. The ability of the model to predict high cost users was evaluated for selected percentiles of cost

based on the sensitivity, specificity, positive predictive value and accuracy of the model. Next, we examined the prevalence of multimorbidity and identified particular health conditions found most commonly among the heaviest users of health services.

Results

Ten percent of the population (n=1.17 million) had annual costs exceeding $3,050 per person in fiscal year (FY) 2016, accounting for 71.6% of total expenditures, five percent had costs greater than $6,374, accounting for 58.2%, and one percent exceeded $22,995, accounting for 30.5%. The CIHI model was 93.1% accurate at the 95% risk percentile in predicting the top 5% of cases in terms of cost. The c-statistic was 0.81 (strong). Prevalence of multimorbidity rose with both risk score and actual cost.

Discussion

High cost users account for a staggering share of public expenditures on healthcare. The CIHI model may provide a tool to predict risk of future high cost utilization that can be employed by policymakers in targeting individuals for disease management or other interventions to improve timely and coordinated care delivery. We found that the CIHI model did a fairly good job of predicting high cost users even though it was not designed for this purpose.

8:30 AM –10:00 AM WEDNESDAY [Production Of Health, Health Behaviors & Policy Interventions]

Universität Basel | Kollegienhaus – Hörsaal 116

Behavioral/Psychology Economics

SESSION CHAIR: **Ana Balsa**, Universidad de Montevideo

I Can't Get No... the Role of Domain-Specific Reference Points in Life Satisfaction

PRESENTER: **Sebastian Neumann-Boehme**, Erasmus School of Health Policy & Management

AUTHORS: Arthur E. Attema, Werner Brouwer, Job van Exel

Objectives: For an individual's well-being, it is not only important what people have, in absolute terms, but also how this compares to relevant reference points. To assess the effect of these relative comparisons on SWB, we tested seven potential reference points for income and health. This provided insight into which reference points may be relevant in self-assessments of well-being, and whether different reference points apply in the monetary and health domains.

Methods: We used Multiple Discrepancies Theory (MDT) to empirically investigate whether multiple reference points regarding income and health are associated with the subjective well-being (SWB) of individuals. We measured SWB in a representative sample (N=550) of the public in the Netherlands. Subjects were asked to complete the Satisfaction with Life Scale (SWLS) to assess to what extent they agreed with five propositions about their life. For the income-related reference points, we elicited the monthly household income and asked subjects to indicate how they assessed their income compared to seven reference points (self-needs, self-deserves, self-wants, self-others, self-past, self-progress and self-future). These questions were derived from MDT and asked again for the health domain using the EQ5D-5L as a health measure.

Results: In line with the literature, we found a negative convex relationship between SWLS and age, and a positive relationship with being employed, income, and health. SWB was most strongly associated with people's comparison of their income to their needs (self-needs) and their progression over time compared to past expectations (self-progress). For health, what they felt to deserve (self-deserve) and what people in their direct environment had (self-others), were associated with SWLS. These discrepancies may function as reference points in SWB.

Conclusion: This study suggests that multiple but different reference points for income and health are associated with subjective well-being scores. We found negative effects on life satisfaction if there are negative discrepancies between the status quo and self-needs or self-progress for income and with self-deserve and self-others for health.

Biased Health Perceptions and Risky Health Behaviours—Theory and Evidence

PRESENTER: **Dr. Nicolas Robert Ziebarth**, Cornell University

AUTHORS: Patrick Arni, Davide Dragone

This paper investigates biased health perceptions as a potential driving force of risky health behavior. We define absolute and relative health perception biases and illustrate their measurement in surveys. Based on this, we present novel and unique evidence on health perception biases exploiting three different population surveys, two of which we complemented with such new bias measures. Next, we theoretically show that risky behavior increases in health perception biases when such biases induce people to underestimate the marginal costs of risky behavior. Using data from the mentioned surveys, we provide robust empirical evidence that respondents who overestimate their health are less likely to exercise; they are more likely to eat unhealthy and to have higher BMIs. Moreover, they sleep fewer hours and drink alcohol more often. We do not find evidence of a relation between overestimation of health and smoking. The pattern of evidence is in line with the suggested theory, focusing on the ability of individuals to estimate and adequately perceive the marginal costs of risky health behavior.

Why Are People so Bad at Predicting Their Own Demise? Explaining Inaccurate Longevity Expectations

PRESENTER: **Dr. Teresa Bago d'Uva**, Erasmus School of Economics

AUTHOR: Dr. Owen O'Donnell

Longevity expectations should influence investment in health and human capital, health behaviours and insurance of long-term care needs, as well as saving, retirement and annuitization of wealth. It is worrying, therefore, that subjective survival probabilities (SSP) reported in surveys suggest that longevity expectations are rather inaccurate. From an equity perspective, the fact that the least educated make the least accurate longevity predictions is of even greater concern. In this paper, we explain this inaccuracy and its education gradient. We do so by combining an established decomposition of the mean squared prediction error – into i) outcome variance, ii) bias, iii) discrimination and iv) noise – with linear models for the actual outcome (survival to 75) and SSP. The resulting extended decomposition further identifies: v) outcome predictability, vi) inconsistency between subjective and objective weighting of risk factors, and vii) private information on longevity captured by SSP but not the measured risk factors.

We use this new decomposition to explain differences in the accuracy of SSP by educational attainment in the US using data from the Health and Retirement Study. This spans 22 years and enables comparison of respondents' predictions of their chances of living to 75 with their actual survival to that age. We confirm that SSP are very inaccurate – worse than if everyone had reported a fifty-fifty chance of surviving to 75. This inaccuracy is greatest for the least educated. Partly, this is because they have a higher mortality rate, which makes the prediction task more difficult. But their predictions are also much noisier, consistent with lower ability to form probabilistic beliefs about longevity. SSP have some, albeit low, discriminatory power: on average, the probability of survival to 75 reported by those who reach that age is 10 pp higher than the probability reported by those who do not. The low discriminatory power is partly due to insufficient responsiveness to risk factors, including onset of disease (e.g. cancer, lung, stroke, etc.), smoking and body mass index. Even the higher educated underestimate these mortality risks but the lower educated do so by about twice as much. We also find that - however inaccurate - SSP do contain private information that predicts longevity. On the other hand, SSP are much less accurate than predictions obtained by regressing them on the risk factors. This is because the gain from reducing noise in SSP is much greater than the loss of private information. This dominance of noise over private information in SSP holds for all groups, but especially for the lower educated.

Present Bias, Salience, and Malaria Prevention in Ghana

PRESENTER: **Dr. Ellen Moscoe**, University of Pennsylvania

AUTHORS: Jessica Cohen, Margaret McConnell

Background

Individuals often do not engage in preventive health behavior even when preventive services are low-cost. Cheap preventive technologies are available for many illnesses that remain important contributors to the global burden of disease, such as malaria, diarrheal disease, and vaccine-preventable illnesses. Behavioral economics offers an innovative lens through which to view low engagement in preventive behaviors: Prevention is characterized by costs borne in the present in exchange for uncertain future payoffs, a scenario particularly unlikely to appeal to individuals who weigh the present period particularly heavily or who are not attentive to future outcomes. In this paper, we focus on two behavioral explanations of decision-making, time preference and inattention. We evaluate the relationships between time preferences and inattention on malaria prevention in Ghana.

Methods

This study uses data from a baseline survey and nine rounds of follow-up surveys among vendors in a market in Tamale, Ghana. Using linear regression and individual fixed effect models, we evaluate the associations between time preferences, salient illness episodes, and malaria prevention. Specifically, we assess the outcomes of spending on malaria prevention products and insecticide-treated bednet utilization. To explore the mechanisms that underpin the role of salience in malaria prevention, we assess the association between salient illness episodes and beliefs about malaria risk.

Results

Time preferences do not predict spending on malaria prevention or bednet utilization, but recent salient illnesses are associated with 50% more spending on malaria prevention. We find that respondents whose children had been ill in the past two weeks report higher subjective expectations of malaria risk, suggesting that recent episodes of illness may increase an individual's perception of risk and lead to increase spending on malaria prevention.

Conclusions

These findings highlight the importance of understanding the role of behavioral biases in malaria prevention, and may contribute to intervention design to increase preventive behaviors in highly endemic environments. As health systems grapple with how to increase engagement in preventive behaviors, these findings can expand our understanding of decision-making and malaria prevention.

8:30 AM –10:00 AM WEDNESDAY [Evaluation Of Policy, Programs And Health System Performance]

Universität Basel | Kollegienhaus – Hörsaal 117

The Economics of Addiction

SESSION CHAIR: **Chunhuei Chi**, Oregon State University

What Are(n't) ACOs Doing to Promote the Prevention and Treatment of Opioid Use Disorder?

PRESENTER: **Carrie Colla**, Dartmouth College

AUTHORS: Susan Busch, Ellen Meara, Andrew Wood

Background: As the crisis around prescription and illicit opioid use continues to escalate, solutions both inside and outside the health system have become priorities. Little systematic evidence describes how alternative payment models affect the health system's approach to prevention and treatment of opioid use disorder (OUD). Accountable care organizations (ACOs) are financially responsible for quality and cost of care for their patients, and therefore offer a window into how new delivery and payment approaches ameliorate or exacerbate OUD prevention and treatment. ACOs may vary along several opioid-related dimensions: degree of financial risk, addressing workforce needs, coordination, and access to treatment.

Methods: We use two sources of data to investigate how ACOs are addressing the opioid crisis. First, the 2018 National Survey of ACOs (N=419) included a novel module related to behavioral health. ACO leaders self-reported contract provisions and OUD prevention and treatment activities related to Medicare, Medicaid and commercial ACOs. Second, we use Medicare claims data to quantify the likely need for OUD services in ACO patients in 2009-2011 and after ACO implementation (2012-2016), measuring differences in potentially hazardous opioid prescribing (chronic use, above 120 morphine equivalents daily, 4 or more prescribers, more than 4 pharmacies, or nonfatal opioid overdose).

Results: ACO contracts typically hold providers responsible for the cost of addiction treatment (all Medicare ACO contracts/67% of commercial ACOs/65% of Medicaid ACOs), but not the quality of care (15% of commercial and 33% of Medicaid ACOs were responsible for screening for OUD). The workforce used to deliver services to patients with OUD varied, including psychiatrists (53% of ACOs), nurse practitioners/physician assistants (59%), psychologists (50%), and social workers (63%). Fewer ACOs have addiction-specific clinicians such as peer support specialists (19%), addiction treatment counselors (25%), or addiction medicine specialists (23%). Relevant to coordination of treatment, most ACOs have no formal relationship with addiction treatment providers (63%). Only 9% of ACOs have an addiction treatment facility as a participating provider. Regarding information sharing, 45% of ACOs report access to addiction treatment records in ACO sites, while only 25% report that they have access to non-ACO sites. Finally, 41% offer medication-assisted treatment. After controlling for region, ACO beneficiaries were slightly less likely to have a potentially adverse outcome pre-ACO implementation (-0.14, SE=0.001) and preliminary analyses suggest small but significant effects post-implementation. In 2012, rates of potentially adverse prescribing outcomes were high in both Medicare ACO and non-ACO patients (25.7% and 28.6% respectively).

Conclusions: Most ACOs are responsible for the cost of addiction services under at least one contract, but contracts do little to encourage high quality care for these patients, as addiction-related quality measures like screening for OUD were largely absent from contracts, evidence-based medication-assisted treatment was available in a minority of ACOs, access to addiction treatment records is problematic, and addiction treatment providers are rarely ACO participants. The need for these services based on potentially risky prescribing and treatment for nonfatal overdose suggests an opportunity for alternative payment models to affect these outcomes, but early ACO efforts had only minimal impact.

Evaluating the Population-Level Effects of Supervised Consumption and Overdose Prevention Sites in British Columbia, Canada

PRESENTER: **Dr. Dimitra Panagiotoglou**, McGill University

Background: Beginning December 2016, British Columbia implemented overdose prevention sites (OPSs) and supervised consumption sites (SCSs) to address the rapidly escalating rates of opioid-related overdose events and deaths in the province.

Objective: To evaluate the population-level effects of the new OPSs and SCSs on opioid overdose-related health outcomes and health service use.

Design: Retrospective cohort study.

Setting: British Columbia, Canada.

Study period: January 1 2015 to December 31 2017.

Participants: All individuals with a confirmed or suspected opioid overdose event captured in the BC Overdose Cohort – a set of eight, linked, health administrative datasets.

Exposure measures: Opioid overdose events included all events with a call to poison control; a coroner-determined illicit opioid overdose death; visit to hospital, emergency department or physician with an associated opioid overdose diagnosis; or indication of treatment with naloxone by paramedics.

Outcome measures: Health outcomes included all-cause and overdose-related mortality, and overdose-related sequelae (pulmonary: oedema or pneumonia; muscular: rhabdomyolosis; renal failure; cardiovascular: arrhythmia, acute cardiomyopathy or haemoglobinaemia; or neurological: seizure, anoxemic encephalopathy or brain death). Health service use included events attended by paramedics, hospitalized, and admitted to an intensive care unit.

Analysis: We will use interrupted time series with segmented regression to evaluate the population-level effects of the intervention on health outcomes and service use. Models will be structured using study time for eight, weekly intervals, pre- and post-intervention initiation. Cases will be restricted to events that occurred within local health authorities (LHAs) that implemented an OPS or SCS at some point during the study period, orgnaized relative to the date of the local site opening. Controls will be events that occurred in any other LHA, and propensity score matched to cases on age, sex, month and year of event, and degree of residential urbanicity using census dissemination data. Controls will be assigned the same study interval as their matched case. Outcomes will be aggregated rates per interval. For communities that opened more than one site, intervention time will be set to the operation date of the first new OPS or SCS. We will use the 2-sided Durbin-Watson test to examine for autocorrelation, and adjust accordingly. We will use log-likelihood outputs to assess model fit.

Results: During the study period there were over 15,000 opioid-related events and 2977 mortalities in BC. Twenty-six OPS and SCS were implemented including one mobile unit each in Kelowna and Kamloops, three OPSs in the Greater Victoria area, five OPSs and one new SCS in Vancouver's Downtown Eastside, and two OPSs and two SCSs in Surrey. Together they accrued 545,488 visits, reversed 2500 overdoses, and reported no overdose fatalities. Results of the interrupted time series are forthcoming.

Limitations: An estimated 12% of events were excluded from the cohort because of missing personal health number, or lack of event record (e.g. were treated with naloxone in private setting).

Conclusion: This is a timely and comprehensive evaluation of the effects (both intended and unintended) of OPSs and SCSs in a hard-hit Canadian setting.

Differential Effects of the Smoking Ban in England

PRESENTER: **Matthew Robson Dr**, University of York
AUTHORS: Tim Doran, Richard Cookson

Background: The UK Government made it illegal to smoke tobacco in most enclosed public places in England on 1 July 2007. Early evaluations of the smoking ban indicate that it was successful in reducing exposure to second-hand smoke in public places, but had limited impact on tobacco consumption, suggesting that smokers changed the location where they smoked but not the amount. However, most studies of the smoking ban to date have been subject to two main limitations: a reliance on before-and-after designs measuring association, rather than strong econometric designs identifying causal effects; and a focus on average effects across the population, without considering differential effects across different population groups and settings. The latter limitation is particularly important, as national policies of this kind are frequently more effective in more affluent socioeconomic groups, and as a result have the unintended consequence of widening existing health inequalities.

Objective: To identify causal treatment effects of the smoking ban, on smoking behaviour and exposure to second hand smoke; and to disentangle the observed average effects, by identifying who is affected by the ban and the mechanisms through which any differential effects are caused.

Data and methods: We use individual-level data from Health Survey for England, within a regression discontinuity framework, to identify causal treatment effects. We develop a novel non-parametric econometric method to identify heterogeneous treatment effects, conditional on individual characteristics. We focus on identifying such effects for socioeconomic status, and construct a composite multidimensional measure to do so. We further decompose the observed effects to identify underlying mechanisms and moderators of the ban.

Results: Neither smoking prevalence nor intensity of smoking were significantly reduced by the ban. However, the ban did reduce exposure to second hand smoke (-0.22*** ppt) and the intensity of exposure (-1.39*** hours). Heterogeneous effects of the ban are found across different levels of socioeconomic status, but these effects were not statistically different from one another. Decomposition analysis reveals the majority of the treatment effect stems from the reduction of exposure in pubs.

Conclusions: The smoking ban in England had no immediate impact on smoking intensity, but had the intended effect of reducing second-hand exposure to smoke in public places - particularly in pubs - without increasing exposure in private residences. The reduction in second-hand smoke exposure followed a weak socioeconomic gradient, with impact increasing with socioeconomic status, but this increase was not statistically significant.

Keywords: Regression Discontinuity, Health Inequity, Conditional Average Treatment Effects, Heterogeneity, Smoking Ban.

8:30 AM –10:00 AM WEDNESDAY [Evaluation Of Policy, Programs And Health System Performance]

Universität Basel | Kollegienhaus – Hörsaal 118

Performance and Quality in International Settings

SESSION CHAIR: **Jonathan Stokes**, The University of Manchester

Effect of Pay-for-Performance in Primary Health Care on Infant Mortality: Evidence of Synthetic Control for Argentina

PRESENTER: **Alfredo Palacios**, Institute for Clinical Effectiveness and Health Policy (IECS)

Context: There is an open debate in developed countries about the role of pay-for-performance mechanisms in improving the quality of health services and health outcomes. This health policy instrument could be relevant in the context of Latin American countries, in order to provide more timely health services to the vulnerable population and improve their health outcomes. However, the evidence on the role of these payment mechanisms is very limited in the region, making it difficult to have an informed debate.

Objective: To analyse whether the pay-for-performance mechanism proposed by the SUMAR program -a maternal and child health program implemented on a large scale in Argentina in 2004 (then called Plan Nacer)- had a causal effect in reducing the infant mortality rate (<1 year), neonatal mortality rate (<28 days) and under-five mortality rate in the country.

Methods: Because the SUMAR Program was implemented in Argentina and not in others Latin American countries and/or middle-income countries, the Synthetic Control Method (Abadie and Gardeazabal, 2003; Abadie, Diamond and Hainmueller, 2014) is used to construct a counterfactual for the country as a convex combination of a set of control countries. To do this, a panel of data was constructed with information published by the World Bank, where the observation units are each of Latin American countries and middle-income countries and the time period analysed is 1990-2015, with Argentina being the unit treated and the year 2004 the beginning of the intervention. The health outcome variables are represented by the infant mortality rate, the neonatal mortality rate and the under-five mortality rate. The variables used to construct the synthetic control are the per capita GDP of each country, total health expenditure as a proportion of the GDP, the birth rate, the Gini coefficient, the poverty rate, among others.

Results: After the implementation of the incentives proposed by the SUMAR Program there was a moderate reduction in the infant mortality rate in Argentina in relation to the synthetic control. In particular, there was a decrease of 1.41 percentage points (p.p.) in the infant mortality rate, a reduction of 0.86 p.p. in the neonatal mortality rate and 1 p.p. in the under-five mortality rate. These results appear to be robust for a series of placebo experiments.

Discussion: It is expected that the results obtained in this work will contribute to the informed debate on the role of payment mechanisms and the results of child health in Latin American countries, with the intention to design and implement care policies more timely and efficient for the vulnerable population.

An Assessment of Efficiency across Health Facilities before and after the Implementation of Performance-Based Financing in Tanzania: A Data Envelopment Analysis

PRESENTER: **Peter Binyaruka**, Ifakara Health Institute

AUTHOR: Laura Anselmi

Background

Emerging evidence shows that most health facilities in low and middle-income countries could improve their technically efficiency, which implies that the use of significant share of limited resources could be more effective. Performance-based financing (PBF), which provides financial incentives for health workers and/or facilities reaching pre-defined targets, are gaining popularity as a means of improving facility performance and health system strengthening by incentivizing the achievement of pre-determined targets. PBF would therefore be expected to enhance technical efficiency across facilities by promoting an output oriented financing system. However, there is no study which has systematically assessed efficiency scores across facilities before and after the introduction of PBF. This paper seeks to fill this knowledge gap by analyzing a PBF scheme implemented in Tanzania.

Methods

We build on previous impact evaluation and use data on health care inputs and outputs from 75 health facilities (6 hospitals, 16 health centres and 53 dispensaries) in the intervention region of Pwani and 75 selected facilities from control districts. Data were collected in two rounds – January 2012 and 13 months later through facility survey. We measure technical efficiency using Data Envelope Analysis (DEA) technique relating facility inputs (number of staff, beds, drugs and equipment) and outputs (outpatient visits, antenatal care visits, normal deliveries), representing facility resources and output profiles respectively. We also obtain an efficiency score for each facility before and after the implementation of PBF. We then analyze which factors influence technical efficiency by regressing the efficiency scores over a number of contextual factors. We also test the impact of PBF on efficiency through a difference-in-differences analysis. Sensitivity analysis will be carried out to account for multiple outputs and quality of outputs.

Results

Efficiency scores will be presented to show the degree of technical inefficiency across facilities and the factors affecting it. Preliminary results from the difference-in-difference analysis suggest that efficiency did not increase in PBF facilities compared to non PBF ones.

Discussion

Preliminary results indicate that the positive impact of PBF on a number of outcomes is a reflection of increased inputs, rather than a significant change in the way that health facilities use resources to reach outcomes. Understanding the level of technical inefficiencies across facilities before and after PBF is crucial to inform better design of PBF or scale-up for improving overall health system's performance. Identifying potential factors and/or challenges influencing facility efficiency is an important step for policy makers to address them, and enhance optimal use of limited resources.

Addressing Quality in the Private Healthcare Sector – a Randomised Controlled Trial of the Safecare Quality Improvement Programme in Tanzania

PRESENTER: **Catherine Goodman**, LSHTM (London School of Hygiene and Tropical Medicine)
AUTHORS: Jessica King, Timothy Powell-Jackson, Christina Makungu, Nicole Spieker

Introduction

Private health facility provision has grown rapidly in sub-Saharan Africa in recent years, both in market share and number of providers. Engagement with these private providers is seen as increasingly important, reflecting both their prominence in the market and potential role in achieving universal health coverage. One key challenge is ensuring that private providers deliver high quality care: regulation is often weak and although interventions such as social franchising and strategic purchasing have been shown to improve coverage and patient perceived quality, there is very limited evidence on the impact of private sector engagement on clinical quality of care.

The SafeCare model links quality improvement and business development for small and medium sized private health facilities, and has been implemented in African countries. Facilities are assessed against setting-appropriate standards and given a quality score. They are then provided with quality and business training, mentoring, and support with applying for loans. The aim is to leverage private provider incentives, whereby facilities attract more patients by providing higher quality care, and the improved business performance enables further quality improvements.

Methods

We assessed the impact of the SafeCare model in a randomised controlled trial in Tanzania covering both faith-based and for-profit private facilities. 237 facilities were recruited in March-December 2016, and randomised to the control or intervention arm. Facilities in both arms received a SafeCare assessment at baseline. In addition, intervention facilities were given a quality improvement plan, classroom training on business practices, customer care and infection control, and quarterly progress visits to provide mentoring and additional training. Endline quality of care was measured at 18-24 months' follow-up with co-primary outcomes of correct management of standardised patients, and compliance with infection prevention and control (IPC) practices.

At endline facilities were visited by four covert standardised patients, presenting with symptoms of asthma, malaria, tuberculosis and upper respiratory tract infection (URTI). The standardised patients recorded all history questions, tests ordered and drugs prescribed. Compliance with IPC was directly observed across domains of hand hygiene, personal protective equipment, waste segregation, processing of reusable equipment and sharp safety for six hours per facility. Secondary outcomes were the endline SafeCare score, utilisation and revenue in last three months (assessed through provider survey), and patient satisfaction (assessed through exit interviews).

Results and Discussion

A total of 909 standardised patient visits were carried out, and IPC practices were observed in 5425 patient-provider interactions. Results will be presented on correct management of each SP case (prescription of a salbutamol or beclomethasone inhaler for asthma, provision of a malaria test for malaria, referral for sputum smear microscopy for tuberculosis, and withholding antibiotics for URTI). IPC observation data will be presented in aggregate and by IPC domain. Together with presentation on the secondary outcomes, these results will allow us to assess the effect of the SafeCare programme on quality of care and business outcomes. We will discuss possible reasons for the findings and the implications for quality improvement, and enhancing quality throughout the health system more generally.

The Largest Social Health Insurance in the World Speaks-out: Impact of Capitation Pay-for-Performance on Health Centers' Performance in Indonesia

PRESENTER: **Mundiharno Sumarno Hizboel**
AUTHORS: Andi Afdal Abdullah, Wan Aisyiah, Royasia Viki Ramadani, Erzan Dhanalvin, Eka Pujiyanti, Aldi Andalan, Dedy Revelino Siregar, Nur Cahyadi, Citra Jaya, Zahrina Laborahima, Budi Hidayat

Indonesia reforms its capitation payment by linking it to meet some set measure of performance (Capitation P4P). The nature of capitation reforms with a phased implementation enables us to perform a rigorous impact evaluation. Using a natural-experiment study design, we

investigate the impacts of Capitation P4P on health centers' performance, measured by the utilization of primary healthcare services (e.g., contact rate, visit rate, and the percentage of routine visits by chronic patients) and referral rates (e.g., overall referral and non-specialist cases indicators) of patient to secondary care.

We used three datasets provided by BPJS Health: membership, the status of capitation P4P, and utilization. We also took advantage of health center database obtained from the Ministry of Health. Our empirical analysis compare pre-post differences change in outcome measures for the treated health centers with those for the matched comparisons groups over-time, and takes the difference between the two trends to determine the average effect of capitation P4P. Here we applied a difference-in-difference (DD) combined with a propensity score matching (DD-PSM). The DD coefficient and its 95% confidence interval was estimated base on a fixed-effect panel data models. Our estimation was robust with clustering at health centers level.

After merging the BPJS Health data with administrative data, as of December 2016, we observed 995 health centers implemented the capitation P4P of which 868 in the period of January to December 2016 and 127 during a period of August to December 2015. We assigned the identified 995 facilities that have implemented the capitation P4P as the treatment group at pre-intervention, while for those haven't implemented (8.350) were assigned as our candidate for the control group. Our PSM methods, the PS-caliper, resulted in the matched 653 treatment and 344 control groups. The tests of equality of means for the matched sample revealed the differences among the two groups were no statistically significant, suggesting our matching helps reduce the bias associated with observable characteristics.

While patient access to health centers were a close to parallel between the treatment and the control during the pre- and early-intervention periods (January 2014-December 2015), we observed a peak in patient access to health centers treatment at the expand-intervention period 2016 (i.e., the capitation P4P performed better than control particularly after January 2016). Average impacts of the capitation P4P on contact rates, visit rates and proportions of chronics patients routinely visits were 0.46 per thousand points, 0.6 per thousand points, and 0.37 percentage points, respectively. We also observed significant impacts of the intervention on reducing overall referral rates by minus 0.14 percentage points.

This study gives evidence that capitation P4P has a significant effect on health centers performance in the form of increasing patients' contact rate, visit rate, routine visits rate amongst those chronically patients, as well as reducing overall referral and non-specialist referral cases. The two latter impacts have further implications on reducing healthcare spending at the hospital levels. We discuss implications of the study and future reforms.

8:30 AM –10:00 AM WEDNESDAY [Production Of Health, Health Behaviors & Policy Interventions]

Universität Basel | Kollegienhaus – Hörsaal 119

Infant & Child Health #2

SESSION CHAIR: **Matthew Forsstrom**, Wheaton College

Abortion Costs and Single Parenthood: A Life-Cycle Model of Fertility and Partnership

PRESENTER: **Dr. Matthew Forsstrom**, Wheaton College

Elective abortion, while legal in a handful of states prior to 1973, became legal in the United States at a national level in 1973 following *Roe v. Wade*. Individual states have since passed a number of restrictions that increase the cost of abortion. As of 2011, 45 percent of pregnancies in the United States were unplanned and 42 percent of these were aborted (Finer and Zolna, 2016). Hence, changes in state-level restrictions affect a large number of women. In this paper, I answer to what extent and through which channels parental consent laws and laws that eliminate Medicaid funding for abortion impact single parenthood.

Economic theory has viewed abortion as a decision that women make while weighing contemporaneous costs, personal preferences, and the impacts of having a child on lifetime utility. A simple model of the abortion decision predicts that any decrease in the cost of abortion will decrease total births and births to single women because pregnant women on the margin will switch from birth to abortion. If individuals are forward-looking when making sexual and contraceptive decisions and avoiding pregnancy is costly, then these women will accept a higher probability of becoming pregnant. These two effects together predict that a decrease in the cost of abortion will lead to a decrease in births and an increase in pregnancies, which is consistent with the results from the empirical literature on the 1973 legalization of abortion.

Empirical research on state-level restrictions has found mixed evidence for effects on births. In particular, a handful of studies found that removing restrictions could increase the number of births. These results, along with the steady rise in the rate of births to unwed women, led economists to consider other mechanisms through which abortion restrictions might impact behavior. Kane and Staiger (1996) argue that some women who become pregnant as a result of a change in abortion law could realize information upon becoming pregnant that makes birth the optimal choice. Akerlof, Yellen, and Katz (1996) argue that it is also important to consider how changes in abortion law might affect partnership opportunities for pregnant women.

I first use variation in abortion restrictions to identify reduced-form models that provide evidence on each mechanism. While these reduced-form models are suggestive, they leave implicit the various tradeoffs that women face when making abortion decisions and cannot decompose total effects into theoretical channels. Hence, I estimate a dynamic, structural model that explicitly nests each mechanism and simulate

behavior under a number of counterfactual scenarios. Simulation results show that removing restrictions causes some women to become pregnant, and a subset choose birth upon realizing their partner is committed. While this subset is less likely to be single at the birth, their partnership is more likely to dissolve over time. Overall, the resulting increase in abortions from the policy change would more than offset these additional births. However, the proportion of births to single women increases because removing restrictions decreases the average pregnant woman's partnership opportunities.

The Effect of a Nationwide Neonatal Intensive Care System on Infant Mortality and Long-Term Health Impairments

PRESENTER: **Mr. Tamas Hajdu**, Centre for Economic and Regional Studies, Hungarian Academy of Sciences
AUTHORS: Agnes Szabo-Morvai, Gabor Kertesi, Gabor Kezdi

We estimate the effects of the expansion of a Neonatal Intensive Care Units (NICU) system and a Newborn Emergency Transportation System (NETS) on infant mortality. We utilize a setup where such a system was built up gradually in Hungary and use individual-level administrative data on all births and all infant mortality events in Hungary from 1990 through 2016, complemented with information we collected on the expansion of the NICU and NETS systems. We identify the effect from longitudinal variation in access to NICU establishments and NETS. We handle selection by an instrumental variables strategy using the distance of residence to NICU/NETS cities. Our estimates for the 1990-2015 time period imply that birth in a city with a NICU decreases 0-6-day mortality by 171 per 1000 live births for very low birthweight infants (<1500g) and by 29 per 1000 live births for low birth weight infants (<2500g). We find that giving birth in a city that is connected to NETS decreases infant mortality, too, but the magnitudes are weaker, reflecting the substantial risks of transportation. The estimated effects on 0-364 day mortality are very similar to 0-6-day mortality, suggesting that lives saved by NICU/NETS in the first six days tend to be lives saved for much longer. Finally, we link the administrative data on births to the national census with self-reported data on various types of severe impairment and use the same empirical strategy to estimate potential effects on impairment in the long run. We find no such effects, suggesting that by saving lives NICU/NETS leads to little, if any, increase in the risk of severe impairments.

Terrorist Violence and Newborn Health: Estimates for Colombia

PRESENTER: **Laura Rodriguez**, The University of Manchester

In this paper I study the relationship between maternal exposure to terrorist violence during pregnancy and newborn birthweight. The identification strategy exploits the variation in the timing of exposure to the shock, which originates from the fluctuations of terrorist attacks over time and the stage of gestation when such an event occurs, and the geographic location of attacks in the municipalities of Colombia, a country with a lengthy internal armed conflict. I obtain the long-span, high-frequency data for this analysis by linking historical records of terrorist violence with household survey data for births spanning 16 years. Exposure to terrorist violence during early pregnancy had a large negative impact on birthweight, but primarily for baby boys, as there was no scarring effect observed in the girls' birthweight. Nonetheless, girls were affected by shocks occurring at later stages of gestation. Additionally, girls' mothers who were exposed to a terrorist attack during pregnancy were more likely to drink and less likely to use prenatal care. The effect of a violence shock was mitigated by the mothers' education, and in fact, the reduction in birthweight was more clearly observed for the babies of the least educated mothers. Since birthweight is an important determinant of later-life outcomes, this finding may help explain the intergenerational persistence of disadvantage.

Access to Public Health Insurance: Longitudinal Changes in Maternal Behaviors, Infant and Child Health

PRESENTER: **Dr. Puneet Kaur Chehal**, Emory University
AUTHORS: Kathleen Adams, Anne Lang Dunlop

In the US, the public health insurance program for low-income populations, Medicaid, historically only provided coverage to select populations including low income pregnant women. As a consequence, childless, low income women experiencing their first pregnancy may be exposed to reproductive medical care for the first time through Medicaid coverage. The Medicaid eligibility expansions which allowed first-time expectant mothers to enroll in the program are attributed with improved utilization of prenatal care and reduced infant mortality, as well as long-term health benefits for individuals exposed to Medicaid coverage in utero. However, outcomes from first time pregnancies may not reflect the full benefit of Medicaid exposure. As compared to first pregnancies, subsequent pregnancies among women reliant on Medicaid for pregnancy related care will benefit from any time-sensitive mechanisms by which Medicaid coverage produces positive outcomes. This could include for example, previously acquired knowledge about the program/providers or healthy behaviors. Empirical models used to study the implications of birth order offer a framework to study longitudinal exposure of Medicaid coverage across pregnancies. While there is significant research exploring the implications of birth order, researchers have yet to consider the relationship between public health insurance and birth order. Testing for differences in maternal behavior and infant outcomes after first-birth exposure to Medicaid coverage also offers an opportunity to empirically test for mechanisms that could be driving the improved outcomes observed across birth order.

Using matched vital and hospital discharge record data from the state of Georgia, we follow women across pregnancies while accounting for their health insurance coverage. Our primary outcome variables of interest are measures of birth outcomes and health behaviors. Consistent with past research we use birth weight, gestation and infant mortality to measure birth outcomes. Similarly, for health behaviors we use month of first prenatal care visit and total number of visits but we also consider inter-pregnancy intervals. Short inter-pregnancy intervals (less than 18 months) are associated with pre-term birth and reduced cognitive development. In addition to optimizing health behaviors during pregnancy, women enrolling in Medicaid for their first pregnancy may learn about the importance of optimizing the timing of their pregnancies. Because first-time pregnancies may be distinct from subsequent pregnancies for reasons unrelated to Medicaid, we compare the difference in outcomes between Medicaid and privately insured women. Using data 2008 through 2017, there are striking differences across higher parity births when comparing Medicaid and privately insured women. Unadjusted results show that births to Medicaid insured women

are strictly worse on outcome measures after first birth whereas outcomes for births to privately insured women vary with parity. To adjust for unobserved heterogeneity among women, we use mother fixed effects and exclude women experiencing incomplete pregnancies before their first birth.

8:30 AM –10:00 AM WEDNESDAY [Production Of Health, Health Behaviors & Policy Interventions]

Universität Basel | Kollegienhaus – Hörsaal 120

Organized Session: Sanitation & Hygiene — a Public Health Challenge Requiring Behavioural Solutions Informed By Health Economics

SESSION CHAIR: **Fern Terris-Prestholt**, Faculty of Public Health and Policy, London School of Hygiene and Tropical Medicine

DISCUSSANT: **Fiona Gore**, World Health Organisation; **Sergio TorresRueda**, London School of Hygiene & Tropical Medicine

Understanding Demand for Higher Quality Sanitation in Peri-Urban Lusaka, Zambia: Through Stated and Revealed Preference Analysis

PRESENTER: **James Benjamin Tidwell**, Harvard Kennedy School

AUTHORS: Matthew Quaife, Fern Terris-Prestholt, Robert Aunger

Poor peri-urban sanitation is a significant public health problem, likely to become more important as the world rapidly urbanizes. However, little is known about the role of consumer demand in increasing sanitation quality in such settings, especially for tenants using shared sanitation as only their rental choices can be observed in the market. We analyzed data on existing housing markets using the Hedonic Pricing Method (HPM) to capture the percentage of rent attributable to sanitation quality. We then conducted discrete choice experiments (DCEs) to obtain willingness to pay (WTP) estimates for specific sanitation components, and the implications of the results were explored by estimating the proportion of plots for which improved sanitation quality would generate a higher return on investment for landlords than building a place for an additional tenant to live. The HPM attributed 18% of rental prices to sanitation (~US$8.10 per month), but parameters for several components were poorly specified due to collinearity and low overall prevalence of some products. DCEs revealed that tenants were willing to pay $2.20 more rent per month for flushing toilets on plots with running water and $3.39 more rent per month for solid toilet doors, though they were willing to pay little for simple hole covers and had negative WTP for adding locks to doors (-$1.04). Solid doors and flushing toilets had higher monthly rent increase to cost ratios than other ways landlords commonly invested in their plots, especially as the number of tenant households on a plot increased. DCEs yielded estimates generally consistent with and better specified than HPM and may be useful to estimate demand in other settings. Interventions leveraging landlords' profit motives could lead to significant improvements in peri-urban sanitation quality, reduced diarrheal disease transmission, and increased well-being without need for subsidy or infrastructure investments by government or NGOs.

Information Internalization in Public Health Campaigns

PRESENTER: **Reshmaan Hussam**, Harvard Business School

AUTHORS: Abu Shonchoy, Chikako Yamauchi

Bacterial and viral transmission, manifesting in diarrheal disease and acute respiratory infection, kill nearly two million children a year. Though handwashing with soap is considered the most effective vaccine against such infections, public health campaigns, which focus on information and resource provision, have failed to yield changes in behaviour or child health. This study employs a randomized controlled trial to examine the impact of a novel informational campaign in rural Bangladesh, in which households are delivered a combination of entertainment and hand hygiene edutainment on memory cards to watch on their mobile phones, on behaviour and health. We find that the campaign raises handwashing rates by 20%, reducing loose stool incidence by 50%, and reducing symptoms of acute respiratory infection by 29%. Using custom-designed handsoap dispensers which track the frequency and time of use, we additionally collect minute-level data on both inputs (when treated households watched the edutainment) and outputs (when the household washed). We then employ machine learning techniques to exploit the detailed time series data and identify which patterns of information exposure best predict changes in hand hygiene behaviour.

Human Waste of Time – Valuing Time Savings When People Stop Open Defecation, Using Indian Survey Data

PRESENTER: **Giulia Greco**, London School of Hygiene & Tropical Medicine

AUTHORS: Ian Ross, Oliver Cumming, Catherine Pitt

Cost-benefit studies of sanitation programmes aimed at global audiences have diverging headline results. We identify that this difference is largely driven by how authors estimated and valued time savings from avoided open defecation. The two most-cited authors tend to use very high and very low values respectively. After reviewing the literature, we use survey data for 2,000 open defecators from five Indian states to estimate a distribution of this avoided time. We also use a distribution of rural wages for a variety of agricultural and non-agricultural occupations in the same states. Combining these two data sources, we estimate the economic value of time that would be saved if those people switched to household sanitation from open defecation, using Monte Carlo simulation. We find that, in this rural Indian setting, the median daily travel time for rural people who practise open defecation is 40 minutes, and that an appropriate value of time saved from avoided open defecation in this setting was around US$ 0.20 per hour. At those parameter values, there could be an annual saving of $US 25 billion if all the 490 million Indians practising open defecation switched to using a household toilet. However, this finding should be

interpreted carefully, given the heterogeneity among practices and valuations which we demonstrate. Based on our results, we make recommendations for the measurement and valuation of time savings in future economic evaluations of sanitation programmes. Specifically, we propose values of time to be considered as base case, lower-bound and upper-bound, based on our data. These fall mid-way in the range of previous estimates in the literature.

8:30 AM –10:00 AM WEDNESDAY [Production Of Health, Health Behaviors & Policy Interventions]

Universität Basel | Kollegienhaus – Seminarraum 208

Long Term Care

SESSION CHAIR: **Joseph Dieleman**, University of Washington

Modelling Joint Distribution of Income and Wealth in Long-Term Care Tasks Provision

PRESENTER: **Dr. Andrej Srakar**, Institute for Economic Research

AUTHORS: Ricardo Rodrigues, Stefania Ilinca, Valentina Hlebec, Maša Filipovič Hrast

Care to frail older people can comprise a wide range of tasks addressing different needs, associated with different consequences in terms of care-giving burden or ability to conciliate informal care with paid work (Leitner, 2003; Bettio and Plantenga, 2004; Schulz and Sherwood, 2008, Saraceno, 2010). Understanding how different tasks are shared between formal and informal care could improve targeting of long-term care benefits and ensure an efficient and sustainable mix of care provision in the future. This is particularly relevant in a context of demographic ageing in which informal carers are being tasked with substituting or supplementing more expensive formal care services across Europe (Noelker and Bass, 1989, Litwin and Attias-Donfut, 2009, Prieto et al., 2011).

In our article we contribute to the literature multifold. In theoretical terms, we develop a detailed analysis of the various task division models in a comparative perspective using a complementation model of task division which combines a model with a complete division of tasks between formal and informal carers (dual specialization, Litwak, 1985) with formal specialization (Noelker and Bass, 1989, Hlebec and Filipovič Hrast, 2016).

In empirical terms, we verify two broader hypotheses: socio-economic gradient will be steeper in the context of familialism by default than in supported familialism; supported familialism is more conducive to a wider distribution of care within families and increasing gender equality. To verify the first one, we jointly model income and wealth, subject to collinearity problem (Sierminska et al., 2006, Jäntti et al., 2008, Sierminska et al., 2013). We control for the joint distribution between the two by extending the copula-based approach of Jäntti, Sierminska and Van Kerm (2015) to nonparametric setting (their approach is based on parametric assumptions, based on Singh-Maddala model, which they acknowledge has distributional problems). We present results of three broad modellings, using multinomial models, copula based regressions and new approach based on local linear approximations. The models allow us to estimate causal effects of income and wealth variables (jointly) on different types of long term care provision. We consider also Bayesian extensions.

We use cross-sectional dataset of SHARE (Survey of Health, Ageing and Retirement in Europe) in Wave 6, for two selected countries, Austria and Slovenia, with two contrasting care regimes – supported familialism and familialism by default. Our results show the socioeconomic gradient is clearly differentiated between the two countries only in some categories of the complementation model. Bequest can act as a powerful motivation for informal care provision, but the differentiated role of wealth in explaining use of informal care only between the two countries may reflect dissimilar patterns of living arrangements in old-age. Intergenerational co-habitation is known to be concentrated among the wealthier and this type of living arrangement is far more predominant in Slovenia.

The article brings an extended theoretical model of care tasks provision and its verification in empirical settings, extending previous analyses. Novel joint modelling of income and wealth has important consequences and applications for research in health economics and economics (and social sciences) in general in future.

Racial Disparities in the Long-Term Services and Support Sector

PRESENTER: **Ulrike Muench**

Objective

A robust long-term care workforce is the foundation for delivering health care to an aging population. Research suggests that long term services and support (LTSS) workers are at risk for turnover and experience high rates of burnout. The aim of this study was to examine racial differences in skilled and unskilled LTSS workers and compare these workers to those of other health professional (OHPs) workers with comparable education/skills to better understand disparities in factors that might contribute to work stress, burnout, and retention among LTC workers.

Study Design

We used the American Time Use survey (ATUS) from 2003-2017, a novel and underutilized survey conducted by the Bureau of Labor Statistics. Following the literature, we grouped individuals into skilled and unskilled workers based on their education and wages. We examined (1) living in poverty, (2) time spent on six work and leisure activities; and (3) quality of life. Multivariate regression models tested

for differences by race among LTSS workers with OHPs for skilled and unskilled workers separately, controlling for age, gender, marital status, and children at home.

Population Studied

A national representative sample of health care workers employed in LTSS (n=2,004) and OHP (n=5,717).

Principal Findings

All skilled and unskilled non-white LTSS workers (black, Hispanic, other races) were significantly more likely to live in poverty compared to their white OHP counterparts. Across all activities analyzed unskilled black workers and individuals from other races spent significantly more time on work, work related travel and caring for children, and significantly less time on household activities, socializing, and time eating and drinking compared to white OHP workers. Findings for skilled workers were similar, but tended to have smaller effect sizes. Finally, quality of life was substantially lower for black unskilled LTSS workers compared OHP with no differences by race for skilled workers.

Conclusions

Minority unskilled LTSS workers, especially blacks, are hardest hit between living in poverty and spending more time of their day on work related activities and less time on leisure activities. This may partly explain the low quality of life scores only reported in this group of workers.

Implications for Policy and Practice

With the lack of education, unskilled LTSS workers may have little opportunity to move into the skilled worker category. Employers need to develop strategies to support career advancement and wage mobility for LTSS workers, an already strained workforce. Building a workforce fit to care for the needs of an aging population is a national priority and warrants developing both private and public policies in support.

A Test for *Ex Ante* Moral Hazard in a Market for Long Term Care Insurance (LTCI): Dead Men Tell No Tales

PRESENTER: **David Rowell**, The University of Queensland Centre for the Business and Economics of Health
AUTHORS: Son Nghiem, Peter Zweifel, Luke Connelly

In 2006, Finkelstein and McGarry published an empirical investigation of asymmetric information in a market for long-term care insurance (LTCI) using data obtained from the Asset and Health Dynamics (AHEAD) cohort of the Health and Retirement Study (HRS).

A bivariate probit model was used to show no evidence of asymmetric information in the market for long term care insurance (LTCI) when conventional controls for the insurer's information set are used. However, they hypothesize that individuals may possess other dimensions of private information that confound conventional tests for asymmetric information. They utilize gender-appropriate preventive health care measures and seat-belt compliance as proxies for an individual's unobserved preference for insurance to demonstrate the existence of multiple dimensions of private information.

However, the authors stated that their analysis

...does not, however, allow us to distinguish between *ex ante* private information (adverse selection) and *ex post* private information (moral hazard) (Finkelstein and McGarry p. 945).

In this paper we extend their analysis asymmetric information in the market for LTCI to present two tests for *ex ante* moral hazard. The HRS data are rich. In additional to collecting many of the variables which are observable to insurers the HRS also provides many variables that are not collected by insurers and could therefore contain variables that may function as either (i) a proxy for unobserved risk type or (ii) an instrument for the endogenously determined decision to purchase insurance.

The first approach uses an IV to address the endogeneity of the respondent's decision to purchase $LTCI_R$, whereby the spouse's decision to purchase $LTCI_S$ is utilised as an instrument for the respondent's insurance decision. The residual correlation between $LTCI_R$ and LTC is presented as *prima facie* evidence of *ex ante* moral hazard. Tests for weak instruments are presented, and the credibility of our assumption that our IV be uncorrelated with the error term is discussed.

The second approach is a "survival model" that uses time to death (TTD) following admission to LTC as test for *ex ante* moral hazard. The *ex ante* moral hazard hypothesis being that *ceteris paribus*, LTCI would be casually linked with an increase in the length of survived in LTC prior to death.

The results from both models are presented and their strengths and weaknesses are analysed.

The Dynamic Health Effects of Providing Informal Care in the UK

PRESENTER: **Jannis Stöckel**, Erasmus School of Health Policy & Management
AUTHOR: Judith Bom

Background & Objectives: A rapidly ageing population globally is one of the key factors driving the increasing demand for long-term care (LTC), and in developed economies in particular. In the United Kingdom (UK), the current LTC system places responsibility for non-health related LTC predominantly with the individual and their family. As a result, the growing demand for care is increasingly met via informal care. While seemingly advantageous from the perspective of the state and often preferred by care recipients, informal care has been shown to be demanding for caregivers, potentially leading to mental and physical health problems. This caregiving effect has not been extensively studied for the UK. In view of the ageing population, it is important to understand (i) the extent of this effect and its persistence, and (ii) whether it is related to care-duration. This study aims to estimate the causal long-term and dynamic health effects of providing informal care in the UK using data from the UK Household Longitudinal Study.

Methods: To overcome endogeneity concerns when estimating the causal impact of care provision we model the caregiving decision in a propensity score matching framework. We match individuals based on the following elements related to ones propensity of informal care provision: the presence of a family member or partner in need, personality traits, socio-economic characteristics, and pre-caregiving decision health status.

To estimate the dynamic impact of providing care we employ a dynamic matching procedure, matching individuals on the defined variables at every decision point. Doing so we estimate the impact of providing a second (third) year of care after providing one (two) initial year(s) of care.

Data: We utilize all 7 waves (2009-2016) of the UK Household Longitudinal Study, a nationally representative stratified panel data survey covering the adult UK population. After excluding individuals with missing data a total of 25.170 respondents remain. Among these, 1.804 initial and 2.943 continuing caregivers are identified, of which 2.285 can be followed up to five years after the care provision decision decision. Among these, we identify 914 individuals that provide care for more than one consecutive year, allowing for extensive subgroup analyses including male caregivers often omitted in previous studies.

Results: Using a kernel matching approach (bandwidth 0.03) we observe good matching quality for our long-term model; a sufficient level of common support exists between treated and matched sample. The matching procedure successfully balanced covariates between these groups with a marginal number of individuals excluded after imposing more restrictive inclusion criteria.

We expect to find small or non-present long-term health effects of care provision, as individuals might recover from the negative caregiving effect. As coping resources decline over time, we do however expect the dynamic direct effect of providing an additional year of informal care to have a negative health effect.

Conclusion: The growing reliance on informal care requires a thorough understanding of its long-term and dynamic effects for caregivers. This study will provide crucial insights on the hidden costs of informal care provision to inform LTC policy.

8:30 AM –10:00 AM WEDNESDAY [New Developments In Methodology]

Universität Basel | Kollegienhaus – Seminarraum 209

Survival and Treatment Path Modelling

SESSION CHAIR: **Pieter van Baal**, Erasmus School of Health Policy & Management

Validation of a Cyclic Algorithm to Proxy Number of Lines of Systemic Cancer Therapy Using Administrative Data

PRESENTER: **Ms. Deirdre Weymann**, BC Cancer

AUTHORS: Sarah Costa, Dean Regier

Background: Patients diagnosed with cancer often undergo treatment that includes systemic therapy. Advancing to new lines of therapy typically occurs following disease progression, relapse, or toxicity. As a result, multiple lines of therapy can indicate treatment resistance and correlates highly with disease prognosis. To date, researchers analyzing health outcomes and comparative effectiveness have manually reviewed records to identify lines of therapy, which is time-consuming to complete and infeasible in large or heterogeneous populations. Past efforts automating this process are limited by short follow-up periods, a lack of validation, and complex data requirements. In this study, we develop and validate a supervised learning algorithm to determine the optimal proxy for number of lines of therapy using information routinely recorded in administrative prescription drug data.

Methods: We retrospectively analyzed British Columbia Cancer Registry pharmacy records from time of patients' initial cancer diagnosis until the end of the follow up period (cohort-specific, 2014 or 2015). We created a cyclic algorithm identifying the optimal proxy for number of lines of therapy and validated our algorithm in four heterogeneous patient cohorts with: 1) advanced cancers of varying histologies, including those with unknown primaries; 2) diffuse large B-cell lymphoma; 3) follicular lymphoma; and 4) chronic lymphocytic leukemia. To assess validity, we considered lines of therapy identified through manual record review as our criterion standard. We determined the level of agreement between each proxy generated and the criterion standard based on correlation coefficients, mean squared error estimates, non-parametric hypothesis testing, and quantile-quantile plots.

Results: Cohorts examined in our study varied in terms of disease trajectory, common treatment plans and sample size. Sample sizes ranged from 93 patients with advanced cancers, to 121 patients diagnosed with CLL, to 442 patients with FL, to 679 patients diagnosed with DLBCL. The distribution of the criterion standard and the length of patients' treatment period varied significantly across patient cohorts ($p<0.01$). Despite these differences, our algorithm successfully identified an optimal proxy for number of lines of therapy, which was moderate to highly correlated with ($0.64 \leq$Pearson correlation≤ 0.81), and whose distribution did not significantly differ from the criterion standard ($p>0.10$) for each cohort.

Conclusions: The cyclic algorithm developed in this study requires minimal data manipulation and uses information commonly recorded in administrative databases to determine the optimal proxy for number of lines of systemic therapy. Despite heterogeneity in cohort characteristics, our approach identified an optimal proxy for number of lines of therapy in each cohort, which was correlated with and whose distribution was not significantly different from manually coded number of lines. Our results provide evidence that supervised learning algorithms are a valid tool for recognizing prescription drug patterns and approximating number of lines of therapy. They can be used in all jurisdictions with access to administrative pharmacy data.

A Comparison of Multi-State and Partitioned-Survival Modelling Approaches – Findings from a Case Study in Oncology

PRESENTER: **Holly Louise Cranmer**, Takeda Pharmaceutical Company Limited
AUTHORS: Gemma Shields, Ash Bullement

Introduction: When assessing the cost-effectiveness of new oncology treatments, partitioned-survival analysis (PartSA) has commonly been used to determine the incremental cost-effectiveness ratio (ICER) of the new treatment versus current care. A critical review of oncology appraisals in the UK by the National Institute for Health and Care Excellence Decision Support Unit found that of those reviewed, 73% adopted a PartSA approach. Published literature notes several limitations of this approach, including the assumption of independently-modelled survival functions and that probabilities are not estimated for each possible transition. More recently, the multi-state model (MSM) has been presented as an alternative approach to assessing the cost-effectiveness of new interventions that goes some way to addressing these limitations. To the authors knowledge, there have been few studies comparing the two approaches (PartSA and MSM).

In this study, we construct both a PartSA and MSM to assess the cost-effectiveness of a novel cancer treatment from a UK perspective and compare the differences in results.

Methods: Data from a cohort of late-stage cancer patients (N>700) enrolled within a randomised, controlled trial were used to populate both modelling approaches. The statistical software *R* was used to fit parametric survival models to overall survival (OS) and progression-free survival (PFS) data to inform the PartSA (package *'flexsurv'*). The package *'mstate'* was used to estimate the MSM transitions (permitted transitions: (T1) *'progression-free'* to *'dead'*, (T2) *'post-progression'* to *'death'*, and (T3) *'pre-progression'* to *'post-progression'*). The choice of parametric form was based on statistical fit and clinical plausibility. Patients within the study were assumed to be treated until progression. Key costs included were treatment-related (initial, subsequent, and concomitant), adverse events, hospitalisations and monitoring. Utilities were stratified by progression. Outcomes were discounted at 3.5% per annum.

Results: The PartSA and MSM approaches estimated ICERs of £342,474 and £483,097, respectively. These were based on generalised gamma (PFS) and Weibull (OS) fits for the PartSA, and generalised gamma (T1) and Weibull (T2 and T3) parametric forms for the MSM transitions. Scenario analyses exploring alternative parametric forms provided incremental discounted life-year estimates that ranged from +0.16 to +0.47 for the PartSA approach, compared with -0.17 to +0.25 for the MSM approach. This variation was reflected in the range of ICERs – the PartSA produced ICERs between £189,708 and £490,151; whereas the MSM provided instances where the new treatment was dominated (i.e. costlier and less efficacious) as well as ICERs above £17 million (caused by very small incremental QALY gains).

Discussion: Structural uncertainty in economic modelling is rarely explored due to time and resource limitations. Our comparison of structural approaches indicates that the choice of structure may have a profound impact on the cost-effectiveness results – in our example, the PartSA provided much more favourable results for the new treatment in most scenarios. The MSM approach is also subject to various limitations, primarily due to data availability for uncommon transitions. This highlights the importance of carefully considered model conceptualisation, and the need for further research to ascertain when it may be most appropriate to use each approach.

Predicting Utility That Is Missing By Design Using Directed Acyclic Graphs.

PRESENTER: **Winnie Mei**
AUTHORS: Joel Smith, John Forbes, Gillian Mead, Martin Dennis

Quality-adjusted life years (QALYs) are the primary measure of effectiveness in many economic evaluations conducted alongside randomised controlled trials. Utility values from generic preference-based measures of health related quality of life are commonly used to adjust patient survival times in the calculation of QALYs. Longitudinal measurement of health-related quality of life may not be feasible in some studies for a number of reasons, including ethical and budget constraints. There are also practical limitations in deriving baseline utility values from health-related quality of life measures if the underlying health condition has a high rate of mortality and morbidity. This is particularly pertinent in randomised controlled trials in acute care settings for stroke where many patients may be unable to respond at baseline combined with significant mortality prior to an intermediate timepoint for health-related quality of life. Although proxy respondents such as clinicians or family members may demonstrate concordance for objective measures of health, there is a discord for latent measures of health-related

quality of life including pain and mental wellbeing. To address this limitation, we consider the appeal of directed acyclic graphs as a means of predicting baseline utility values from the EuroQoL five level (EQ-5D-5L) questionnaire within an acute care stroke population.

Our analysis uses data from a large multicentre randomised controlled trial in stroke to predict baseline EQ-5D-5L utility values for over 3000 patients. We construct a Bayesian Network via a two-step process that "learns" the underlying dependency structure across the five domains of EQ-5D at 6 months and predicts response across the five levels within each domain. Baseline estimates of EQ-5D-5L are derived by conditioning the 6 month learned Bayesian Network structure on baseline prognostic covariates to penalise predictions that overestimate health-related quality of life. The sensitivity of results to the underlying Network structure learning algorithm and selection of baseline covariates will be discussed. We also consider the appeal of Bayesian Networks for predicting future health-related quality of life utility values by extrapolating based on past evidence.

8:30 AM –10:00 AM WEDNESDAY [Evaluation Of Policy, Programs And Health System Performance]

Universität Basel | Kollegienhaus – Seminarraum 212

Organized Session: Barriers and Proposed Solutions for Using Value of Information Analysis to Improve Reimbursement Decisions: The Case of Tomosynthesis for Breast Cancer Screening.

SESSION CHAIR: **Sabine Elisabeth Grimm**, Maastricht University Medical Centre (MUMC+)

PANELISTS: **Manuela Joore**, Maastricht University Medical Centre (MUMC+); **Xavier Pouwels**, Maastricht University Medical Centre+ (MUMC+); **Nicolien van Ravesteyn**, Erasmus MC, University Medical Center; **Elisabeth Fenwick**, Pharmerit International

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8:30 AM –10:00 AM WEDNESDAY [Health Care Financing & Expenditures]

Universität Basel | Vesalianum – Grosser Hörsaal EO.16

Measuring Financial Protection in Health: Experiences from Sub-Saharan Africa, Latin America and Asia

SESSION CHAIR: **Virginia Wiseman**, London School of Hygiene & Tropical Medicine

The Impact of Survey Design on the Measurement of Financial Protection: Experimental Evidence from Nouna, Burkina Faso

PRESENTER: **Dr. Karen Ann Grepin**, Wilfrid Laurier University

AUTHORS: Bejamin Sas Trakinsky, Bridget R Irwin, Ali Sié, Till Bärnighausen

Universal Health Coverage (UHC) is one of the targets of the newly adopted Sustainable Development Goals and achieving it includes ensuring access to necessary health services and providing protection against financial hardship from using those health services. This latter concept, known as financial protection, is measured using data on aggregate household health expenditures and total household income or consumption, which are typically sourced from nationally representative household budget and expenditure surveys, such as those based on the living standards and measurement survey (LSMS) questionnaire. There are, however, no standardized instruments to collect data on household health expenditures and great variation in methods used both within countries and across countries.

Studies have shown that survey design features can have a large effect on estimates of total income and consumption, including which recall periods are used and the number expenditure categories included in the survey. A few studies have also explored the effect of survey design features on estimates of health expenditures in low and middle-income countries. For example, one study which compared estimates generated from the World Health Survey (WHS) to those generated by LSMS surveys found that in most countries, a lower level of disaggregation (i.e. fewer items) gave a lower estimate for average health spending, and a shorter recall period yielded a larger estimate. Another study in Rwanda found that a survey with a shorter recall period had higher health expenditures than another survey with a longer recall period. However, to date, no study has compared the effect of survey design features in the same population and at the same time.

In summer of 2018, we conducted a randomized experiment of survey instruments in Nouna, Burkina Faso as part of a larger aging study to test the impact of survey design features on estimates of financial protection. Over 3000 adults were surveyed using a randomly assigned survey instrument, which measured both health expenditures and total household consumption. Surveys varied according to recall periods (1 month vs. 3 months), the number of health spending categories (4 vs. 8), and method to calculate total consumption (LSMS vs. WHS). Our preliminary estimates suggest that - unlike previous studies - fewer health spending categories actually increased estimates health expenditures. Additional findings will be finalized in the coming month.

Trends in Household Out-of-Pocket Expenditure for Health Care and Associated Financial Risks in Vietnam 1992-2014

PRESENTER: **Hoang Van Minh**

Vietnam has made concerted efforts to reduce household out-of-pocket (OOP) payments for health and the associated risk of impoverishment over the last two decades. These efforts have been pursued largely through increased public funding for health and significant expansion of social health insurance, which now covers more than 80% of the population. Other strategic health system reforms, including strengthening primary health system, promoting preventive medicine activities, and regulating private health services, have been implemented. During this period, Vietnam has also had rapid economic growth. To evaluate the extent of financial protection of health financing reforms in Vietnam, we analyse the trends in household OOP for health and associated incidence of catastrophic expenditure and impoverishment from 1992 to 2014. Data for this assessment are derived from nine rounds of nationally representative household surveys in Vietnam: the Vietnam Living Standard Survey (VLSS) for the years 1992, 1998, 2002, 2004, 2006, 2008, 2010, 2012 and 2014. In nominal terms, the mean annual household OOP increased from US$3.0 to US$15.8 between 1992 and 2014. During the same period, the annual incidence of catastrophic health expenditure and impoverishment declined from 8.2% to 2.3%. In addition, the annual proportions of households pushed into poverty because of OOP declined from 5.3% to 1.7%. Taken together, the results indicate that financial protection has improved in Vietnam, but perhaps less than anticipated, as catastrophic health expenditure and health-related impoverishment still occurred. Rural households and households with older people suffered more catastrophic expenditure and impoverishment compared to urban households and those with younger people. Overall, the financial protection impact of the social health insurance scheme in Vietnam has been modest and more attention is needed to develop appropriate configuration of the health system that will further enhance financial protection.

Temporal Trends and Urban-Rural Disparity in Catastrophic Health Expenditure in China, 1989-2015

PRESENTER: **Jiajia Li**, Shandong University

AUTHORS: Zhuohui Liang, Yuekun Tang, Lingzhong Xu, Chengchao Zhou

Background

Although dramatic strides have been achieved in recent years to expand insurance coverage for both rural and urban residents in China, many of the country's households were impoverished by medical expense. Financial risk from medical expenses in rural may be more profoundly than that in urban due to distinct welfare system. The aim of this study is to map trends in Catastrophic Health Expenditure (CHE) and its urban-rural disparities, and to draw implications to health care system reform.

Methods

Data of 41105 individuals located in 12 provinces/districts of China were derived from the China Health and Nutrition Survey (CHNS) for the period 1989-2015. We defined expenditure as being catastrophic if a household's financial contributions to healthcare exceed 10% and 25% of their income. Both absolute incidence and relative incidence of catastrophe were measured. Multivariate logistic regression with Robust Standard Error were performed to examine the extent and trends of urban-rural gaps in CHE after controlling for the confounding factors and possible heteroscedasticity.

Findings

The mean catastrophic out-of-pocket payment rates are 15.22% and 11.05 at the 10% threshold and 25% threshold, respectively. Irrespective of the threshold, household have experienced an uprising risk to face catastrophic health expenditure. After controlling for confounding variables, the absolute incidence of CHE in 2015 were 4.332 times and 6.056 times of that in 1989 at 10% and 25% threshold ($p<0.01$), respectively. Similar upward trend could be concluded from those who actually occurred health care expense. More notable increase extent could be observed from relative incidence than absolute incidence, 25% threshold than 10% threshold. What's more, households living in rural were exposed to greater financial risk verse their urban counterpart in any thresholds. The urban-rural gaps in medical finical risk gradually narrowed in a longitudinal perspective, from the peak in 1993 to the valley in 2011, and slightly increased before 2015 at both thresholds. At the 10% threshold, urban-rural disparities in 2015 were 57.2% and 40.7% smaller than that in 1989 for absolute and relative incidence, respectively.

Conclusion

This study is among the first to investigate the extent and trend of urban-rural disparities in CHE by using a longitudinal individual-level database which including the most recent data and explored some up-to-date findings. The present study showed that regardless of the fact that rural households had higher risk to be catastrophic by health expenditure when compared to their urban counterparts, the significant decrements in urban-rural disparities reflect the positive effect of the on-going health system reform in China. However, China is still among one of the regions having the highest rate of catastrophic spending on health worldwide. The universal health insurance coverage and diminishing gaps between rural and urban region that seems ready to provide better financial protection to the population do not reflect in the uprising CHE headcount, which suggested that more targeted efforts such as Critical Illness Insurance and Health Poverty Alleviation Program should be popularize and perfect to protect the medical financial risk.

Financial Protection Under Public and Private Health Insurance Schemes in Latin America

PRESENTER: **Dr. Arturo Vargas Bustamante**, UCLA

Background: Latin America has experienced considerable improvements in population health and access to care as public and private health insurance coverage has expanded. Few studies, however, have investigated differences in financial protection by type of health insurance coverage.

Objective: To analyze the relationship between financial protection and type of health insurance coverage (public vs. private) in four Latin American countries.

Methods: We used a Latin American survey with nationally representative samples of experiences of care in Brazil (n=1486), Colombia (n=1485), México (n=1492) and El Salvador (n=1475). The statistical analyses consisted of weighted multiple Poisson regression with robust variance and log-linear regression models for each country. The main dependent variables were i) having to pay out of pocket (OOP) health spending in the last year, and ii) having to pay more than US$200 in OPP. Three additional measures of reported problems paying medical bills, insurance support for payments, and prescription medication payment were used in separate specifications. The main explanatory variable was type of health insurance coverage (public, private and uninsured). The covariates included socio economic and demographic characteristics and reported health status.

Results: The four countries report a wide variation in OOP health spending and financial protection across age groups and genders. Having to pay OOP in the last year was reported more often in El Salvador (85.93%) and Mexico (88.93%). Differences between public and private coverage were statistically significant. In both cases, the highest financial burden was reported among individuals with private insurance. Differences by public/private insurance status in Brazil and Colombia were non-statistically significant. In terms of having to pay more than US$200 in OPP, Brazil, El Salvador and Mexico report differences between public and private health insurance coverage. Individuals with private insurance have higher shares (27% in Brazil, 12% in el Salvador and 49% in Mexico) compared to individuals with public coverage. When asked about having problems to pay for medical bills, no country reported statistically significant differences across insurance groups. By contrast, when respondents were asked about payment for prescription drugs, Brazil, El Salvador and Mexico reported statistically significant differences by insurance coverage. Brazil is the single country where insurance denying payment or paying less than expected was statistically significant.

Conclusions: Our study provides evidence that private insurance coverage is less effective at procuring financial protection compared to public coverage in four Latin American countries. While recent government efforts have focused on procuring financial protection of users of public health insurance, new regulatory schemes to ensure financial protection are needed for users of private coverage. Differences in private health insurance financing and organization across Mexico, El Salvador, Brazil and Colombia may explain these differences.

Key Words: health care spending, financial protection, health insurance, Latin America

The National Health Insurance Fund and Improved Community Health Fund As Vehicles to Drive Universal Health Coverage in Tanzania

PRESENTER: **Mr. Bryant Lee**, Palladium

AUTHORS: Kuki Gasper Tarimo, Dr. Arin Dutta

Background: Universal health coverage (UHC) and increasing domestic resource mobilization through the establishment of sustainable financing mechanisms for health have become major policy priorities in Tanzania. The National Health Insurance Fund (NHIF), which covers the formal-sector, through cross subsidization of the improved Community Health Fund (iCHF), which covers the informal sector and the poor, can be an intermediary step towards the reform objective of a Single National Health Insurer (SNHI), which is intended to end fragmentation of insurance coverage and provide a minimum benefits package for all.

Methodology: The USAID-funded Health Policy Plus (HP+) project assessed the NHIF and iCHF as pathways for outward expansion of health insurance in Tanzania. HP+ forecasted enrollment growth based on three scale-up scenarios, including enrolling the poor under government subsidy of premiums. Baseline premium rates and provider payment mechanisms were set to mirror Tanzania's scheme design and current structure. Historical financial statements from NHIF and PharmAccess, an NGO that piloted the iCHF, were examined to determine recent trends on health expenditure, utilization, and administrative expense ratios to project pro-forma income statements and examine scheme sustainability over time.

Results: NHIF currently has US$437 million in surpluses carried forward since FY 2007/08. However, there are legitimate concerns with worsening claims ratios over the past five years. If current trends continue, NHIF is projected to begin running a deficit within eight years. The strong reserves NHIF has built up does allow time to introduce a mix of reforms to achieve efficiency gains from stricter referral systems and changes to provider payment mechanisms at the primary health care level. NHIF may also consider a slight increase to premium rates for middle- to high-income Tanzanians—who make up most formal sector workers that are generally more willing to pay for health care—to help curtail claims ratio deterioration. A 3% increase to premium rates would raise an additional US$7 million in revenue in 2019. If NHIF can stabilize its financial position, it can support the insurance reform agenda through cross-subsidization of the iCHF. Specifically, NHIF could meet some financing needs for subsidizing enrollment of the extremely poor in the iCHF. HP+ estimates that US$7.4 million is needed for subsidies in 2018 with the figure rising to US$34 million by 2022. The iCHF also relies heavily on funds provided by the government that "match" premium contributions from households to help with scheme sustainability, forecasted at US$41 million in 2019. Currently, it is unclear where funding for these government obligations will come from.

Conclusion: If NHIF, working alongside the iCHF, is to be a vehicle to drive UHC, it will need to find the right balance between managed expenditure growth, progressivity in revenue generation, and increases in utilization due to beneficiaries' needs rather than poor provider practices. Future discussions related to reform need to include expanding the depth of the benefits package to cover new areas, for example HIV or family planning. However, if recent trends in cost escalation are not remedied, NHIF will not have the ability expand its benefits.

10:30 AM –12:00 PM WEDNESDAY [Special Sessions]

Universitätsspital Basel | ZLF – Gross

Special Organized Session: Health Equity: Economic Evaluations Shouldn't Just be About Efficiency

SESSION CHAIR: **Paula Lorgelly**,

PANELISTS: **Richard Cookson**, University of York; **Susan Griffin**, University of York; **Ijeoma Edoka**, PRICELESS SA, School of Public Health, Faculty of Health Sciences, University of Witwatersrand

10:30 AM –12:00 PM WEDNESDAY [Economic Evaluation Of Health And Care Interventions]

Universität Basel | Kollegienhaus – Hörsaal 001

Organized Session: Health Economic Modeling of Obesity Prevention and Therapy: Insights on Published Approaches and Discussion of Alternative Methodologies

SESSION CHAIR: **Emma Frew**, University of Birmingham

Landscape of Modelling Obesity – Insights on the Structural Approaches of Published Models

PRESENTER: **Mr. Bjoern Schwander**, AHEAD GmbH

OBJECTIVES: Decision analytic modelling is particularly relevant in the case of prevention and therapy of obesity due to the chronic nature of the condition, its associated morbidities (e.g. type 2 diabetes, coronary heart disease, stroke, osteoarthritis and various cancers) and the increased mortality. For assessing the long-term economic impact of such programs, several decision analytic models have been used. The core of each model is the structure that addresses the clinical aspects; accordingly, the details of the specific simulation approaches are fundamental as these have a major impact on all clinical, economic and patient outcomes estimated using a decision model. The objective of our research is to determine and compare the methodological variations in structural aspects (e.g. model type, time horizon, health states) and discuss these with a special emphasis on the methodological variations in the obesity associated event simulation approaches and the related external validations.

METHODS: The literature on decision models for health economic assessments in obesity, was searched systematically using Pubmed and NHSEED, applying the PRISMA guidelines. For each model, details of its structure and simulation approach were extracted including: obesity-associated events, event-specific risks, impact of obesity program or intervention on the risks, time horizon, and external validation, if any.

RESULTS: A total of 4,293 abstracts were identified and 87 papers were reviewed, of which 72 reported on simulations of obesity-associated events. Most simulated coronary heart disease (≈83%), type 2 diabetes (≈74%), or stroke (≈66%). Although a large number of modelling approaches were identified, we found some simulation methods were frequently applied. Only ten performed external validation, and only for one the predictiveness of the event simulation was investigated in a cohort of obese subjects.

DISCUSSION: We have identified a wide range of event simulation approaches which highlights the need to develop recommendations and/or minimal requirements for model-based economic analysis of obesity interventions. Furthermore, only a limited number of published decision models in obesity have applied external validation. Therefore, further work on comparing and validating these event simulation approaches is required to investigate their predictiveness and validity, which will offer guidance for future modelling in the field of obesity.

Modelling Obesity – Might an Event-Driven Decision Tree Model be a Suitable Modelling Approach?

PRESENTER: **Mark Nuijten**

OBJECTIVES: The assessment of the long-term natural course as well as assessing the clinical and economic consequences of obesity management is quite complex. Decision analytic modelling is particularly relevant in the case of obesity due to the chronic nature of obesity the possibility to extrapolate short-term RCT data to long-term outcomes. The objective is present methodological strengths and weaknesses of a event-driven model.

METHODS: We present here an event-driven decision tree model as an alternative. The choice of model design was based on: 1) results of clinical trials, especially on weight loss and BMI improvement, 2) clinical guidelines on the treatment of obesity and its complications, and 3) available clinical and economic data that determine the complexity and validity of the model. The complications were included in the model by direct relationships between BMI and risk of complications from the literature.

RESULTS: Markov models are the first choice for chronic diseases, when patients can be stratified in mutually exclusive health states. However obesity is more complex disorder, patients cannot be stratified in a limited mutual exclusive health states as they may experience multiple complications (more than 20) leading to a large number of combinations, which would not lead to a transparent Markov model. The most practical limitation is that there would not be statistically significant data available on probabilities, costs and utilities for each combination of possible complications. An individual-level approach is better suited than a cohort-level approach to capture the chronic implications of both weight and weight-related health events in a heterogeneous group of overweight and obese patients, but may be constrained by other factors.

DISCUSSION: We will consider methodological strengths and weaknesses of this approach as well as results of scoping review on the risk of complications in obesity. We will take into consideration data availability, confounding variables, validity, extrapolation, time horizon and perspective of the analysis. Finally besides technical issues we will address transparency and practical issues like running time of the model.

Considerations for Modelling Obesity – New Approaches and Recommendations for Path Forward

PRESENTER: **Dr. Jaime Caro**, Evidera

OBJECTIVES: In order to estimate the impact of programs for preventing obesity and of interventions to decrease the risks of associated morbidities and mortality, it is essential to model the course of the condition. This is challenging because body weight fluctuates over time, it has complex relationships to adverse consequences, and the results of treatment are highly individual and variable. Thus, it is essential to have a model concept that can accord closely with reality and handle time dependencies accurately; yet remains flexible; fast to create, easy to modify with new data or assumptions and able to examine the influence of assumptions ("structural" sensitivity analysis). The objective of this session is to present a novel method that meets these requirements; and does so with no need for programming or learning new software.

METHODS: DICE (Discretely Integrated Condition-Event) simulation is a modeling technique specifically designed for decision-analytic modeling that conceptualizes a disease process and its management in terms of conditions and events. Conditions represent any aspect of the problem that persists over time; they have levels, which can change over time and a person can bear any number of conditions at the same time (e.g., age, body weight, glycemia, treatment, etc.). Events are aspects of the problem that happen instantaneously. They can occur at any time and can modify the levels of conditions and the times to other events. Thus, conditions are integrated with events. Conditions, events and their consequences are tabulated in text and the model is executed by a simple macro that reads the tables and implements the discrete integration.

RESULTS: DICE simulates a population specified by the user. While a standard cohort Markov model is easily implemented in DICE, a simulation of obesity and its management takes advantage of the features of DICE to model the course of individuals, the changes in their BMI and the occurrence of associated morbidities. This will be illustrated in the session in comparison with the individual Markov model presented in the second section.

DISCUSSION: Using DICE simulation, it is possible to construct a detailed model of obesity and its consequences, incorporating treatments and other activities. This model can reflect the available data, time-dependencies, heterogeneity and other aspects central to the problem in a natural way. Several structures can be developed in one model to allow for consideration of structural uncertainty. All of it is specified transparently in spreadsheet tables with no need for additional software and the resulting model is very flexible, easy to modify with new data or assumptions, straightforward to review and simple to communicate.

10:30 AM –12:00 PM WEDNESDAY [Supply Of Health Services]

Universität Basel | Kollegienhaus – Hörsaal 102

Organized Session: Supporting Evidence Informed Decision Making for Health Benefit Packages: Global, Regional and Country Perspectives

SESSION CHAIR: **Tessa Tan-Torres Edejer**, World Health Organization

PANELISTS: **Melanie Bertram**, ; **Gwenael Dhaene**, World Health Organization; **Melissa Guerrero**, ASEAN; **Getachew Teshome Eregata**, University of Bergen

10:30 AM –12:00 PM WEDNESDAY [Organization Of Health Care Markets]

Universität Basel | Kollegienhaus – Seminarraum 103

Analysis of Hospital Markets

SESSION CHAIR: **Olga Rozanova**, Office of Health Economics

Investigating the Geographic Variation of Hospital Readmission in Italy: What Are the Length-of-Stay and Readmission Cost Trade-Offs?

PRESENTER: **Yuxi Wang**, Cergas Bocconi

AUTHORS: Aleksandra Torbica, Simone Ghislandi

Background

Since the recent financial crisis, the Italian central government had employed stringent measurements to shorten hospitalization after major surgeries, reduce number of hospital beds, and promote lower but more appropriate hospital admissions. These cost-containment efforts, along with the decentralized healthcare system, may have produced substantial regional variations in early discharges and consequent unplanned readmissions.

Objective

This paper aims to (i) identify the patient and hospital factors that influence the propensity of elderly early readmission, (ii) examine how the risk of readmission varies across regions in Italy, (iii) understand what are the hospital behaviours that potentially drive the quality disparity. We pay special attention to the hospitals' incentive structures and the trade-offs between length-of-stay and readmission cost across regions and hospital ownerships.

Data and Methods

We use the hospital discharge data from 2010 to 2015 for patients above 65 years old admitted with acute myocardial infarction (AMI) (462,044 patients) given the high volume of readmitted patients. We also merge the dataset with hospital-level information that contained bed counts and quality indicators. We first employ a multilevel cox proportional hazard model for time to readmission with patient- and hospital-level covariates to identify the degree of variations of readmission risks across hospitals and regions. Given the substantial variation, we base our empirical analysis on a theoretical model where we capture hospitals' discharge incentives in response to payment systems and penalty rules. A two-part model with instrumental variable (for length-of-stay) was used investigate the impact of length-of-stay on probability of readmission and the trade-offs between length-of-stay and readmission cost.

Analysis and Discussion

We find that female, education, and discharged to institution, along with several comorbidities are negative associated with propensity for readmission. Moreover, hospitals with higher AMI patient volume and lower capacities have lower readmission, and public trust, teaching trust as well as private clinics have lower probability of readmission than local health authority directly managed hospitals. After adjusting for patient- and hospital- level indicators, there is substantial geographic variation in elderly readmission and contextual effects on the risk, with intra-class correlations 42.16% at hospital and 25.64% at regional level. The analysis on the trade-off between length-of-stay and readmission cost showed that length-of-stay reduces probability of readmission, and on average, increasing length-of-stay would reduce overall episode cost (index hospitalization and readmission cost). However, the offsetting effects are considerably different across regions and hospital types, reflecting disparate discharge behaviours. The results shed light on the cost-saving incentives of the providers and on the drivers for variation in healthcare quality in Italy and in countries that have decentralized healthcare system.

Planned Hospitalizations – Does Quality of Care Matter for French Patients?

PRESENTER: **Ms. Myriam Lescher**, LIRAES

AUTHORS: Charlène Le Neindre, Nicolas Sirven

Objectives: This paper investigates the influence of hospital quality on patients' willingness to travel some extra distance from the nearest appropriate hospital. The referral system in France guaranties free patient's choice in the case of planned hospitalizations. In practice, a significant part of patients bypass the nearest appropriate hospital, suggesting that other factors than geographical proximity remain important.

Method: We combine four datasets: (i) the French health, healthcare and insurance survey (ESPS 2012-2014) providing nationally representative data on individual health, insurance and socio-economic attributes, (ii) the Hospitals national information system database (PMSI, 2011-2014) which records the type of care delivered to the patient, (iii) the Annual hospital establishments statistics (SAE, 2011-2014) describing main production features and (iv) a unique dataset provided by the French National Health Authority (HAS, 2013-2016) where hospital quality and security is assessed by five measures (global certification, Hospital-acquired infections (HAI) prevention, pain assessment, medical record, links with external care). The extra distance from the nearest appropriate hospital is approximated by means of

geo-tracking of health care facilities and patients' homes. We use a negative binomial regression to analyse the influence of individual and hospital characteristics on (i) the propensity to bypass and (ii) the additional distance to the nearest appropriate hospital.

Results: People are more prone to bypass the nearest hospital when attending specific, long-term care. They are also more willing to go to bigger, regional hospitals. Quality is found to increase the probability to bypass the nearest appropriate hospital, while it is relatively independent from the amount of extra distance travelled. In other words, patients seeking quality of care have a demand function rather inelastic to the opportunity cost of travel. Age and socio-economic deprivation remain the most important drivers that confined the patients to go to the nearest appropriate hospital.

Discussion: As patients undergoing planned hospitalizations appear less sensitive to travel costs than the quality of care, competition among health facilities may rise between hospitals that are far apart. In that case, economic theory predicts increased hospital specialization and differentiation across territories. However, this raises the question of equity in access to elective care for older and poorer populations.

Socioeconomic Gradients in Waiting Time for Hospital Admissions

PRESENTER: **Dr. Oddvar Kaarboe**, Uni. of Oslo

AUTHORS: Fredrik Carlsen, Tor Helge Holmås

Recently, several papers have estimated socioeconomic gradients in waiting time for hospital admissions, that is, how waiting time for elective treatment depends on the patient's socioeconomic status. Waiting time is the period between the hospital receives the letter of referral and the patient is admitted. For approximately half of the Norwegian patients admitted to hospitals for elective treatment, the admission is preceded by an outpatient visit. For these patients, waiting time consists of two subperiods, time from referral to out-patient visit and time from out-patient visit to admission. In this paper, we study how the two subperiods of waiting contributes to the overall socioeconomic gradient and whether waiting time and socioeconomic status differs between patients that are directly admitted (without an outpatient visit) and patients that are admitted only after an outpatient visit. We find that the educational and income gradients in waiting time are due to two factors. First, patients that are directly admitted have on average lower waiting time and higher socioeconomic status than patients that are not directly admitted. Second, among patients that receive an out-patient visit first, patients with higher education and income have lower waiting time from referral to the outpatient visit than other patients. We find no evidence of a socioeconomic gradient in waiting time from the outpatient visit to admission.

Impact of Pre-Transplant Dialysis Duration on Kidney Transplant Recipient Survival: An Instrumental Variable Approach

PRESENTER: **Rui Fu**, Institute of Health Policy, Management and Evaluation, University of Toronto

AUTHORS: S.Joseph Kim, Claire de Oliveira, Peter Coyte

Dialysis prior to kidney transplantation may have a detrimental effect on post-transplant outcomes but prior studies have not fully characterized the nature of this relationship and may have been subject to confounding. We investigated the association between post-transplant mortality and pre-transplant dialysis duration by conducting a retrospective, population-based, cohort study in all deceased-donor kidney transplants performed in Ontario, Canada, from April 1, 2002 to March 31, 2013. Patient blood type was chosen as an instrumental variable and a two-stage modelling procedure that included a threshold-adjusted Cox proportional hazards model was used to assess the association between increased dialysis time and post-transplant mortality. Among 4,728 transplant recipients, the risk of death increased non-linearly with dialysis time and was more prominent during the earlier years. Each dialysis year prior to 3 years was associated with a 42% increase in the relative hazard of death, with expected post-transplant mortality increasing from 6.4% to 10.8% as dialysis duration increased from 1 to 3 years. The relative hazard fell to 5% per additional dialysis year thereafter, with the expected mortality increasing from 10.8% to 11.6% as dialysis duration increased from 3 to 5 years. These findings highlight the urgency to develop strategies to shorten waiting times and optimize the management of wait-listed patients, with the goal of improving kidney transplant outcomes.

10:30 AM –12:00 PM WEDNESDAY [Supply Of Health Services]

Universität Basel | Kollegienhaus – Seminarraum 104

Emerging Issues in Health Care Labor Markets: Labor Supply

SESSION CHAIR: **Nils Gutacker**, Centre for Health Economics at the University of York

Can We Pay Soon-to-Retire GPs to Work More? Analysis of the Effect of "Goodwill Payments" on GP Behaviour

PRESENTER: **James O'Halloran**, University of Southern Denmark

AUTHORS: Anne Sophie Oxholm, Line Bjørnskov Pedersen, Dorte Gyrd-Hansen

Aim

Danish general practitioners (GPs) reduce their activity when they are close to retirement (by ~6% five years prior to retirement). Lower activity levels may reduce access to optimal care in times of GP shortage. In this paper, we exploit a natural experiment to verify whether soon-to-retire GPs can be incentivised to maintain high activity rates until the day of retirement.

Background

Danish GPs own their practices and sell their share of the practice upon retirement. The selling price is regulated such that it cannot exceed the GP's "goodwill", which is set as the average revenue over the last three years plus 30%. This regulation creates an incentive for retiring GPs to increase their revenues to achieve the largest possible goodwill (potential selling price).

To test whether the goodwill selling price influences GPs' activity-level we exploit variations in the average selling price across time. In 2001 the average selling price was 113% of goodwill, whereas in 2016 it was only 44%. This variation in the selling price enables us to test whether - and how - the change in the magnitude of the financial incentive alters the retiring GPs' behaviour.

We hypothesize that the size of the financial incentive provided by goodwill determines the potential responses of GPs. When goodwill is high, GPs will increase their activity three years prior to retirement as the financial incentive to do so is strong. However, when GPs' goodwill is low the financial incentive to change behaviour is weaker.

Our second hypothesis is that GPs with a previously high activity-level respond less to the financial incentives than those GPs with a previously low activity-level. We base this hypothesis on the assumption that GPs with high activity levels are more likely to be operating at their maximum capacity level and therefore are unable to respond to the financial incentive.

Methods

To estimate the effect of the goodwill on GP behaviour, we compare GPs who are soon-to-retire (3 to 1 years from retirement) with those who are next-in-line to retire (5 to 7 years from retirement). To account for the GPs' previous activity levels, we standardize the outcome variable such that we measure a percentage change in revenues across time. The base year is set to 8 years prior to retirement. We use a linear regression with GP level fixed effects controlling for the complexity of the patient population, list size, and GPs' health.

Data

We use data from the National Health Service Register and the Provider Register, which includes information on Danish practices' activity and characteristics of all GPs (around 3,500 GPs in 2,200 practices) from 1996 to 2014.

Results

We find that when goodwill is high, GPs tend to increase activity. When dividing our sample into high and low activity groups, we find that GPs who previously had a low activity-level respond more to the financial incentive. We conclude that retiring GPs respond to financial incentives, and that such incentives may be a useful tool for ensuring higher activity levels amongst soon-to-retire GPs.

How Does Gender Differences in Family Responsibilities Affect Doctors' Labour Supply: Evidence from Australian Panel Data.

PRESENTER: **Terence C Cheng**, University of Adelaide
AUTHOR: JIA Song

Over the last half century, one marked change in the medical profession across OECD countries is the gender composition of the labour force. With women constituting an increasingly larger share of medical students and the medical workforce, it is important to understand how female doctors make decisions on whether and how much to work. The extent literature emphasises the role of pecuniary (e.g. remuneration) and non-pecuniary factors (e.g. job characteristics, family circumstances), though the existing evidence is predominantly from cross-sectional studies. In this paper we investigate how family factors influence the labour supply of doctors using longitudinal data in Australia. We focus on how family responsibilities, namely having children and the children's age, influence the number of hours worked per week and how family factors differs for female and male doctors. We also examine how marital status, and the employment status of a doctor's partner, influence hours worked.

Our data is from seven annual waves of the "Medicine in Australia: Balancing Employment and Life (MABEL)" longitudinal survey of Australian doctors. MABEL is a panel survey of workforce participation, labour supply and its determinants among Australian doctors. In each annual survey are questions about the workload (e.g. hours worked, on-call) and work setting (public/private hospitals), finances (income, sources), professional characteristics (specialty, qualifications) and family circumstances (partner and children). Our analysis sample comprises of over 61,000 doctor-year observations over a span of seven years, from which we observe considerable variation in family characteristics and hours worked. In our empirical analyses we use fixed-effects estimation to identify within-doctor changes in hours worked arising from changes in family responsibilities.

Our results show that while having children has a significant impact on hours works, the effects are opposite for female and male doctors. For females, having one or more children has a negative effect on labour supply compared with not having children, with the number of hours worked decreasing by an average of 1.5 hours per week. The magnitude of the reduction is similar for across having different number of children. For males, on the other hand, having two or more children increases hours worked by 0.6—0.75 hours per week. We also find that labour supply for female doctors increases significantly as their children becomes older. Compared with female doctors with pre-school children (ages 0—4 years), those with primary school (age 5—12 years) and high school (age 13—18 years) going children increase their hours worked by 3.8 and 7.0 hours per week. Finally we find that the employment status of doctors' partners has a significant and opposite effect on labour supply for female and male doctors. All else being equal, females doctors with children and have partners in full-time employment have lower hours worked per week compared with male doctors with a similar circumstance.

An Examination of Determining Factors for Canadian Personal Support Workers Labour Supply Behaviours Using a Panel Survey

PRESENTER: **Prof. Audrey Laporte**, University of Toronto
AUTHORS: Katherine Zagrodney, Raisa Deber, Mike Saks

Given the increased utilization of Personal Support Workers (PSWs), supply of PSWs is of rising importance in the delivery of care across multiple countries. Yet there is limited research surrounding PSW supply and PSW labour supply behaviours. To fill in some of the major gaps in current PSW literature, the set of empirical analyses presented in this paper investigated the relative impact of factors at the individual and socio-demographic (e.g. age, education, immigrant status), geographic (rurality, provincial), job (e.g. shift-type, unionization) and sector (hospital, long-term care, home and community) levels in regards to labour supply behaviours of PSWs (probability of participation in the labour force, wages, and hours worked) over time. The data source used in this research is a longitudinal panel dataset collected by Statistics Canada, the Survey of Labour and Income Dynamics (SLID), which captures individual-level data for Canadian PSWs in a series of five panels from 1993 to 2010. The panel structure of the dataset granted the opportunity to account for common issues that need to be addressed in labour supply analyses (unobserved heterogeneity and endogeneity). Methods utilized a dynamic framework to model an individual PSW's labour supply behaviours and closely followed Killingsworth and Heckman's labour supply model by running a series of models utilizing two-stage residual inclusion (2SRI) which included OLS regression, random effects regression, with the addition of fixed effects Mundlak specification models. To our knowledge, no previous PSW literature has run such a comprehensive labour supply model. Results show the relative impact of multiple individual and socio-demographic, geographic, and policy variables on the decision to participate in the PSW labour market. For instance, health status and disability had a significantly negative correlation with working as a PSW. Higher minimum wages set in a given province and year translated to a decreased likelihood of working as a PSW in that year and location; highlighting the implications of provincial minimum wages on supply for this labour force. Furthermore, multiple individual socio-demographic, geographic, and job-related factors that impact PSW wages and the number of hours worked by PSWs were found. For instance, variables related to informal caregiving suggest that unpaid family caregiving negatively impacts the number of hours which a PSW works in their paid PSW occupation. Importantly, there were significant PSW wage and hours worked differences by hospital versus long-term care versus home and community care sectors; suggesting sectoral heterogeneity for PSW labour market outcomes and behaviours that should be accounted for in initiatives and policies related to PSW supply. Knowledge gained through these methods sheds light on the PSW labour force and such information can help to inform and improve strategies dealing with recruitment and retention of PSWs.

10:30 AM –12:00 PM WEDNESDAY [Demand & Utilization Of Health Services]

Universität Basel | Kollegienhaus – Seminarraum 105

Organized Session: 'No Size Fits All' - Measurement and Use of Data on Preference Heterogeneity to Inform HIV Testing Programs: Lessons from Discrete Choice Experiments

SESSION CHAIR: **Obinna Onwujekwe**, University of Nigeria

DISCUSSANT: **Matthew Quaife**, London School of Hygiene & Tropical Medicine; **Fern Terris-Prestholt**, Faculty of Public Health and Policy, London School of Hygiene and Tropical Medicine; **Joanna Coast**, University of Bristol

Heterogeneity in Preferences for HIV Testing Assessed in Discrete Choice Experiments: A Systematic Literature Review

PRESENTER: **Dr. Monisha Sharma**, University of Washington

Background: HIV testing and counseling (HTC) is the critical first step to accessing lifesaving antiretroviral (ART) treatment and preventing onward transmission. Yet HIV testing rates remain low, particularly in populations with high HIV burden. Barriers and facilitators to HIV testing differ among population subgroups. Understanding variations in HIV testing preferences can help inform the optimal combination of HIV testing programs needed to maximize testing coverage. Discrete Choice Experiments (DCEs) are well-suited to characterize individuals' preferences for HIV testing attributes and assess variations in preferences. We conducted a systematic review of DCEs on HIV testing preference to synthesize information on user testing preferences and assess heterogeneity of preferences.

Methods: We searched Pubmed using MeSH terms including "HIV testing" AND "preferences" for articles published from 2000 to 2018. We identified and screened 188 abstracts; 12 studies met eligibility criteria for inclusion. We characterized each DCE by population, sampling strategy, estimated model, results, generalizability of findings, and heterogeneity in results by subgroups assessed.

Results: The DCEs included were conducted in 10 countries; eight of the 12 studies were conducted in sub-Saharan Africa, two in North America, one in Europe, and one in South America. Populations assessed include men who have sex with men, female bar workers, male porters, long distance truck drivers, adolescents, university students, and the general population. Six studies recruited random samples, five DCEs recruited participants from STI clinics, and two used convenience sampling. Across studies, test cost was one of the strongest drivers of preference, particularly in resource-limited settings where financial incentives were preferred in order to offset considerable opportunity costs associated with HIV testing. Confidentiality was also an important concern. Short travel distance and immediate availability of HIV medications were often associated with preference in resource-limited settings. The majority of studies reported preference heterogeneity by participant characteristics. For example, while home HTC was preferred by women in the general population, it was not preferred by high

risk groups (e.g. female porters) or men, who preferred a traveling a short travel for testing. Many persons in the general population preferred a finger prick test, however, men who have never tested preferred an oral swab. While HIV self-testing (HIVST) was acceptable, many groups including adolescents, adults, and truck drivers valued HTC counselling.

Conclusion: Substantial heterogeneity in HTC preferences exists across subpopulations which should be considered when developing HTC programs. Overall, participants value low-cost, confidential testing with a short travel distance. Integration of testing with other sexually transmitted infection care, family planning, and immediate availability of ART can increase HTC uptake. HIV self-testing (HIVST) is a promising strategy to increase testing coverage but individuals' preferences for HTC counseling indicate post-test support should be made available. Educational campaigns to build confidence in oral testing is also important to the success of HIVST. DCEs conducted within clinic settings likely have limited generalizability to those not seeking care, particularly for high risk populations. Future DCEs are needed in settings beyond the 10 countries represented and with participants recruited outside of healthcare settings.

Using Latent Class Analysis to Model Preference Heterogeneity Among Australian Men Who Have Sex with Men for Access to HIV Self-Testing: A Discrete Choice Experiment

PRESENTER: **Jason J Ong**, London School of Hygiene & Tropical Medicine

Introduction

Latent class analysis (LCA) can be used to explore preference heterogeneity but its application in health is relatively new to the field of HIV. LCA provides a method to identify subgroups that are not directly observable (i.e. latent) and addresses statistical challenges from traditional subgroup analysis (e.g. via stratification) such as inflated type I error rate, data sparseness, and failure to detect subgroups defined by higher-order intersection of subgroup variables. We illustrate the use of LCA to assess preferences among Australian gay and bisexual men (GBM) for HIV self-testing (HIVST) relative to other testing methods and for how to access HIVST.

Methods

We conducted a discrete choice experiment (DCE) among HIV-negative GBM age ≥18 years in 2018, recruited from online advertisements and sexual health clinics in Melbourne and Sydney. Men were randomized (with 8:3 ratio) to one of two DCEs which included a series of 16 choices, each with two alternatives for HIV testing: DCE1 for HIV preferences (price, accuracy, test type, collection method and who collects the specimen) and DCE2 for HIVST kit preferences (price, location, packaging and usage instructions). Conditional logit regression explored variability in preferences among latent classes defined by infrequent testers (last HIV test > 2 years ago or never tested), recent migrants (arriving in Australia <5 years), young (age ≤30 years) and higher number of sexual partners in the last 6 months (i.e. more than median of two regular or casual partners). The final models were chosen based on Akaike information criteria and interpretability of the latent groups.

Results

1610 men participated in the survey: 1168 for DCE 1 and 442 for DCE2. Their median age was 34 years (interquartile range 27-43), and 63% were born in Australia. Regarding the type of HIV testing (DCE1), four latent groups were identified: those preferring '*high accuracy'* (class size 22%) were more likely to be infrequent testers, those preferring *'cheap testing'* (class size 15%) were more likely to be recent migrants and those with more sexual partners, those preferring *'self-testing'* (class size 27%) were more likely to be infrequent testers age over 30 years, and those preferring '*shorter window period*' (class size 36%) were more likely to be Australian-born, frequent testers, aged over 30 and had two or less sexual partners in the last 6 months. Regarding HIVST kit preferences (DCE2), three latent groups were identified: '*only cost matters*' (class size 46%) where cost was the only attribute affecting choice, '*public access*' (class size 37%) where men preferred access via online ordering, pharmacy shelves or vending machines, and '*health-facilities*' (class size 17%) who preferred purchasing kits via medical clinics and pharmacies.

Conclusion

LCA estimated the probability of individuals being in the classes based on the similarity of their preferences. Tailoring public health interventions to these subgroups of MSM with distinct differences in preferences could help optimize their uptake of HIV testing.

Turning Data on Heterogeneous HIV Testing Preferences into Policy Options: Lessons from the DCE-Based Design of a Randomized Controlled Trial to Evaluate Uptake of Preference-Informed HIV Testing Interventions

PRESENTER: **Dr. Jan Ostermann**, University of South Carolina

Introduction. Worldwide, rates of HIV testing remain far below the target set by UNAIDS. Policies aimed at improving testing rates tend to focus on average populations; incremental adaptations subsequently target non-testers, high-risk groups, and difficult-to-reach subpopulations. Stated preference methods may offer a cost-effective means for the a priori characterization of preference heterogeneity and for reducing trial-and-error adaptations for heterogeneous subpopulations.

Methods. Between September 2017 and July 2018, 300 female barworkers and 440 male mountain porters, two high risk populations in Northern Tanzania, were presented with 12 DCE choice tasks and asked to rank the options in each triplet. Testing characteristics included venue (home, health facility, HIV testing center); everyday availability vs. weekdays only; counseling modalities (one-on-one, couple counseling, group counseling); type of sample (venipuncture, finger prick, oral swab); availability of complimentary health check or STI

screens; and (f) partner notification options for those infected with HIV. Scale-adjusted latent class (SALC) logit models were used to characterize preference heterogeneity. Simulated forced-choice scenarios identified combinations of options predicted to jointly maximize testing uptake over a default scenario.

Results. SALC analysis identified massive heterogeneity, including 8 preference classes and 3 latent scale factors. The range of feasible testing characteristics implied that more than 600,000 combinations of 4 implementable testing options exist. Ranking methods identified three combinations whose uptake is currently being evaluated in an RCT with 1200 participants: Arm 1 options target preference heterogeneity with respect to existing features, Arm 2 options include enhanced features; Arm 3 options include predicted less preferred options as a control condition.

Conclusion. Using reasonably straightforward methods, we were able to systematically select 3 combinations of 4 testing options each (from a choice set of more than 600,000 combinations) that jointly target preference heterogeneity; two of these combinations are expected to significantly increase uptake of testing among high risk populations. The methods are directly applicable to a vast array of policy scenarios and research settings and may greatly improve the efficacy and efficiency of targeting specific subpopulations.

Enhancing Public Health Messages: Discrete Choice Experiment Evidence to Design HIV Messages in China

PRESENTER: **Maya Durvasula**, Duke University

Introduction While a growing literature documents the effectiveness of public health messaging on social media, our understanding of the factors that encourage individuals to engage with and share messages is limited. In the context of HIV among men-who-have-sex-with-men (MSM) in China, rising incidence and low testing rates despite decades of interventions suggest the need for effective, targeted messaging to reach underserved populations. Social media platforms and sex-seeking apps present a promising avenue, as web-based strategies can take advantage of existing trust within dense social networks.

Methods We conducted an online discrete choice experiment in January 2017 with MSM from across China. Participants were presented with six choice tasks, each composed of two messages about HIV testing, and were asked in which scenario they were more likely to share the content. Participants were given information about the source of the HIV message, the social media sharing platform, and the recipients/network with whom they would share the message and were given the options of sharing one message or neither. Multinomial and mixed logit models were used to model preferences within four subgroups, based on education levels and sexual history disclosure.

Results 885 MSM joined the survey, completing 4387 choice tasks. The most important attribute for three of the four subgroups was social media sharing platform. Men were more willing to share messages on sex-seeking mobile phone applications and less willing to share materials on generic (non-MSM) social media platforms. We found that men with more active online followers were less willing to share HIV messages on generic (non-MSM) social media platforms.

Conclusions Our findings suggest that sex-seeking platforms represent a targeted, efficient method of actively engaging MSM in public health interventions.

10:30 AM –12:00 PM WEDNESDAY [Specific Populations]

Universität Basel | Kollegienhaus – Seminarraum 106

Valuing Outcomes in Chronic Disease

SESSION CHAIR: **Julie Ratcliffe**, Flinders University

A Discrete Choice Experiment to Elicit Chinese Patients' Preferences for Osteoporosis Medications

PRESENTER: **Lei Si**, The George Institute for Global Health

AUTHORS: Jieruo Gu, Andrew J Palmer, Dr. Yuanyuan Gu, Mingsheng Chen, Mickael Hiligsmann

Objective The study aimed to elicit patients' preferences for osteoporosis (OP) medication treatments in a Chinese population.

Methods A discrete choice experiment (DCE) was conducted in a convenience sample of Chinese patients who were at risk of OP fractures. All patients were recruited through at Rheumatology Department of the 3rd Hospital of Sun Yat-sen University. Patients were asked repetitively about their preference among two hypothetical OP medications and no treatment. The hypothetical OP medications differed in four attributes: 1) treatment efficacy in reducing fracture risk; 2) out-of-pocket (OOP) payment; 3) type of potential side effects from taking the medication and; 4) mode of medication administration. Mixed logit models were used to assess patient's preferences with associated unobserved and observed heterogeneity. Observed heterogeneity in patients' preferences was further assessed using sub-group analysis based on patients' age, sex, school education level, family income, osteoporosis status and status of previous fracture.

Results A total of 267 patients were included in the analysis. On average, patients preferred to receive treatment than no treatment. Patients preferred treatment with higher efficacy in preventing fracture and lower OOP cost. The least preferred medication side effect was gastro-intestinal disorders followed by flu like symptoms then skin reactions. The most preferred mode of administration was annual intravenous infusion, followed by 6-month subcutaneous injection, weekly oral tablet, daily nasal spray, with daily oral tablets ranked as the least

preferred mode of administration. Differences in preference in all attributes were statistically significant. While the preference in each of the attributes pertained in the subgroup analyses, only age contributed to observed preference heterogeneity in most of the included attributes: those who were 60 years or younger had a statistically significant stronger preference in having a treatment, skin reaction, annual intravenous infusion, higher clinical efficacy and lower OOP cost compared to the older counterparts.

Conclusions This study reports Chinese patients' preferences for OP treatments. In comparison to a previous DCE with rather similar attributes in European populations, [1] some differences are worth to be noted. While gastro-intestinal disorder is the least preferred side effect in both Chinese and European patients, Chinese patients prefer yearly intravenous infusion to 6-month subcutaneous injection which is the most preferred mode of administration in several European populations. [1] This suggests that preferences vary between the Chinese and European populations.

Reference

1. Hiligsmann et al. Rheumatology (2017), 56(7):1167-1176.

Acknowledgement LS is supported by a NHMRC Early Career Fellowship (GNT1139826).

Pregnancy, Medication and Perspective: Examining the Impact of Reproductive Issues on Treatment Choice By Women with Multiple Sclerosis Using a Discrete Choice Experiment

PRESENTER: **Edward Webb**

AUTHORS: David Meads, Ieva Eskyte, Hilary Bekker, Jeremy Chataway, Helen L Ford, George Pepper, Dr. Joachim Marti, Sue H Pavitt, Klaus Schmierer, Ana Manzano

Background: Relapsing multiple sclerosis is an incurable, degenerative, neurological disease characterised by relapses (short periods of loss of function) followed by full or partial recovery, and permanent loss of function in the long-term. Several disease modifying treatments (DMTs) are available which help reduce relapses and slow disease progression. Most carry risks to children if taken during conception or pregnancy and are contraindicated, some require a discontinuation period before trying to conceive, and some are contraindicated for breastfeeding. Between 66-75% of people with multiple sclerosis (pwMS) are women, with most diagnosed in their 20s, yet there is limited knowledge about how reproductive issues impact DMT preference.

Aim: To conduct a discrete choice experiment (DCE) on DMT choice including attributes related to reproduction.
Methods: Attributes were identified from 30 interviews with pwMS, three focus groups (n=17) with pwMS, neurologists and MS nurses, and literature reviews. A DCE instrument was created with attributes including probability of problems with pregnancy, discontinuation period, and breastfeeding safety. It had a dual-response, multiple time-perspective design: participants first chose which of two treatments they preferred, then whether they preferred that treatment or no treatment. They also imagined making decisions at three time points: now, when trying to conceive, and when pregnant. Participants who indicated they were female and intending to have children were recruited online from the MS register. Data was analysed using generalised extreme value models.

Results: Participants preferred treatments with lower risk of problems with pregnancy and shorter discontinuation periods, but there was no effect of time perspective. Coefficients relating to breastfeeding were not statistically significant. Participants' most preferred option was no treatment in 20.5% of cases when the time perspective was the present, increasing significantly to 36.8% when it was trying to conceive and 61% when it was being pregnant (Kruskall-Wallis $p < .001$). The difference between the present and trying to conceive was largely driven by 63.2% and 49.9% reductions in relative preferences for relapse reduction and reducing the probability of disease progression respectively. The difference between the trying to conceive and pregnant perspectives is largely driven by intrinsic preference for no treatment. The marginal rate of substitution between reduction in annual relapse rate and percentage probability of disease progression after 10 years was 4.93 in the present, with equivalent figures of 6.26 and 5.62 when trying to conceive and pregnant respectively.

Conclusion: Women with relapsing multiple sclerosis (wwRMS) prefer DMTs with a lower risk of problems with pregnancy and shorter discontinuation periods. Reproductive issues also influence preferences for DMT attributes not directly related to pregnancy. Differences in treatment choices depend on time perspective. When trying to conceive or pregnant, wwRMS are less concerned about reducing relapses or slowing disease progression, and more likely to choose no treatment. There is also evidence they become relatively more focussed on the present, becoming more willing to sacrifice avoiding disease progression in the future for an immediate reduction in relapse rate. This DCE's innovative design highlights the benefits of considering the time perspective at which participants make choices.

Obtaining EQ-5D-5L Utilities from the Disease Specific Quality of Life Alzheimer's Disease Scale: Development and Results of a Mapping Study

PRESENTER: **Dr. Ines Rombach**, University of Oxford

AUTHORS: Marvi Iftikhar, Ron Handels, Gurleen Jhuti, Anders Gustavsson, Pascal Lecomte, Yovanna Castro, Jan Kors, John Gallacher, Filipa Landeiro, Alastair Gray

Background
Dementia is a progressive condition characterised by cognitive and functional decline, which is increasing in prevalence. More research on the health economics aspects of dementia is considered important to assess disease burden and due to the need to develop effective

interventions. The Quality of Life Alzheimer's Disease Scale (QoL-AD) is commonly used in research to assess disease specific quality of life (QoL) as rated by patients and their informal carers. For cost-utility analyses, utilities from a generic QoL instrument (such as the EQ-5D) are often preferred but not always available.
We present the development of a mapping algorithm to obtain EQ-5D-5L values in scenarios where only QoL-AD data are available. To our knowledge, this is the first mapping algorithm to generate EQ-5D utilities from QoL-AD data.

Methods
Data on self-reported and proxy-reported QoL-AD and EQ-5D-5L scores completed by people with dementia and their carers were used from Actifcare, a longitudinal cohort study aiming to identify best practice for access to formal care for dementia patients. Different statistical models were estimated: direct mapping models, including ordinary least square regression, tobit, CLAD and two-part models, estimated EQ-5D utilities directly; response mapping models, including ordinal and multinomial logistic regression models, estimated responses to the individual EQ-5D-5L questions, which were then converted to EQ-5D-3L utilities using the cross-walk by van Hout et al, as recommended by the National Institute for Health and Clinical Excellence (NICE). Different scenarios considered all possible combinations of mapping from self- or proxy-rated QoL-AD questionnaires to self- or proxy-rated EQ-5D. Model performance was assessed based on the lowest root mean square error (RMSE) and mean absolute error.

Results
Data for up to 1099 observations from people with predominantly mild to moderate dementia were included in this mapping study. Mean self-rated QoL-AD scores and utilities were 35 (standard deviation (SD) 6) and 0.77 (SD 0.21), respectively. Mean proxy-rated QoL-AD and utility scores were lower, at 30 (SD 6) and 0.62 (SD 0.24), respectively.
The response model based on a multinomial logistic regression model, including age and gender, performed best in all scenarios. RMSE values ranged between 0.13 for the scenario mapping self-reported QoL-AD to self-reported EQ-5D and 0.19 for self-rated QoL-AD to proxy-rated EQ-5D. The models showed good face validity, and their high prediction accuracy was replicated in the independent LEARN study's dataset for the proxy-reported QoL-AD mapped to proxy-reported EQ-5D scenario.

Conclusions
We have generated a mapping algorithm that allows researchers to estimate EQ-5D values for any population with available QoL-AD data, thus enabling the performance of cost-effectiveness analyses in the absence of utility values collected during such studies.

The Mental Health Quality of Life Seven-Dimensional Questionnaire (MHQoL-7D): Development and First Psychometric Evaluation of a New Measure to Assess Quality of Life in People with Mental Health Problems

PRESENTER: **Ms. Frederique van Krugten**, Erasmus School of Health Policy & Management, Erasmus University Rotterdam
AUTHORS: Jan J.V. van Busschbach, Matthijs M. Versteegh, Leona Hakkaart-van Roijen, Werner Brouwer

Background: Assessing the effectiveness and cost-effectiveness of mental healthcare interventions is important, also given the prevalence and impact of mental health problems, but crucially depends on the availability of appropriate outcome measures. Whether common generic health-related quality of life measures adequately capture and value all relevant dimensions of the quality of life of individuals with mental health problems has been questioned. Better measures may be required in order to be able to establish the value of mental health interventions.

Aims of the study: The aim of this study was to develop and psychometrically evaluate the descriptive system of a new, short self-report measure, the Mental Health Quality of Life seven-dimensional Questionnaire (MHQoL-7D), assessing quality of life in people with mental health problems.

Methods: The MHQoL-7D dimensions were based on prior research, highlighting the seven most important quality of life domains in the context of mental health. Items were generated following a systematic review onexisting quality of life measures used in mental health research and through inviting expert opinion. The psychometric properties of the MHQoL-7D were evaluated in a multi-stage mixed methods approach. Focus groups and an online qualitative study were carried out to assess the face and content validity of the MHQoL-7D. The MHQoL-7D was further tested for its internal consistency, convergent validity, known-group validity and test-retest reliability among (previous) mental healthcare service users (N=479) and members of the general population (N=110) aged 18 year and over. Respondents completed the MHQoL-7D, together with socio-demographic and health status questions and convergent measures (the ICEpop CAPability measure for Adults (ICECAP-A), the five-level EuroQol five-dimensional questionnaire (EQ-5D-5L), the Manchester Short Assessment of Quality of Life-16 (MANSA-16) and the Brief Symptom Inventory (BSI)). To assess test-retest reliability, a subset of respondents (N=195) completed the MHQoL-7D again after one week. An exploratory factor analysis (EFA) was carried out to examine the factor structure of the MHQoL-7D.

Results: The MHQoL-7D consists of 7 items covering 7 dimensions (self-image, independence, mood, relationships, daily activities, physical health and hope) and a visual analogue scale of general psychological well-being (MHQoL-VAS). Internal consistency was high (Cronbach's alpha=0.85) and Spearman's rank correlations between overall MHQoL-7D sum score and ICECAP-A index (0.71; P<0.001), EQ-5D-5L index (0.63; P<0.001), MANSA-16 (0.75; P<0.001), and BSI (-0.64; P<0.001) scores supported convergent validity. The intraclass correlation coefficient of the overall MHQoL-7D sum score for test-retest reliability was 0.85. Known-group validity was supported by the ability of the MHQoL-7D to detect significant differences in overall MHQoL-7D levels between service users and the general population, and between groups with different levels of psychological distress.

Conclusion: The descriptive system of MHQoL-7D was demonstrated to be a valid measure to assess quality of life in people with mental health problems. To make the MHQoL-7D suitable for use in economic evaluations, a preference-based scoring algorithm should be developed.

10:30 AM –12:00 PM WEDNESDAY [Demand & Utilization Of Health Services]

Universität Basel | Kollegienhaus – Regenzzimmer 111

Health Insurance

SESSION CHAIR: **Harry E. Frech**, University of California-Santa Barbara

Voluntary Pooling of Genetic Risk: A Health Insurance Experiment

PRESENTER: **Ms. Janina Nemitz**, ZHAW School of Management and Law

AUTHORS: Christian Waibel, Wanda Mimra

Scientific and technological advances increasingly allow for better tailoring of health insurance plans to individual health risk profiles. This development questions the sustainability of health plans that feature strong cross-subsidization across different health risk types and health behaviors. An important observation is that the willingness to cross-subsidize risks in health plans might depend on whether the risk is uncontrollable by individuals, such as genetic risk, or modifiable via health behaviors. That is, people might be willing to pool genetic risks because individuals have no control over these. However, the converse might be true for behavioral health risks, for which homogeneous premia do not reward or punish health behaviors.

In this study, we use a laboratory experiment to investigate how the possibility to adjust health insurance premia according to health risk information affects the willingness to pay for different health insurance schemes. In particular, we test whether individuals are more willing to pool on genetic risk, if health insurers can condition parts of the insurance premium on preventive effort. Individually pricing preventive effort reduces free-riding incentives and, thus, separates out one confounding factor in group insurance schemes. In particular, it allows to isolate the presence of social preferences for pooling of genetic risk. To derive our experimental hypotheses, we develop a theoretical model of health insurance choice with social preferences. By eliciting subjects' voting preferences for health insurance systems in a survey, we furthermore investigate whether there is a discrepancy between preferences expressed by voting and those revealed by the incentivized experiment.

Our results show a higher willingness to pay for a group insurance scheme that pools genetic risks but includes individual premium discounts based on preventive effort, compared to a group insurance scheme that pools both genetic risk and the effort component. Thus, our results indicate that pooling on genetic risk due to social preferences is more likely to occur when the effort component, and thereby free-riding incentives, are separated. However, we do not observe an increase in preventive effort across insurance schemes when effort is priced individually, contrary to theoretical prediction. This finding can be explained by the low level of group insurance under the health insurance scheme that pools both genetic and behavioral risk. We also find a strong discrepancy between preferences for health insurance systems expressed in the survey and the subjects' choices in the incentivized experiment.

Our study provides an important contribution informing the design and regulation of health insurance by investigating social preferences for pooling of genetic and behavioral health risks as well as the impact of health risk information from new information technologies. Given the continuously growing health care costs in most countries, the role of (new) health risk information in health care markets has to be reassessed, also for health insurance. While current legislation still prohibits the use of genetic testing information in health insurance, at the behavioral side, health insurers in the US and Europe started to provide monetary incentives that are tied to health behaviors that are monitored via, e.g., mobile devices.

The Impact of Lifetime Community Rating Regulations on Health Insurance Coverage in Ireland.

PRESENTER: **Conor Keegan**, Economic and Social Research Institute

Background

Between 2008 and 2014 Ireland’s community rated voluntary private health insurance market saw a decline in population coverage from 50.9% to 43.4%. Over the same period, the ageing of the insured population was linked to rising premiums. In this context, in May 2015, Ireland introduced lifetime community rating (LCR) of health insurance premiums to encourage take-up of health insurance at younger ages. LCR requires that late-entry premium loadings are applied to those who postpone purchase of health insurance until later in life. Specifically, the loadings are set at 2% per year starting at age 35, up to a maximum loading of 70% at age 69 and older. The focus of this study is to identify the impact, if any, these regulations had on health insurance take-up in Ireland.

Data and Methods

This study uses quarterly administrative health insurance coverage data between 2014 and 2015 obtained from the Health Insurance Authority (the insurance market regulator). Data are aggregated by year of age, sex and plan type. Supplementary data included in the analysis are age-specific population volumes, age-specific unemployment rates, health insurance price indices, and waiting list volumes for publicly financed

care. This study employs quasi-experimental difference-in-differences analysis to identify the impact of LCR regulations on health insurance take-up for a target age group, aged 35-69 years old who are subject to the new regulations. The main model specification estimates the change in insurance coverage rates for adults pre and post the introduction of LCR regulations for the target age group relative to a comparator group aged 18-33 (to whom the regulations did not apply), controlling for potentially confounding factors. Sub-group analysis examines the effect of LCR regulations on take-up of specific plan types. Sensitivity analyses examine alternative categorisations of treatment and comparator groups.

Findings

LCR regulations increased coverage rates for those 35-69 by approximately 2.0 percentage points ($p<0.01$) relative to an overall pre-reform coverage rate of 45.8% for this group. Over 65% of this increase relates to take-up of the most common standard cover plans, followed by low-cover (26%) and high cover plans (8%), respectively. However, relative to underlying plan coverage rates, take-up was proportionately greatest for low-cover plans. Additionally, those aged between 35-49 were more likely to purchase cover in response to the introduction of LCR compared to older cohorts.

Discussion

The introduction of LCR has encouraged insurance take-up by those who may have otherwise postponed take-up to older ages contributing to a stabilisation in coverage trends, at least initially. A popular response to the introduction of these new regulations was to purchase cheap low-cover insurance plans. While purchase of these cheaper plans may indeed be a reasonable response to avoid late-entry loadings, these plans tend to offer limited benefits and consumers may still face significant out-of-pocket costs to access private care. Future research should consider the longer-term implications of these regulations on health insurance coverage, claims costs and premiums, in Ireland.

Care-Seeking Behaviour of Patients with Private Health Insurance in Australia

PRESENTER: **Rezwanul Rana**, University of Southern Queensland
AUTHORS: Khorshed Alam, Jeffrey Gow

Background: In the emergency department of public hospitals, Australian patients with private health insurance (PHI) are asked to decide whether they want to be public patients or private patients. Interestingly, for people with PHI cover, the answer is not always obvious. The policies promoting PHI often focus on increasing the enrolment into PHI rather than emphasising on the effectiveness and efficiency of the PHI system and type of services covered and used.

Objective: This study aims to examine the health care-seeking (hospital, primary and preventive care) behaviour of patients with private health insurance (PHI). The article also aims to examine the socio-economic, demographic and lifestyle factors that influence the choice of hospital care in Australia. The outcomes will offer guidance for a more coherent and rational policy based on the consumers demand and use of health services rather than focusing on increasing the enrolment rate of PHI cover which will mainly benefit private service providers.

Method: Repeated measure t-test, Pearson's Chi-square test and a logistic regression model were used to investigate the PHI cover and healthcare utilisation nexus in a country with universal health coverage. Waves 9 and 13 of the nationally representative Household, Income and Labour Dynamics Australia (HILDA) survey data were used for analysis. Data from the two waves were merged to examine the effects of dropping PHI cover on healthcare use.

Results: As expected, PHI cover redirects demand from public care towards private care. However, around one-fourth of Australian adults with PHI cover preferred public care over private care. Patients aged <45, with lower BMI and no long-term health conditions favour public care. Conversely, patients with higher incomes and higher education levels, who are male, or non-smokers, or with lower risk-taking attitudes and lower psychological distress choose private care when they have PHI cover. According to the findings, young patients are 2.2 times more likely to select public care compared to older patients. In addition, patients from lower income households are 1.4 to 1.8 times more likely to choose public patient care compared to patients from higher-income households. Conversely, patients with higher education levels are 1.56 times less likely (odds ratio=1/0.64) to opt for public patient care in comparison to a patient with lower education levels. Similarly, patients with hospital doctor visits have a lower probability of choosing public patient care (odds ratio = 1.76). However, patients with higher specialist doctor visits have a 76.55% probability of selecting public patient care. Patients with higher risk-taking attitudes tend to choose public care (1.2 to 1.4 times more) over private care in comparison to patients with lower risk-taking attitudes. Experiencing serious personal illness and financial distress also influences the patients' choices of hospital care significantly. Lastly, the findings also support the advantageous selection hypotheses in the PHI sector in Australia.

Conclusions: Revised health policies are required to encourage higher utilisation of private hospital care among patients with PHI cover in Australia. This will increase the effectiveness of the current policy of promoting PHI by the provision of tariff subsidies.

Long-Term Effects of Temporary Inducements: A Nationwide Randomized Health Insurance Experiment in the Philippines

PRESENTER: **Dr. Owen O'Donnell**, Erasmus University Rotterdam
AUTHORS: Aurelien Baillon, Joseph Capuno, Kim van Wilgenburg

There is mixed evidence on the effectiveness of interventions, such as premium subsidies, intended to encourage health insurance enrollment. Even when an effect is positive, it would be expected to dissipate once the inducement is withdrawn, unless a positive experience of insurance raises the valuation of it. Purchasing at a discounted price might even reduce willingness to pay the full price aftr the subsidy is removed. The direction and magnitude of any long-term effect of a temporary inducement is critical to its cost-effectiveness. Yet there is almost no evidence of effects on insurance that stretch more than a year from the withdrawal of inducements. This paper uses a nationwide randomized experiment to estimate the impact after four years of two temporary inducements to enroll in the National Health Insurance Program of the Philippines (Philhealth). A multi-stage cluster randomized design was used to select 2950 households from 243 municipalities, of which 179 were randomly assigned as intervention sites where randomly selected households eligible for the program were offered a one-off premium subsidy of up to 50%, plus information advertising the benefits of insurance and SMS reminders to enroll ("subsidy+info"). Among those households in the intervention sites who did not enroll despite receiving this inducement, a randomly selected 50% were offered one-time assistance with the application for insurance ("handholding"). The baseline survey was fielded and the first inducement offered in February-April 2011 and the long-term effects were assessed in July-August 2015. We use inverse probability weights and a doubly robust estimator to correct for potential bias arising from both attrition and the fact that the second inducement was offered conditional on households not responding to the first. We estimate that being offered only the "subsidy+info" inducement raised the probability of being voluntarily insured four year later by 4.8 pp ($p<0.05$), which is four fifths of the short-term effect. In contrast, there was no significant long-term effect of the "handholding" inducement despite this having a much larger short-term impact. The combined long-term effect of the two inducements is an 8.5 pp increase in enrollment ($p<0.01$), which is almost a quarter of the short-term effect. These results demonstrate that the effects of some temporary inducements can be partially sustained in the long-term. But short-term effects are not necessarily a good guide to the relative effects of inducements in the long-term.

10:30 AM –12:00 PM WEDNESDAY [Health Care Financing & Expenditures]

Universität Basel | Kollegienhaus – Fakultätenzimmer 112

Health Care Expenditures

SESSION CHAIR: **Karen Ann Grepin**, Wilfrid Laurier University

Analysis of Health Care Expenditures and Their Determinants in Palestine

PRESENTER: **Dr. Dana A Forgione**

AUTHORS: Rabeh Marrar, Samer Jabr, Rula Ghandour, Niveen M.E. Abu-Rmeileh, Mustafa Younis

Aims: We develop a forecasting model through year 2020 to examine the relationship between public and private national health expenditure and its determinants in Palestine, to help decision makers set policies for resources utilization and types of interventions that will reduce disease prevalence. Palestine is a lower middle-income country, with Gross Domestic Product (GDP) of US$14,498 million in 2017; and GDP per capita of $3,096. The population totals 4.78 million people, of which 50.8% are male and 49.2% are female. The population under 15 years of age is 39.4% and those over age 65 comprise only 2.9%. Our forecasts will help managers, planners, ministers, and other public health leaders plan the kinds and quantities of services supplied, types of facilities and equipment to deploy in which locations to optimize service delivery for targeted patient populations, and help plan use of the system in short, medium and long range horizons for supplies, workforce, purchasing, production, budgeting, and scheduling.

Methods: We forecast health expenditures and examine Granger-Causality Relations between health expenditure and its salient determinants. Our forecasting method uses the E-Views software the financing agency perspective. Our causality tests involve estimating simple vector auto regressions (VAR). Our health expenditure data is obtained from Palestinian Ministry of Health reports and national health accounts reports. Our data for the determinants of health expenditure were obtained from the Institute of Community and Public Health (ICPH) at BirZeit University.

Results: National health expenditure in Palestine over the period of 2019–2020 is projected to grow at an average of 6%, government health and household spending are expected to grow at an average of 4% and 6%, respectively. The proportion of government health expenditure is expected to decrease for the coming years and to 32–35%, where household out-of-pocket costs is expected to reach more than 40% by 2020. The coefficients of our chronic disease variables (cancer, cardiac diseases, diabetes, and hypertension) in relation to health expenditure are all significant at 5% level. Macroeconomics variables, such as change in GDP per capita and population growth, also have causality effects on total health expenditure. Other socioeconomic variables, such as age under 15, age above 65, physicians per 1,000 of population, and beds per 1,000, demonstrated no causality with the national health expenditure in Palestine.

Conclusions: Population growth and the increase in chronic diseases contribute highly to the rise in healthcare costs. Preventive healthcare is even more important, given that the population is young—70 percent the population is below the age 30—and the return on such investment is high. Issues to focus on include tobacco, drug abuse, alcohol, unhealthy diets, physical inactivity, obesity and stress.

Key words: Health care spending, determinants of health, lower middle income country

Exploring Medical Expenditure Clustering and the Determinants of High-Cost Population from the Family Perspective: A Population-Based Retrospective Study from Rural China

PRESENTER: **Ms. Shan Lu**

AUTHORS: Dr. Zhang Yan, Yadong Niu, Liang Zhang

Background

The most costly 5% of the population (identified as high-cost population) accounts for 50% of the healthcare spending as one frequently cited statistic shows. Understanding the high-cost population in rural China from the family perspective is essential because the fund of health insurance for rural residents is managed at household level and families are decisive in members' healthcare behavior and expenditure. The results of this study can inform the government and the health insurers to improve healthcare provision and alleviate burden on patients.

Objective

To analyze the clustering of medical expenditure from a household perspective, explore the characteristics of high-cost families (HC families), and figure out the determinants of the annual household medical expenditure in rural China.

Methods

We integrated the New Rural Cooperative Medical Scheme (NCMS) database and the NCMS register to collect data for families which had generated medical expenditure in Macheng, Hubei province, 2014. And 202482 families were enrolled in analysis after data processing. The most costly 5% of the families were defined as HC families. The Lorentz curve and Gini index were adopted to describe the clustering of annual household medical expenditure; t-test, χ^2 and a binary logistic regression model test were used to find out the characteristics and determinants of these families.

Results

The annual household medical expenditure showed an extreme uneven distribution with a Gini index 0.76. The HC families cost 54.0% of the total expenditure, and their inpatient expenditure accounted for 99.9% of their total expenditure. The family size, average age, distance (km) from and arrival time (min) to the county hospital of HC families were 4.05, 43.18, 29.67 and 45.09, respectively, which is significantly different from RM families (3.68, 42.46, 30.47, 46.29, respectively). And there are more HC families living in towns with low-capacity township hospitals and better traffic condition than the RM families (28.98% vs 12.99%, 71.19% vs 69.6%). The binary logistic regression model indicated that family size, average age, with children, time to county hospital, capacity of township hospital, traffic condition, economic status, healthcare utilizations and the utilization level were associated with high household medical expenditure.

Conclusion

Healthcare spending distributes disproportionately among the most costly 5% of families in rural China. Findings of the characteristics of these families suggest that both the capability of primary care and the policy of the health insurance should be improved to guide the behaviors of rural residents, reduce their economic burden and saving healthcare spending.

Estimating Spending on Emergency Medical Care in the US By Health Condition and Drivers, 1996-2016

PRESENTER: **Angela Liu**, Institute for Health Metrics and Evaluation

AUTHORS: Kirsten Scott, Ms. Abigail Chapin, Herbert C Duber, Mr. Joseph Dieleman

Background

Health care in the United States (US) is the most expensive in the world and accounts for an estimated 18% of gross domestic product (GDP). Understanding drivers of health care spending is paramount for informing policymakers on interventions that may curtail ineffective spending and optimize value. The emergency department (ED) has been viewed as an opportune place for policy interventions given that it often serves as a gatekeeper for inpatient admissions. Though the ED plays such an important role in the healthcare system, ED spending estimates have varied widely, ranging from 2% to 12% of overall health care spending. These varying estimates have generally relied on limited data sources, completed through cross-sectional analyses, and/or systemically underestimated ED spending by excluding costs for patients who were ultimately admitted.

Data and Methods

To overcome these barriers, we leveraged the Nationwide Emergency Department Sample and the Nationwide Inpatient Sample to provide comprehensive estimates of ED health care spending. Specifically, we assessed the spending on patients in the National Inpatient Sample who had ED spending that occurred at another hospital in order to estimate the fraction of spending associated with care provided in the ED for patients who were ultimately admitted to the inpatient facility. These fractions were modeled across time and age, and applied to existing ED and inpatient spending estimates from the Institute for Health Metrics and Evaluation's Disease Expenditure Project. These data track spending for 38 age and sex groups, 154 health conditions, and six types of care, including ED and inpatient care. These estimates also account for excess spending that occurs due to the presence of comorbidities.

Results

Over a 20-year horizon, ED spending has grown from $35 billion in 1996 to $120 billion in 2016, resulting in an annual rate of change of 6.33%. Preliminary underestimates indicate that in 2016, spending in the ED was greatest for falls, exposure to mechanical forces, and urinary diseases, with $11.9 billion, $11.4 billion, and $9 billion, respectively. We stratified these condition-specific estimates by age and sex, in order to understand specific sub-populations of interest; women more frequently use the ED relative to men and the age group with the highest prevalence of ED use are between 25-44 years. Finally, we quantified the relative impact factor of specific contributors of ED spending, including changes in population size, the aging of the population, and changes in disease prevalence or incidence, service utilization, and service price and intensity.

Implication

Improved understanding of health care spending in the ED is a crucial first step to informing an evidence-based discussion on how to provide value-based ED care. Our study findings offer critical evidence-based findings that help to elucidate ED spending over time, by condition, sex, and age. Furthermore, this assessment of key drivers of changes in ED spending will provide needed evidence for policy discussions, spur advocacy, and catalyze future research.

Forecasting German Hospital Expenditure: A One-Year Ahead Forecast

PRESENTER: **Ms. Ricarda Milstein**, Universität Hamburg
AUTHOR: Jonas Schreyögg

Background: Across OECD countries, the inpatient sector represents the most expensive part of healthcare costs. In Germany, it accounts for 35% of the total expenditure of the Statutory Health Insurance making it its costliest component. Due to this magnitude, a good forecast is vital to better plan the budget. In this paper, we search for a simple, stable and effective forecast to allow policy makers to make informed budget decisions. We perform a short-term forecast of one year because forecasts on longer time horizons are less stable and because budget planning takes place about a year in advance.

Data: We use aggregate quarterly inpatient cost data from the Statutory Health Insurance from the first quarter of 2010 to the second quarter of 2017.

Methods: We apply Holt-Winters‘ seasonal method, SEATS decomposition, ETS, seasonal ARIMA and ARIMAX models to perform one-year ahead forecasts of our time series. We allow for a damped trend and use a BoxCox transformation whenever applicable. We investigate the forecast accuracy based on the graphic inspection of the residuals and use the Portmanteau test for autocorrelation using the Ljung-Box-Q-test. We compare our models based on Mean Percentage Error and the Mean Absolute Scaled Error. Furthermore, we compare whether the difference between the forecasts is significant based on a two-sided modified Diebold-Mariano test.

Results: Our time series has a strong multiplicative seasonal pattern. We find that forecasts based on Holt-Winters’ seasonal method with multiplicative seasonality, and an ETS model with a multiplicative error term, additive trend and multiplicative seasonality perform best. The Diebold-Mariano test indicates that both models are of similar quality.

Conclusion: We could demonstrate that simple methods can produce effective forecasting results. We propose that policy makers consider employing forecasting methods to make more informed budget decisions.

10:30 AM –12:00 PM WEDNESDAY [Economic Evaluation Of Health And Care Interventions]

Universität Basel | Kollegienhaus – Hörsaal 114

Organized Session: Measuring and Valuing Outcomes of Interventions Affecting Multiple or Under-Researched Populations and/or Outcomes with Multiple Dimensions

SESSION CHAIR: **Silke Fernandes**, London School of Hygiene & Tropical Medicine

DISCUSSANT: **Werner Brouwer**, Erasmus School of Health Policy & Management

Measuring and Valuing Outcomes of Interventions during Pregnancy and Childbirth: Use of Cost Effectiveness Analyses of Malaria in Pregnancy Prevention Interventions As a Case Study

PRESENTER: **Ms. Silke Fernandes**, London School of Hygiene & Tropical Medicine
AUTHOR: Kara Hanson

Background

Interventions during pregnancy, childbirth and possibly also post-partum have the potential to affect two different populations, namely the mother and the offspring. This does not happen frequently in health, where generally interventions aim to improve the health of one particular population. Other notable examples of comparable situations, where interventions can affect two different populations are for example

interventions aimed at improving health and well-being of carers of people with disabilities or the elderly. While for an intervention during pregnancy, there can be a direct clinical effect on both populations, the pathway of effect in a carer-dependent situation is more likely indirect.

While in epidemiological studies, results are typically reported separately for each outcome, in a cost-effectiveness analysis (CEA) an aggregated outcome such as a DALY or QALY is usually envisaged. This poses a risk in the context of interventions with more than one affected population, where one or more population can be neglected or even ignored in the analysis. This is particularly true if the outcomes are in opposite directions, potentially benefitting one population and harming the other.

Methods and findings

We are aiming to explore this topic by using CEA of malaria during pregnancy prevention intervention as a case study:

The choice of outcomes when conducting CEA of malaria during pregnancy interventions is complex, as outcomes can be positive or negative for the mothers as well as their infants. Generally one would anticipate they should include a measure of malaria, maternal anaemia and low birth weight and ideally also stillbirth and death (possibly modelled). A summary of the outcomes included in more recent CEAs on malaria during pregnancy prevention was compiled. It shows that even in relatively current studies there is no consensus on which outcomes were included in the CEA. Only two out of six studies included three main measures (clinical malaria, maternal anaemia, low birth weight) and two studies did not include any child outcomes. DALYs generally combined all included outcome measures, except in one study where separate DALYs were calculated for maternal and child outcomes. We will use our experience in malaria in pregnancy prevention to reflect on the choice of outcomes if two populations are affected and how this will shape the analysis and results.

Measuring and Valuing Outcomes in Interventions Tackling Gender-Based Violence: Capturing Complexity in Impact Dimensions and Populations

PRESENTER: **Giulia Ferrari**, LSHTM (London School of Hygiene and Tropical Medicine)
AUTHORS: Prof. Stephen Morris, Sergio TorresRueda, Gene Feder, Anna Vassall

Interventions designed to tackle gender-based violence (GBV) impact multiple other aspects of recipients' lives, such as mental health and social, economic and subjective empowerment. This poses a challenge to health economists attempting to capture intervention effectiveness. For example, interventions designed to reduce exposure to GBV by offering access to life- and financial-skills sessions have the potential to reduce women's exposure to violence and improve women's physical and mental health. They also potentially impact aspects of women's livelihoods, such as increased control over resources, improved earnings and stronger social networks.

Some interventions also target men and, at times, families affected by violence. This poses the challenge of measuring corresponding outcomes in men and children by identifying relevant dimensions and appropriate measures.

Finally, some interventions focus on specific aspects of women's wellbeing, such as interventions designed to improve the mental health of women exposed to violence. Standard utility measures for economic evaluation are inadequate to capture these specific effects and their interaction with exposure to violence, and a better understanding of the relationships between such measures and the overlap between psychological distress and exposure to violence is needed to better value the impact of these interventions.

We present results from methodological work on outcomes from six interventions tackling GBV in various geographical and health care settings, and across different populations as defined by gender, age and severity of exposure to GBV.

We use data from six randomized controlled trials, which present a large overlap in measures of violence, mental and physical health, wellbeing and socio-economic dimensions.

We identify and estimate impact on all outcomes identified by the interventions' theory of change. We illustrate how the list of measured outcomes vary across populations, identify domains that are currently excluded, but of potential relevance, based on interventions and populations' characteristics, and mechanisms of impact that may have been overlooked. Further, we use matching and exploratory factor analysis on the existing data to identify indicators with the potential to summarise impact in specific domains. In addition, we use synthetic measures of subjective and psychological wellbeing to explore how specific domains contribute to participants' overall utility, and use these estimates to inform alternative quantifications of impact.

Finally, we explore the relationships between preference-based measures of utility and intervention outcomes using lowess estimators and non-linear regression.

We show how outcomes inventories vary between groups, and differences in the exhaustiveness of measurement across groups. To investigate ways of synthesizing impact, we also show which of the measured outcomes capture a sizeable portion of impact in a specific domain, and how these may vary across populations and geographical setting; we also show how different wellbeing measures summarize impact across multiple outcomes, and whether standard preference-based measures capture significant change in main intervention outcomes.

Our results can inform outcome measurement for policy and economic evaluation of complex interventions. They highlight the challenges in providing exhaustive measures of intervention impact when interventions are complex in terms of number of intervention components, potential outcomes and populations of interest, and offer possible solutions.

Informing the Measurement of Wellbeing Among Young People Living with HIV in Sub-Saharan Africa for Health Economic Policy Evaluations: A Mixed-Methods Systematic Review

PRESENTER: **Darshini Govindasamy Ms**, South African Medical Research Council
AUTHORS: Giulia Ferrari, Ioana Olaru, Alison Wiyeh, Catherine Mathews, Janet Seeley

Background

Globally, sub-Saharan Africa (SSA) accounts for an estimated 73% (4 million) of the total number of young people aged 15-24 years living with HIV. Despite the success of HIV treatment scale-up in SSA, young people living with HIV (YPLHIV) are exposed to severe psycho-social and economic challenges which are likely to increase their risk for poor mental health, educational and employment outcomes in adulthood. If demographic dividends in SSA are to be achieved, then economic policies need to target this vulnerable population. In line with the Sustainable Development Goal 3 ("Ensure healthy lives and promote well-being for all at all ages"), wellbeing is now a major public policy goal. In the field of social psychology, wellbeing is conceptualised under two distinct paradigms, subjective and psychological wellbeing, which has underpinned wellbeing measurement in economics. In development studies, wellbeing is conceptualised broadly in terms of the capability approach, and has been extended to include relational wellbeing. However, there is lack of clarity on appropriate wellbeing measures for policy evaluations in SSA. Understanding the alignment of local determinants of wellbeing to international wellbeing theories, could inform the selection of wellbeing measures for young people in HIV policy evaluations. Applying measures that are culturally appropriate and based on what YPLHIV value, will provide more accurate data on the wellbeing effects of HIV policies. This could guide investment decisions in health.

Objectives

To synthesise the literature on the determinants and lived experiences of wellbeing among YPLHIV in SSA.

Methods

A segregated mixed-methods review design was used. We searched six databases (Medline, Web of Science, PsychINFO, Econlit, Africa-Wide Information, International Bibliography of the Social Sciences) and grey literature (Dissertations and Theses- A&I, World Cat; the International AIDS Society conference abstracts). This was complemented with hand searching. We included quantitative, qualitative or mixed-method studies that focused on any conceptualisation of wellbeing from the fields of social psychology or development studies among YPLHIV in SSA from 01 January 2000 to 30 April 2018. Randomised controlled trials, editorials and commentaries were excluded. Two reviewers independently screened abstracts, full texts, and assessed articles for methodological quality. DG conducted data extraction and this was checked by JS and GF. A meta-analysis and thematic framework analysis was conducted to synthesise quantitative and qualitative studies, respectively.

Results

We identified 5310 citations. Of these, thirty-two qualitative and eight quantitative studies met our inclusion criteria. The following key determinants of wellbeing were identified together with themes that explained how wellbeing and illbeing were experienced among YPLHIV: 1) emotional support from family and friends; 2) aspirations for the future; 3) psycho-social resources such as religious coping and spiritual beliefs; 4) experiences and fear of stigma; 5) HIV disclosure anxieties; 6) treatment adherence challenges; 7) food insecurity.

Conclusion

Findings from this review suggest that psycho-social, material and relational factors interact to shape wellbeing among YPLHIV in SSA, and that social support is a key driver of wellbeing in this setting. Future policy evaluations on YPLHIV should consider using a combination of measures that encompass themes identified above.

10:30 AM –12:00 PM WEDNESDAY [Demand & Utilization Of Health Services]

Universität Basel | Kollegienhaus – Hörsaal 115

Health Services Demand/Supply

SESSION CHAIR: **Anthony Scott**, The University of Melbourne

Demand for Long-Term Care Insurance in Singapore: Results for Randomized Discrete Choice Experiments

PRESENTER: **Marcel Bilger**, Vienna University of Economics and Business
AUTHOR: Wan Chen Kang Graham

Due to rapid population aging, long-term care financing is a pressing concern globally. Voluntary long-term care insurance generally has low uptake due to numerous reasons such adverse selection and difficulties forecasting future long-term care demand. With approximately two-thirds of its population enrolled, Singapore stands apart with the highest take-up rate of voluntary long-term care insurance in the world.

However, its basic insurance package only covers a fraction of formal long-term care costs and only about a fifth of its population opted for a more generous coverage. This study analyzes the demand for long-term care insurance in Singapore in efforts to identify factors that might increase the depth of coverage and further increase uptake.

We analyze the demand for long-term care insurance by means of a randomized discrete choice experiment. We surveyed a total of 1,600 respondents aged 35-39 by presenting them 12 to 14 choice sets of two alternative hypothetical insurance plans plus an opt-out alternative. We used a best-best design in order to obtain the full ranking of all alternatives presented. The discrete choice experiment includes 4 attributes relating to pay-in options into the insurance plan, and 4 attributes relating to the insurance benefits. We randomly assigned each respondent into 1 of 4 equally-sized treatment groups in efforts to test the effectiveness of information on uptake and willingness-to-pay for long-term care insurance. We followed a fractional design to allocate information regarding probability and duration of disability, and future costs of various long-term care services.

We further randomly split each study group into 4 subgroups according to a fractional design in order to study to methodological issues arising when conducting discrete choice experiments. Given the complexity involved in choosing insurance plans that include 8 attributes, the first comparison analyzes differences between standard D-efficient and a novel and less complex design for the discrete choice experiment. The other comparison analyzes differences between computer-assisted interviewing of a national representative sample and an online panel of similar respondents to determine whether the latter can give similar results at a fraction of the cost of the former. In addition to the discrete choice experiments, we asked respondents to self-report actual long-term care coverage along with a large variety of factors that might affect uptake. These factors notably include risk aversion, preference for the present, and expectations in terms of informal care supply.

We analyze all data using a mixture of revealed and stated preferences by means of rank-ordered logit models with random parameters. All attributes are dummy coded and interaction terms between all pay-in attributes, and between all benefit attributes are included. Results are expressed as the willingness-to-pay in terms of yearly insurance premium as well as increased insurance uptake for specific plans.

Optimizing Treatment Models for People Living with HIV in Urban Zimbabwe: Findings from a Discrete Choice Experiment

PRESENTER: **Michael Strauss**, Health Economics and HIV and AIDS Research Division (HEARD), University of KwaZulu-Natal
AUTHORS: Gavin George, Munyaradzi Mapingure, Joanne E Mantell, Matthew R Lamb, Godfrey Musuka, Jennifer M Zech, Innocent Chingombe, Martin Msukwa, Rodrigo Boccanera, Clorata Gwanzura, Tsitsi Apollo, Miriam Rabkin

Background

As Zimbabwe strives to provide universal access to antiretroviral therapy (ART) for people living with HIV (PLHIV), the Ministry of Health and Child Care has endorsed differentiated service delivery models (DSDM) designed to streamline delivery of HIV treatment. DSDM for patients who are virally suppressed and stable on treatment are intended to maximize both patient satisfaction and health system efficiencies by decreasing health facility (HF) visit frequency, expanding community-based service delivery, and shifting selected tasks from health care workers (HCW) to peers/lay providers. Understanding patient preferences and demand for DSDM characteristics is critical to scaling up high quality treatment models and achieving HIV epidemic control in Zimbabwe.

Methods

We conducted a discrete choice experiment among 500 virally suppressed adult ART patients in Harare, Zimbabwe. Preferences regarding characteristics of potential DSDM were assessed using a fractional factorial main effects design and binary, unlabeled choice sets with no opt-out option. Attributes included: 1) HF *vs.*community location; 2) individual *vs*. group consultations; 3) provider type; 4) HF operation times; 5) visit frequency; 6) visit duration; and 7) total visit cost to patient. Fixed effects logit models were used for parameter estimates, and interaction effects were estimated for gender and age.

Results

Participants had no preference between services costing US$1 and free services, but increasing cost from US$1 to US$3 decreased acceptability (OR=0.763; p<0.001), as did increasing cost to US$10 (OR=0.323; p<0.001). Participants were indifferent between services delivered by a professional HCW vs. a peer/lay provider, but were less than half as likely to choose services delivered by staff who were not respectful or understanding (OR=0.416; p<0.001 and OR=0.434; p<0.001 for HCW and lay providers respectively). Participants also preferred HF-based services over home-based (OR=0.740, p<0.001) or community-based services (OR=0.808, p=0.001); individual consultations over group sessions (OR=0.761; p<0.001); and shorter waiting times (two hours OR=0.864, p=0.024) and four hours (OR=0.829; p=0.062) compared to a one-hour wait. Changing visit frequency from once every three months to once every six months had a significant, but small effect in increasing preferences (OR=1.092; p=0.015). Changing HF operating times to include mornings, evenings or weekends had no significant effect. Importantly, preferences were mostly consistent between younger and older patients, and between men and women.

Conclusions

These findings suggest that stable ART patients in Harare prefer the characteristics of individual HF-based DSDM such as appointment spacing and fast-track visits, rather than community-based group models such as community ART refill groups, which to date have seen relatively low demand in urban areas in Zimbabwe. There are possible efficiency gains from decreasing HF visit frequency and task shifting

to lower cadres of healthcare workers and/or to peers/lay providers, both of which align with patient preferences, although the attitudes of health providers towards patients are critical for patients' experiences of any DSDM. Waiting times and visit costs are a concern for patients, and efforts should be made to ensure both remain low. These results have important implications for implementation and policy, and future cost-effectiveness analyses must take these preference structures into account.

Physician Retirement

PRESENTER: **Katrin Zocher**, University of Linz

In the EU the share of (all) physicians aged 55-74 rose from 26% in 2005 to 37,5% by 2015. About 70% of general physicians in Austria are 50 to 64 years old, which means that the majority of physicians will retire during the next few years. The retirement of GPs and practice closures not only mean a loss of a trusted expert but also cause additionally search costs for patients. The causal impacts of practice closures on patients' health outcomes and behaviors are estimated, by using administrative data from Austria in a quasi-experimental settings. In the main specification I exploit the randomness in timing of nearly 125,000 treated individuals. Therefore, I compare matched individuals T (treatment) and C (control) before and after the retirement of Ts' primary general physician, whereas the primary GP of T retires earlier than the primary GP of C. The results indicate that the retirement of the primary GP leads to an increased utilization of health services within the intramural sector and slighlty higher expenditures for general physicians.

Pay-for-Performance Incentives and Cancer Screening:Evidence from Ontario, Canada

PRESENTER: **Dr. Sisira Sarma**, Western University

AUTHORS: Rose Anne Devlin, Lihua Li, Nirav Mehta, Gregory Zaric, Amardeep Thind, Salimah Shariff

In early 2000s, the Government of Ontario introduced pay-for-performance incentives (P4P) with the intention to improve the provision of preventive health care services. This paper evaluates the impact of P4P incentives for breast, cervical and colorectal cancer screening. We use population-based administrative data from 2002 to 2014 to obtain the annual cancer screening-status for eligible patients, including characteristics of the family physicians who performed the screening. We calculate the proportion of enrolled patients eligible for screening that received the targeted screening by physician practice. A suitable difference-in-differences (DID) approach is employed to estimate the effect of the P4P incentives on each targeted cancer screening, controlling for physician and patient characteristics. The control group is physicians ineligible to receive P4P incentives during our study period and the treatment group includes physicians exposed to incentives for a minimum of three years. Testing various parallel paths assumptions suggests that DID fixed-effects is the preferred specification for breast cancer screening, the preferred specification for cervical cancer screening is the standard DID model and the standard DID model with a linear time trend is the preferred specification for colorectal cancer screening. The results from these preferred specifications show that P4P incentives increase the provision of breast, cervical and colorectal cancer screenings by 2.4, 2.2 and 7.3 percentage points, respectively, relative to the traditional FFS. Subsequent analyses suggest some dynamic effects: a very small or no effect initially, which increases gradually until 2011 and declines thereafter with no or a small effect in 2014. The cost of P4P incentives for cancer screening is over C$16 million (2002 dollars) per annum. Thus, policy makers need to weigh the substantial cost of the P4P incentives against small improvements in the provision of preventive cancer screening.

10:30 AM –12:00 PM WEDNESDAY [Production Of Health, Health Behaviors & Policy Interventions]

Universität Basel | Kollegienhaus – Hörsaal 116

Psychological /Mental Health

SESSION CHAIR: **Anja Smith**, Economics Department, Stellenbosch University

Intergenerational Mental Health Mobility Among Older Adults in the US

PRESENTER: **Mehmet Gurbuz**, Gebze Technical University

AUTHOR: Dr. Murat Anil Mercan

Alzheimer's disease (AD) is a complex genetic disorder (Pericak-Vance, et al. 1998; p.39). To understand the genetic etiology of AD, it is necessary to examine the determinants of human health. For example, age is one of the most important biological factors (Cacace, 2016; p.733). AD exhibit a two-sided model. The first of these is the early onset (under 65 years age) familial AD, which is likely to be inherited. The other was defined as late onset (above 65 years of age) AD (Tanzi, 2012; p.1). Besides age, other risk factors include familial history of AD, head trauma, genetic factors, female being, low level of education and environmental factors (Castellani, 2010; p.487). AD affects 25-30 million people worldwide (Cacace, 2016; p.733). In the USA, prevalence was estimated at 5 million in 2007 and, by 2050, is projected to increase to 13 million in the USA alone (Castellani, 2010; p.487).

Alzheimer's disease with genetic research conducted in the context of active struggle, it will inform about the causes of Alzheimer's disease. Significant progress will be made in solving this complex etiology using genetic linkage analyzes.

The intergenerational inheritance of Alzheimer's disease will be examined. Considering the life tables of individuals, it will help us to understand the status of family members with Alzheimer's disease in the labor force partical (LFP).

We have used probabilistic regression models to investigate the relationship between parents' mental illnesses and the probability of having mental illneses for older Americans. Our analysis depends on three waves of the Health and Retirement Study (HRS) by the USC Gateway to

Global Aging Data team from 2010 to 2014.

Our probit results suggest that older women, who report their parents did not have the Alzheimer's Disease (AD) are more likely to have dementia at older ages. We did dot find any statistical effects for older men. We try to use several different regression forms and all of them give similar results. In addition, we investigate the the AD mobility among generations. Our estimates suggest that there is no statistically significant relationship between having the AD and their parents' the AD background.

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Psychological Resilience to Major Socioeconomic Life Events

PRESENTER: **Prof. Fabrice Etile**, Paris School of Economics

AUTHORS: David Johnston, Michael Shields, Paul Frijters

Nearly everyone will experience a major adverse life event, such as a bankruptcy, job loss, divorce, or serious injury. How well do individuals cope with such events, and do some suffer significantly more than others do? It is important to understand who in the population is resilient, and how the distribution of psychological resilience differs across types of adverse life events. This knowledge provides policy-makers with information that can be used to better direct resources to individuals and communities most at risk.

In this paper, we use a novel, finite mixture dynamic model applied to 17 years of data from a rich, nationally representative panel survey, to explore in detail the extent of individual heterogeneity in the psychological response (or level of resilience) to ten major adverse events. We leverage the model structure to define a global measure of resilience as the expected inter-temporal loss of psychological health due to a 'standardised' event, and derive from that a distribution of resilience for the population. Our model allows for heterogeneity in both anticipation and adaptation responses, while also accounting for the initial conditions problem and selection into events based on fixed unobservable characteristics. We then document the relationship between resilience and adult socioeconomic characteristics, explore the distinctiveness of resilience from measures of cognitive ability and non-cognitive traits, and finally we relate individual-level adulthood resilience to one's childhood to better understand the extent to which resilience can be predicted by childhood socioeconomic characteristics. We believe that these analyses provide a useful integration of the limited literature on resilience in economics with the large psychology literature on this important topic.

Our results demonstrate substantial heterogeneity in the psychological response to major adverse life events: around one-third of the sample are little affected by such events, while one-third experience substantive declines in their psychological health. The finite mixture dynamic model also predicts large differences between the most resilient and least resilient individuals in our sample. Notably, we find some support for our measure of resilience in the strength of its relationship with experienced mental health conditions: our measure of psychological resilience is strongly correlated with being diagnosed with depression or anxiety, taking medication for depression or anxiety, and having seen a psychiatrist or psychologist in the last year. In particular, those who are estimated to be the least resilient are seven times more likely to be currently diagnosed with depression or anxiety than those estimated to be the most resilient. Further, we show that our resilience measure captures a different construct to cognitive ability, locus of control, and the Big-5 personality traits. We find that resilience is significantly correlated with these measures, in plausible directions, but predict little of the variation in resilience. Finally, we find some evidence that broad socioeconomic circumstances in childhood are predictive of psychological resilience in adulthood, although there is much left unexplained by the variables that we have available.

Health and Economic Effects of Direct Household Exposure to Disaster Events

PRESENTER: **Olena Stavrunova**, University of Technology Sydney

AUTHORS: David Johnston, Michael Shields, Peter Siminski

Natural disasters caused well over $100 billion dollars per year in worldwide damages during the past decade, and many scientists believe that global climate change will increase the number of severe weather events. However, despite the sizable aggregate costs and long history of natural disasters in developed countries, relatively little is known about the causal effects of disaster exposure on adult health and wellbeing. In this paper, we use nine waves of a unique Australian nationally-representative household panel dataset that includes information on whether a weather related disaster (e.g. flood, bushfire, cyclone) has damaged or destroyed a respondent's home. This information, combined with detailed data on location of residence allows us to estimate novel treatment effects. In particular, using a two-way (individual and area) fixed effects regression approach, this data allows us to estimate the effects of being directly affected by a disaster event (i.e. damage to the home) versus being indirectly affected (i.e. residing in a disaster zone but suffering no damage to the home) relative to those unaffected (i.e. residing in 'comparable' unaffected areas) on mental health, physical health, and quality of life.

Particular attention is devoted to understanding the heterogeneity in natural disaster impacts: that is, the individual variation in the ability to cope with and react to disaster that causes some people to suffer more than others. A related issue we explore is how quickly people recover following the disaster. Although several economics studies examine the speed of adaptation to different types of events, such as major financial shocks and bereavement, far less is known about what determines the speed of adjustment. We additionally explore the potential for economic and financial mechanisms for the observed health effects.

Results suggest that direct exposure to a natural disaster event (damage to the home) significantly reduces mental health, but not physical health. Indirect exposure (residing in disaster zone) has little effect on health outcomes. The direct negative effects are short lived, but there is substantial heterogeneity in the estimated impacts. The magnitude of the mental health effects vary strongly with socioeconomic status, financial capital, and the non-cognitive skills of the individual.

Can Childhood Circumstances Explain Later Life Loneliness and Social Isolation? Life-Course Evidence from Three UK Longitudinal Surveys

PRESENTER: **Claryn Kung**, Monash University Centre for Health Economics
AUTHORS: Emilie Courtin, Michael Shields

A growing literature has documented a strong link between measures of both loneliness and social isolation, and a range of poor health behaviours, lower access to health and social care, adverse physical and mental health outcomes, and ultimately higher mortality. Loneliness and social isolation are particularly prevalent in old age, but recent studies have documented that these are also common issues in adolescence, and early- and mid-adulthood. Issues around loneliness and social isolation are consequently at the top of national public health agendas in many developed countries, with growing interest in the associated economic costs.

Despite the strong policy interest in loneliness and social isolation, and their consequences, robust evidence on the drivers over the life course is limited. The genetic heritability of loneliness, for example, has been found to be very low (< 5%), but few studies have quantified the role that childhood conditions and circumstances might play in putting individuals on a trajectory of future (chronic) loneliness. This is an important missing piece in the evidence base to inform the design of preventive strategies. In this study, we aim to provide a detail analysis of the role of childhood, with a focus on socioeconomic conditions, parental investment, health, maltreatment, neglect and abuse.

To do this we use data from the (1) English Longitudinal Study of Ageing (ELSA), (2) UK Biobank, and (3) the Millennium Cohort Study. Together with its nine biennial measurements of loneliness and social isolation, the ELSA administers a rich set of life history questions such as childhood socioeconomic status, health, household composition including parents' marital status, adverse events, and parenting style (aged 50+). The UK Biobank also contains similar retrospective historical questions as well as current health and loneliness questions, administered to sample of over 500,000 adults (aged 37 to 81). We supplement our findings an analysis of the UK Millennium Cohort Study, which provides detailed prospective data on these childhood socioeconomic conditions, as well as reports on loneliness and measures of social isolation in early adolescence (age 14, 16). The unique combination of these three longitudinal surveys spanning early life, mid- and late-adulthood enables us provide a unique life-course perspective, and by far the most comprehensive study focusing on the potential importance of childhood in explaining later life loneliness and social isolation.

In order to estimate the long-term relationship between childhood circumstances and loneliness, we use a variety of econometric techniques, including a dynamic panel finite fixture model that enables us to shed new light on the heterogeneity in response to childhood. Preliminary findings reveal childhood health, particularly mental health and disabling injuries, parenting style, financial hardship, maltreatment and abuse strongly predict both future loneliness and social isolation for older adults. Upon checking consistency across data sets we further aim to examine the proportion of variation in early-middle adulthood loneliness explicable from fixed childhood variables, and how their impact evolves over time. We also aim to examine pathways via which these childhood variables impact later life loneliness, such as marital status, fertility and employment.

10:30 AM –12:00 PM WEDNESDAY [Production Of Health, Health Behaviors & Policy Interventions]

Universität Basel | Kollegienhaus – Hörsaal 117

Opioids and Painkillers

SESSION CHAIR: **Sonja Cornelia Kassenboehmer**, Monash University

Understanding the Opioid Epidemic: Economic Conditions and Opioid Abuse

PRESENTER: **Sonja Cornelia Kassenboehmer**, Monash University
AUTHORS: Oliver Armstrong, John Haisken-DeNew, David Johnston

Opioids are the most harmful drugs worldwide: Usage has increased dramatically over the last 10 years and they are the main reason for overdose deaths. Countries such as the United States, Australia and Canada have seen sharp increases by up to 300% in the use of prescription opioids over the last 10 years accompanied by a dramatic rise in opioid overdose deaths. In Australia for example, there has been a 92% increase in opioid related deaths since 2001 (AIHW, 2018), which dwarfs the change in other comparable drugs. Prescription opioids are now the cause of more than 70% of overdose deaths in Australia (Australian Government 2018).

Motivated by the scale and rise of opioid mortality in Australia, this study investigates whether short-term economic changes at the local area level impact on opioid abuse. Opioid abuse at the local area level is measured by opioid overdose death rates, ambulance attendance due to opioids, hospitalizations due to opioids and opioid dependence treatment. We compare the effect of macroeconomic conditions on opioid abuse with their impact on other drug abuse and investigate potential drug substitution effects. Furthermore, heterogeneous effects are investigated by population subgroup, in particular age, gender and employment status.

We follow Carpenter et al. (2017), Hollingsworth et al. (2017) and Ruhm (2018) to estimate the causal relationship between contemporaneous economic changes and opioid related harms across a number of different statistical regions in Australia between 2001 and 2016:

$$Y_{j,t} = \beta_1 U_{j,t} + \beta_2 Z_{j,t} + \beta_3 t_{j,t} + \eta_j + \delta_t + \varepsilon_{j,t}$$

where $Y_{j,t}$ measures opioid abuse in statistical area j and year t, $U_{j,t}$ is the unemployment rate and $Z_{j,t}$ is a vector of control variables. Area level fixed effects η_j control for fundamental differences across statistical areas, such as in primary care availability, industry mix, and demographics. Time fixed-effects δ_t control for common nation-wide policy changes, such as the availability of certain prescriptions and macroeconomic trends which are time variant. Also included are area linear time trends $t_{j,t}$ to account for unobserved factors varying within areas over time.

Our preliminary results indicate that a 1-percentage point increase in a lag period of 1 year in total unemployment correlates with an increase of 0.13 deaths (3.1 percent) per 100k persons on average in local areas. Our results become more significant and the point estimates larger when we investigate for heterogeneity among certain sub populations. We provide evidence that the counter cyclical relationship is likely driven by middle-aged unemployment and more specifically middle-aged male unemployment.

Overall, we conclude that economic shocks are only weakly related to rising opioid harm and it is likely that there are a number of other root causes. For example, economic conditions are likely to interact with supply side factors such as drug availability. In this sense, we suggest that it is possible that economic conditions may have strong effects on the propensity of economic insecure individuals to overdose from opioids while at the same time being unable to fully explain the total rise in opioid overdoses.

Evaluating Policy Changes to Prescription Opioids and Their Close Substitutes

PRESENTER: **John Haisken-DeNew**, University of Melbourne

AUTHORS: Daniel Hoyer, Sonja Cornelia Kassenboehmer, Karinna Saxby

Using data from the Australian National Coronial Information System (2001-2016), we identify the impact of various policy changes, in particular the introduction of abuse-deterrent opioids, on the development of opioid deaths and substitution effects between various forms of legal and illegal opioids such as Oxycodone, Fentanyl and heroin.

The development of opioid use in Australia follows a very similar pattern to that of the United States, yet on a lower absolute level. Despite the near 7-fold increase in the 10-year period 2007-2016, analgesic related deaths (as defined by deaths in which the toxicology report found analgesics in the body) top out at 6 deaths per 100,000 per year (1500 in total) in Australia compared to 15 deaths per 100,000 (50,000 in total) in the USA according to the National Institute on Drug Abuse.

On April 1, 2014, the most common prescription opioid Oxycodone was replaced entirely by an abuse-deterrent version on the nationally available Pharmaceutical Benefit Scheme, the nationally subsidised provider of the clear majority of all pharmaceuticals in Australia. It became substantially more difficult to crush Oxycodone tablets to be used for unintended intravenous injections, and the policies substantially reduced the rapid release aspects of Oxycodone, crucial for drug abusers.

Alpert, Powell and Pacula (2018; AEJ:EP) demonstrate that upon introduction of such an abuse-deterrent drug in the U.S. in 2010, many prescription drug users switched into the street drug heroin to meet their needs. We build on their analysis and investigate in the Australian context the response to the introduction of the abuse-deterrent formula of Oxycodone. We are particularly interested in investigating substitution responses between various forms of opioids and identifying heterogeneous effects by subgroup.

Our identification strategy follows Albert et al (2018), in which we identify the causal effect of the Oxycodone reformulation by examining whether regions with the highest rates of Oxycodone misuse before the reformulation experienced the highest drops in Oxycodone related deaths and switches to other opioids or other close substitutes. We estimate an *event-study specification* for Oxycodone deaths in local areas (and alternatively other likely substitutes) by controlling for Oxycodone prescription prevalence before the introduction of the reformulation interacted with year fixed effects. We additionally control for area and year fixed effects and cluster the standard errors at the local area level. The main coefficient of interest is the one of the interaction term which indicates whether persons in those geographical regions that have previously had high prescription usage are most likely to find the constraint of abuse-resistant Oxycodone formulations to be the most binding and are most likely to switch to other substitute drugs such as legal prescription Fentanyl and the illegal street drug heroine. Should these substitute drugs have a higher prevalence in coroner-inspected corpses, we can conclude the existence of a mere substitution effect, and not the intended elimination of the original abuse of Oxycodone.

JEL: I12, I18

Keywords: Opioids, Health Behaviour; Government Policy; Regulation; Public Health

The Impact of Staggered Benefit Disbursement on Opioid Use, Hospitalizations, and Mortality

PRESENTER: **Alicia Atwood**, Vassar College

A commonly recommended policy to alleviate the opioid burden is to distribute income benefits multiple times a month to a household instead of a single lump sum payment. This recommendation stems from two established bodies of literature that (1) establish the cyclical nature of the monthly opioid-mortality cycle and (2) document a relationship between benefit disbursement (income transfer) day and substance use. However, despite the national importance of the opioid epidemic, and the frequent intersection of opioid users with those who receive government benefits, no paper has empirically examined the relationship between the two. Our project overcomes prior data limitations to provide the first causal evidence on the relationship between income transfer schedules and opioid misuse, in a state that has been disproportionately impacted by the opioid epidemic.

West Virginia (WV) has the highest opioid-related death rate in the country. One of the poorest US states, WV relies heavily on government cash transfer programs, specifically Supplemental Nutrition Assistance Program (SNAP), which aims to alleviate food insecurity in low-income households, and Temporary Assistance for Needy Families (TANF), which aims to help families achieve self-sufficiency. Government income transfers, including SNAP and TANF, are disbursed to each household once monthly. Across the U.S., it is common to receive both SNAP and TANF benefits on the same day (i.e., one cash transfer from the government per month). However, WV distributes TANF to everyone on the 1stof the month, but distributes SNAP during any one of the first nine days of the month, according to last name.

We take advantage of this novel and pseudo-random distribution schedule and WV's willingness to provide linked Medicaid, SNAP and TANF data to estimate the causal impact of benefit disbursement schedules on opioid misuse. Our outcomes include licit and illicit opioid use, emergency department visits, hospitalizations, and mortality. We estimate the impact of multiple benefit distribution days across the month compared to a single distribution day. We then determine whether there are differential impacts by relative size of each transfer to total household income. Our results will provide evidence on not only the impact of multiple distribution dates, but also on the relative importance of longer versus shorter time intervals between payments. Next, we test for distributional changes to opioid overdose, mortality, and usage patterns. Then, we conduct a decomposition analysis to determine the proportion of the mortality/overdose spike due to benefits transfers (versus other factors). Finally, we offer a welfare calculation derived from the change in composition for days overdoses occur.

Preliminary data from the linked SNAP, TANF, and Medicaid dataset show that from 2014-2016, there were 4,767 opioid-related overdoses, 83% of which resulted in death. Of those who received SNAP benefits between 2014-2016, 3,281 also had an overdose. Among all overdoses, 20% occur in the first 5 days of the month; fewer than 2.5% occur during the last 5 days of the month, with declining rates in between. A paper and a full set of results will be available before iHEA this summer.

Impact of Medical Marijuana Policies on Opioid Related Hospitalizations and Emergency Department Visits

PRESENTER: **Dr. Jayani Jayawardhana**, University of Georgia

Currently thirty three states and District of Columbia have passed some form of medical marijuana law. While clinical effects of marijuana might be still unclear, few studies have examined the association of medical marijuana laws and utilization of healthcare including prescription drugs. However, there is little information on impact of medical marijuana policies on hospitalizations and emergency department (ED) visits. The objectives of this study are to examine the associations between medical marijuana legalization and hospitalizations and emergency department visits related to opioids. We utilized hospital discharge data from Healthcare Cost and Utilization Project's (HCUP) Fast Stats Database. HCUP Fast Stats database provides annual rates of opioid-related hospitalizations and ED visits data for every available calendar year between 2005 and 2016 across 47 states and 35 states respectively. Data from HCUP Fast Stats database were merged with state level socio-demographic data and opioid-related state health policy data for the analysis. Analyses were carried out using both a descriptive analysis and a difference-in-difference regression analyses. Descriptive analysis results show that rates of hospitalizations and ED visits associated with opioid use increased overtime across all states, although the percent increase in average rates of hospitalizations (169%) and ED visits (247%) were higher among the states that have legalized medical marijuana compared with states that have not legalized medical marijuana (94% and 140% respectively). Regression results indicate that medical marijuana legalization was positively and significantly associated with 5% increase in ED visit rates related to opioids, although its association with opioid-related hospitalizations was not significant. Further research is needed to investigate causal effects of medical marijuana on healthcare utilization.

10:30 AM –12:00 PM WEDNESDAY [Evaluation Of Policy, Programs And Health System Performance]

Universität Basel | Kollegienhaus – Hörsaal 118

Benefits and Assistance

SESSION CHAIR: **Steven Paling**, NHS England & NHS Improvement

Provider Responses to Insurance Benefit Restrictions: The Case of Ophthalmology

PRESENTER: **Kees van Gool**, CHERE, UTS

AUTHORS: Olukorede Abiona, Jane Hall, Philip Haywood, Denzil Gwydir Fiebig

Background: Around one million Australians qualify for the Medicare Safety Net each year. The Safety Net pays 80% of the fee charged by doctors for out-of-hospital services funded by Medicare once a family reaches a threshold in out-of-pocket costs. Its design is akin to 'donut

hole' insurance. In 2010, the government placed restrictions on a small number of medical services that limited the benefits paid by the Safety Net to a pre-determined amount. The aim was to curtail government spending on the Safety Net as well as generate stronger price signals for patients to shop around for low-fee doctors.

Aim: This study examines the impact of the Safety Net restrictions on provider behaviour, using ophthalmologists as a case study. We examine whether ophthalmologists use their market power to alter their fees across services to compensate for potential policy-induced income losses from one part of their income stream.

Methods: We employ a difference-in-difference model to compare the change in fees charged by ophthalmologists with those charged by other medical specialists who were not affected by the policy change. We measure both the direct effect on the ophthalmology services affected by the policy change and the in-direct effect of unaffected ophthalmology services. To uncover further potential heterogeneity, we examine whether high-fee charging ophthalmologists responded differently to those who charged lower fees before the policy change. We use the Sax Institute's 45 and Up study of 260,000 residents living in New South Wales, Australia. This study is linked to administrative data that provides us with an accurate picture of fees charged by providers before and after the Safety Net changes.

Results: The results show that compared to other medical specialists' fees, ophthalmologists substantially reduced their fees for services directly affected by the Safety Net restrictions. There is also some evidence that they increased their fees for services not affected by the Safety Net restrictions. High fee-charging ophthalmologists exhibited a higher fee reduction response than low-fee ophthalmologists.

Conclusions: Provider responses are an important consideration in evaluating the impact of insurance change. Our results indicate that that the direct effect of the change led to fee reductions but that due to their market power, providers were able to offset potential income losses by redistributing their fee structures. Our result has important implications on the wider issue of insurance design and the unintended consequences of reforms.

Collaborative Mental Health Care Program Versus a General Practitioner Program and Usual Care for the Treatment of Patients with Mental or Neurological Disorders in Germany: A Cost Comparison Based on Administrative Claims Data

PRESENTER: **Mr. Alexander Engels**

AUTHORS: Dr. Katrin Christiane Reber, Julia Magaard, Dr. Hans-Helmut Koenig, Martin Härter, Ariane Chaudhuri, Sabine Knapstein

Mental and neurological disorders are widespread, debilitating and associated with high direct and indirect costs. Usual care for patients with such disorders in Gemany is considered to be poor in coordination and cooperation between providers. Since 2010, the AOK Baden-Würtemberg gradually extended its general practitioners (GP) program ("Hausarztvertrag") with selective contracts that change regulations in the outpatient sector. One of these contracts, the PNP program ("Facharztvertrag"), aims to improve treatment for acute and chronic patients in the fields of psychiatry, neurology and psychotherapy by promoting collaborative care networks and evidence-based treatment. Studies from the United States suggest that collaborative care models may favorably influence cost-effectiveness, but the evidence for similar models in Germany is limited. The purpose of this study was to compare costs between the collaborative PNP program, the GP program and usual care from the perpective of the health insurance. Additionally, sick leave days were analyzed.

We used claims data from 2014-2016 of 55,472 adults with an index sick leave in 2015 due to a disorder addressed by PNP (i.e. affective, anxiety, somatoform, adjustment, alcohol use disorder, schizophrenia, multiple sclerosis). The individuals were grouped according to the program enrolled in the quarterly period of their index sick leave diagnosis as either usual care, GP or PNP patients. We applied entropy balancing to balance the groups regarding potentially confounding covariates. We employed two-part generalized linear models to compare groups with respect to outpatient, inpatient and medication costs as well as sick pay by the AOK during 12 months after the index sick leave. In addition, we compared the number of sick leave days using a censored negative binomial model.

The PNP program significantly ($p<.05$) reduced average sick pay by 164€, compared to usual care, and by 177€, compared to GP. Consistently, in PNP the number of sick leave days was 3.84 days ($p< 05$) lower than in usual care and 3.99 days ($p<.05$) lower than in GP. We found significantly ($p<.05$) lower inpatient costs in PNP than in usual care (-194€) and in the GP program (-177€). However, we did not find a significant reduction in psychiatric or neurological inpatient costs.

Our results indicate that the PNP program reduces costs from the health insurance perspective as well as sick leave days. However, the observed reduction of inpatient costs in the PNP group was likely due to other regulations, as the share of the specific inpatient costs due to psychiatric/neurological disorders was not reduced. Future research on subgroups, the quality of care and the underlying mechanisms are needed to recommend the implementation of similar programs.

Childhood Asthma and Housing Assistance

PRESENTER: **Michel Boudreaux**, University of Maryland

AUTHORS: Andrew Fenelon, Natalie Slopen, Sandra Newman

In the U.S., nearly three million low-income families with children pay an excess of 50% of family income in rent or live is substandard housing. Unaffordable, inadequate, and unstable housing is thought to adversely impact child health by increasing stress and environmental exposures and by creating barriers to community resources such as health care, education, and social networks. Policy makers and researchers have long been interested in the potential effects that the Department of Housing and Urban Development's housing assistance programs

might have on child health. However, the topic has been relatively understudied due to insufficient data and the difficulty of generating credible estimates that overcome unobserved selection. A handful of influential experimental and quasi-experimental papers have examined the effects of changes to program type (e.g. public housing versus vouchers), but few have examine the effect of any assistance versus none.

In this paper we examine the effects of housing assistance on childhood asthma. We use a unique dataset of longitudinal administrative records on housing assistance participation linked to the nationally representative National Health Interview Survey. Outcomes include asthma attack and visiting the ER for asthma-related symptoms. We employ a pseudo-waitlist design that compares the outcomes of interest between those currently residing in assisted housing (the treatment group) to a control group of survey respondents that are not currently in assisted housing, but will enter within 2 years of the interview date. These two samples appear similar on pre-determined variables, suggesting that they are drawn from the same population except for their current exposure to housing assistance. The waitlist design controls for any time invariant factors that determine selection into housing assistance.

We do not find evidence that housing assistance reduces asthma attack. However, we do find that housing assistance reduces ER visits, conditional on attack, by 15 to 18 percentage points (a 25% to 30% reduction). Event study models demonstrate that these effects only emerge after entry into housing and not before it, suggesting that our results cannot be explained by regression to the mean or the presence of unobserved time-varying omitted variables. Results are not explained by a number of potential mechanisms, including neighborhood and county characteristics (demographics, economic indicators, crime, or pollution) or by individual level measures of health care access.

Our paper suggests that housing assistance reduces utilization of ER visits for asthma. There are two possible pathways for this effect: (1) housing assistance might reduce the severity of asthma attacks; or (2) housing assistance might better help families manage attacks at home. Our results suggest that housing assistance has the potential to improve childhood health and to produce cost-savings from avoided health care utilization.

Does Indonesia's National Health Insurance Scheme Reduce Illness-Related Worker Absenteeism?

PRESENTER: **Ms. Lyubov Teplitskaya**, Palladium
AUTHORS: Dr. Arin Dutta, Dr. Kristen N Brugh

Introduction: In 2014, the government of Indonesia integrated multiple social health insurance programs into a single national insurance scheme, *Jaminan Kesehatan Nasional* (JKN), with an aim to achieve universal health coverage (UHC) by 2019. Recent research in Indonesia suggests that the economic cost of illness-related productivity losses totaled 6.5% of the national GDP in 2015, and that 95% achievement of JKN coverage by 2019 would more than double Indonesian economic output and value-added GDP. Evidence from the United States suggests that expanded health benefits are associated with enhanced worker productivity and reduced absenteeism. However, relationships among insurance coverage and labor force health in Indonesia may be more complex. Based on survey data, we suggest that JKN provides members the financial resiliency to miss work for illness-related care, rest, and recovery, which would contradict the reduced absenteeism effect.

Methods: This study uses data from Indonesia’s 2015 national socio-economic survey (Susenas) to understand the pathways through which JKN affects the health of workers and productivity in Indonesia’s labor market. Given that insurance uptake is not random, we apply propensity score methods to address self-selection problems. If self-selection is a result of adverse selection in health insurance markets, then we would expect positive selection bias in estimates of JKN effects on absenteeism as sicker workers would be more likely to both have insurance and miss work; if self-selection results from national insurance rolling out to formal economy sectors first, then we could expect negative selection bias as these workers are more likely to have better socioeconomic standing, better general health, and be less likely to miss work due to illness. A hurdle regression model was applied to the matched analytical sample (N = 376,390) to reflect the two-stage process underlying the incidence (probit) and duration (zero-truncated negative binomial) of illness-related worker absenteeism.

Results: Results indicate that workers with JKN health insurance are 12% more likely than those without insurance to miss work due to illness ($p<0.001$), but no difference in the average number of days missed from work due to illness was detected. Workers from the richest consumption group are 21% more likely to miss work than workers from the poorest consumption group ($p<0.001$), and the risk of illness-related absenteeism does not differ by employment sector or type.

Discussion: Study results do not provide evidence in support of the hypothesized relationship between JKN and reduced illness-related absence from work, but rather suggest that JKN affords members the financial resiliency to take sick leave from work; these findings may conversely be an indication of the barriers faced by uninsured and poor workers preventing them from taking time away from work to seek care or recover. Further research is needed, including longitudinal analysis to determine whether relationships have changed in response to the achievement of UHC in Indonesia. Results of this study can be used to refine the understanding of the impact of JKN coverage, and inform labor market and social policies at the intersection of health, workforce, and economic development.

10:30 AM –12:00 PM WEDNESDAY [Health Care Financing & Expenditures]

Universität Basel | Kollegienhaus – Hörsaal 119

Organized Session: Financing Reproductive, Maternal, Newborn, and Child Health in Low-Income Countries: Past Trends and Future Challenges

SESSION CHAIR: **Josephine Borghi**, London School of Hygiene & Tropical Medicine

DISCUSSANT: **Maria Eugenia Bonilla-Chacin**, Global Financing Facility

Aid for Reproductive, Maternal, Newborn, and Child Health in Low-Income Countries, 2002-2017: Development of the Muskoka2 Method and Latest Empirical Estimates

PRESENTER: **Catherine Pitt**, London School of Hygiene & Tropical Medicine

AUTHORS: Antonia Dingle, Josephine Borghi, Dr. Leonardo Arregoces, Melisa Martinez Alvarez

Substantial progress was made in reducing both maternal and child mortality during the era of the Millennium Development Goals (MDGs), but many countries did not meet their MDG targets. Rates of maternal and child mortality remain highest in low-income countries (LICs), which also have the most limited domestic resources for health and often face conflict and state fragility. For LICs to achieve the ambitious targets of the health-related sustainable development goals (SDG3+), they require adequate financing for reproductive, maternal, newborn and child health (RMNCH). Whilst the role of external, donor financing is waning in middle-income countries, it remains a large component of RMNCH funding in many LICs, and critical to achieving SDG3+ and the Global Strategy for Women's Children's and Adolescents' Health. Reliable estimates of aid for RMNCH are thus essential, but challenging to generate.

We developed the Muskoka2 method for tracking official development assistance and private grants (ODA+) benefitting RMNCH through an extensive stakeholder engagement process. Muskoka2 is a transparent algorithm, implemented in Excel, which estimates the amount of ODA+ benefitting RMNCH globally, by donor, and by recipient country, as well as by more specific health areas and beneficiary groups. Muskoka2 builds on the simplicity and replicability of, and political support for, the original Muskoka methodology developed by the G8 (2010) by improving its comprehensiveness and precision and its ability to track changes over time. Muskoka2 will be applied to the December 2018 update of the OECD Creditor Reporting System, the most complete and comparable global dataset on aid, to which donors report annually. We examine the share of all aid for RMNCH that goes to LICs, and then compare total and per capita receipt of aid for RMNCH across LICs. We examine how ODA+ for RMNCH in LICs changed from 2002 to 2017 and look specifically at funding for reproductive health, maternal and newborn health, and child health, exploring how aid varies by donor and other drivers of variation.

Our findings are important for informing discussion regarding the role of external financing in the context of the burgeoning domestic finance agenda, innovative financing mechanisms, and non-traditional donors. Our findings are also crucial for holding donors to account for global commitments made to improve RMNCH. We reflect on the methodological challenges in tracking aid for health and in estimating how much aid benefits RMNCH.

Estimates of Domestic and External Financing for Reproductive, Maternal, Newborn, and Child Health in Low-Income Countries Using the System of Health Accounts

PRESENTER: **Hapsa Toure**, World Health Organization

AUTHORS: Ke Xu, Maria Jackelin Aranguren Garcia

The 2011 revised framework for producing national health accounts, known as the System of Health Accounts (SHA 2011), reflects collaborative efforts by the World Health Organization (WHO), the Organization for Economic Co-operation and Development, and Eurostat. A tool designed to track countries' overall spending on health, the SHA 2011 provides a single, global framework for the production of health accounts. With international agreement on the Sustainable Development Goals in 2015, the paradigm shifted from a strictly disease-by-disease approach, with vertically conducted resource-tracking exercises (such as the National AIDS Spending Assessment for HIV/AIDS or the Joint Reporting Framework for immunization) to a more holistic view of health spending, with disaggregated comparative spending estimates available for all diseases for use at both country and global levels. Over the past five years, WHO and partner agencies have worked closely with low- and middle-income countries both to produce annual SHA data, and to disaggregate these estimates in various ways, including by beneficiary characteristics – e.g. age or gender – and by health intervention areas – e.g. immunization programmes and family planning services, to enable comparative assessments of relative spending on specific beneficiary groups and diseases.

We present the latest financing estimates for low-income countries (LICs) for four critical areas relevant to reproductive, maternal, newborn, and child health. For 16 LICs, all of which are in Africa, we present actual estimates of expenditure over 2010-2016 on reproductive health, including both maternal health and family planning services, from governments' own generated resources and from external sources. We also present expenditures on immunization programmes and on services consumed by children under 5 years old. We discuss the policy implications of these estimates, methodological challenges, and the challenges these LICs face in routinely producing this disaggregated expenditure data in contexts where underlying health information systems are yet to be optimal.

Sub-National Equity in Health Financing By Source in Senegal: An Assessment of Trends

PRESENTER: **Melisa Martinez Alvarez**, London School of Hygiene & Tropical Medicine

AUTHORS: Mouhamed Abdou Salam Mbengue, Carrie B Dolan

Low- and middle income countries (LMICs) face substantial shortfalls in funding necessary to achieve the Sustainable Development Goals, with the global funding gap currently standing at $US 371 billion. There are indications that external resources for health will decrease over time, putting countries under increased pressure to ensure that the resources they have are well spent. In addition, there is currently little evidence on the effect decreased external financing will have on LMICs, and whether the gap will be filled by government funding or out of pocket spending, or if it will result in a decrease in health services available to the population. This presentation will shed light on these issues, using Senegal as a case study. Drawing on five existing datasets (Service Provision Assessment, Demographic Health Survey, Senegal Aid Management Platform, data on government health care spending and private financing available from the Ministry of Health), we will explore funding for reproductive, maternal, newborn and child health (RMNCH) in Senegal. First, we will compare trends in financing by source (government, external and out of pocket) over time. We will then analyse resource distribution along three axes: distribution by funding priority (for instance, family planning versus child health), distribution by region within Senegal, and distribution according to need (calculated using an index based on maternal and newborn mortality, remoteness and income). The presentation will reflect on the potential effect of a decrease in external financing for RMCNH on other sources of financing and healthcare use, as well as on the methodological and data challenges that arise when conducting national and sub-national analyses of health expenditure in low income settings. This work will inform the domestic agenda in Senegal and other low-income countries (LICs) on how best to allocate financing from different sources at the sub-national level, and on how to best prepare for a potential shortfall in funding (Senegal already receives a lower proportion of its health expenditure from external aid than other LICs). This work will equally inform the global health financing agenda by shedding light on the equity of distribution of financing at the subnational level, and on the impact on LICs of financing decisions made at the global level.

10:30 AM –12:00 PM WEDNESDAY [Production Of Health, Health Behaviors & Policy Interventions]

Universität Basel | Kollegienhaus – Hörsaal 120

Organized Session: Social Determinants and Health Economics

SESSION CHAIR: **Karoline Mortensen**, University of Miami

Unintended Consequences of the #MeToo Movement? Results from Surveys of Male Managers and Female Employees

PRESENTER: **Dr. Michael T French**, University of Miami

In 2006, the term “Me Too” was first used by Tarana Burke to draw attention to women who were victims of sexual violence. Several years later, the #MeToo movement was officially launched with numerous high-profile accusations of sexual harassment by some of the most powerful men in entertainment, business, and politics. The #MeToo movement has evolved, and more women have publicly come out with their experiences as victims of sexual misconduct. Many feel that workplace culture has slowly improved because male managers and supervisors have been “put on notice” that any form of sexual harassment (e.g., physical, verbal, social) will now be met with swift and harsh punishments, including immediate termination, large financial settlements, and even incarceration. These changes are viewed as long overdue by many in society, but are these shifts in workplace policies and oversight creating unintended consequences for women’s career trajectories?

To address these issues, we fielded two surveys during the summer of 2018. The first is a crowdsourced survey of relatively young female employees, which was administered via Amazon’s Mechanical Turk (MTurk) platform (n=1,931). The second survey recruited male and female managers from a database compiled by Qualtrics Panels (n=203). Both surveys included several questions about mentoring, working one-on-one in a private room, and working together on a project after normal business hours. Descriptive analysis of these data show that nearly 70% of female employees today are somewhat or very comfortable being mentored by an older male co-worker, supervisor, or manager. Conversely, a majority of female employees are unwilling to have a late dinner with a male mentor after working on a project that extends beyond normal working hours or work on a project with a male mentor that required overnight travel. Moreover, about 32% of the sample report that their answers about male/female work interactions are different today than they were 1-2 years ago. This latter finding mirrors the descriptive results from the manager’s survey, in which male managers are less likely to mentor or work one-on-one with younger female employees compared to younger male employees. On the other hand, female managers are more likely to mentor or work one-on-one with younger female employees compared to younger male employees. Multivariate regression analysis reveals characteristics that significantly influence these answers for employees (age, race, ethnicity, education, marital status, years of work experience, industry) and managers (education, industry, years of managerial work experience, gender of employee, attractiveness score for employee). The obvious and unfortunate implication of these findings is that, while female employees seem more at ease working one-on-one with an older male co-worker/supervisor/manager, male managers are less likely to reciprocate relative to 1-2 years ago, opting instead to more often work with male subordinates or more attractive female employees. If these disparities remain or even increase as the #MeToo movement matures, the adverse effects for career growth and advancement of less experienced female employees could be profound. Human resource managers and workplace counselors should consider updated training and group role-playing to reverse these trends.

Food Insecurity, Chronic Conditions, Health Care Utilization and Expenditures in the United States

PRESENTER: **Dr. Karoline Mortensen**, University of Miami

Background Food insecurity, an important social determinant of health, impacts the health status and wellbeing of over 15 million households, comprising over 40 million individuals in the US. Almost 6 million households were considered very low food secure in 2017, meaning they had difficulty at any point during a year providing enough food for all family members because of lack of resources.

A growing literature finds that food insecurity is a strong predictor of poor physical and mental health, and preventable chronic conditions among adults and the elderly. Food insecurity can affect health through a number of pathways, including a less healthy diet than necessary to sustain health, fluctuations in dietary intake that make management of chronic disease a challenge, and the need for a meal may be prioritized over health care needs such as prescription refills or preventive care.

Food insecurity is associated with more health care utilization and significantly greater mean annual health care expenditures than for individuals who are not food insecure. The increase in expenditures is most pronounced for people with conditions such as diabetes, hypertension, and heart disease. The relationships among food insecurity, poor health reflected by the presence of chronic disease, and higher health care expenditures are complicated to disentangle. This study is the first to use contemporaneous, detailed USDA measures of food insecurity (food secure, marginal, low, very low food security), detailed data on health care use and expenditures, and chronic conditions to inform the relationships between food insecurity, chronic conditions, and health care utilization and spending.

Data and Methods

We use data from the 2016 Medical Expenditure Panel Survey (MEPS), the first year the food insecurity measures are captured in the dataset. The data include observations on 12,287 adults age 18-64. We employ a variety of two-stage empirical models (probit for any use/expenditure, negative binomial and other regression models for amount of utilization/expenditure) and a number of sensitivity analyses, controlling for demographics, health insurance, poverty status, chronic conditions, etc.

Results

Our results show that the likelihood of any health expenditure (total, inpatient, emergency department, outpatient, and pharmaceutical) increases for low and very low food secure individuals. Relative to food secure households, very low food secure households are 3.9 percentage points ($p<0.001$) more likely to have any health expenditure, and have health expenditures that are 28.7% higher ($p=0.01$). However, once we include chronic conditions in the models (high blood pressure, heart disease, stroke, emphysema, high cholesterol, cancer, diabetes, arthritis, and asthma), these underlying conditions explain the differences in expenditures by food insecurity (only the emergency department spending remains statistically significant). Results from analysis on charges rather than expenditures are similar.

Discussion/Conclusions

Policymakers are increasingly focused on addressing deficiencies in social determinants of health, and the resulting impacts on health status and health care utilization. Our results are timely, as CMS recently announced strategies to address food insecurity. Future attempts to alleviate food insecurity should consider the dual burden of chronic conditions.

Side Effects May Include Poor Parenting: Prescription Opioids and Adverse Family Outcomes

PRESENTER: **Matthew C Harris**, University of Tennessee

According to the standard Grossman model, individuals' consumption of medical care yields benefits in two dimensions. As a consumption benefit, improved health from consuming medical care yields greater utility, in and of itself. Improved health also yields investment benefits in the form of increased labor productivity and higher wages. At times, the health economics literature also acknowledges other spillover effects from medical care usage, including those to the family, but often these are difficult to measure.

In this paper, we examine how one form of medical care, the usage of prescription opioids to treat pain, affects adverse family outcomes such as engagement of child protective services, engagement with the foster care system, domestic violence, and tendency for children to run away from home. Ex-ante, it is unclear how opioid use should affect these outcomes. If some proportion of parents are suffering from conditions which result in chronic pain, the right dosage of opioids may yield therapeutic value, thereby enabling parents to more fully engage with their children and reduce the incidence of these adverse outcomes. Alternatively, if overprescribing and/or improper use is more common, increased opioid prescribing may lead to greater numbers of adverse outcomes. Our model is identified using an instrumental variables through the presence of high-volume prescribers and the implementation of must access PDMP programs, similar to Buchmueller and Carey (2018) and Harris et al. (2018). Using data from multiple sources, including the Prescription Drug Monitoring Programs of ten states, county level data from AFCARS (Adoption and Foster Care Analysis and Reporting System), NCANDS (National Child Abuse and Neglect Data System), and data from the Bureau of Justice Statistics, we find that higher levels of opioid prescribing are linked to greater engagement of foster care services, and increased numbers of complaints for child neglect, but not abuse. Similarly, in the UCR data, we find that areas with more prevalent opioid prescribing lead to increased arrests for runaways, but not for domestic violence. All of these result are consistent with the pharmacological depressant effect of opioids: increased prescribing leads to greater apathy/neglect, but not increased violence or aggression.

The Effects of Early Pregnancy Loss on Health Care Utilization and Costs

PRESENTER: **Dr. Erin Strumpf**, McGill University

Background: Early pregnancy loss (EPL) is estimated to occur in 15-20% of pregnancies. Although common, we currently have little understanding of the impact of these events on women, including on their subsequent use of health care services. This knowledge gap stems from two central challenges: identifying women who experience an EPL in secondary databases, and identifying an appropriate comparison group. In this analysis, we evaluate the impact of a first EPL on health care utilization patterns to better understand how this prevalent health event and subsequent bereavement affects Canadian women and health systems.

Methods: We developed an algorithm to identify woman experiencing their first EPL (miscarriages and ectopic pregnancies) using diagnosis and billing codes in linked administrative health databases from Manitoba, Canada 1984-2014. To minimize bias in our estimates of the effects of EPL, we created a propensity score model to match women who experienced their first loss from 2003-2012 to women with a live birth within 6 months. Predictors of loss included social, clinical, and health care use factors. We follow these women for two years after the event, with outcome measures available through 31 December 2014. We used a difference-in-differences approach and multivariable negative binomial models to estimate the effect of EPL on health care use and costs, including all ambulatory care services, general practitioners (GPs), specialists, and hospitalizations. Models were specified using generalized estimating equations (GEE) to control for intrasubject correlation over time and the matched structure of the data.

Results: Our propensity score matching procedure achieved balance on all observed predictors of loss, yielding a final sample of 11,570 matched pairs. Compared to women who experienced a live birth, women who experienced a first EPL incurred higher ambulatory care costs in the year immediately following the loss (risk difference (RD): $36.07, 95% CI: $30.41, $41.72). GP and specialist costs (particularly OB-GYN) were notably higher in the year following the loss (OB-GYN RD: $9.69, 95% CI: $8.68, $10.69). Similarly, EPL was associated with an increased number of visits to ambulatory care providers (RD: .92, 95% CI: .80, 1.03), general practitioners (RD: .56, 95% CI: .45, .66), and OB-GYNs (.22, 95% CI: .20, .24) in the year following the loss. We did not detect an effect of EPL on hospital visits, costs, or length of stay. While the association between EPL and costs/visits did not persist beyond the year following the event for total ambulatory care and general practitioners, OB-GYN costs and visits remained elevated for 2 years following the event.

Conclusion: We observed a short-term increase in health service utilization following an EPL. This increase was more sustained among OB-GYNs. Beyond the direct effects on family members, early pregnancy loss appears to lead to increases in certain types of health care utilization among affected women.

10:30 AM –12:00 PM WEDNESDAY [Production Of Health, Health Behaviors & Policy Interventions]

Universität Basel | Kollegienhaus – Seminarraum 208

Prevention

SESSION CHAIR: **Nicolas Libuy**, University College London

Do Increases in Reimbursement Fees Improve Vaccination Rates for Medicaid-Eligible Children?

PRESENTER: **Nicole L Hair**, Arnold School of Public Health

While the United States' national vaccine program has made tremendous progress in reducing the burden of vaccine-preventable disease, gains in coverage have been uneven – across vaccines, across geographic regions, and across populations – leaving significant gaps. Ameliorating socioeconomic disparities in pediatric immunization will require identifying risk factors of low vaccination coverage as well as protective factors that enable some children to stay up-to-date on vaccination, despite their disadvantage. We consider one such policy response: increasing Medicaid reimbursement for pediatric vaccine administration.

Our research question is motivated by growing concern that payments, especially public-sector payments, have failed to keep pace with the significant costs of administering childhood vaccines. If practices provide child and adolescent vaccines at a financial loss, policies that raise Medicaid payments could reasonably be expected to increase vaccine coverage as providers become more willing to participate in the national Vaccines for Children (VFC) and Medicaid programs. If, however, a general dissatisfaction with payment does little to dissuade physicians from providing essential health services, such policies may result in little to no change in immunization rates among low-income and Medicaid-eligible children.

Whereas contemporaneous associations between Medicaid payments and vaccination rates are likely biased produce biased estimates, we pursue a quasi-experimental approach. By exploiting a temporary "bump" in Medicaid payments for certain primary care services during calendar years 2013 and 2014, we are able to estimate the effect of provider reimbursement on vaccination rates among low-income children.

Our analysis combines the 2009-2015 National Immunization Surveys (NIS) with state-level data on Medicaid vaccine administration fees over the same period. The NIS are sponsored and directed by the CDC to monitor vaccination coverage among two-year-old children in the United States. Up-to-date immunization status, subject to receipt of all ACIP-recommended doses, is recorded for individual vaccines as well as combined vaccine series.

While all states were required to increase vaccine administration fees in 2013, our study design exploits the significant variation in “treatment intensity”. Our approach compares the vaccination status of children (1) within a given year across “high reimbursement” and “low reimbursement” states and (2) within a given state across “high reimbursement” and “low reimbursement” years. Regressions controlled for state, year, age, sex, and a number of family characteristics.

Among the population most likely to be affected by the Medicaid payment bump (poor children from households below the federal poverty level), we find that higher physician reimbursement for vaccine administration has no effect on coverage rates for universally recommended vaccines in the 4:3:1:1:3:3:1 series.

While it appeals to common sense that realigning provider financial incentives might increase vaccination levels by encouraging providers to implement more aggressive vaccination efforts, our results indicate that policy changes aimed at increasing physician compensation (in isolation) will prove insufficient to meet national goals of increased vaccination coverage.

Do Health Checkups Reduce Costs and Utilization of Healthcare? Evidence from a Local Municipality in Japan

PRESENTER: **Mr. Yuichi Watanabe**, Waseda University
AUTHORS: Dr. Haruko Noguchi, Nobuyuki Izumida

1. Background and Objective

Prevention of chronic non-communicable diseases (NCDs) has become a key concern in most countries in recent years. While the importance of prevention is widely recognized, there remains a controversy on the cost-effectiveness of clinical preventive care or relevant policy interventions between the perspectives of economics and public health: namely a question of whether prevention can reduce medical expenditures. Japan launched the mandatory health checkups called "Specific Health Checkups and Specific Health Guidance" in 2008 under the universal healthcare insurance. They target the insured aged between 40 and 74, focusing on preventing metabolic syndrome. The objective of this study is to investigate the association of receiving the annual health checkup with costs and utilization of healthcare by using a unique local administrative dataset in Japan.

2. Data

We use the compiled administrative data provided by a local municipality located in the northern part of Japan, which has a population of around 35 thousand people. Our data consist of master data of the National Health Insurance, medical claims data, health checkup data, and information on income including public pension. All of these data can be uniquely linked by an individual subscriber ID. Thus, we construct individual-level longitudinal data, covering all of the insured under the National Health Insurance and the period between FY 2012 and FY 2016.

3. Methods

To examine the relation of taking health checkups with costs and utilization of healthcare, we apply the fixed-effects negative binomial model with estimating the parameters of the beta-binomial distribution. We use four types of outcome measures as our dependent variables: inpatient and outpatient annual medical fees (including dental and drug dispensation fees), and inpatient and outpatient total number of days of medical/dental care utilization in a year. A key explanatory variable is whether or not the insured receives the annual health checkup. We control for his/her demographic and socio-economic characteristics as follows: age; age squared; gender; number of household members; whether he/she is a householder; the level of annual per-capita household income; whether he/she receives a public pension; and FY dummies. Time-invariant unobserved heterogeneity across the insured such as health awareness and educational attainment that are likely to affect his/her decision to have health checkups is also adjusted for as individual fixed-effects.

4. Results and Discussion

Our empirical results show that a person who takes health checkups is associated with reduced costs and utilization with regard to inpatient care by approximately 43 to 48 percent points on average. In contrast, a person who receives health checkups is likely to spend higher medical fees for outpatient care by around 37 percent points and increase its utilization by about 6 percent points on average. Though we are subject to an endogeneity concern stemming from omitted variables such as time-varying person's health status, our findings may demonstrate different health behaviors toward inpatient and outpatient care among people who have health checkups. Especially, the cost-effectiveness of mandatory health checkups regarding the relation to outpatient care should be carefully examined.

Incident Breast Cancer Burden Attributable to Modifiable Risk Factors Among Hong Kong Chinese Women Population

PRESENTER: **Irene Wong**
AUTHORS: Benjamin J Cowling, Kwok-fai Lam, Gabriel M Leung

Background:
Globally breast cancer is the most common malignancy in women, accounting for an estimated one-quarter of all female malignancies. Hong Kong (HK), a westernized and urbanized Chinese city, suffers heavy health and economic burdens from breast cancer, and the city does not have population-based screening for breast cancer. In this study, we aim to provide systematic assessment on the current breast cancer disease

burden attributable to known modifiable risk factors, and to evaluate the potential effects of risk factor modifications for HK Chinese women. The findings would be useful for developing population-specific risk reduction strategies for cancer control.

Methods:
We estimated the population attributable risks PAR of three selected known modifiable risk factors such as lifestyle modification (obesity, physical inactivity) and reproductive history (parity) for HK Chinese women population. We applied Bruzzi et al. methods that allow for the joint PAR estimation for combinations of risk factors/exposures. We included the following variables in our analyses: excess weight in terms of BMI>=23, physical inactivity, and age at first live birth. We obtained data from the on-going population-based case control study, namely Hong Kong Breast Cancer Study (HKBCS), where data collection commenced in September 2016 and is expected to finish in 2019. In the PAR estimation, we used distribution of exposures and the relevant risk ratios estimated from HKBCS. We applied multivariable logistic regression methods to estimate the relevant risk ratios. The 95% confidence intervals were estimated using bootstrapping method. The PAR estimates were further analyzed and stratified by menopausal status. Counterfactual scenarios of exposures were studied.

Results:
We included 3522 cases (women with invasive breast cancer or ductal carcinoma in situ) and 2653 controls (women without breast cancer) from HKBCS (n=6175) with the recruitment period between September 2016 and September 2018. The estimates will be updated when HKBCS is concluded. Overall, appropriate control of the modifiable lifestyle (obesity, physical inactivity) and reproductive factors (parity) could reduce breast cancer incidences and its related burdens by 16.1% (95%CI = 8.6, 22.8) for HK Chinese women. The risk factors such as obesity and physical inactivity that are modifiable at menopause account for 7% of postmenopausal breast cancer. The largest individual PAR% was 13.3% (95% CI = 8.7, 17.6), for age at first live birth. Other individual PAR%s were modest.

Discussion:
A moderate proportion of breast cancer amongst HK women is preventable. Whilst our PAR% estimates are somewhat lower than those for US and UK women (with the age at first live birth being the exception), our findings are important for health policy makers concerned with preventive measures and public health intervention establishment for cancer control.

Health Insurance and Preventive Health Behaviors: Evidence from Chinese Social Health Insurance Schemes

PRESENTER: **Ms. Jingxian Wu**, Xi'an Jiaotong University

A motivation for increasing health insurance coverage is to improve health outcomes for impacted populations. However, health insurance coverage may alternatively reduce preventive effort (namely, increase in risky health behaviors or decrease in beneficial health behaviors) due to ex ante moral hazard. Much of previous empirical research on this issue has been conducted with regard to private health insurance programs and has drawn mixed conclusions. The present study aimed at examining the incentive effect of social health insurance on individual's preventive health behaviors and discussing the ex ante moral hazard problem in the presence of social health insurance schemes in China. Following theories of consumer behavior and health production, I assumed that a typical consumer draws utility not only from his or her health but also from a consumption of composite goods, and makes health-related choices to maximize utility. Due to the uncertainty of sickness risk, consumer expected utility model was applied to set up a theoretical model of individual preventive effort with receipt of social health insurance. The effect of social medical insurance, including insurance premium, copayment rate, and deductible on individual's optimal level of preventive effort was theoretically analyzed on the basis of individual utility function under double-budget of time and income. The results of formula deviation proved that social health insurance has an ambiguous effect on individual's preventive effort, which is mainly because of the decrease in both marginal utility and opportunity cost of preventive effort due to social health insurance. In order to empirically test the research hypothesis, this paper used a panel from a national representative household survey, the China Health and Retirement Longitudinal Survey, to examine the effects of the Chinese social health insurance scheme on individual preventive health behaviors. The preventive behaviors included regular physical exercise, smoke, excessive drink, and periodic physical examination. Panel binary logit regression approaches were applied to test the relationship between social health insurance participation and health preventive behaviors. Endogeneity in insurance participation was accounted by propensity score matching. The regression results showed that social health insurance has not evidently changed the physical exercise and alcohol consumption behaviors among the insured individuals whereas resulted in certain decrease in cigarette consumption among the insured males. Additionally, social health insurance had significant incentive to encourage individuals to take periodic physical check-ups. The regression results was robust in regard to changes in analytical methods and sample selection. There was no evidence of ex ante moral hazard caused by Chinese social health insurance schemes. On the contrary, certain beneficial health behaviors have been cultivated with the universal coverage of social health insurance.

10:30 AM –12:00 PM WEDNESDAY [New Developments In Methodology]

Universität Basel | Kollegienhaus – Seminarraum 209

Organized Session: Modeling the Impact of Infectious Diseases and Interventions in Africa

SESSION CHAIR: **Sachiko Ozawa**, University of North Carolina-Chapel Hill

DISCUSSANT: **Mieraf Taddesse Tolla**, Harvard T.H. Chan School of Public Health

Health Gains and Financial Protection from Human Papillomavirus (HPV) Vaccination in Ethiopia

PRESENTER: **Ms. Allison Portnoy**, Harvard T.H. Chan School of Public Health
AUTHORS: Dawit Desalegn, Jane J Kim, Prof. Stephane Verguet

Background

Ethiopia is one of the largest countries in Africa and has one of the top ten growth rates in the world. There are 31.5 million women over the age of 15 at risk of cervical cancer in Ethiopia, but cervical cancer screening coverage is 0.8%. The currently planned human papillomavirus (HPV) vaccination program in Ethiopia involves yearly catch-up vaccination of single age cohorts from 2018 to 2021, but an evaluation of both the health gains and financial protection from continued routine HPV vaccination will be critical to support cervical cancer prevention in this setting.

Methods

We used a multiple modeling approach that captured HPV transmission, cervical carcinogenesis, and population demographics to project health and economic outcomes associated with routine HPV vaccination in Ethiopia. Costs included vaccination and operational costs in US$2015 over 2018-2118 and cervical cancer costs over the lifetimes of the current female population in Ethiopia. Health outcomes included number of cervical cancer cases and deaths. We estimated household out-of-pocket (OOP) expenditures averted (assuming 34% of health expenditures are financed by OOP in Ethiopia), catastrophic expenditures averted, and cases of poverty averted by HPV vaccination. The number of cases of poverty averted depended on individual income (relying on GDP per capita of Ethiopia as a proxy [$768 in US$2017], distributed by income quintile according to the lognormal distribution and a Gini coefficient), disease incidence, health-care use, and OOP payments. Catastrophic expenditures are defined as 10% of individual income and the number of poverty cases averted is measured as the number of individuals who no longer fall below the international poverty line ($1.90 per day).

Results

Our analysis shows that, per dollar spent by the Ethiopian Government, routine two-dose HPV vaccination could avert up to 49 cervical cancer deaths per $100,000 spent. Additionally, routine two-dose HPV vaccination could avert 10,185 cases of catastrophic expenditure at 50% coverage, 14,466 cases at 70% coverage, or 19,164 cases at 90% coverage. Using the international poverty line, this equates to averting 1,126, 1,599, or 2,119 cases of poverty, respectively.

Conclusions

Our approach incorporates financial risk protection into the economic evaluation of routine HPV vaccination in Ethiopia. This understanding can help policymakers in the decision-making regarding continued routine HPV vaccination once the global vaccine shortage is overcome.

Development of an Agent-Based Model to Assess the Impact of Substandard and Falsified Antimalarials: Uganda Case Study

PRESENTER: **Ms. Colleen Higgins**, The University of North Carolina at Chapel Hill
AUTHORS: Sachiko Ozawa, Daniel R Evans, Sarah K Laing, Phyllis Awor

Background

Global efforts to address the burden of malaria have stagnated in recent years with malaria cases beginning to rise. Substandard and falsified anti-malarial treatments contribute to this stagnation. Poor quality anti-malarials directly affect health outcomes by increasing malaria morbidity and mortality, as well as threaten the effectiveness of treatment by contributing to artemisinin resistance. Research to assess the scope and impact of poor quality anti-malarials is essential to raise awareness and allocate resources to improve the quality of treatment. A probabilistic agent-based model was developed to provide country-specific estimates of the health and economic impact of poor quality anti-malarials on paediatric malaria. This paper presents the methodology and case study of the SAFARI (Substandard and Falsified Antimalarial Research Impact) model applied to Uganda.

Results

The total annual economic impact of malaria in Ugandan children under age five was estimated at US$614 million. Among children who sought medical care, the total economic impact was estimated at $403 million, including $57.7 million in direct costs. Substandard and falsified anti-malarials were a significant contributor to this annual burden, accounting for $31 million (8% of care-seeking children) in total economic impact involving $5.1 million in direct costs. Further, 8.7% of malaria deaths relating to cases seeking treatment were attributable to poor quality anti-malarials. In the event of widespread artemisinin resistance in Uganda, we simulated a 12% yearly increase in costs associated with paediatric malaria cases that sought care, inflicting $48.5 million in additional economic impact annually.

Conclusions

Improving the quality of treatment is essential to combat the burden of malaria and prevent the development of drug resistance. The SAFARI model provides country-specific estimates of the health and economic impact of substandard and falsified anti-malarials to inform

governments, policy makers, donors and the malaria community about the threat posed by poor quality medicines. The model findings are useful to illustrate the significance of the issue and inform policy and interventions to improve medicinal quality

Impact of Antibiotic Resistance on Treatment of Pneumococcal Disease in Ethiopia: An Agent-Based Modeling Simulation

PRESENTER: **Sachiko Ozawa**, University of North Carolina-Chapel Hill
AUTHORS: Hui-Han Chen, Andy Stringer, Tadesse Eguale

Antimicrobial resistance (AMR) is a growing threat to global health. While AMR endangers continued effectiveness of antibiotics, the impact of AMR has been poorly estimated in low-income countries. This study sought to quantify the effect of antimicrobial resistance on treatments for pediatric pneumococcal disease in Ethiopia. We developed the DREAMR (Dynamic Representation of the Economics of AMR) model that simulates interactions between bacteria *Streptococcus pneumoniae* and humans. We simulated children under age five who acquire pneumococcal disease (pneumonia, meningitis, and acute otitis media) and seek treatment from various health facilities in Ethiopia over a year. We examined the AMR levels of three antibiotics (penicillin, amoxicillin, and ceftriaxone), number of treatment failures and attributable deaths. We employed the cost-of-illness method to assess the resulting economic impact of AMR by estimating the direct and indirect treatment costs and productivity losses. We found that AMR against antibiotics used to treat pneumococcal disease led to 266,033 treatment failures, which contributed to 1,291 child deaths annually in Ethiopia. AMR resulted in first-line treatment failure rate of 29.35%. In one year, the proportion of non-susceptible versus susceptible *S. pneumoniae* bacteria increased by 0.45% and 0.79% for amoxicillin and penicillin, and reduced by 0.25% for less commonly used ceftriaxone. Annual costs of AMR to treat pneumococcal disease were $14,245,000, including $4,079,000 for ineffective first-line treatments and $10,166,000 for additional second-line treatments. Antibiotic stewardship to reduce misuse and overuse of antibiotics is essential to maintain the effectiveness of antibiotics and lessen the health and economic burden of AMR.

10:30 AM –12:00 PM WEDNESDAY [Economic Evaluation Of Health And Care Interventions]

Universität Basel | Kollegienhaus – Seminarraum 212

Economic Evaluations within Cancer: Reviews, Applications and Issues

SESSION CHAIR: **Richard Norman**, Curtin University

Is It Cost-Effective to Offer Genetic Testing to All Patients with Breast Cancer?

PRESENTER: **Li Sun**, London School of Hygiene and Tropical Medicine
AUTHORS: Shreeya Patel, Adam Brentnall, Diana Buist, Erin Bowels, Diana Eccles, Gareth R Evans, Shuai Li, John Hopper, Isabel dos-Santos-Silva, Zia Sadique, Rosa Legood, Ranjit Manchanda

Background Currently breast cancer (BC) patients are offered genetic-testing only if they have a ≥10% risk of being a BRCA carrier based on family history and clinical criteria. However, this approach misses a large proportion (~50%) of overall mutation carriers as they fall below this 10% threshold. Mutation identification enables primary prevention for ovarian cancer (OC) in BC-patients and BC-&-OC in unaffected relatives. We evaluate the incremental lifetime effects, costs, and cost-effectiveness of offering unselected panel genetic testing to all BC patients compared to the current practice of restricting genetic testing for breast cancer patients based on family history and clinical criteria.

Methods We developed a patient-level microsimulation model to estimate the lifetime costs-&-effects for all UK and USA BC patients. Data were obtained from 11,836 BC patients (regardless of family-history) recruited to four international clinical trials. All women diagnosed with BC are offered genetic testing for BRCA1, BRCA2 & PALB2 mutations. Mutation carriers can choose contralateral prophylactic mastectomy to reduce contralateral BC-risk and prophylactic oophorectomy to prevent OC. Relatives undergo cascade testing to inform BC/OC prevention. Identified carriers undergo annual screening/chemoprevention/risk-reducing mastectomy for BC and risk-reducing salpingo-oophorectomy for OC. The main outcome measure was the incremental cost per quality-adjusted life-year (QALY) gained with a 3.5% annual discount. Parameter uncertainty was explored using one-way and probabilistic sensitivity analyses.

Results The model shows that compared with the current clinical/FH-based genetic testing, offering unselected genetic testing to all BC patients would cost £10,470 in the UK or $58,702 in the US per QALY gained (below UK & US thresholds of £30,000/QALY & $100,000/QALY). Testing all BC patients annually can prevent 1,776 BC/OC cases and 557 deaths in the UK and 8,258 BC/OC cases and 2,143 deaths in the US respectively. The results are shown to be robust through the sensitivity analyses.

Conclusions Unselected panel genetic-testing for all BC patients compared to current clinical-criteria restricted testing is extremely cost-effective. We recommend changing the current policy to expand genetic testing to all BC patients.

Cost-Effectiveness Analysis of the National Scaling up of Human Papillomavirus Vaccination for the Prevention of Cervical Cancer in Bangladesh

PRESENTER: **Sayem Ahmed**, International Centre for Diarrhoeal Disease Research, Bangladesh
AUTHORS: Ferdousi Zaman, Mr. Md. Zahid Hasan, Jorge Martin del Campo, Wahid Hasan, Farzana Dorin, Mohammad Touhidul Islam, Ziaul Islam, Dr. Jahangir A. M. Khan

Background: Globally cervical cancer is one of the most prevalent cancers among women which is necessarily caused by human papillomavirus (HPV). It is the second most common cancer among women that causes a substantial disease burden for the health systems in Bangladesh which can be averted significantly through HPV vaccination program. The objective of this study was to assess the cost-effectiveness of HPV vaccination program from the health systems perspective of Bangladesh.

Methods: In this cost-effectiveness analysis, we compared current HPV vaccination program (50% coverage) in Gazipur district with the model of national vaccination program among the annual cohort of 10 years old girls (assuming 80% coverage). We developed an excel based model for estimating incremental cost-effectiveness ratios (ICERs) using input parameters from secondary sources and considering death averted and disability-adjusted life years (DALYs) averted as outcomes. The ICERs were estimated in terms of cost per death averted and DALYs averted. The cost-effectiveness decision was reported using the gross domestic product thresholds proposed by the World Health Organization. A sensitivity analysis was performed to assess the robustness of the ICER estimates.

Results: The national vaccination program would prevent the incidence of 2,690 cervical cancer cases, 1,481 deaths annually. The incremental cost averted would be US$ 77,241 for inpatient and US$ 4,080 for outpatient visit. Considering vaccination cost as US$ 4.6 per-dose, the ICER would be US$6,364 per death averted and US$ 458 per DALY averted. In sensitivity analyses, considering changes in model parameters (e.g. vaccine efficacy, vaccine price, discount rate, cost of delivery process), we found that HPV vaccination would be still a cost-effective decision in Bangladesh.

Conclusions: We found that the vaccination program would be highly cost-effective in Bangladesh and would greatly reduce cervical cancer disease burden. This highlights that initiating a nationwide scale-up of this program is economically attractive in this country.

Systematic Review of Overdiagnosis and Cost-Effectiveness Analysis in Cervical Cancer Screening: How Can Overdiagnosis be Included in Cost-Effectiveness Analysis?

PRESENTER: **Dr. Chisato Hamashima**, Teikyo University
AUTHORS: Takafumi Katayama, Seijyu Sasaki, Satoyo Hosono, Keika Hoshi, Teruhiko Terasawa

Background: Cervical cancer screening is a common strategy for cancer control worldwide. Although its real target is invasive cancer, precancerous lesions have become the actual target of cervical cancer screening. These is possibility that there is a high degree of overdiagnosis among the detected cancers. How overdiagnosis can be incorporated in CEA of cervical cancer screening was investigated

Methods: First, to determine the overdiagnosis rate in cervical cancer screening, a systematic review was performed by searching Medline, Cochrane Central, Embase, and Igaku-Cyuo zasshi (for Japanese articles) before July 2018. The articles were original articles limited to English-language or Japanese-language publications. Then, to select the appropriate articles on the overdiagnosis rate, a two-stage review process was used: the title and abstract were initially checked, and then potential papers were reviewed. Second, CEA for cervical cancer screening was searched using PubMed before 2017, and then how to apply overdiagnosis in CEA was investigated.

Results: 1) Of 1783 articles identified, 2 studies calculated the overdiagnosis rate of cervical cancer screening. One modeling report from the Netherland and one article from a Finnish RCT for HPV testing were selected. In the Finnish study, overdiagnosis was estimated based on the diagnosis of cervical intraepithelial neoplasia (CIN) 3 at screening and interval cancer based on 4.5 years of follow-up after the first round of RCT. The overdiagnosis rate was 69% for HPV testing and 52% for cytology. In the Dutch modelling study, the estimated overdiagnosis rate was 50% from the population perspective and 55% from the individual perspective when including CIN3 and invasive cancer. 2) Of 152 studies identified, 17 studies analyzed the cost-effectiveness of HPV testing or co-testing compared with cytology. Of these articles, 4 studies analyzed the cost-effectiveness of both tests. These models were developed based on the natural history from precursor lesion to invasive cancer. The time horizon of these studies was lifetime, and they included all diagnosis and treatment cost. However, cancers detected by cancer screening were not divided into overdiagnosis or not. Therefore, the QALYs were equal in these models between overdiagnosis or not.

Discussion: All models for CEA of cervical cancer screening did not consider overdiagnosis of cervical cancer screening. In the models, all detected precursor lesions were assumed to progress to invasive cancer. However, there is a huge amount of overdiagnosis of precursor lesions and it cannot be ignored. When a precursor lesion is diagnosed, most lesion are treated based on the assumption of progression to invasive cancer. If patients know the possibility of overdiagnosis in cervical cancer screening and its frequency cannot be ignored, the value of cervical cancer screening and patients' choice for treatment might change. Since these models ignored overdiagnosis, the value was overestimated.

Conclusion: CEA of cancer screening has been commonly reported, and the results are used for political decision-making. Overdiagnosis of cancer screening causes serious harm and must be reduced. To clarify the true efficiency of cancer screening, overdiagnosis should be included in the CEA model of cancer screening.

Key Issues and Areas for Further Development When Capturing Quality of Life and Calculating QALYs for Chemotherapy Treatment for Cancer

PRESENTER: **Sabina Sanghera**, Health Economics at Bristol, Population Health Sciences, Bristol Medical School, University of Bristol
AUTHORS: Tim Peters, Axel Walther, Joanna Coast

Background: Side effects of chemotherapy treatment for cancer cause recurrent fluctuations in health. Chemotherapy is administered in 3-4 weekly cycles; each cycle has a treatment and rest phase to allow patients to recover. These cyclical fluctuations can occur for up to 8 months

in patients treated with curative or non-curative intent. When patients experience such recurrent fluctuations in health, the adequacy of quality of life estimates will be impacted by the: (1) standard recall period associated with the measure (e.g. 'health today' for EQ-5D, 'past month' for SF-12), (2) timepoints for assessing quality of life in relation to the health fluctuations , and (3) assumptions used to interpolate between measurement time points and thus calculate quality-adjusted life-years (QALYs). These problems apply whether condition-specific measures or generic preference-based measures (such as EQ-5D or SF-12) are used to generate QALYs. Treatment recommendations may thus be based on cost-effectiveness results that are derived using inappropriate methods. It is not clear, however, what methods in relation to the timing of assessments are routinely employed in economic evaluations to assess quality of life and calculate QALYs for chemotherapy regimen. Aim: To determine methods related to timing of assessment used in economic evaluations of chemotherapy regimens, and to identify key issues for methodological development. Methods: Systematic review, following CRD guidance, of cost-effectiveness studies, observational and experimental studies published since 2010 from electronic databases and grey literature assessing any chemotherapy regimens for any cancer. Information was extracted on study characteristics, measures used, timing of assessment, recall period, interpolation assumption used, and the extent to which uncertainty in these areas has been accounted for in the cost-effectiveness analysis. Results: 326 studies have been identified of which 50 are economic evaluations and 276 are observational studies or randomised controlled trials. Studies included quality of life measures such as EQ-5D, SF-12 and the condition-specific measure EORTC-QLQ-C30. Preliminary results suggest that timing of assessment is predominantly taken at the start of the cycle of chemotherapy. Some studies using EORTC-QLQ-C30 found that timing of assessment influenced the results. Authors discuss difficulties in timing of assessment in chemotherapy, highlighting that measurement is taken at the start of the cycle for logistical reasons, but underestimates symptom burden as treatment side effects are missed. Standard recall periods associated with each measure were used and linear interpolation assumptions were employed to calculate QALYs. Discussion: This work and its implications for how and when to ask questions about quality of life when health fluctuates will be discussed. Current data collection and analytical methods may well lead to an overestimation of the QALY and underestimation of quality of life impact of chemotherapy. Due to current methods, average scores are unlikely to incorporate the range of quality of life values expected throughout a cycle of chemotherapy regardless of sample sizes. QALYs may be inflated and particularly in non-curative treatment this overestimation will not be offset by extended survival. Suggestions for development within this area will be made.

10:30 AM –12:00 PM WEDNESDAY [Health Care Financing & Expenditures]

Universität Basel | Vesalianum – Grosser Hörsaal EO.16

Organized Session: Measuring Primary Health Care Expenditure: Why, How, and Results

SESSION CHAIR: **Joseph Dieleman**, University of Washington

PANELISTS: **Karima Saleh**, Bill and Melinda Gates Foundation; **Nathalie Vande Maele**, World Health Organisation; **Matthew Thomas Schneider**, Institute for Health Metrics and Evaluation

1:00 PM –2:30 PM WEDNESDAY [Specific Populations]

Universitätsspital Basel | ZLF – Klein

Organized Session: Scaling Everest: Moving Beyond Conventional Economic Approaches in Palliative & End-of-Life Care

SESSION CHAIR: **Charles Normand**, Centre for Health Policy & Management, Trinity College, Dublin

DISCUSSANT: **Helen Mason**, , Yunus Centre for Social Business & Health, Glasgow Caledonian University; **Eric Andrew Finkelstein**, Duke-NUS Medical School; **Mendwas Dzingina**, Cicely Saunders Institute, Kings College, London

Novel Approaches for Valuing Health at the End of Life

PRESENTER: **Koonal Shah**, Office of Health Economics

A source of debate in health economics is whether health gains should be valued differently at the end of life. In England, the National Institute for Health and Care Excellence (NICE) has applied a supplementary policy in the NICE technology appraisals since 2009 that effectively acts as a 'premium' for life-extending end-of-life treatments. Such a policy may be social welfare enhancing if: (a) people value health gains at the end of life more than health gains at other times, thinking about their own health/life; (b) people value health gains at the end of life more than health gains at other times, thinking about the health/lives of others; or (c) people value life extensions at the end of life more than quality of life improvements at the end of life. However, whether any of these conditions hold in practice is unclear.

In this presentation, Dr Shah will briefly present an overview of the empirical evidence as reported in the stated preference literature. The evidence is mixed overall: some studies report evidence consistent with an end of life premium, and a slightly greater number of studies do not. An increasingly large body of evidence suggests that the perspective used to elicit preferences (individual or social decision maker) matters, as does the type of health gain (life extension or quality of life extension). Many studies also reveal that the preferences held by members of the public regarding end of life treatments are very heterogeneous, which makes it difficult to establish firm policy recommendations or even to report a single measure of overall preference for a given study.

Dr Shah will discuss some of the more novel approaches being used to examine these issues, drawing on techniques used in recent studies conducted in Denmark, Netherlands, Spain and the UK. These include choice-based tasks designed to investigate the influence of study perspective, and techniques such as Q methodology that are designed to allow unexpected and conflicting views to emerge. Finally, Dr Shah will highlight some of the normative and practical challenges for health economists seeking to undertake research on valuing health at the end of life.

Patients & Informal Carers' Preferences for Palliative Care: The Value of Process Utility

PRESENTER: **Bridget Johnston**, Trinity College Dublin
AUTHORS: Karen Ryan, Charles Normand

Research shows people place significant value on the process of accessing care and how services are delivered, suggesting that a sole focus on health-related outcomes is unlikely to ever fully capture the benefits of palliative care interventions for patients and families. Discrete choice experiments (DCEs) offer a useful approach to priority setting and are an established method for evaluating preferences related to process or other attributes of care not specifically captured using health-related quality of life measures. This is important in the context of palliative care, where interventions are tailored towards optimising longitudinal experiences rather than reducing mortality or morbidity.

This research aimed to quantify patients' and informal carers' preferences for aspects of services and supports when living with a life-limiting illness using a DCE and also assessed concordance between preferences. A mixed methods design was used based on best practice recommendations for developing a DCE instrument. Guided content analysis was used to examine semi-structured interviews and identify the attributes of services patients need or value. The DCE was administered during face-to-face interviews.

Respondents chose between combinations of attributes including: access to information; symptom burden; monthly costs; carer burden; shared decision-making; place of care; arranging access to services; and access to specialist palliative care teams (SPC). Identical DCEs were conducted with patients and carers, allowing for comparison of preferences and determinants. The data were analysed using latent class logit regression. Trade-offs among attributes levels were examined using the two continuous variables (monthly costs, hours of assistance).

Sixty-six patients and 69 carers were interviewed. Two latent classes were identified for patients, three for carers. Patients prioritised ease and efficiency of access to services and support with highest priority given to knowing whom to contact. Similarly, participants also prioritised ongoing access to SPC and preferred scenarios where a healthcare professional assisted them with arranging access to services. Preferences differed around place of care, monthly costs and carer burden; however, remaining at home was not influential for the majority of participants.

Carers had strong preferences for autonomous decision-making, something that was not prioritised by patients. However, they did also prioritise efficient access to services: having help arranging services; knowing whom to contact when they had queries; and SPC input at any time during their loved one's illness. Carers differed in their preferences for providing assistance indicating that the caring role can be a positive experience for some.

Participants placed significant value on the process of accessing care and aspects of how services are delivered; dimensions of quality of life not traditionally considered or measured using standard economic evaluation techniques. To avoid systematically undervaluing the benefits experienced by recipients of SPC services in future evaluations, outcome measures focusing on trajectories of care near the end of life should look to include dimensions that explore utility derived from ease of access to services and the well-being of carers.

New Methods and Tools for Capturing Informal Care in Palliative Economic Evaluations

PRESENTER: **Nikki McCaffrey**, Deakin Health Economics
AUTHORS: Hareth Al-Janabi, David Currow, Renske Hoefman, Julie Ratcliffe

International estimates of the value of informal care as a percentage of GDP range from 0.3-7.4%. Despite informal carers' integral role in supporting people affected by disease or disability, economic evaluations often ignore their costs and benefits, especially in the palliative care setting. Given societies increasing and implicit reliance on carers and the economic consequences if carers become unavailable, it is crucial that carer impacts are considered when making health and social care resource allocation decisions.

Despite the imperative to include carer effects, there is little guidance on how to do this, particularly the selection of suitable outcome measures. Many generic, preference-based instruments, such as the SF-6D and EQ-5D used to capture the 'Q' in the QALY do not include important carer aspects, such as relationships and fulfilment, and are insensitive to impacts of caring. Therefore, evaluations using such instruments as the sole measure of benefit could lead to misinformed clinical and policy decisions. Further, methods allowing joint consideration of costs, care-related quality of life (CrQoL) and health-related quality of life (HrQoL) under uncertainty for patients and carers are needed to robustly inform societal decision making.

As a response to concerns, new preference-based instruments capturing CrQoL have been emerging. However, little is known about whether these instruments are suitable for use in palliative care. Consequently, a systematic review was conducted to identify care-related, preference-based instruments for measuring outcomes in economic evaluations, summarise their psychometric properties and assess the suitability of these instruments for use in the palliative care setting. Additionally, a new method for jointly considering costs, carer and care recipient outcomes is illustrated drawing on the findings from the review.

Comprehensive literature searches of seven electronic databases were conducted to identify preference-based instruments measuring care-related outcomes, psychometric validation studies and applications. The psychometric properties were synthesized and the suitability of the instruments for palliative economic evaluations was assessed using minimum standards for patient-reported outcome measures and the checklist for reporting valuation studies of multi-attribute utility-based instruments.

Five preference-based, care-related instruments were identified from initial search results (7,504 citations); the Adult Social Care Outcomes Toolkit for Carers (ASCOT-Carer), Care-related Quality of Life instrument (CarerQoL), the Carer Experience Scale (CES), the Caregiver Quality of Life Instrument (CQLI), and the ICECAP-Close Person Measure (ICECAP-CPM). Generally, the CarerQol had the most evidence for the greatest number of measurement properties. Three instruments, the CarerQol, CES and ICECAP-CPM have been validated in a palliative or end-of-life carer population. Only the ICECAP-CPM was primarily developed for application at the end of life. Whilst the ASCOT-Carer shows promise, further research is needed to validate this instrument in palliative care settings.

Findings from this review indicate the CarerQol currently has the largest body of evidence for assessing the CrQoL of informal carers of people receiving palliative care in economic evaluations. New approaches such as multiple outcomes cost-effectiveness analysis enable robust, joint consideration of cost, CrQoL and HrQoL under uncertainty for patients and carers to better inform efficient and equitable allocation of scarce public funds in these settings.

1:00 PM –2:30 PM WEDNESDAY [Specific Populations]

Universitätsspital Basel | Pathologie – Unten (U)

Organized Session: Access to Medicines in Health Systems in Low- and Middle-Income Countries

SESSION CHAIR: **Sachiko Ozawa**, University of North Carolina-Chapel Hill

Availability and Use of Cancer Medicines in Six Asian Countries Working Towards Universal Health Coverage

PRESENTER: **Alessandra Ferrario**, Harvard Medical School

AUTHORS: Peter Stephens, Dennis Ross-Degnan, Anita Wagner

Background: Low- and middle-income countries are moving towards universal health coverage. Such expansions have the potential to increase accessibility of cancer medicines. Currently, little is known about availability of the 40 cancer medicines on the 2017 WHO essential medicines' list in these countries and whether use has increased as health coverage expands.

Objectives: 1) To assess trends in availability and use of cancer medicines in public and private sectors of six Asian countries. 2) To contribute to the developing research agenda on cancer care in middle-income countries.

Methods: Using nationally-representative annual sales data from IQVIA (formerly IMS Health), we quantified availability (number of WHO recommended cancer medicines on the market) and use (daily medicine dose [DDD] per new cancer case based on incidence data from Globocan 2012) by therapeutic group and year in China, Indonesia, Kazakhstan, Malaysia, the Philippines and Thailand from 2007-2017.

Results: In 2017, at least 83% of the 40 WHO essential medicines for cancer were on the market in all six countries. Between 2007 and 2017, use of 30 traditional chemotherapy medicines included in the 2017 WHO EML increased from 3.0 DDD (lowest baseline) to 40.1 DDD per new cancer case in Indonesia. In Thailand (highest baseline), it increased from 50.5 DDD in 2007 to 94.8 DDD 2017.

Use of five targeted therapies (dasatinib, imatinib, nilotinib, rituximab and trastuzumab) increased from 0.03 DDD (lowest baseline) in 2008 to 9.14 DDD per new cancer case in 2017 in Kazakhstan. In Malaysia (highest baseline), it increased from 3.7 DDD in 2007 to 11.3 DDD per new cancer case (highest value in 2017).

Use of four endocrine therapies (anastrozole, bicalutamide, leuprorelin and tamoxifen) increased from 4.8 DDD in 2007 in Indonesia to 13.6 DDD per new cancer case in 2017. In 2017, use of hormones was highest in Malaysia (146.1 DDD per new cancer case). In all countries use was highest for tamoxifen.

Conclusions: Despite high levels of availability, use per cancer case varied substantially across countries. Using surveys and quasi-experimental analyses, we will assess how specific coverage policies and other system changes have contributed to utilization changes over time.

Access to Essential Cardiovascular Medicines for Children: A Pilot Study of Availability and Affordability in Nigeria

PRESENTER: **Samuel Orubu**, Niger Delta University

AUTHORS: Mercy Samuel, Daniel Megbule, Faith O. Robert

Introduction: Policies to improve access to medicines for children in low and middle income countries, LMICs, should consider the growing threat of non-communicable diseases (NCDs) in programmes designed to improve access to medicines. The aim of this study was to generate information on availability and affordability of essential cardiovascular medicines for children in Nigeria as an exemplar LMIC.

Materials and methods: The study was a descriptive survey conducted in two phases. Phase I scoped availability in two conveniently selected states in Nigeria using a modified WHO/HAI questionnaire (1). Survey was conducted in June/August 2016. Medicines surveyed were the 10 formulations of the INN listed as essential cardiovascular medicines or diuretics: enalapril, dopamine, mannitol, hydrochlorothiazide, spironolactone, digoxin, and furosemide (2). A total of 20 public and private hospitals and pharmacies were surveyed. Availability was determined as percentage of facilities having the medicine on the survey date, and described as: “not available” (0%), low (<50%), fairly high (50-80%), or good (>80%) (1, 3). Phase II surveyed affordability of four medicines: enalapril, furosemide, hydrochlorothiazide, and spironolactone tablet. Prices were obtained for brands and generics. This phase was conducted in the capital city of Bayelsa and Lagos States and in Abuja; or in 3 out of the 6 geopolitical zones of Nigeria. 11 private pharmacies were surveyed. Survey date was December 2016. Affordability was calculated using the Least Paid Government Worker (LPGW) method (1). One tablet or infusion bag was assumed equivalent to a day’s dose. A medicine was affordable if 1-month’s supply costs ≤ 1-day’s wage (1).

Results: Only 20% of the formulations – furosemide and hydrochlorothiazide tablets – had good availability; howbeit, in formulations that may not be suitable for young children who cannot safely swallow tablets intact. Oral liquids were not available. Of the four medicines assessed for affordability, only generic furosemide and hydrochlorothiazide were affordable.

Conclusion: Availability and affordability were suboptimal for the essential cardiovascular medicines and diuretics for children in the facilities sampled, suggesting poor access. There is the need for improved access to age-appropriate cardiovascular medicines for children in Nigeria.

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Inappropriate Use of Medicines and Associated Factors in Brazil: An Approach from a National Household Survey

PRESENTER: **Dr. Vera Lucia Luiza**, National School of Public Health Brazil

AUTHORS: Luiz Villarinho Pereira Mendes, Noemia Urruth Leão Tava, Andrea Damaso Bertoldi, Andréia Turmina Fontanella, Maria Auxiliadora Oliveira, Monica Rodrigues Campos

This paper aims to describe the inappropriate use of medicines in the Brazilian urban population and to identify associated factors. We conducted a data analysis of a household survey conducted in Brazil in 2013-2014. The sampling plan was done by clusters with representativeness of the urban population and large regions of the country, according to gender and age domains. In this analysis we use data collected with a sample of adults (≥ 20 years) who reported having chronic non-communicable diseases, medical indication for drug treatment and medicines use (n = 12,283). We evaluated the prevalence of inappropriate use in the domains: non-adherence, inappropriate use behavior, and inadequate care with medicines, verified in the following groups of independent variables: demographic and socioeconomic characteristics, health and pharmaceutical care, health status and use of medicines. Crude and adjusted prevalence ratios were obtained using robust Poisson regression. It was found 46.1% of the people having at least one behavior of inappropriate use of medicines. The worst results were found for the domain of inappropriate use behavior, a situation of 36.6% of the users, which included unauthorized prescriber, inadequate source of information and indication of the medicines by non-authorized prescribers. The best result was found for lack of medicines care, informed by only 4.6% of users presenting drugs expired at home. The inappropriate use of medicines was associated with gender (female), residence in Northeast region, do not visit the doctor regularly or visit more than one doctor, do not have free access to medicines and use of five or more medicines. There was a high prevalence of inappropriate use, which was associated with both the characteristics of the individuals, pointing out priorities for health education, and the health system, pointing out priorities for public interventions.

1:00 PM –2:30 PM WEDNESDAY [New Developments In Methodology]

Universitätsspital Basel | Klinikum 1 – Hörsaal 1

Organized Session: The Role of Qualitative Data in Health Economics: In Theory and in Practice

SESSION CHAIR: **Martin Hensher**, Health System Financing and Organisation at Deakin University's Institute for Health Transformation and Deakin Health Economics in Melbourne, Australia

PANELISTS: **Lesong Conteh**, School of Public Health, Imperial College London; **Joanna Coast**, Bristol University; **Julie Campbell**, Menzies Institute for Medical Research, University of Tasmania; **Melisa Martinez Alvarez**, Medical Research Unit, The Gambia at London School of Hygiene and Tropical Medicine

1:00 PM –2:30 PM WEDNESDAY [Economic Evaluation Of Health And Care Interventions]

Universitätsspital Basel | Klinikum 1 – Hörsaal 2

Organized Session: Measurement of Preference-Based Quality of Life Outcomes in Paediatric Care

SESSION CHAIR: **Lisa Gold**, Deakin University

A Comparison of Multi-Attribute Utility Measures to Routine Used Outcome Measures in Children and Adolescents with Mental Disorders

PRESENTER: **Dr. Gang Chen**, Monash University Centre for Health Economics

AUTHORS: Cathy Mihalopoulos, Jeff Richardson, James Scott, Rosalie Viney, John Brazier, Julie Ratcliffe, Richard Norman, Peter Jenkins, Cassie Allen, Stephen Stathis, David Coghill, George Patton, Jessica Bucholc, Tiffany Au

Background: Few economic evaluation studies in children with mental disorders have used Quality-Adjusted Life-Years (QALYs) capable of allowing transparent comparisons. Multi-attribute utility instruments (MAUIs) are the most common method of determining QALYs. The existing MAUIs have never been systematically evaluated in children/adolescents with mental disorders. The aim of this presentation is to present preliminary results of the Child MAUI study that compares four existing MAUIs (AQol-6D Assessment of Quality of Life, EQ-5D-Y EuroQoL Five Dimension Youth, HUI 2/3 Health Utilities Index, CHU9D Child Health Utility 9D), one generic paediatric quality of life instrument, the Pediatric Quality of Life Inventory (PedsQL) and three routinely used outcome measures in child mental health (SDQ, CGAS and the HoNOSCA).

Methods: Cross-sectional survey of children/adolescents recruited via five child and youth mental health services in Queensland (Queensland Children's Health and South West Hospital and Health Service) and Victoria (Barwon Health, Eastern Health and the Royal Children's Hospital). Preliminary results from the first 273 survey participants with some outcome measures available are reported but will be updated for the conference presentation using the full sample.

Results: The mean age of this preliminary sample is 13.7 years and 62% are female. Means and Standard Deviations (SD) for the MAUIs range from 0.73 (0.19) for the HUI3 to 0.52 (0.25) for the CHU9D. Mean and (SD) for the PedsQL is 61 (16), HoNOSCA is 16 (9) and the CGAS 57 (19). Correlations between all the MAUIs ranged from 0.86 to 0.66. The AQoL- 6D had the strongest correlation with the PedsQl (0.83) and the HoNOSCA (-0.76).

Conclusion: The results are suggesting that the existing MAUIs correlate well with both the PedsQoL, and the HoNOSCA and are all indicative of reduced quality of life and functioning in this sample. The MAUI with the highest correlation to both the PedsQL and the HoNOSCA was the AQoL- 6D. These preliminary results suggest that all MAUIs are valid for use in children/adolescents with mental disorders. The presentation will also include plans for future analyses.

Assessing the Validity of the CHU-9D in Adolescents Experiencing a Mental Health Condition

PRESENTER: **Lidia Engel**, Deakin University

AUTHORS: Long Khanh Dao Le, Scott Richards-Jones, Mary Lou Chatterton, Cathy Mihalopoulos

Background: While resource-allocation decisions need to be made in paediatric care, there is currently a gap in the literature regarding which outcome measure to use for assessing the benefits of health interventions in children and adolescents. The CHU-9D is a new paediatric preference-based measure that consists of nine dimensions for use in children aged 7-17. It has been widely used in different countries across different conditions but its validity has not been fully explored, particularly within the context of mental health.

Aim: The aim of this study was to assess the validity of the CHU-9D in Australian adolescents aged 11-17 using data from the second Child and Adolescent Survey of Mental Health and Wellbeing in Australia.

Methods: Data were derived from Young Minds Matter (YMM): The second Australian Child and Adolescent Survey of Mental Health and Wellbeing. Adolescents aged 11-17 completed a self-report questionnaire on a tablet or computer between May 2013 and April 2014. Mental disorders were assessed using the Diagnostic Interview Schedule for Children Version VI (DISC-IV) during a parent/carer interview. Health state preference values for the CHU-9D were derived from a representative sample of Australian adolescents. Analyses comprised the investigation of known-group validity differences based on recommended thresholds of external measures that included the Strengths and Difficulties Questionnaire (SDQ) and Kessler Psychological Distress Scale-10 (K10). Population weights were applied in analyses to make results generalizable to the entire Australian population aged 11-17.The adjusted Wald test was applied to detect statistically significant differences of weighted means.

Results: The sample comprised 2,967 adolescents aged 11-17 of whom 415 experienced the following conditions in the previous 12 months: Attention-Deficit/Hyperactive Disorder only (n=98), Anxiety Disorder only (n=82), Major Depressive Disorder only (n=66), Conduct Disorder only (n=15), and Comorbid diagnosis (n=154). The CHU-9D mean score was 0.798 (SD=0.19) in adolescents without a disorder compared with 0.695 (SD=0.24) in those who experienced a mental disorder ($F=59.35$, $p\leq0.001$), with mean CHU-9D scores on a statistically significant decreasing trajectory from mild (0.727 (SD=0.22)), to moderate (0.682 (SD=0.25)), to severe (0.636 (SD0.25)), $F=4.46$, $p=0.012$. The CHU-9D was able to discriminate adolescents with a low, moderate, high, and very high K10 score ($F=641.39$, $p\leq0.001$), as well as adolescents with a normal, borderline and abnormal score on the SDQ total score and across all five subscales.

Conclusion: The CHU-9D demonstrated good construct validity in Australian adolescents experiencing a mental health condition and as such can be recommended to derive quality-adjusted life years (QALYs) within the mental health context to guide resource allocation decisions. However, replication of the study is needed in a clinical sample using a longitudinal study design.

Health-Related Quality of Life in Young Children with Developmental Language Disorder or Congenital Hearing Loss, As Measured By the PedsQL and Health Utility Index Mark 3

PRESENTER: **Ha Le**, Deakin University

AUTHORS: Solveig Peterson, Fiona Mensah, Lisa Gold, Melissa Wake, Sheena Reilly

Objectives

To examine health-related quality of life (HRQoL) in young children with developmental language disorder (DLD) or congenital hearing loss (CHL); and to explore the additive value of assessing HRQoL by concurrently using two HRQoL instruments in populations of children.

Methods

Data were from the two completed Australian community-based studies: Language for Learning (children with typical language and DLD at age 4 years, n = 1,012) and Statewide Comparison of Outcomes (children with CHL, n = 108). HRQoL of children in the two studies was measured using the parent-reported Health Utilities Index Mark 3 (HUI3) and the Pediatrics Quality of Life Inventory 4.0 (PedsQL) generic core scale. Agreement between the HRQoL instruments was assessed using intra-class correlation (ICC) and Bland-Altman plots.

Results

Children with DLD and CHL had significantly impaired HRQOL, particularly those with CHL. The lower HRQoL was mainly due to impaired school functioning (PedsQL), speech and cognition (HUI3). Children with CHL had impaired physical and social functioning (PedsQL), vision, hearing, dexterity and ambulation (HUI3). Correlations between instruments were moderate but agreement was low.

Conclusions

Children with DLD and CHL had poorer HRQoL than children with typical language and hearing indicating a need of interventions to improve health and well-being of these children. The HUI3 and PedsQL are both suitable in population of children with DLD or CHL. They each provides unique information on different aspects of young children's life and thus, can supplement each other in assessing HRQoL of young children, including young populations with DLD or CHL.

Assessing the impact of movement limitations on health-related quality of life in Australian children with cerebral palsy and developing mapping algorithms from cerebral palsy quality of life questionnaire (CPQoL-Child) onto child health utility 9D CHU9D

PRESENTER: **Utsana Tonmukayakul**, Deakin University

AUTHORS: Cathy Mihalopoulos, Christine Imms, Dinah Reddihough, Sophy Ting-Fang Shih, Rob Carter, Dr. Gang Chen

Background: Cerebral palsy (CP) is a group of permanent disorders of movement and posture, causing activity limitations, that are attributed to non-progressive disturbance that occurred in the fetal or infant brain. Many children with CP have tightness or weakness in the muscles of the arm and hand which can lead to changes in structures resulting in long-term difficulty in performing day-to-day tasks e.g. dressing feeding and play. Some children experience pain. While health-related quality of life (HRQoL) has been recommended to be included in routine CP management, the preference-based HRQoL measures are not commonly used.

This study investigated the relationship between upper limb impairment and HRQoL in children with CP and derived algorithms to map scores from the CPQoL-Child onto the CHU9D.

Methods: Data were extracted from 76 Australian children aged 6-15 years participating in an upper limb orthoses trial. Physical and upper limb movement severity were assessed using the Gross Motor Function Classification System (GMFCS), Manual Ability Classification System (MACS), Bimanual Fine Motor Function (BFMF) and Neurological Hand Deformity Classification (NHDC). Proxy-report HRQoL was collected.

The Spearman's rank correlation (r_s) was used to analyse correlations coefficients between the impairment measures and HRQoL; Kruskal-Wallis test for investigating the mean difference according to the severity level.

A direct mapping was adopted to predict the CHU9D from the CPQoL-Child total/domain scores, age and sex using five econometric methods: ordinary least squares estimator, generalised linear model, robust MM-estimator, tobit and beta binomial regression model. Mean absolute error (MAE) and Concordance Correlation Coefficient (CCC) were used to identify optimal performance mapping algorithms. Five-fold internal validation approach was applied.

Results: Participants had mild impairment of upper limb function and deformity (50% MACS level I & II, 60% NHDC F1 & F2 & E1). Most of the children (74%) were classified BFMF level I & II and 65% were in GMFCS level I & II.

MACS was significantly negatively correlated with CHU9D and CPQoL-Child (r_s = -0.39 to -0.46, respectively ($p < 0.05$)). There was a negative relationship between the NHDC and CPQoL-Child with r_s=*-0.48 ($p<0.05$)*.

The generalised linear model Gaussian family logit link with participation domain, pain domain and age had the highest predictive accuracy. Confirmed by internal validation, the MM-estimator with CPQoL-Child domain scores had the best predictive accuracy (MAE 0.07, CCC 0.62).

Conclusion: The weak negative correlations between functional impairment and HRQoL measures might be explained by the fact that the sample of children with CP in the current study had mild impairment of upper limb function. The MACS and NHDC explained the impact of the upper limb impairment on HRQoL better than the other assessments. The GLM with participation domain, pain domain and age is the suggested mapping algorithm. The mapping algorithm can be useful to generate quality-adjusted life year estimates for conducting cost-utility analyses where only CPQoL-Child data is available.

1:00 PM –2:30 PM WEDNESDAY [Economic Evaluation Of Health And Care Interventions]

Universitätsspital Basel | Klinikum 1 – Hörsaal 3

Organized Session: Economic Evaluation of Violence Against Women and Children Prevention Programming: Results and Key Methodological Challenges

SESSION CHAIR: **Anna Vassall**, London School of Hygiene & Tropical Medicine

DISCUSSANT: **Claudia Garcia-Moreno**, World Health Organisation; **Regis Hitimana**, University of Rwanda

Four Interventions to Prevent Violence Against Women and Girls: Cross-Country Analysis of Costs of Pilot Projects and Estimation of National Scale up

PRESENTER: **Sergio TorresRueda**, London School of Hygiene & Tropical Medicine

AUTHORS: Giulia Ferrari, Stacey Orangi, Regis Hitimana, Emmanuelle Daviaud, Theresa Tawiah, Rebecca Dwommoh, Anna Vassall

Violence against women and girls (VAWG) is a global problem with profound consequences. Evidence on the effectiveness of VAWG prevention interventions is rapidly growing. However, evidence on the costs of designing and piloting these interventions, as well as scaling them up, is scant.

To address these knowledge gaps, we collected costs from four different VAWG prevention intervention pilots whose effectiveness was being evaluated through randomised controlled trials as part of the 'What Works' programme in four countries. The interventions varied in terms of delivery platforms: social norms change interventions delivered to communities (Ghana), workshop-based small-group sessions (South Africa), classroom-based school interventions (Kenya), and a combination of workshop-based small-group sessions and social norms change interventions delivered to communities (Rwanda). The interventions also varied in terms of setting (urban/rural), coverage (from one city to several regions), theoretical approaches (gender norms-based, self-defence, skills and livelihood) and durations of implementation (12-22 months).

To standardise data collection across intervention types and ensure comparability, we defined a protocol following international best-practice guidelines, and taking into account the requirements of the 'value for money' framework of the programme funder (DfID). Cost data were collected from a provider's perspective, capturing the period from inception to end of service delivery. We collected the cost of all inputs,

including volunteer time and donated goods. Data collection occurred prospectively and retrospectively through a mix of structured interviews, direct observation and record review.

Annuitised start-up costs (set-up and adaptation, excluding initial development) varied from US $8,662 in the workshop-based intervention in South Africa to US $970,000 in a community-based intervention in Rwanda. Total implementation costs also varied widely: whereas implementing the Rwandan intervention cost US $2,318,000, the others ranged from US $207,000 to US $278,000. The large differences in total costs can be attributed to the fact that the Rwandan intervention encompassed more activities, was rolled out across several regions of the country and for a longer period of time. The largest cost driver across all countries was staff (~30% - 50% of total costs). In the social norms change interventions volunteer costs were about 25% of staff costs.

We calculated unit costs, including cost per frontline worker trained (ranging from $84 (N=840) in the Rwandan intervention to $272 (N=122) in Ghana) and cost per session delivered (from $17 (N=20,160) in Rwanda to $93 (N=801) in South Africa). We also calculate a range of costs per participant reached, although these need to be interpreted with caution as different programmes have different levels of participant exposure.

In addition to calculating costs in a research setting, we model the costs of scaling up at a national level, taking into account programme-specific platforms of delivery.

Cost-Analyses of Interventions to Prevent Violence Against Women and Girls in Kenya and Rwanda: Do Different Platforms, Settings and Populations Determine Different Costs?

PRESENTER: **Stacey Orangi**, KEMRI-Wellcome Trust Research Programme
AUTHORS: Regis Hitimana, Sergio TorresRueda, Giulia Ferrari, Anna Vassall

Evidence suggests that 35% of women globally experience physical and/or sexual intimate partner violence (IPV) or non-partner sexual violence. However, evidence on the costs of violence against women and girls (VAWG) prevention is scarce. To inform the allocation of scarce resources to VAWG prevention, this paper reports on the cost analysis of two interventions, one in Kenya and one in Rwanda. Both interventions were evaluated using the What Works methodology. Together, they present a range of populations and methodological issues representative of a large number of VAWG prevention interventions in low and middle income countries (LMICs).

In Kenya, IMpower is a self-esteem and bystander intervention for adolescent girls and boys in upper primary schools in Nairobi's informal settlements. IMpower builds girls' self-esteem, their ability to avoid risky situations and, if necessary, defend themselves against an attack; it teaches boys positive masculinity, gender equality and effective bystander intervention techniques. In Rwanda, the Indashyikirwa programme first offered training on life-skills and VAWG awareness to couples of village loans and savings associations (VSLAs) in seven rural districts. Programme implementers then taught community mobilisation techniques to some volunteers from the VSLA + life-skills training groups, who became community activists and delivered the gender norms change intervention in their communities.

We conducted cost-analyses alongside cluster-randomised controlled trials of IMpower and Indashyikirwa, using a bottom-up micro-costing approach to collect financial and economic costs retrospectively from a provider's perspective. We computed total and unit costs of developing and implementing the intervention. We report on costs of initial frontline worker training, session delivered and beneficiary reached, and identify and discuss key cost drivers. All costs are reported at 2018 prices.

M Orangi reports total start-up costs of US$817,285 for IMpower, with implementation accounting for 30%. Mr Hitimana contrasts this with a total cost of US$4.2 million for Indashyikirwa in Rwanda, evenly split between start-up and implementation.

For both interventions, the largest cost driver are staff salaries. Local staff salaries accounted for 62% of IMpower's costs. Salaried staff accounted for 61% of total costs during Indashyikirwa's start-up; local staff accounted for 45% and volunteers for 16% of total implementation costs.

Core intervention delivery costs account for 65% of Indashyikirwa's annuitised implementation costs, and 62% of IMpower's.

The average cost per IMpower facilitator trained was US$114 (N=99), the cost per session delivered US$50 (N=864) and the average cost per student reached US$8 (N=24,000). In Rwanda, the cost per couple trained was US$84 (N=840); cost per session delivered US$17 (N=20,160), and the cost per participant reached US$0.6 (N=586,962).

Despite differences in geographical context, delivery platforms and target populations, these interventions reveal consistent patterns in costs. Staff costs are the largest cost driver, and increase with internationally competitive staff. The internationally competitive trainers hired to train IMpower facilitators explain the discrepancy in initial training costs. The local cadre of highly skilled facilitators trained by these interventions contributes to reducing training costs at scale-up. Unit costs decrease as the number of staff trained or sessions delivered increases, suggesting potential economies of scale.

The Cost-Effectiveness of Preventing Violence Against Women and Girls: Results from a Multi-Country Study of Four Interventions, from Piloting to National Scale-up

PRESENTER: **Giulia Ferrari**, LSHTM (London School of Hygiene and Tropical Medicine)

AUTHORS: Sergio TorresRueda, Stacey Orangi, Andrew Gibbs, Esnat Chirwa, Kristin Dunkle, Deda Ogum Alangea, Benjamin Omondi, Rachel Jewkes, Anna Vassall

Violence against women and girls (VAWG) is a human rights violation and has adverse health and socio-economic consequences. Interventions to prevent VAWG in low and middle income countries (LMICs) are showing promise. However, little is known on the value for money of these interventions to inform policy decisions.

We addressed this gap by designing and conducting a four-country synthesis cost-effectiveness study of VAWG prevention interventions. The effectiveness of these interventions was evaluated with randomised controlled trials (RCTs) under the What Works Global Programme in sub-Saharan Africa. The interventions were delivered via different platforms to different populations. Workshop-based small-group sessions were offered to young unemployed adults in South Africa; a social norms change intervention delivered to communities targeted the general adult population in Ghana; a classroom-based school intervention offered self-esteem and self-defence sessions to adolescents between 11 and 14 years old in Kenya; in Rwanda, a combination of workshop-based small-group sessions targeted adult couples members of village loans and savings association (VSLAs), and a social norms change intervention delivered to communities targeted the general population.

We apply state-of-the art economic evaluation methods to VAWG programming to determine the cost-effectiveness of these interventions. We measure the cost per year free of physical and/or sexual violence from an intimate partner (IPV) as the common primary outcome for this economic evaluation. This constitutes a standard metric to compare the efficiency of different types of VAWG prevention interventions. We first report on intervention cost-effectiveness in a research setting, and then show how cost-effectiveness changes as interventions are scaled up across the different platforms, based on relevant scale-up models.

In addition, such interventions are likely to impact a large number of outcomes, ranging from IPV to other health and socio-economic outcomes. Therefore, we also report how cost-effectiveness changes as we progressively expand the outcome inventory from interventions' primary outcome, expressed in natural units (years free of violence), to health outcomes (captured by DALYs averted), to outcomes that fall under the remit of other sectors of the economy, such as marital status, income, employment and education. We use new methods of estimating impact from a large set of outcomes to determine returns on investment as interventions are scaled up, and show how results change as the full spectrum of intervention effectiveness is accounted for.

Economic Evaluation of the Good School Toolkit: An Intervention for Reducing Violence in Primary Schools in Uganda

PRESENTER: **Giulia Greco**, London School of Hygiene & Tropical Medicine

AUTHORS: Louise Knight, Karen Devries, Dipak Naker, Willington Ssekade

This paper presents the cost and cost-effectiveness of the Good School Toolkit (GST), a programme aimed at reducing physical violence perpetrated by school staff to students in Uganda.

The effectiveness of the Toolkit was tested with a cluster randomised controlled trial in 42 primary schools in Luwero District, Uganda. A full economic costing evaluation and cost-effectiveness analysis were conducted alongside the trial. Both financial and economic costs were collected retrospectively from the provider's perspective to estimate total and unit costs.

The total cost of setting up and running the Toolkit over the 18-month trial period is estimated at US$397 233, excluding process monitor (M&E) activities. The cost to run the intervention is US$7429 per school annually, or US$15 per primary school pupil annually, in the trial intervention schools. It is estimated that the intervention has averted 1620 cases of past-week physical violence during the 18-month implementation period. The total cost per case of violence averted is US$244, and the annual implementation cost is US$96 per case averted during the trial.

The GST is a cost-effective intervention for reducing violence against pupils in primary schools in Uganda. It compares favourably against other violence reduction interventions in the region. Differences in costs and outcomes measures compared to the What Works methodology are identified and their role in explaining differences in estimates assessed.

1:00 PM –2:30 PM WEDNESDAY [Economic Evaluation Of Health And Care Interventions]

Universitätsspital Basel | Klinikum 1 – Hörsaal 4

Health Technologies and Economic Burden

SESSION CHAIR: **Nesrin Cilingiroglu**, Hacettepe University

The Impact of SMS Appointment Reminders on Primary Care Clinic Attendance: Evidence from Chile

PRESENTER: **Tadeja Gracner**

AUTHORS: Claire Boone, Paul Gertler, Josefina Rodriguez, Pablo Celhay

Background: Missed clinic appointments present a significant burden to health care systems through disruption of care, inefficient use of physician- and nurse-hours and wasted clinical resources. The most cited reasons for no-shows include forgetting or confusing the date, time or the location of the appointment. The use of Short Message Service (SMS) appointment reminders offers a cheap and time-efficient strategy to either increase appointment adherence that may improve health, or to decrease non-attendance and thereby improve the efficiency of healthcare delivery.

Methods: We estimate the impact of SMS appointment reminders on attendance at primary care clinics using a difference-in-difference approach. In particular, we exploit spatio-temporal variation in clinic-level implementation of Chile's at-scale "Critical Care Appointment Management Program". This program sent automatic SMS reminders 48 hours prior to the scheduled appointment with information on date, location and time of the appointment to patients diagnosed with type 2 diabetes (T2D) and/or hypertension. Patients could reschedule or cancel their appointment via SMS. This program started in January 2015 and was implemented across 270 primary care clinics in Chile (out of 764) by December 2016. We compare the number of medical appointments for patients with and without chronic disease before and after the program was implemented between clinics that did and did not adopt the program. We estimate both 1) the direct effect of the program: attendance of chronic patients, and 2) the indirect effect of the program: the attendance of non-chronic patients.

Data: We use facility-level data from the Chilean Ministry of Health from 2013 to 2016. Using the unique clinic-level identifier we combine the quarterly data into a panel that contains all public primary care clinics in Chile. We match clinics by municipality to Chile's National Socioeconomic Survey (Casen 2015) to obtain municipality-level controls.

Results: We find that chronic patients with T2D and/or hypertension did not increase the total number of medical appointments at primary care clinics due to the program. However, we find a positive indirect effect of the program: the number of medical appointments for reasons unrelated to T2D or hypertension increased in clinics that were sending SMS appointment reminders to chronic patients at their clinic by 2.9% percent per quarter, or 11.8% annually compared to the primary care clinics that did not. This impact was limited to non-isolated areas with more than two primary care facilities per municipality, and was larger in clinics with the highest share of diabetic and hypertensive visits relative to total number of visits at baseline.

Conclusion: Our findings suggest that resources in primary care clinics in Chile may be under-utilized due to the non-attendance of scheduled chronic appointments. This could potentially be improved by sending cost-effective SMS appointment reminders to chronic patients. We find suggestive evidence that when this program is implemented, timely cancellations and rescheduled appointments may result in vacant slots being filled by other patients, which would not have happened otherwise. We also find that this program may be most beneficial for primary care clinics with a larger share of chronic appointments.

Quantifying the Life-Cycle Value of Innovative Medicines: The Case of Risperidone and Second-Generation Antipsychotics

PRESENTER: **Dr. Mikel Berdud**, The Office of Health Economics

AUTHORS: Niklas Wallin-Bernhardsson, Bernarda Zamora, Peter Lindgren, Adrian Towse

OBJECTIVES: To estimate the life-cycle value of risperidone – representative of Second-Generation Antipsychotics (SGA) – to balance the view that cost per Quality-Adjusted Life Year (QALY) estimates at launch should be used to guide access decisions. Study results will also drive the discussion on access and price, whilst recognising the dynamic nature of pharmaceutical pricing over the long-run.

METHODS: We estimated the number of patients with schizophrenia who were treated with risperidone in Sweden and the UK between 1994-2017, based on historical data of usage and volume sales. We collected data on the effectiveness (QALYs per patient per year) and direct and indirect costs (per year € 2017) of risperidone (SGA) and haloperidol – representative of First-Generation Antipsychotics (FGA) – by performing a literature review. Next, we modelled the life-cycle uptake of risperidone to estimate the life-cycle incremental cost (e.g., direct, indirect and medicine costs) and incremental QALYs of risperidone (SGA) vs haloperidol (FGA). We also assessed the life-cycle distribution of the social surplus between the payer (consumer surplus) and the innovator (producer surplus). For the UK, we estimated the consumer surplus (at £20K/QALY threshold), the producer surplus, the Net Monetary Benefit (NMB) and Incremental Cost-Effectiveness Ratio (ICER) at each year and in aggregate terms (1993-2017). For Sweden, we estimated the consumer surplus (at €70K/QALY threshold).

RESULTS: For the UK, the producer surplus represents around 25% of the total surplus before patent expiration and around 5% after patent expiration. Life-cycle NMB for the health system is estimated at €1,090m. During the life-cycle, NMB experienced a significant increase as a response to two events: (i) the launch of Risperidone Long-Acting Injectable (RLAI) and (ii) the generic entry. The ICER was negative (dominant) for the whole period, and savings generated significantly increased with both, the launch of RLAI and the generic entry. For Sweden, the producer surplus represents around 5% of the total surplus before patent expiration and around 1% after patent expiration. Life-cycle NMB is estimated at €1,343m, and both NMB and ICER follow the same pattern than in the UK. These results are under review and therefore subject to potential change.

CONCLUSION: Our analysis of the life-cycle value of risperidone versus haloperidol shows that health systems (consumers) were able to appropriate most of the life-cycle value (surplus) generated. The value added by SGA significantly increased with the launch of RLAI and the

generic competition as the evolution of surplus distribution, NMB and the ICER shows. This suggests that considering the entire life-cycle, the value added by SGAs to the system is higher than the value estimated using cost-effectiveness analysis at launch. This is because the latter does not consider generic entry and the launch of new and more effective presentations. Our results suggest that pricing and reimbursement decisions should consider the dynamic nature of pharmaceutical markets and value added by innovative medicines over the long-run.

The Relationship Among Health Information Technology, Hospital Productivity, and Quality of Care in Acute Care Hospitals

PRESENTER: **Dr. Hengameh Hosseini**, The Pennsylvania State University

The Affordable Care Act of 2010 has placed US hospital operations under enormous pressure, as new reimbursement restrictions and incentives exert downward pressure on inpatient admissions and thus utilization. Readmission penalties, and an increasing rate of hospital closures have further burdened hospitals. To contend with this challenging environment, many hospitals have turned to health information technology (HIT) to reduce costs, and increase efficiency and hospital productivity without reducing quality of patient care.

Few studies of hospital productivity to date have considered quality-of-care measures that influence hospital costs. As a result, productivity gains and efficiency associated with different interventions can be understated. For example, high nurse-to-patient ratio, a quality of care measure, is associated with improved patient outcomes despite creating a net increase in hospital costs. For-profit hospitals typically have lower nurse-to-patient ratio to lower the risk-adjusted costs, a measure of efficiency, and thus may appear more resource-efficient than nonprofit hospitals that typically have a higher nurse-to-patient ratio

Hospital readmissions, often used as an indicator of between-hospital variation in the quality of care, is another such important measure. High rates of hospital readmissions reflect poor quality of care. To reduce the readmission rates, a federal program tied to the ACA penalizes hospitals for thirty-day readmission rates that exceed national averages. Despite the program's success in reducing the readmission rates, there is widespread concern that the program disproportionately penalizes hospitals serving economically disadvantaged patient populations.

Given the high financial stakes involved, it is essential to determine whether quality-of-care measures have a significant impact on measured productivity before making between-hospital comparisons based on existing productivity measures. To this end, we attempt to characterize the relationship among quality of care measures, productivity, and HIT adoption. We focus on two main health information technologies: electronic health record (EHR) and health information exchange (HIE), the adoption of both of which has been driven by US federal regulations and incentives programs.

We present a new dataset containing information on hospital structure, quality of care measures, and HIT use. We also use a measure of productivity, the non-parametric Malmquist Index (Grosskopf, 1993). The Malmquist Index can be decomposed into two main components: Technical efficiency change and technological change. Using a Tobit regression model, we examine the relationship among hospital productivity, quality of care, and HIT adoption, using hospital size, ownership structure, and complexity as explanatory variables.

Our results to date indicate that use of EHR has a positive impact, and HIE a negative impact, on technical efficiency. Furthermore, hospitals that try to differentiate their services by providing care at QC1/QC2 are found to exhibit greater technological change, suggesting that productivity and cost measures that ignore quality of care may be biased. Finally, technical efficiency is found to be significantly greater for hospitals that have the highest nurse-to-bed ratios.

1:00 PM –2:30 PM WEDNESDAY [Specific Populations]

Universität Basel | Kollegienhaus – Hörsaal 001

Organized Session: Does One Size Fit All? Methods and Considerations for Measuring Obesity-Related Quality of Life in Children and Adolescence.

SESSION CHAIR: **Rachael Morton**, University of Sydney

Growing Pains: A Longitudinal Analysis of the Association between Weight Status and Health-Related Quality of Life throughout Childhood

PRESENTER: **Anagha Killedar**, University of Sydney

Background

In Australia, 25% of children are overweight or obese which poses immediate and long-term health risks. One of the impacts of overweight and obesity is poor health-related quality of life (HRQoL), but a clear understanding of this relationship across different age and socio-demographic groups has not been well-established in children. Examination of how HRQoL, measured using a non-preference based metric, changes with age and socioeconomic position may be informative when applying utility-based measures in economic evaluation of strategies addressing childhood obesity.

Objective

To determine how the association between weight status and HRQoL changes with age and socioeconomic position in children and adolescents.

Methods

We used data from the Longitudinal Study of Australian Children (LSAC), in which children and their families were interviewed every two years from ages 4 to 15. This dataset contains measures of health-related quality of life (PedsQL Generic Core Scales (GCS)), BMI, and sociodemographic characteristics at each wave. With a cohort of 4702 children and 21586 observations, we used generalised estimating equations to assess whether age and SEP modified the association between weight status and PedsQL GCS scores, after controlling for sex, long-term medical condition, language spoken to child and maternal smoking status. To gain insight into the results, we also conducted similar analyses on two components of the PedsQL GCS: The Physical Health Summary Score and The Psychosocial Health Summary Score.

Results

Without adjusting for other characteristics, weight status was a significant predictor of the PedsQL total GCS score ($P<0.001$). After adjustment, there was very strong evidence that this association was modified by age ($P<0.001$ for interaction). Children at age 4 with overweight (but not obesity) had, on average, a 0.004 point lower PedsQL GCS total score than children at healthy weight and by age 15 this increased to a 2.64 point decrement, after adjustment for known predictors of HRQoL. Children with obesity at age 4, had on average, a 1.71 point lower PedsQL GCS total score than children at healthy weight, and this increased to a 7.86 point decrement by age 15. Children at low SEP had an, on average, a 0.99 point lower PedsQL GCS total score than children at high SEP ($P<0.001$). There was no evidence of an interaction between weight status and SEP ($P>0.05$). Significant interactions between weight status and age were also found for the Physical Health and Psychosocial Health Summary Scores.

Conclusion

These results show that HRQoL decrements are age-specific and that the age of the child should be considered when estimating utilities for children and adolescents of different weight status. Future work will use existing mapping algorithms to adapt these generic HRQoL decrements for each weight status by age to utility decrements. More broadly, these results suggest that the prevention of obesity in the early years may prevent severe losses in HRQoL in later stages of childhood and adolescence. For this reason, the evaluation of strategies to prevent obesity in early childhood years should take a long-term outlook in order to fully capture consequences on HRQoL.

The Association between Weight and Health-Related Quality of Life in Children: Evidence from a Chinese Trial

PRESENTER: **Dr. Mandana Zanganeh**, University of Birmingham
AUTHORS: Peymane Adab, Bai Li, Emma Frew

Background: Rapid socioeconomic and nutritional transitions in urban Chinese populations over a relatively short period have contributed to the rising prevalence of obesity among children. There is growing evidence that obesity in childhood has a detrimental effect on health-related quality of life (HRQoL), as children living with severe obesity have reported HRQoL that is comparable with cancer. There is also evidence to suggest that HRQoL is affected by gender and is positively associated with socio-economic status. Obesity trends follow a different pattern in China compared with high-income countries as the risk of obesity is greater in children from higher socio-economic backgrounds and it is interesting to explore how this translates to utility-based HRQoL. This is because Quality-Adjusted Life Years (QALYs) are used to make judgements about the relative cost-effectiveness of competing interventions and require an understanding of the relationship between weight and HRQoL when measured in utility terms.

Objectives: We aim to explore how weight is associated with HRQoL in 6-7 year olds. We will also examine the psychometric properties of the Child Health Utility 9D (CHU-9D) instrument.

Data and methods: As part of the Chinese randomised controlled trial (CHIRPY DRAGON) (ISRCTN11867516), data was collected from 1641 children. This dataset contains demographic information and a range of other characteristics. Height and weight measures were taken at school by trained researchers using standardised methods, and BMI z-scores were calculated using the WHO 2007 Growth Charts. Utility-based HRQoL was measured using the Chinese-translated version of the CHU-9D instrument, and general HRQoL was measured using the validated Chinese version of PedsQL instrument. We calculated utility scores using both UK and Chinese tariff scores. To explore the relationship between HRQoL and sample characteristics we will report mean (SD) of CHU-9D and PedsQL scores by weight status category, gender and socio-economic status. The association between weight and HRQoL will be examined through a series of descriptive and multivariate analysis. We will also examine the construct validity of the CHU-9D instrument by reporting specifically on the discriminant and convergent validity. To facilitate this assessment, the CHU-9D will directly be compared to the PedsQL instrument. All analyses will be undertaken in Stata version 13.

Results/Discussion: The result of this study will have methodological and policy implications in terms of how the cost-effectiveness of childhood obesity interventions is measured in children aged 6-7 years.

Estimating CHU-9D Utility Scores from the Waite: A Mapping Algorithm for Economic Evaluation

PRESENTER: **Tomos Robinson**, Newcastle University

Background: The **W**eight-Specific **A**dolescent **I**nstrumen**t** for Economic **E**valuation (WAItE) is a new condition-specific patient reported outcome measure that incorporates the views of adolescents in assessing the impact of above healthy weight status on key aspects of their lives. Presently it is not possible to use the WAItE to calculate quality adjusted life years (QALYs) for cost-utility analysis (CUA), given that utility scores are not available for health states described by the WAItE.

Objective: This paper examines different regression models for estimating Child Health Utility 9 Dimension (CHU-9D) utility scores from the WAItE for the purpose of calculating QALYs to inform CUA.

Methods: The WAItE and CHU-9D were completed by a sample of 975 adolescents. Nine regression models were estimated: Ordinary Least Squares, Tobit, Censored Least Absolute Deviations, Two-Part, Generalised Linear Model, robust MM-estimator, Beta-Binomial, Finite Mixture Models, and Ordered Logistic Regression. The mean absolute error (MAE) and mean squared error (MSE) were used to assess the predictive ability of the models.

Results: The robust MM-estimator with stepwise-selected WAItE item scores as explanatory variables had the best predictive accuracy.

Conclusions: Condition-specific tools have been shown to be more sensitive to changes that are important to the population for which they have been developed for. The mapping algorithm developed in this study facilitates the estimation of health-state utilities necessary for undertaking CUA within clinical studies that have only collected the WAItE.

1:00 PM –2:30 PM WEDNESDAY [Supply Of Health Services]

Universität Basel | Kollegienhaus – Hörsaal 102

Organized Session: Gaps in Quality of Care and Policy Implications for Sub-Saharan African Countries on the Quest for Effective Universal Health Coverage

SESSION CHAIR: **Laura Di Giorgio**, World Bank

DISCUSSANT: **Federica Secci**, World Bank

Levels and Variation in Quality of Maternal and Child Health Care with a Focus on Providers' Performance: Evidence from Eight Sub-Saharan African Countries

PRESENTER: **Dr. Laura Di Giorgio Dr.**, World Bank

AUTHORS: Dr. Anna Welander Tarneberg, Dr. David Evans, Dr. Magnus Lindelow

Background: Coverage of key health interventions has expanded dramatically in low- and middle-income countries (LMICs) over the Millennium Development Goals period and health outcomes have improved significantly. When taking maternal mortality and under-5 mortality as tracer indicators of a population's overall wellbeing, the data show that huge progress has been made and millions of lives have been saved. The global maternal mortality ratio was estimated to have fallen by 45% over the last two decades reducing the number of maternal deaths per year from 523,000 to 289,000. Similarly, the global under-5 mortality has dropped by 53% since 1990, from 91 deaths per 1,000 live births to 43 in 2015. However, recent research has shown that the remaining burden of disease can only be addressed thorough efforts to improve quality of care, especially in Africa where huge gaps exist. In response to this realization, the Sustainable Development Goals have included a focus on quality of care, however efforts to routinely measure and monitor quality of care remain limited and have historically focused on factors that can be easily tracked - such as infrastructure and inputs availability – but are not strongly correlated with health outcomes. Increasingly, the global health community has recognized that the effectiveness of health systems depends in grand part on the knowledge, skills and motivation of the people responsible for delivering health services. This study aims to fill the gap by providing evidence on levels, variation and drivers of quality of care in Sub-Saharan Africa (SSA).

Methodology: This study merged and compared SDI data from eight nationally-representative countries in SSA: Kenya, Madagascar, Mozambique, Nigeria, Senegal, Tanzania, Togo, and Uganda for a total of 4,295 health facilities and 8,326 health workers. The surveys collected data on: structural measures of quality with a focus on MCH (availability and functionality of inputs), staff absenteeism and health worker clinical knowledge. It administered standardized patient vignettes to assess knowledge of health providers on seven tracer conditions (post-partum hemorrhage, neonatal asphyxia, diarrhea, diabetes, malaria with anemia, pneumonia, TB) w.r.t. accurateness of diagnosis, appropriateness of treatment and adherence to medical guidelines. Providers absenteeism rate was measured using unannounced visits. Pooled regression analysis was used to investigate if facility characteristics explain variation in multiple indicators of quality (clinical knowledge, absenteeism rate) within and across countries.

Results: Among the full sample of facilities, only 6% had basic infrastructure, 40-45% had functional medical equipment and drugs, and almost 80 percent had vaccines available. However, only 2% offered the array of MCH-related services needed to address the more complicated delivery cases (neonatal resuscitation, ambulance services, blood transfusion, C-section, instrumental deliveries). Where services are offered, providers are often absent (7-47%) and perform poorly in diagnosing (43-73%) and prescribing the correct treatment for key MCH conditions (4-17%). Finally, no strong relationships were found between health facility characteristics and the quality indicators,

despite the huge variation across and within countries. Significant investments in quality improvement interventions are needed to close the gaps in MCH outcomes.

Using Service Delivery Indicators to Track Progress Towards UHC in Kenya

PRESENTER: **Catherine Ndei**
AUTHOR: Francis Kundu

Background: Kenya is committed to achieving universal health coverage (UHC) by 2022. Various health systems reforms are underway in the country to improve access towards affordable health care services of good quality. To this purpose, it is critical for the country to keep track on progress towards UHC through continuous monitoring and evaluation. The health Service Delivery Indicators (SDI) survey provides a set of key indicators that benchmark service delivery performance and ascertain the quality of service delivery in basic health services. A unique feature of the SDI survey is that it examines the production of health services at the frontline from the perspective of beneficiaries accessing services. While many data sources provide information on the average availability of these elements across the health sector, the SDI surveys allow for the assessment of how these elements interact to produce quality health services in the same facility simultaneously. This is the second health SDI to be conducted in Kenya, and forms the baseline for tracking progress towards key UHC supply side indicators.

Methods: Data were collected from a nationally and county level representative sample of 3,094 health facilities (n=1,781 public; n=1,313 private) between March and July 2018. The survey team observed 8,382 workers for absenteeism and assessed 4,430 health workers for diagnostic and treatment knowledge using patient case simulations. Data collection focused on three dimensions of service delivery: (i) the availability of key inputs such as drugs, equipment and infrastructure; (ii) provider skills; and (iii) providers who exert the necessary effort in applying their knowledge and skills. Successful service delivery requires that all these elements be present in a facility at the same time.

Findings: Slightly above half of priority drugs (54.1%) were available in Kenyan facilities. Priority drugs for mothers were less available than drugs for children with average scores of 34.6 percent and 62.3 percent respectively. Health providers in Kenya could correctly diagnose about two-thirds (67.5 percent) of the four tracer conditions. There were substantially large discrepancies between diagnosis and treatment across the board revealing a critical disconnect in provider knowledge and practice gap. For example, while 90 percent of health providers got the diagnosis for postpartum hemorrhage, only 43 percent got the correct treatment.

Over half (54.6%) of health workers in Kenya were absent from duty during an unannounced visit. Absenteeism was higher in the public sector absenteeism (59.2%) than the private sector (48.8%), and ranged from 23 percent to 70 percent per county. On average, a health worker in Kenya attends to 13 patients per day (ranging from 7 to 42).

Conclusions: Results show large gaps in availability of drugs and equipment and a high know-do-gap. High absenteeism is also common across the level of care. As Kenya embarks on the UHC journey, significant investments and closer supervision are required to improve quality of care in both public and private facilities.

Assessing the Know-Can-Do Gap of Health Care Worker Performance in Guinea Bissau

PRESENTER: **Dr. Manuela Villar Uribe**, World Bank Group
AUTHOR: Edson Araujo

Introduction: One of the poorest countries in the world, Guinea Bissau has faced continuous political instability and lack of stable social and economic institutions for more than two decades. Despite some progress in the recent years, the country's health system faces acute constraints. The country's life expectancy is 55 years, which is lower than the regional (59 years) and the average among countries in the same income group (60 years). Some progress has been made to reduce child mortality, but both infant mortality and under-five mortality remain high, 60 and 92 per 1,000 live births, respectively. Additionally, Guinea-Bissau has one of the highest maternal mortality rates in the world, 900 per 100,000 live births. Health outcomes are exacerbated by acute constraints in service provision: there are a total of 132 health facilities serving the population of 2 million, staffed by under 700 heath care professionals and less than 50 medical doctors.

Methodology
In April 2018, an SDI Survey was conducted with additional modules that measure health worker competences through hypothetical patient cases (vignettes) and direct observations. The survey was conducted as a census of the 132 health facilities and all health workers present in the facility were interviewed. This unique design of the SDI survey has allowed us to assess a know-can-do gap in service provision for children (as defined by Ibna et al., 2018) by comparing health worker adherence to clinical guidelines in hypothetical cases (know), the availability of key inputs for the delivery of care (can) and the health worker adherence to guidelines during an observed consultation (do). Three measures were defined: (1) the difference between a target of service delivery quality as defined by clinical guidelines and the availability of inputs (target-can gap), (2) the difference between the availability of inputs and the health worker knowledge (know-can gap), (3) the difference between the knowledge and action of a provider (know-do gap). We use linear regression models to elicit key health facility and health worker characteristics that drive these gaps.

Results: Preliminary results indicate moderate target-can gaps, with approximately 30% of health workers not having the necessary medicines and equipment available to undertake all necessary steps for a child consultation. The know-can gap is large; approximately 48% of health workers with available equipment in their facility, adhere to clinical guidelines for treatment of childhood pneumonia, malaria and diarrhea. The know-can gap is also large; less than 60% of health workers that know to follow clinical guidelines do so as outlined in

guidelines. Preliminary results show health facility size and location as important determinants of these gaps, health worker cadre is not strongly correlated with the know-do gap in our preliminary analysis.

Conclusions: Understanding the differences and drivers of each gap is essential for targeted policy making: separate efforts need to tackle availability of inputs, health worker training and incentives to increase health worker performance.

1:00 PM –2:30 PM WEDNESDAY [Organization Of Health Care Markets]

Universität Basel | Kollegienhaus – Seminarraum 103

Hospital Market Incentives

SESSION CHAIR: **Kees van Gool**, CHERE, UTS

Changes in Quality of Care after Hospital Mergers and Acquisitions

PRESENTER: **Nancy Beaulieu**, Harvard University

AUTHORS: Leemore Dafny, Dr. Bruce Landon, J. Michael McWilliams

Changes in Quality of Care After Hospital Mergers and Acquisitions

Background: Over the last two decades, the hospital industry has consolidated substantially, with a recent wave of mergers and acquisitions accelerating the pace. Multiple studies have demonstrated that hospital mergers have led to higher prices for commercially-insured patients, but research about the effects on quality is limited. Conceptually, hospital mergers and acquisitions could lead to improvements or deterioration in the quality of care. For instance, acquiring hospitals might bring additional expertise to hospitals they acquire, and greater scale achieved by a merger might support better clinical outcomes. Conversely, consolidation could weaken competitive pressures for hospitals to provide high-quality care to attract patients and could create diseconomies of scale (e.g., bureaucracy) that could interfere with important care processes.

Methods: Using Medicare claims and Hospital Compare data from 2007-2014 and Irving Levin Associates data on hospital mergers and acquisitions occurring from 2009-2011, we assessed performance on process, outcome, and patient experience measures for hospitals acquired by another hospital or system, before and after the transaction. In difference-in-differences analyses, we compared these changes with concurrent changes among control hospitals that were located in the same area and did not experience a change in ownership.

Results: The study sample included 102 acquired and 584 control hospitals. Being acquired was associated with a significant differential decline in patient experiences (adjusted differential change in composite score: - 0.27 standard deviations (SDs); P=0.006) and minimal differential changes in 30-day readmission rates (0.07 SDs; P=0.77) and mortality rates (0.02 SDs; P=0.86). These effects were not continuations of trends predating the transactions and were not explained by changes in the composition of hospitals' patient populations. Acquired hospitals exhibited a differential improvement in performance on clinical process measures (0.15 SDs; P=0.03), but improvement started prior to acquisition and thus could not be attributed confidently to a change in ownership. Results of multiple sensitivity analyses were not substantively different from those of our main analyses. In analyses stratified by the location and quality of the acquiring hospital or systems results did not reveal significant differential improvements among acquired hospitals that may have been obscured in our main analysis of all transactions.

Conclusion: In summary, hospital mergers and acquisitions were associated with worsened patient experiences and no changes in readmission or mortality rates. These findings challenge arguments that price increases from ongoing hospital consolidation are accompanied by improvements in quality from the patients' perspective.

Cream Skimming By Health Care Providers and Inequality in Health Care Access: Evidence from a Randomized Field Experiment

PRESENTER: **Anna Marie Werbeck**, RGS Econ

AUTHORS: Dr. Ansgar Wuebker, Dr. Nicolas Robert Ziebarth

Objective

This paper uses a randomized field experiment in a well-suited institutional setting outside the U.S. to show that specialists cream-skim the more profitable privately insured patients and discriminate against the publicly insured because of lower reimbursement rates.

Methods

In the German two-tier system, reimbursement rates for both the publicly and privately insured are centrally determined and fixed but more than twice as high for the privately insured. In addition, the privately insured are on average healthier, have higher incomes, and their reimbursement is 100% fee-for-service. In our field experiment, we selected a total of 36 representative counties (both urban and rural) and called a total of 991 outpatient specialists to ask for wait times and make appointments for elective medical treatments. We called each practice twice, once as a fictitious privately insured new patient and once as a fictitious publicly insured new patient, randomizing the

insurance status over the two calls. In other words, the same test person called each private outpatient practice twice following the exact same protocol, thereby ensuring balanced covariates by construction. This allows us to carry out straightforward statistical tests to assess whether extensive and intensive access barriers to health care differ significantly by insurance status.

Results

Our findings show that access to the health care system differs significantly between the privately and publicly insured, both on the extensive and intensive margin. The likelihood of being offered an appointment is a highly significant ten percent larger for privately insured patients. Moreover, conditional on being offered an appointment, the wait times for publicly insured patients are more than twice as long, on average 13 weekdays longer.

Conclusion

The paper makes important contributions to the literature. Although the literature on physician behavior and treatment styles is rich and traditional in economics (e.g., Clemens and Gottlieb 2014), the causal effects literature on how providers discriminate against less profitable patients is less diverse. We contribute to a better understanding of the role of varying reimbursement rates in achieving more equitable access to the health care system for disadvantaged population groups. Moreover, ours is one of the first real-word studies that leverage a randomized field experiment, calls almost one thousand providers twice, and randomizes the insurance status in a non-emergency outpatient setting.

Our findings yield important insights into the driving forces of inequality in health care access. They suggest that uniform reimbursement rates could help mitigate inequality in health care access and align economic incentives with medical needs and priorities.

Evaluating Hospital Performance Using Instrumental Variables

PRESENTER: **Thomas Schober**, Johannes Kepler University Linz
AUTHOR: Gerald Pruckner

There is an increasing interest in measuring and comparing the quality of care in hospitals. Widely used risk adjustment methods rely on observable characteristics to account for patient selection, but are often criticized for their inability to fully control for differences in patients across hospitals. We assess hospital performance using exogenous variation shaped by the institutional setting of inpatient care in Upper Austria. Hospitals have agreed on a rotating schedule, where on every day, one or two hospitals are primarily responsible for the admission of inpatients. For patients in need of acute care, this schedule creates a quasi-random allocation into different hospitals. We use this variation in an instrumental variable (IV) framework to estimate hospital performance, and compare the results to traditional risk adjustment methods. We use patient mortality and readmissions as quality indicators and draw on administrative data from Upper Austria with hospital visits from the years 2005 to 2015. We find substantial differences between IV and risk adjustment estimates, and show that increasing the number of variables used to control for patient differences often does not provide more credible results.

Cream Skimming, Hospital Transfers and Capacity Pressure

PRESENTER: **Dr. Ou Yang**, Melbourne Institute of Applied Economic and Social Research
AUTHORS: Marc Chan, Terence C Cheng, Jongsay Yong

The proliferation of prospective payment arrangements, and more recently bundled payment models, has highlighted issues surrounding cream skimming or cherry picking, whereby providers maximize financial gains by selecting patients with the best risks. This paper examines cream skimming by hospitals in the mixed public-private system of Australia. We examine the decision of hospitals in transferring patients and investigate how this behaviour relates to a hospital's capacity. We propose a novel approach of identifying cream skimming by linking the likelihood of transfers with capacity utilization. Using a theoretical model, we show that a profit maximizing hospital will engage in patient selection by transferring ‘hard’ patients - those with more severe or complex conditions - to free up capacity to accommodate ‘easy’ patients who have less severe or complex conditions. Given finite capacity, the hospital is more likely to transfer hard patients as capacity utilization rises. Although not-for-profit public hospitals do not engage in selecting patients for financial gains, we show that a forward-looking welfare maximizing public hospital will also transfer hard patients as its capacity utilization rises. However, the likelihood of this occurring is strictly dominated by the likelihood of private hospitals transferring hard patients. That is, not-for-profit public hospitals are strictly less likely to transfer patients than for-profit private hospitals. This result is the key in identifying cream skimming. Our theoretical model presents two testable hypotheses that we examine empirically using hospital administrative data. First, both public and private hospitals will increase the likelihood of transferring complex patients as capacity utilization increases. Second, private hospitals have a strictly higher probability of transferring complex patients than public hospitals at every level of capacity utilization. We show that both hypotheses are supported by the data, indicating strong evidence of cream skimming.

1:00 PM –2:30 PM WEDNESDAY [Supply Of Health Services]

Universität Basel | Kollegienhaus – Seminarraum 104

Primary Care Supply and Quality

SESSION CHAIR: **Anthony Scott**, The University of Melbourne

Fixed-Term Contracts, Decentralization, and the Quality of Primary Care: Evidence from China's Iron Rice Bowl

PRESENTER: **Sean Sylvia**, University of North Carolina at Chapel Hill

AUTHORS: Hongmei Yi, Xue Hao, Yaojiang Shi, Gordon G. Liu

Several developing countries have sought to improve public service delivery through decentralization reforms granting managers of public facilities greater authority over hiring and firing and employee compensation. In this paper, we present causal estimates comparing the quality of primary care provided by centrally-deployed civil service physicians with physicians hired directly by facility managers on fixed-term contracts in rural China, where physicians of both types are commonly employed to provide primary care at the same facilities. We control for important sources of endogeneity by using data from interactions with unannounced standardized patients and controlling for facility fixed effects. We present three key findings. First, physicians employed on fixed term contracts substantially outperform those on civil service contracts on measures of clinical process quality and this difference persists after controlling for observable clinician characteristics. Second, we find direct evidence that these effects are due to increases in effort as civil service physicians exhibit greater underperformance relative to their knowledge of appropriate clinical practice. Third, despite the potential for stronger incentives to generate clinic revenue, we find no evidence that contract physicians increase outpatient costs or are more likely to prescribe unnecessary treatments relative to civil service physicians.

Primary Care Nurse Practitioner Supply and Population Health

PRESENTER: **Dr. Lynn Unruh**, University of Central Florida

AUTHORS: Dr. Xinliang Liu, Carla J. Sampson

Research Objective and Rationale: The U.S. has experienced shortages of primary care physicians for a number of years. An aging population and the continuation of the Affordable Care Act suggest that the problem of primary care shortages will only worsen. This shortage reduces access to care and may lower population health outcomes. The supply of nurse practitioners is related to greater access to care that is as good or better than comparable physician care. Would increasing NP supply, in particular primary care nurse practitioners (PCNPs), lead to better population health outcomes? Few studies have explored the relationship between PCNP supply and population health outcomes. This study looks at the relationship between PC NP supply and population health at the county level in Florida.

Methods: This is a retrospective, cross-sectional, observational design. Building on studies of the relationship between PCP supply and population health, this study examines potential correlations between county level PCNP supply and several county population health measures using secondary data from the Florida Center for Nursing, the Area Health Resource File, and the University of Wisconsin County Health Rankings. The PCNP measure was a rate of PCNPs per 100,000 population per county. Population health outcomes measures included county-level rates of premature mortality, years of potential life lost, poor/fair health, preventable hospital stays, and a clinical care ranking. The study controlled for PCP supply, population demographics, health behavior, and socio-economic and physical environment factors. Data for PCNP supply were from the Florida Center for Nursing. Country urban population data were from the Area Health Resource Files. All other data were from the Country Health Rankings. All measures, particularly dependent variables, were fairly normally distributed. Residual terms in Ordinary Least Squares (OLS) regressions were also normally distributed. Endogeneity of the PCNP (simultaneity with the dependent variables) was tested using Hausman's specifications. The null hypothesis was not rejected, so instrumental variables were not needed. The models of PCNP relationships to population outcomes with controls were run using OLS regressions.

Results: Higher county-level primary care Nurse Practitioner supply was significantly related to better quality of clinical care and prevention of ambulatory care-sensitive hospital admissions in the county population. It was also related to lower premature mortality, fewer years of potential life lost and better health, but these relationships were not significant. PCP supply showed a similar relationship to the population health indicators. In contrast, the percentage of the population with insurance, and socio-economic, physical environment and behavioral factors played large roles in the less clinical population health indicators.

Discussion: While these results suggest that PCNPs play a strong role in clinical care, they do not (nor do CPs) have a strong influence over less directly clinical health outcomes such as premature mortality, length of life, and overall health. The strong influence of socio-economic status, physical environment and behavioral factors indicates that those factors need to be addressed. Developing a more complex model of PCNP impacts on population health may bring out indirect and interaction effects of primary care providers on population outcomes.

Meeting the Target? the Impact of Targeted Financial Incentives on Primary Care Physicians' Labour Supply

PRESENTER: **Maripier Isabelle**, INSEAD

Targeted financial incentives such as bonuses and premiums have been extensively used to influence the delivery of health care and encourage the provision of certain services by physicians. Despite their frequent use in various health care systems, and especially in primary care, evidence on whether such financial incentives work is mixed, and often points to little net effect on the provision of the services they target. Questions remain as to why this is, and answering them is important in order to improve the design of policies put forward. Physicians might not always seek to maximize their income and they could remain insensitive to changes in the absolute and relative prices of the services they provide. When the fee for a given service changes, own substitution effects might not dominate income effects, such that increasing the financial payoff associated with a procedure may not necessarily increase physicians' propensity to provide it. Increasing the remuneration associated with a specific set of services may also lead to unintended consequences and impact other parts of physicians' practice not directly targeted by incentives. In this paper, I exploit a bonus payment targeting services in obstetric care to more precisely identify primary care physicians' responses to targeted financial incentives. Drawing on a non-linearity introduced in their budget constraint by the incentive, I investigate changes to physicians' provision of services in instances where the premium should only generate an income

effect, and in cases where it should foster both an income effect and a substitution effect. Overall, physician fixed effects and difference in differences estimates are in line with the predictions of a labour supply model departing from the hypothesis of pure income maximization, and in which income effects are relatively strong. Despite an apparent absence of response when looking at the full population of primary care physicians, I find that among those who were initially higher-volume providers of intrapartum care, the introduction of the incentive led to a 8% annual reduction in the volume of the services targeted by the bonus. I also find suggestive evidence that income effects also led higher-volume providers to reduce their provision of services in other (non-targeted) areas of care. At a time when health care budgets are growing at a pace often qualified as unsustainable, my results suggest that government policies designed to increase the provision of health services can actually produce the opposite effect. The results also contribute to a wider body of work documenting the relative importance of income effects in determining workers' behaviour.

The Cost Impact of the Changing Role of the General Practitioner in Trauma Care – a Decomposition Analysis

PRESENTER: **Dr. Marc Höglinger**, Zurich University of Applied Sciences - WIG
AUTHORS: Klaus Eichler, Fabio Knöfler, Stefan Scholz

Background
General practitioners (GPs) play an essential role in the Swiss health care system as the primary providers of ambulatory care. This also holds for trauma care, where GPs provide initial care in most cases. However, the period 2008 - 2014 saw a marked decrease from 60% to 54% in initial care by a GP while there was an increase from 32% to 38% of cases where a hospital emergency department (ED) became the first point of care. Potential reasons for trauma patients being treated increasingly in EDs rather than by GPs include changes in patient behavior; the skill, readiness, and willingness of GPs to treat trauma patients; and a reduction in GP in and out-of-hours availability.

Objectives
Various studies have shown that GPs provide trauma and other health care services more cheaply than EDs do, which raises fears that reductions in the GPs' contribution might increase costs even further. However, the precise impact on trauma care costs of the change in a GP's role is not known, and our objective is to analyze how overall trauma care costs are affected.

Methods
Based on a claims dataset from the largest Swiss accident insurer (N=2.2 million injury cases between 2008 and 2014), we constructed individual treatment sequences to determine when and from whom patients received care. Using a Blinder-Oaxaca decomposition, we separated the total cost per case increase for the period in question into four parts: (a) due to changing injury characteristics, (b) due to a changing patient population, (c) due to a change in initial care provider and in the GP's role, and (d) an unexplained part.

Results
Overall, changes in the initial care provider account for approximately 25% of the overall cost per case increase for trauma patients between 2008 and 2014. As one might expect, the relative impact is higher for injuries of low to moderate severity than those of high severity.

Conclusions
Our study lies at the intersection of health services research and health economics and provides insights into how a change in treatment pathways affects health care costs. In addition, we can show the impact of changes in treatment pathways (in particular, the role GPs play) relative to other cost drivers such as changing patient population or general health care cost increases. Our results can be used to inform strategies on the cost-efficient provision of care for (trauma) patients and ways to mitigate cost increases.

1:00 PM –2:30 PM WEDNESDAY [Demand & Utilization Of Health Services]

Universität Basel | Kollegienhaus – Seminarraum 105

Telehealth and Spatial Accessibility

SESSION CHAIR: **Katrin Zocher**, University of Linz

Does the Convenience Created By Telehealth Reduce Failure to Attend Rates in the Outpatient Setting?

PRESENTER: **Centaine Snoswell**, Centre for Health Services Research, The University of Queensland

Introduction: Failure to attend or FTA is the notation used when patients do not attend their designated outpatient appointment. FTA events waste appointment resources that could have been allocated to another patient and increase outpatient clinic wait-lists. The costs for providing outpatient appointments in the health service being examined are based on the human and office resources required to undertake the clinic, while the reimbursement is per patient attendance. Therefore, predicting FTA or changing service provision methods to reduce FTA events is expected to have both economic and patient benefits.

Telehealth offered via video-conferencing theoretically enable outpatient appointments to be conducted in a more convenient manner for patients, this increase in convenience is widely assumed to reduce FTA rates. This study investigates if having a telehealth option reduces FTA rates.

Aim: To determine whether the availability of telehealth (site-to-site, and into-the-home) effects FTA rates.

Method:

Using activity data and patient demographic information from the immunology outpatient services at the Princess Alexandra Hospital in Australia descriptive statistics and regression modelling were used to investigate whether the telehealth modality influenced FTA rates. The immunology outpatient service offers both in-person and telehealth (video-conference) appointment options for a diverse patient group, making it a good case study.

Activity data was obtained for the April 2016 to September 2018 time period from the hospital data repository. Clinic attendance information was contrasted with patient and appointment characteristics to determine the predictors of FTA.

Results: From April 2016 to September 2018 8600 appointments were booked, with an overall FTA rate of 14.5%. Telehealth accounted for 280 or 3.2% of the total appointments. When in-person, and telehealth modalities were examined separately the FTA rates were 14.7%, and 8.8% respectively.

Univariet logistic regression analsysis was conducted using a panel set to group individual patient events together to explore the ability of patient characteristics or appointment characterstics to predict FTA events. The greatest predictor variable was found to the modality by which the clinic was delivered; in-person, or telehealth. While most predictor variables including home location, requirement for an interpreter during the appointment, gender, age and others yielded a statistically significant odds ratio close to 1, clinic mode yielded an odds ratio of 4.5.

Conclusion: These results indicate that offering appropriate patients the option of telehealth has the potential to reduce FTA. Given the impact of FTA on clinic viability, case load burden, and waiting lists, telehealth should be explored further and where possible offered as a routine alternative to in-person appointments.

Assessing Spatial Accessibility to Healthcare Services in Beijing, China

PRESENTER: **Li Yang**, Peking University School of Public Health
AUTHORS: Yuqing Shen, Jiawei Zhang, Yang Chen, L.Y Bai, S.S Du

Background: Beijing is not only the capital but also the center of top medical institutions in china, the patients come from neighboring provinces, such as Tianjin, Hebei, Shandong and so on, seeking the medical services. There is few study to measure healthcare spatial accessibility in Beijing using the enhanced two-step floating catchment area (E2SFCA) method, which is one of the most widely used methods.

Objectives: The study aimed to measure spatial accessibility to outpatient and inpatient services in Beijing considering the external patients from neighboring provinces.

Methods: The 2017 electronic medical record, health statistics report from Beijing Municipal Health Commission and the population data from 2010 National Census were collected. Firstly, we classified medical institutions according to their level, such as tertiary hospitals, secondary hospitals, and primary hospitals. Healthcare services are divided into outpatient services and inpatient services. Secondly, we calculated the proportion of local patients of tertiary hospitals based on the registered address of patients. And then calculated the proportion of medical resources serving Beijing local patients. Thirdly, we used the enhanced two-step floating catchment area (E2SFCA) method under ArcGIS 10.3 environment to analyze spatial accessibility to outpatient services and inpatient services of local people. Township is the research unit in this study.

Results： Among the patients visits in tertiary hospitals, 71% were local and 29% were from other provinces. Among the tertiary hospitals, 42.7% of hospitals had less than 80% of local patients visits, and 17.8% of hospitals had less than 50% of local patients visits. For outpatient services, the accessibility to doctor was less than 7.65 doctors per 1,000 person in most townships. For inpatient services, the accessibility to bed was less than 4.89 beds per 1,000 person in most townships. Tertiary hospitals were more accessible in the central city than in suburban and exurban areas, while secondary and primary hospitals were more accessible in the central city and northwestern suburbs.

Conclusions: Compared with the medical resources bulletin of Beijing Municipal Health Commission (12.8 doctors per 1,000 person and 5.6 beds per 1,000 person), the total medical sources are insufficient considering the external patients from other provinces. And The results of the proposed model show that the township-level spatial accessibility to healthcare services shows a significant disparity, and the uneven distribution of general hospitals is the main cause.

Declaration of interests We declare no competing interests.

Funding The National Natural Science Foundation of China (71273016 and 71673004).

1:00 PM –2:30 PM WEDNESDAY [Specific Populations]

Universität Basel | Kollegienhaus – Seminarraum 106

Long-Term Outcomes of Infant Health

SESSION CHAIR: **Oliver Rivero-Arias**, University of Oxford

The Long-Run Effects of Cesarean Sections

PRESENTER: **Ms. Ana Maria Costa-Ramon**, CRES-Pompeu Fabra University

AUTHORS: Mika Kortelainen, Ana Rodriguez-Gonzalez, Dr. Lauri Sääksvuori

Cesarean section is the most common surgical procedure in many countries around the world. Cesarean delivery for low-risk pregnancies is associated with several adverse health outcomes for infants and mothers. The interpretation of these correlations is, however, confounded due to the selection of birth mode. We use high quality administrative data which includes detailed birth and health records for all children born in Finland from 1990 to 2014 to study the causal effects of cesarean delivery on infants' long-term health. We show that physicians are more likely to perform C-sections during their regular shift on Fridays and working days that precede public holidays and use this variation as an instrument for unplanned C-sections. We supplement our instrumental variables estimates using variation within sibling pairs and across families where the second child is born either by unplanned C-section or vaginal delivery. Our results suggest that avoidable unplanned C-sections increase the risk of asthma, but do not affect the probability of being diagnosed with other immune and metabolic disorders previously associated with C-sections.

Demanding Babies: How Unexpected Birth Outcomes Alter the Parents' Life

PRESENTER: **Shiko Maruyama**, University of Technology Sydney

AUTHOR: Eskil Heinesen

Children with severe health problems and disabilities require continuing care from parents. Understanding the impacts of unexpected care needs on parents and how parents cope with these shocks is an essential first step in designing policies to support impacted parents and reduce the catastrophic risk in the life of families. There is a large, long-standing literature on the effect of children's health on parental labor supply, but two major limitations of the literature are identified. First, the vast majority of the literature relies on a simple regression framework without a causal research design. Second, the majority of the literature focuses on the impact on maternal labor supply. Many studies found statistically significant negative effects of children's health problems and disabilities on the mother's labor supply, but an important knowledge gap is whether this is a temporary adjustment or a catastrophic life-long event to families even in a contemporary developed country. In this paper, we use population data from Denmark to investigate the impact of severe child care needs on not only parental labor supply but also the family stability, future fertility decision, and parental crime. To obtain more credible causal estimates than previous studies, we rely on two ideas. First, we focus on birth outcomes, which can be interpreted as the initial health endowment. Second, because many birth outcomes, such as birthweight and perinatal infection, are often non-random significantly correlated with the socio-demographic status of the parents, we study three plausibly exogenous unexpected birth shocks that tend to result in non-negligible care needs but have little long-term impact on the health of mothers: (1) placenta previa, an obstetric complication that tends to cause premature birth; (2) twin births; and (3) congenital heart disease. We argue that, after controlling for an extensive set of independent variables, these shocks at birth are fairly random. Our results show statistically significant effects of these unexpected birth outcomes: these birth shocks decrease parental labor supply and future fertility and increase the risks of parental separation and committing a crime by the 5th birthday of the child. These effects are particularly strong in the group of parents who are younger, immigrants, and lower educated. This study highlights that even in one of the most developed welfare states, the low SES group faces a substantial life-long risk in having a child.

Early Childhood Sleep Problems and Later Cognitive Human Capital

PRESENTER: **Nirosha Elsem Varghese**

AUTHOR: Simone Ghislandi

Objective

To analyse the relationship and underlying mechanism between early sleep problems and later cognitive outcomes. We use a structured life course approach to compare hypotheses about the timing and pattern of exposure to sleep problems to predict later cognition.

Introduction

Fetal period and first 1000 days of life shape life cycle health and skill formation (Almond and Currie,2011). Shocks in early childhood can have negative and heterogeneous effects. Sleep moderates stress/shocks, replenishing the brain, thereby the cognitive and non-cognitive capabilities. Despite the abundance of human capital studies, the single activity that humans resort to—sleeping—has received very little attention in economics literature (Jin & Zeibarth,2018). In this paper, we contribute to human capital literature by looking at the role of sleep quality & underlying mechanism of this empirical effect in children.

Methods

We use ALSPAC data, a prospective birth cohort of 14500 pregnant women and families based in Avon, UK for our study. Children's sleep quality defined as 'continuously gets up after few hours of sleep' is measured at 18, 24, 42, 57, 69, 81 and 108 months of age. The outcomes

are Maths grade at age 4 and 7, Reading score at age 7, IQ and Mathematical Reasoning score at age 8, NARA Comprehension and Accuracy scores at age 9. We used logistic models to identify critical periods, sensitive periods and cumulative effects across childhood adjusting for child, family and prenatal covariates. The Bayesian Information Criterion (BIC) compares the fit across the above three models representing life course patterns of exposure to sleep problems. Next, we assume that non-cognitive outcomes including behavioural difficulties at 81 months of age are affected by sleep problems at 18-57 months to produce treatment effect in cognition at 9 years. Following Heckman and Pinto (2015), we use Oaxaca decomposition, which decomposes the "treatment effect" of high-dose sleep problems into non-cognitive outcomes and unobservables to explain the difference in outcomes between treatment & control group.

Results

We do not identify any critical periods but identified 24 months of age as a sensitive period for some outcomes for which adverse effects of poor sleep is the largest. Cumulative sleep problems offered the best fit and a linear dose-response relationship between the two exists for all outcomes, with larger effect for IQ. Further, behavioural difficulties in mid-childhood explain more than one-third of the later cognition penalty between children with early poor and better sleep quality. In a subgroup analysis, prenatal depression is identified as a risk factor.

Discussion

Quantifying the cognitive penalty of poor sleep allows us to measure the social cost of childhood sleep problems. The findings imply that cumulative sleep problems along with a sensitive period at 24 months may have the worst effect on cognition. Moreover, knowledge of the production function of cognition is important in policy making as efficiency is achieved by reallocating resources from later to earlier in the life cycle. Further we identify prenatal depression as a source of parental disinvestment, exacerbating the adverse effects of poor sleep in childhood.

The Effects on Health of Acute Diarrheal Diseases While in-Utero. Evidence from the Peruvian Cholera Epidemic

PRESENTER: **Dr. Patricia Ritter**, University of Connecticut
AUTHOR: Ricardo Sanchez

There is significant evidence of the detrimental effect of acute diarrheal diseases on infant health. There is, however, very little evidence whether in-utero exposure to acute diarrheal diseases has detrimental health effects after birth. This study estimates the impact of the Cholera Epidemic that broke out in Peru in 1991 on medium and long-term health outcomes of individuals, who were in-utero during the epidemic.

Cholera is an acute, diarrheal disease generated by a bacterial infection. When the infection is severe, the main symptom is profuse diarrhea that causes dehydration. Among pregnant women, severe dehydration caused by Cholera is associated with a reduction of the amniotic fluid, reduced blood flood to the placenta, placental hemorrhage, hypotension, pre-term births, and miscarriages. Given the severity of the potential effects of a Cholera infection on maternal-child health and the vast evidence that in-utero is such a sensitive period in the formation of health capital, we would expect long-term consequences of an epidemic such as the one we are analyzing in this paper. There is a caveat, however; if the epidemic generated an extensive number of miscarriages, we might find no effect, moreover, we might find improvements in long-term health indicators due to "select mortality. Thus, for us to be able to detect an effect, the "scarring" effect on those who survive should be larger than the selection effect.

We apply a Difference-in-Differences model that exploits difference across regions and birth cohorts with a continuous regressor that captures the incidence of cholera in a child's region and while in utero. We find that exposure to cholera during the third trimester in-utero increases mortality rate among infants, while exposure to cholera during the first trimester in-utero increases stunting likelihood of girls age 6 to 9, and obesity rate among women age 16 to 25. Finally, our placebo regressions show that exposure cholera before conceiving had no significant effect or opposite in sign to our results, suggesting that if anything the previous trends are affecting our results downward.

This study contributes to the literature about the medium and long-term impact of in-utero and early life shocks. Because acute diarrhea is predominantly the main effect of a Cholera infection, and all the other consequences are derived from this main effect, we believe our results are informative not only on the effects of cholera epidemics but on acute diarrheal diseases, in general. Given, the high prevalence of diarrheal diseases among developing countries, this study suggests that many individuals in these countries are destined to die early in life or suffer from malnutrition and/or obesity. Cholera spreads mainly through contaminated water; thus, this study further suggests that sanitation programs have very important additional benefits that make the case of universal clean water access even more compelling.

1:00 PM –2:30 PM WEDNESDAY [Production Of Health, Health Behaviors & Policy Interventions]

Universität Basel | Kollegienhaus – Regenzzimmer 111

Organized Session: Substance Abuse, Public Services, Labor Markets, and Health

SESSION CHAIR: **Matthew C Harris**, University of Tennessee

Are Syringe Programs Helpful or Harmful? New Evidence in the Wake of the Opioid Epidemic.

PRESENTER: **Dr. Analisa Packham**, Miami University

AUTHOR: Katherine Wells

The increase in the use of prescription and illegal opioid drugs in the United States since the early 2000s has raised concern about the spread of bloodborne illnesses through syringe sharing. In response, many public health entities have called for an expansion in syringe exchange programs (SEPs), which provide access to sterile syringes and facilitate safe disposal of used needles for injection drug users. This project investigates the effects of recent SEP openings on HIV diagnoses and drug-related mortality in the wake of the opioid crisis using a difference-in-differences approach that compares the changes in health outcomes in counties that introduced SEPs to changes in other US counties with existing SEPs. We find that SEP openings decrease HIV diagnoses by 11.3-30.0 percent, corresponding to 12 fewer HIV cases per county per year, on average. However, we present new evidence that SEPs increase rates of opioid-induced mortality and opioid-related hospital admissions, especially in rural and high-poverty areas, suggesting that needle exchanges may unintentionally encourage more drug use.

Alcohol and Domestic Violence: The Role of Exposure and Access to Substance Abuse Treatment

PRESENTER: **Dr. Keaton Miller**, University of Oregon

AUTHOR: Benjamin Hansen

Alcohol is involved in nearly 55 percent of incidents of intimate partner violence in the United States. In this paper, we study the impact of court ordered sanctions for substance abuse treatment among a known group of alcohol abusers: drunk drivers. Individuals with Blood Alcohol Content (BAC's) just above the legal .08 are threshold are more likelihood to received court mandated alcohol treatment. However, if drunk drivers drink at home instead of public due to their license suspensions, domestic violence could increase despite alcohol treatment. We test the role of each mechanism by studying both the effects of having a BAC over legal thresholds on overall intimate partner violence, and the time periods directly related to exposure (late evening and early morning hours)

Capacity Constraints and the Provision of Public Services: The Case of Workers in Public Health Clinics

PRESENTER: **Matthew C Harris**, University of Tennessee

AUTHORS: Yinan Liu, Ian McCarthy

Unlike in the production of most goods, changes in capacity for labor-intensive services only affect outcomes of interest insofar as service providers change the way they allocate their time in response to those capacity changes. In this paper, we examine how public sector service providers respond to unexpected capacity constraints in the specific context of public health clinics. We exploit an exogenous reduction in public health clinic capacity to quantify nurses' trade-off between patients treated and time spent with each patient, which we treat as a proxy for a quality v. quantity decision. We provide evidence that these small and generally insignificant effects on nurse time favor public sector employees prioritizing quality of each interaction over clearing the patient queue.

1:00 PM –2:30 PM WEDNESDAY [Health Care Financing & Expenditures]

Universität Basel | Kollegienhaus – Fakultätenzimmer 112

21st Century Challenges in Global Health and Their Implications for Financial Protection

SESSION CHAIR: **Virginia Wiseman**, London School of Hygiene & Tropical Medicine

The Impact of Economic Crisis and the Health Reforms on the Financial Protection and of Health Equity in Greece

PRESENTER: **Michael Chletsos**, University of Piraeus

1. **Objectives**

A dramatic rise in unemployment since the start of the economic crisis period in 2008 exposed the limitations of the safety mechanisms in Greece and affected the health status and the health equity of the Greek citizens. The ratio of out-of-pocket expenditures to total current expenditures decreased from 39.4% in 2008 to 28.1% in 2010 and then it increased to 36.6% in 2014 and it decreased again to 34.4% in 2016. As far as the per capita out-of-pocket expenditures is concerned, it was 1,140 US $ in 2008 and it declined to 677 US $ in 2012. Then it started to increase and it reached at 777 US $ in 2016. In 2011 structural reforms of the health sector were implemented due to the agreements between the Greek government and the international lenders (EU, ECB and IMF). The goals of this paper are to: a) estimate the number of people who haven’t financial protection in health due to economic crisis, b) analyze the profile of the financial excluded persons taking into account their economic and social status and c) measure the impact of the economic crisis on the level of out-of-pocket expenditures and on the health equity.

2. **Methods**

As far as the determinants of financial protection in health are concerned, we estimate a logit model using the row data from Household Budget Survey for the period 2008 – 2017. Using three different logit models we estimate separately the determinants of the financial

protection in health, the impact of health crisis and health reforms on financial protection and health equity in the above period. Economic crisis and health care reforms are introduced in the model as a dummy variable.

3. **Results**

Out-of-pocket (OOP) spending finances 31% of total health expenditure in Greece, which is one of the highest shares in the OECD. The poorest 20% of households by total expenditure spend a larger share of their budget on health care than all but the richest 20%, but over most of the distribution OOP payments are an increasing fraction of total expenditure. In 2013, an estimated 1.6% of households with resources below an estimated poverty threshold were further impoverished by medical expenses. A further 1.2% of households were pulled below the poverty threshold when assessed on the basis of expenditure net of medical spending.

4. **Discussion**

During the last years the Greek economy was faced with a serious economic crisis and the Government was obliged to implement austerity measures and structural reforms of the health sector which affected the financial protection in health. As the Greek economy goes out from the economic crisis, the government will be able to improve financial protection of citizens by undertaking specific measures and actions.

Financial Problems and Unmet Needs for Medical Care in Italy for Migrants during the Global Recession

PRESENTER: **Margherita Giannoni**, University of Perugia

This paper analyses the effects of financial difficulties as measured by over-indebtedness on unmet needs for medical care in Italy during the financial global crisis comparing non European citizens regularly living in Italy with the local population. There is evidence of the effect of financial problems on health inequalities in Europe during the crisis (Filippini, Giannoni and Greene, 2017) but not on unmet needs for medical care. Moreover it seems important to understand if the migrant population experienced the same level of problems in access to health care and in financial difficulties, as the general population during the crisis as well as and on the relationship between these two types of problems. The first measure of financial exclusion used is based on over-indebtedness defined as follows: ‘People are over-indebted if their net resources (income and realisable assets) render them persistently unable to meet essential living expenses and debt repayments as they fall due.’ Over– indebtedness should be distinguished from indebtedness (Stamp 2009).Other measures for used are having difficulties in preparing meals(food insecurity) and housing tenure status (having to pay for a mortgage or house rental).

The data used are from the Eurostat 2012 Cross-sectional wave of the of EU-SILC survey for Italy, a representative sample of adult population (n= 39,345, of which approximately 6% non EU citizens regularly residing). By using Generalized structural equation (GSEM) modelling the probability of reporting unmet needs for medical and dental care is estimated together with the probability of reporting financial problems for two population groups: the non-EU citizens or born vs the rest of the population. All estimates are obtained after controlling for several demographic, geographic (region of residence) and socio-economic (income, education, occupational status. Moreover, other dimensions of household economic and financial security such as food insecurity and home ownership are included and modelled. Both direct and indirect effects of these determinants on unmet needs for medical care are reported for the two population groups considered. First results show that financial over-indebtedness is a relevant determinant of unmet needs for medical care and dental care for both Italian and non-EU citizens living in Italy.

This work contributes to the existing literature on socio-economic determinants of access to health care by bringing evidence on a rather new research topic. Moreover, it provides initial evidence on the pathway through which financial exclusion can influence access to health care. Policy implications are discussed.

Financial Burden for People Living in 18 Countries with Non-Communicable Diseases: Evidence from the Pure Cross-Sectional Study

PRESENTER: **Adrianna Murphy**
AUTHORS: Benjamin Palafox, Timothy Powell-Jackson, Kara Hanson, Martin McKee, Salim Yusuf

Background:

At the Third High-Level Meeting on Non-Communicable Diseases (NCDs) in September 2018, the United Nations (UN) reaffirmed their commitment to reducing premature mortality from NCDs by strengthening health systems through universal health coverage. Current evidence indicates that use of proven drugs for cardiovascular disease (CVD; the most common NCD) and hypertension is low globally, and that these drugs are unavailable and unaffordable to large proportions of the population in lower-income countries. Out-of-pocket costs for treatment of NCDs could impose a significant economic burden on the households of affected patients.

Methods:

Using data from 18 countries participating in the Prospective Urban and Rural Epidemiology Study, we estimate catastrophic spending and impoverishment among households with at least one person with NCDs (CVD, diabetes, kidney disease, cancer and respiratory diseases; N=17,435), with hypertension only (the most common risk factor; N=11,831) or with neither (N=22,654). Adjusting for covariates that might drive health expenditure, we estimate the difference in risk of experiencing catastrophic spending or impoverishment among of households with an individual with NCDs or hypertension compared to households with neither. We also describe the use of different financing sources

and experiences of difficulties accessing care due to cost. We separately examine high-income (HIC), upper-middle-income (UMIC), lower-middle income (LMIC) and low-income (LIC) countries, as well as China due to its larger sample size.

Results:

We find that the prevalence of catastrophic spending is highest among households with NCDs in LMIC (10.7%, 95% CI: 8.4-13.7) and China (14.7%; 95% CI: 12.3-17.4), compared to 2.7% (95% CI: 2.0-3.6) in HIC, 5.9% (95% CI: 3.6-9.6) in UMIC and 4.3% (95% CI: 2.4-7.6) in LIC; as is impoverishment: LMIC (3.9%; 95% CI: 2.8-5.5), China (3.3%; 95% CI: 2.3-4.7), HIC (1.0%; 95% CI: 0.6-1.6), UMIC (2.2%; 95% CI: 1.3-3.8), LIC (1.7%; 95% CI: 0.9-3.3). After adjustment, the absolute risk of catastrophic spending is higher in households with NCDs (risk difference=2.64%; 95% CI; 1.70-3.59) compared to no NCDs in LMIC, with similar results in China. A similar pattern is observed for impoverishment. A high proportion of those with NCDs in LIC, especially women (38.7% compared to 12.6% in men), reported not taking medication due to costs. The use of borrowing is most common in LIC (12.8%) compared to LMIC (10.1%), UMIC (1.9%) and HIC (0.8%).

Conclusions:

Our findings show that financial protection from health care costs for people with NCDs is inadequate, particularly in LMICs. While the burden of NCD care may appear greatest in LMICs, the burden in LICs may be masked by care foregone due to costs. The high proportion of females reporting foregone care due to cost may in part explain gender inequality in treatment of NCDs.

Health Shocks, Labour Supply and Medical Savings Adequacy: Evidence from a High Frequency Survey of Elderly Singaporeans

PRESENTER: **Terence C Cheng**, University of Adelaide
AUTHOR: Rhema Vaithianathan

Adverse health events can significantly affect the economic well-being of individuals and households, limit the ability to work and generate income, and reduce savings and wealth. We empirically study how major health shocks affect labour supply, earnings from work, and medical savings in a sample of older Singaporeans. In Singapore's health care system, health care services are financed in part through a mandatory medical savings scheme. Under this scheme, individuals contribute a fraction (8–11 percent) of their monthly income into a medical savings account where funds can be withdrawn to pay for their own health care expenses or those of their immediate family. The occurrence of major health events can severely deplete medical savings and wealth, which is further exacerbated if ill health affects the ability of individuals to participate in the labour market.

Our data comes from 33 monthly waves from a novel high frequency longitudinal data from the Singapore Life Panel (SLP), a monthly survey of a population representative sample of 50–70 year old Singaporeans. In each month of the survey are questions about labour market status and income from work of respondents and their spouses, and the new diagnosis of chronic conditions. The health events we study are the onset of new major health conditions – cancer, heart disease and stroke. The distinctive feature of the SLP lies in the availability of monthly observations, which allows us to examine the short-term dynamics health shocks have on labour supply. Our empirical strategy is based on an event study approach that exploits unanticipated changes in health status through the diagnosis of new health conditions with matched treatment-control subjects. This strategy permits us to identify the causal effects of ill health on labour market outcomes.

Our early results show that while major health shocks significantly reduce income from work, the magnitude and persistence of the impact differs between men and women. For men, we observe a large decline in labour force participation, though the effect is temporary and dissipates 5–6 months after the onset of ill health. Whilst the decline in labour force participation is observed to be smaller in magnitude for women compared with men, the effect appears significantly more persistent, with female respondents reporting a lower probability of having income from work up to 12 months after onset. We also find that in the event of major illness for men, their wives respond by increasing their involvement in the labour market on the intensive margin, but not the extensive margin.

In additional analyses, we document changes in medical savings, cash and wealth arising from health shocks and how these changes vary by characteristics such as individuals' health status and wealth levels. Finally, we assess the adequacy of medical savings by predicting future health care expenditures and compare these projections with observed medical savings balances.

1:00 PM –2:30 PM WEDNESDAY [Economic Evaluation Of Health And Care Interventions]

Universität Basel | Kollegienhaus – Hörsaal 114

Economic Evaluations of Infectious Disease Interventions

SESSION CHAIR: **Marina Antillon**, Swiss Tropical and Public Health Institute

Cost-Benefit Analysis of Employer-Funded Seasonal Influenza Vaccination: A Return on Investment?

PRESENTER: **Frederik Verelst**, University of Antwerp
AUTHORS: Lander Willem, Niel Hens, Philippe Beutels

Introduction

Absenteeism from work due to illness causes a large economic burden to society. Seasonal influenza and influenza-like illness (ILI) among employees account for a significant share of this burden. The benefits of employee vaccination translate in a reduction of disease, directly in vaccinated persons, but indirectly also in the work and other social contacts of vaccinated persons. Therefore absenteeism is expected to reduce more than linearly. The benefits of requiring employees to stay home at the first sign of symptoms on the other hand is that coworkers are indirectly protected from exposure at the workplace, except during the employee's asymptomatic infectious stage. The costs of these strategies to the employer consist of productivity losses (time costs of receiving vaccination and absence from the workplace), and direct vaccination costs. Vaccination and "isolation" of employees can therefore be interesting prevention measures for companies, but there is little information on how these strategies compare in terms of return on investment.

In this study, we estimate the cost-benefit of employer-funded workplace influenza vaccination in Belgium. Moreover, we assess the impact of employees staying home when experiencing ILI symptoms.

Methods

We build on a compartmental model developed by Santermans et al. (2017) to simulate the spread of influenza in the Belgian population. We take into account observed social contact data by age group (including children and adults) and include the possibility of isolation (i.e. staying home from work) when symptomatically infected. We used social contact data, modified during the 2009 influenza pandemic, to incorporate employees staying at home when they are ill. In addition, we also include an asymptomatic infectious compartment in our model. We simulate the impact of two interventions: (1) quadrivalent influenza vaccination at the workplace, funded by the employer, and (2) employee isolation, defined by the proportion of symptomatic cases staying home from work at the start of showing ILI symptoms. We perform a cost-benefit analysis to assess the employers' return on workplace vaccination. Furthermore, we look into the cost-benefit of rewarding vaccinated employees by offering an additional day off.

Results

The "isolation" strategy is expensive at an average of €1068 per day per employee, whereas employer-funded vaccination is relatively inexpensive at €37.38 per vaccinated employee (both strategies including direct as well as indirect costs). Preliminary results, assuming all symptomatically infected individuals stay home from work at symptom onset, indicate employer-funded vaccination to be cost-saving (around €120 per vaccinated employee). When assuming a fraction of employees continue to work when symptomatically infected, vaccination becomes more cost-saving. From an isolation rate of 45% or less, it was found beneficial to reward vaccinated employees by giving them an extra day off up to when a vaccine coverage of 25% in employees is reached.

Discussion

We simulated vaccination as an employer-funded intervention while also taking into account employees with ILI staying at home. We found that workplace influenza vaccination in Belgium is cost saving. These findings are being confirmed in additional scenario and sensitivity analyses.

Assessing Effectiveness and Cost-Effectiveness of HIV Prevention Interventions: Interactions with Assumptions on Treatment Coverage

PRESENTER: **Dr. Markus Haacker**, Harvard T.H. Chan School of Public Health

In models used to analyse the effectiveness and cost-effectiveness of alternative HIV policies, and of the contributions of specific HIV treatment or prevention interventions, treatment coverage is frequently considered a policy variable. Treatment coverage, however, is an endogenous variable that reflects past and current HIV incidence and transition to treatment. In the analysis of HIV prevention interventions, or of policies with a strong HIV prevention component, this raises the possibility of biased results on effectiveness and cost-effectiveness, if the induced decline in HIV incidence – which directly affects treatment coverage through the denominator – is complemented "under the hood" by a contemporaneous implausible reduction in transition to treatment (beyond what would be eventually expected as fewer HIV infection mean fewer people requiring treatment) in order to keep assumed treatment coverage unchanged. The paper assesses the relevance and magnitude of such bias.

The practice assessed in the paper includes the dominant model used in global HIV policy analysis (Spectrum/Goals), underlying the UNAIDS global policy targets and deployed widely in providing policy advice to countries on HIV investment and spending allocations across interventions.

We built a dynamic model of HIV disease progression, with progression from an early and late stage of the disease, transition to treatment, and mortality rate depending on stage of disease and treatment status. HIV incidence depends on a force-of-infection parameter and on treatment coverage. The model was parameterized to match output across Spectrum files for 56 countries with HIV prevalence above 0.5 percent, supplied by UNAIDS. We distinguish three scenarios – with low, medium, and high treatment coverage (30, 55, and 80 percent of adults living with HIV), with transition rates to treatment typical for the respective countries as of 2017. Principal shortcomings of our model include the absence of an age structure, and the relatively crude specification of disease progression (e.g., Spectrum distinguished 7 rather than 2 categories). The model is used to assess the effects of a change in HIV incidence (one-off, or a lasting change in the force-of-infection parameter), keeping transition rates to treatment constant or adjusting them to maintain targeted treatment coverage rates.

We find that the bias in results on effectiveness and cost-effectiveness of HIV prevention interventions, from implausible assumptions on treatment coverage, is substantial. For a one-off HIV prevention intervention, the practice described underestimates the impact on HIV infections (between 3% for low and 9% for high treatment coverage), AIDS-related deaths (between 30% and 55%), and overstates resulting savings in treatment costs (between 115% and 30%), over a time horizon of 15 years. For a lasting decline in HIV transmission, the impact is underestimated for HIV infections (by 5% to 10%) and deaths (61% to 80%), and overestimated for resulting savings in treatment costs (between 56% and 222%).

In conclusion, we find the observed practice problematic for analysis of HIV preventions, resulting in large bias in results on effectiveness and cost-effectiveness, and, by extension, misleading guidance on allocative efficiency and the contributions of alternative policies to supporting financial sustainability or "ending AIDS."

Cost-Effectiveness of *Wolbachia* to Reduce Dengue in Indonesia

PRESENTER: **Prof. Donald S. Shepard**, Brandeis University

Context. Dengue is one of the world's fastest growing vector-borne diseases with 97 million symptomatic infections and US $9 billion in annual costs. A novel strategy for controlling dengue is through the release of mosquitoes infected with *Wolbachia*, which reduces mosquitoes' ability to transmit arboviruses. *Wolbachia* is passed on to the next generation of mosquitoes and therefore can become self-sustaining. A 24-cluster randomized trial and quasi-experimental studies are underway in Yogyakarta, Indonesia, with expansions under discussion. This analysis considered the cost-effectiveness of alternative scale up options.

Methods. Cost of dengue illness was based on interviews with 67 non-fatal symptomatic dengue cases across all settings (hospitalized, ambulatory, and non-medical). Cost of the Wolbachia program came from program budgets. Benefits were estimated from lab data on mosquitoes and a transmission model. Each option was summarized as the present value of cost (in 2018 US dollars), present value of Disability-Adjusted Life Years (DALYs) averted, and cost-effectiveness ratio ($/DALY averted).

Results. Yogyakarta, with 0.46 million people, has an estimated 12,217 dengue cases per year. The cost per dengue case averaged $343 for non-fatal hospitalized cases, $28 for non-fatal ambulatory cases, $7.53 for non-fatal non-medical cases, $77,605 for fatal cases, and $97.40 overall. For hospitalization, 46% of the cost was paid by households (almost all from contributions from the patients and friends) with the remaining 54% from Indonesia's national health insurance (JKN) and other public programs. For ambulatory cases, the patient's household paid most of the expenses (57%, with only minimal contributions from family and friends) while the remainder was covered by JKN (26%) and other programs. For non-medical cases, almost all expenses were paid by the patient's household. *Wolbachia* deployment is projected to cost US$4.4 ($2.9-$6.7) million or $118,797 ($77,923-$181,228) per square km. Our analysis, incorporating the projected impact of *Wolbachia* in a dengue transmission model and the associated costs, projects 534 (138-1,213) DALYs averted per year, a 97.4% reduction. The cost per DALY averted is $1,123 on a gross basis (counting only program costs), but -$82 on a net basis (i.e. a net savings is generated when averted medical costs are included). Extending *Wolbachia* on a rapid (3-year) scale up to Indonesia's 7 largest cities (Jakarta, Surabaya, Bandung, Medan, Semarang, Palembang, and Makassar) would protect against 18.5% of Indonesia's dengue burden while requiring deployment across only 0.21% of the country's area. It would cost $479.9 (305.5-746.3) million, or $13.1 ($8.4-20.3) per person protected and avert 48,454 (12,582-110,074) DALYs annually at a gross and net cost per DALY averted of $1,335 and -$4, respectively.

Discussion. Because *Wolbachia* costs depend on the area covered, they are most cost-effective for large urban areas, and would likely be more cost-effective than routine vaccination in such areas. Projected health care savings (about $50 million/year) would offset program costs over a decade. All parties (households, JKN, and government) would all realize offsets. If field trials confirm pilot data, the scale up of *Wolbachia* to major population centers appears highly cost-effective, and perhaps cost saving.

Mathematical Model and Cost-Effectiveness Analysis for the Scale-up of Interventions Against Malaria in South-West Nigeria

PRESENTER: **Lausdeus Otito Chiegboka**, University of Oxford

Background

97% of Nigerians are at risk of malaria, with transmission perennial in the south and seasonal in the north. The South-West geopolitical zone falls into the region of high endemicity. However, despite this, the coverage of interventions against malaria is suboptimal and worse than other regions of the country. This necessitates evidence generation to support scale-up of the interventions in support of the National Malaria Elimination Programme target of achieving pre-elimination by 2020. Long-lasting insecticidal nets (LLINs) and indoor residual spraying (IRS) are known to be highly effective against malaria. Hence, this study focuses on them.

Objectives

The objectives were to develop a mathematical model to predict the epidemiologic impact and perform a cost-effectiveness analysis of the scale-up of LLINs and IRS for malaria control in the South-West geopolitical zone of Nigeria.

Data and Methods

I developed a deterministic compartmental model for malaria optimised for South-West Nigeria. The model is based on non-linear differential equations and incorporates both the human and vector elements of the malaria life cycle. I then fit the model to data. Thereafter, I assessed the

epidemiological impact of scale-up of LLIN and IRS. Following this, I coded costs into the model, performed a cost-effectiveness analysis and conducted sensitivity analyses on the model parameters.

Results

The results suggest that at the current level of LLIN coverage, there could be a rebound in malaria incidence within 5 years. However, with massive scale-up of LLIN and IRS, there could be a drastic decline in malaria incidence and parasite prevalence, leading to a lower burden of disease and cost incurred in malaria diagnosis and treatment. In general, the study finds that the scale-up of the interventions against malaria in South West Nigeria is cost-effective. The dominant intervention option is the scale-up of LLIN to 95% coverage (LLIN (95%), combined with indoor residual spraying. The incremental cost-effectiveness ratio (ICER) of this dominant intervention is US$ 9.71 per DALY averted, relative to the next best alternative, LLIN (95%) alone. This ICER, against a cost-effectiveness threshold (CET) of US$ 1968.56, Nigeria's GDP per capita, is highly cost-effective. Sensitivity analysis reveals that mosquito biting rate has the most influence on the model, influencing the model outcomes greatly and by extension, the cost-effectiveness of interventions.

Conclusions

Scaling up LLIN and IRS could greatly reduce the incidence of malaria in South-West Nigeria and it is highly cost-effective to do so. The major limitations to these findings are the limited data for model fitting and uncertainties around the model parameters.

1:00 PM –2:30 PM WEDNESDAY [Health Care Financing & Expenditures]

Universität Basel | Kollegienhaus – Hörsaal 115

Payment Mechanisms: Impact on Health Service Supply and Utilization

SESSION CHAIR: **Joseph Dieleman**, University of Washington

Effect of Direct Disbursement and Prospective Payment on Health Care Utilization in Thailand

PRESENTER: **Dr. Kannika Damrongplasit**, Chulalongkorn University

This paper uses five waves of Health and Welfare Survey data (HWS) to study the effect of two changes in provider payment mechanism on health care utilization in Thailand. The first change is a move of provider payment approach from fee-for-service reimbursement towards fee-for-service direct disbursement for outpatient services. The second change is a shift from retrospective fee-for-service towards DRG-based payment for hospital admission. Civil Servant Medical Benefit Scheme (CSMBS), the third largest public health insurance scheme in Thailand, is a group that is affected by both reforms. Difference-in-difference estimation is employed to uncover the change in outpatient and inpatient utilization by comparing CSMBS group to the other remaining public health insurance schemes that are unaffected by the two policy changes during the pre- and post-reform periods. We find that direct disbursement policy leads to increase in outpatient utilization by approximately 5 percentage point while DRG-based payment leads to a decline in hospitalization by about 1 percentage point. There is evidence of substitution between outpatient and inpatient care use when the two reforms occur concurrently. Finally, our analyses also show that both reforms have long-lasting impact on health care utilization in Thailand.

Free for Children? Patient Cost-Sharing and Healthcare Utilization

PRESENTER: **Dr. Toshiaki Iizuka**, The University of Tokyo

AUTHOR: Hitoshi Shigeoka

Understanding how a patient responds to the price of healthcare is key to the optimal design of health insurance. However, past studies on patient cost-sharing are predominantly concentrated on adults and especially the elderly, and surprisingly little is known regarding children. This study exploits over 5,000 variations in subsidy generosity across ages and municipalities in Japan to examine how children respond to healthcare prices. We observe a large number of price changes, because municipalities expanded subsidies for child healthcare in different timings and covered different age groups. This unique variation in subsidy generosity combined with individual panel data enables us to estimate a number of behavioral responses to the price of healthcare among children in a difference-in-difference framework.

We find that free care significantly increases outpatient spending, with price elasticities considerably smaller than for adults. Price responses are substantially larger when small copayments are introduced, indicating more elastic demand around a zero price. We also find that increased utilization primarily reflects low-value and costly care: increased outpatient spending neither reduces subsequent hospitalization by "avoidable" conditions nor improves short- or medium-term health outcomes. By contrast, inappropriate use of antibiotics and costly after-hours visits increase. Taken together, as we find little evidence of increases in "beneficial" care and ample evidence of increases in low-value care, the weight of the evidence supports the notion that generous subsidies for child healthcare leads to the increases in unnecessary and costly visits, implying that short- or medium-term benefits of such generous subsidies are at least limited among the children we examine.

Physicians' Supply Behavior Under Global Budgeting: Empirical Evidence for the Treadmill Effect

PRESENTER: **Meng-Chi Tang**

Universal health care has been tagged as main solution to address global health inequality, but expenditure is inevitable to increase with the broadened health care coverage. Using a retrospective payment system, Canada, Germany and Taiwan successfully controlled their health care expenditure while adopting universal health care system. But an unanticipated consequence of this policy was that physicians' quantity of services increased as the price of their services decreased, which results in a negative sloping supply curve and coined by Benstetter and Wambach (2006, henceforth BW) as the treadmill effect. This effect indicates physicians have incentives to increase unnecessary treatments and medications when the service price was low, likely results in medical expenditure wastes and inefficiency. This paper provides the first empirical evidence of this effect.

Theoretical studies suggest that medical providers have an incentive to increase their quantity of services after global budgeting due to the prisoner's dilemma or the tragedy of commons. However, empirical studies found mixed results such that providers both increased and decreased their service volume after global budgeting. BW's theory explains these seemly conflicting results by incorporating the bankruptcy and effort cost of physicians in their profit maximization decision. They showed that physicians' supply curve would be negative sloping when they have to work to be just avoiding bankruptcy. While the physicians are still likely to maintain their positive sloping supply curve via coordination, BW predicted two potential equilibria after the implementation of global budgeting: the coordinated (CE) and the non-coordinated equilibria (NE). Physicians would maintain their positive sloping supply curve in CE or a negative sloping supply curve in NE.

This paper proposes an identification strategy of physicians' supply curve using the exogenous variation from the quarterly budget change. Straightforward extended theory from BW's model show that the increase of budget would increase physicians' service volume regardless the equilibrium located, but the point value would decrease with budget in the NE but increase with the budget in the CE. This exogenous variation of the quarterly budget thus can be applied as the instrumental variables for the resulting point value in a two stage least square framework. This identification strategy was empirically tested using data from Taiwan. The predetermined budget in Taiwan is separately decided for four sectors, including dentistry, Chinese medicine, community clinics, and hospitals. The data used in this paper were obtained from the National Health Insurance Research Database, including the basic information of medical providers and their service quantity in each sector.

Empirical evidence show that the dentists and Chinese medicine practitioners in Taiwan likely coordinated with each other and maintain a positive sloping supply curve (CE). Hospitals and clinics that practicing Western medicine were found to have a negative sloping supply curve thus less likely coordinated (NE). Robustness tests using a natural experiment on hospitals in Taiwan and an analysis on the relationship between the number of medical providers and the supply quantity in each sector further strengthen the empirical findings on the resulting equilibria under global budgeting.

1:00 PM –2:30 PM WEDNESDAY [Production Of Health, Health Behaviors & Policy Interventions]

Universität Basel | Kollegienhaus – Hörsaal 116

Organized Session: Beliefs and Behavior

SESSION CHAIR: **Owen O'Donnell**, Erasmus University Rotterdam

Can Individuals' Beliefs Help Us Understand Non-Adherence to Malaria Test Results? Evidence from Rural Kenya

PRESENTER: **Manoj Mohanan**

AUTHORS: Elisa Maria Maffioli, Wendy O'Meara, Elizabeth L. Turner

In malaria-endemic countries about a quarter of test-negative individuals take antimalarials (artemisinin-based combination therapies, ACTs). ACTs overuse depletes scarce resources for subsidies and contributes to parasite resistance. As part of an experiment in Kenya that provided subsidies for rapid diagnostic test and/or for ACT conditionally on being positive, we study the relationship between beliefs on malaria status (prior and posterior the intervention), and the decisions to get tested and to purchase ACT. We find that prior beliefs do not explain the decision of getting tested (conditional on the price) and non-adherence to a negative test. However, test-negative individuals who purchase ACT report higher posterior beliefs than those who do not, consistent with a framework in which the former revise beliefs upward, while the latter do not change or revise downward. Further research is needed to improve adherence to malaria-negative test results.

The Benefits of Knowledge: Mortality Perceptions, Sexual Behavior and Forward-Looking Decisions

PRESENTER: **Dr. Alberto Ciancio**, University of Pennsylvania

AUTHORS: Adeline Delavande, Iliana V. Kohler, Hans-Peter Kohler

Survival and disease perceptions (SDPs) are an understudied but potentially important and modifiable determinant of health behaviors and other life-cycle decisions in sub-Saharan Africa. This project is the first study to provide RCT-based evidence about the updating of SDPs after a health-information intervention targeted towards reducing misperceptions about mortality risks. A year after, the intervention was successful in modifying expectations about population survival but did not modify perceptions about own life expectancy. Respondents revised upward the survival probabilities of healthy individuals in their context and individuals using Antiretroviral Therapy (ART), while they did not revise the survival probability of those sick with AIDS, reflecting a strong awareness of the efficacy of the ART treatment. The intervention also reduced risky sexual behavior and increased investments. This is consistent with respondents recognizing that the pool of potential sexual partners has a higher proportion of HIV+ individuals and that their families live longer.

Risk Perceptions, Optimism Bias and Information Response: Evidence from a Cardiovascular Risk Experiment in the Philippines

PRESENTER: **Ms. Evgenia Kudymowa**

AUTHORS: Joseph Capuno, Aleli D Kraft, Dr. Owen O'Donnell

Health information campaigns can improve health by correcting inaccurate beliefs that distort behavior. But the effectiveness of impersonal information is weakened if beliefs are optimistically biased, such that a majority rates their risk as lower than average. This study measures the accuracy of beliefs about exposure to cardiovascular disease (CVD) risk, determines if beliefs are optimistically biased and evaluates whether beliefs and behavior respond to personalized information on CVD risk. We collect data on CVD risk factors (blood pressure, body mass index, smoking, age & sex) and elicit perceptions of CVD risk (of a heart attack or stroke within 10 years) from a clustered random sample of 3795 individuals aged 40-70 in Nueva Ecija, a province of the Philippines. A random sub-sample is given information on average, personal and achievable (with behavior modification) CVD risk. Respondents overestimate their CVD risk by 11 pp, on average. This is due to overestimation of the base rate, not pessimism bias. In fact, there is optimism bias: respondents rate their own risk at 14 pp below the base rate, on average. Beliefs are partially updated in response to information on personal CVD risk and information on the achievable risk increases the perceived effectiveness of health behavior in reducing risk exposure. However, there is no evidence that the information has any effect on actual health behaviors.

A Behavioral Decomposition of Willingness to Pay for Health Insurance

PRESENTER: **Dr. Owen O'Donnell**, Erasmus University Rotterdam

AUTHORS: Aurelien Baillon, Aleli D Kraft, Kim van Wilgenburg

Despite widespread exposure to substantial medical expenditure risk in low-income populations, health insurance enrollment is typically low. This is puzzling from the perspective of expected utility theory, with rational expectations of medical expenses. To help explain the puzzle, this paper introduces a decomposition of the stated willingness to pay (WTP) for insurance into its fair price and three behavioral deviations from that price due to risk perceptions and risk preferences consistent with prospect theory, plus a residual. We apply this approach by eliciting WTP, beliefs about medical expenditures and two dimensions of risk preferences (utility curvature and probability weighting), as well as actual medical expenditures, in a nationwide household survey in the Philippines. We find that the mean stated WTP is less than both the actuarially fair price and the subsidized price at which public insurance is offered. This is not explained by downwardly biased beliefs about medical expenses: both the mean and the median subjective expectation are greater than the subsidized price. Both convex utility in the domain of losses and the transformation of probabilities into decision weights push mean WTP below the fair price and the subsidized offer price. WTP is further reduced by factors other than beliefs and risk preferences.

1:00 PM –2:30 PM WEDNESDAY [Evaluation Of Policy, Programs And Health System Performance]

Universität Basel | Kollegienhaus – Hörsaal 117

Organized Session: The Opioid Epidemic: Policy, Physician Behavior, and Origins

SESSION CHAIR: **Ethan M.J. Lieber**, University of Notre Dame

How Well Do Doctors Know Their Patients? Evidence from a Mandatory Access Prescription Drug Monitoring Program

PRESENTER: **Giacomo Meille**, University of Michigan

AUTHORS: Thomas Buchmueller, Colleen Carey

Many opioid control policies target the prescribing behavior of health care providers. In this paper, we study the first comprehensive state-level policy requiring providers to access patients' opioid history before making prescribing decisions. We compare prescribers in Kentucky, which implemented this policy in 2012, to those in a control state, Indiana. Our difference-in-differences analysis uses the universe of prescriptions filled in the two states to assess the how the information provided affected prescribing behavior. We test for effects along four distinct margins: whether the provider prescribes any opioids, his or her number of patients, the days supplied per patient, and the daily strength of the prescription. Our results suggest that there was substantial heterogeneity in the effect of the policy. As many as forty percent of low-volume opioid prescribers stopped prescribing opioids altogether after the policy was implemented. However, this response accounts for a small share of the overall decline in the volume of opioids prescribed. Among larger providers, the primary margin of response was to prescribe opioids to approximately sixteen percent fewer patients. Consistent with the goal of the policy, reductions were greatest for patients whose prescribing history is suggestive of drug-seeking behavior. We also find reductions in the number of other patients, suggesting that the policy may also have had a general chilling effect.

Physician Behavior in the Presence of a Secondary Market: The Case of Prescription Opioids

PRESENTER: **Molly Schnell**

This paper examines how patient and physician behavior across legal and illegal markets have contributed to the US opioid epidemic. To do so, I design and estimate a model of physician behavior in the presence of an endogenous secondary market with patient search. To access prescription opioids for medical purposes or misuse, patients search over physicians on the legal, primary market or turn to an illegal, secondary market. Physicians, who care about their revenue and their impact on population health, take into account the existence of this secondary market when prescribing. Estimates demonstrate that the presence of a secondary market induces physicians to be more careful in

their prescribing—thereby bringing prescriptions closer to their optimal level—but results in significant harm on net due to the reallocation of prescriptions for abuse.

What Caused the Opioid Epidemic in the United States?

PRESENTER: **Ethan M.J. Lieber**

AUTHOR: William Evans

There were nearly 50,000 opioid overdose deaths in the United States in 2017. By comparison, opioids killed more people than car accidents and approximately the same number of people as the flu. Despite the large number of deaths, there is relatively little quantitative research on what led the limited number of deaths in the early 1990s to grow to into the opioid epidemic. We study a number of factors that are thought to have affected the rise of the opioid epidemic. Of particular interest is the role of Purdue Pharma's marketing campaigns. Using information and data obtained from court cases against Purdue, we find evidence that suggests Purdue's marketing efforts played a key role in driving the increased use of opioids and opioid death rates that began in the late 1990s and continued to the present.

1:00 PM –2:30 PM WEDNESDAY [Health Care Financing & Expenditures]

Universität Basel | Kollegienhaus – Hörsaal 118

Health Benefits

SESSION CHAIR: **Denzil Gwydir Fiebig**, University of New South Wales

Unintended Effects on Evasion of Equalizing the Packages of Benefits in Colombia

PRESENTER: **Carlos Julián Peña Maldonado**, Universidad Industrial de Santander

AUTHOR: Dr. Andres I. Vecino-Ortiz

Objectives: In 2008, the constitutional court ordered the national government to equalize the benefit plans across the two tiers (contributory and subsidized) of the Colombian health system. Until then, people on the higher tier were entitled to more benefits than those who were in the lower tier. The difference between benefits was designed as an incentive for people in the subsidized regime (lower tier) to join when they had the ability to pay, but 15 years later the courts decided that both plan of benefits should be equal. In this paper we assess the unintended effects of equalizing the package of benefits of the health system on evasion in Colombia.

Methods: We use a nationally representative household rolling survey that provides a range of individual and household level annual data, including household income, between 2008 and 2016. The equalization was first performed in two cities of the country (Barranquilla and Cartagena) in 2011 and escalated to the entire country in 2013. Our empirical strategy takes advantage of the differential equalization of packages of benefits across the country to run different specifications of a difference in difference design. Robustness checks and additional data analyses were conducted including mixed effects models and falsification tests. The costs of evasion are equivalent to 650 million USD, which is 5.7% of the health system budget.

Results: The equalization of the benefit plans resulted in the increase between 4.3 and 6.3 percent on the evasion to health insurance contributions across the country.

Discussion: The equalization of the benefit packages, intended to increase coverage for lower income households, had an unintended effect which was the increase on evasion by eliminating the incentive to join a higher tier health insurance scheme. The equalization of the package of benefits might have contributed to the crisis of the health system in Colombia given that it reduced the number of contributors (by increasing evasion) and also increased the costs for the health system.

Health Benefits Design: Integrating Multiple Objectives

PRESENTER: **Katherine Lofgren**, Harvard University

AUTHOR: Prof. Stephane Verguet

Purpose

Achieving universal health coverage (UHC) is a multi-dimensional problem. Policymakers need to expand coverage, limit cost-sharing, and increase access to effective health services. An essential health benefits package (EHBP) helps explicitly address each of these dimensions. One of the main challenges in the design of an EHBP is the need to incorporate multiple priorities including efficiency, equity, and financial risk protection. One common strategy to address multiple priorities is extended cost-effectiveness analysis (ECEA). ECEAs report cost-effectiveness estimates disaggregated by dimensions such as urban/rural status or income quintile. With ECEA results, policymakers can visualize tradeoffs between competing objectives.

However, results from an ECEA do not yield a clear optimal decision. The disaggregated results are often informally weighted to determine a policy strategy. We instead propose the use of mathematical optimization to design EHBPs, formally accounting for two key objectives – disease reduction (deaths averted) and financial protection (catastrophic health expenditures averted).

Methods

We demonstrate the use of mathematical optimization with an illustrative mix of interventions (N=43). The set of interventions includes preventative and curative services that target acute and chronic disease conditions in the country-context of Ethiopia. When a curative service is included in an EHBP, we assume out-of-pocket (OOP) direct medical payments are waived and coverage increases (no more than 10%). As coverage increases, we assume direct mortality reductions for relevant disease conditions. Inclusion of a preventative service is similarly assumed to increase coverage and eliminate direct OOP medical expenditures. However, preventative services reduce mortality through incidence reduction. When disease incidence is reduced, not only is mortality reduced (assuming a constant case fatality ratio), the demand for downstream curative services also decreases (an additional OOP medical expense averted).

We apply optimization to determine the subset of interventions to include in an EHBP conditional on a budgetary constraint. The objective value maximized is flexibly defined as deaths averted, catastrophic health expenditures averted, or a linear combination of these two measures (social benefit).

Results

Disease reduction and financial risk protection vary by health intervention in ways which commonly create tension between the two objectives. Across a range of budgetary constraints, the optimal EHBP to maximize deaths averted is not the optimal EHBP to maximize catastrophic health expenditures averted. When the two objectives are combined, new optimal subsets of interventions are possible, particularly when financial risk protection is highly valued. We are developing a Shiny app to display solutions and allow the user to vary the weight given to mortality reduction compared to financial risk protection to visualize changes in the optimal EHBP.

Conclusions

In the SDG era, policy planners are in need of allocation strategies to meet the UHC goal of 80% coverage of essential services with 100% financial protection by 2030. By formally incorporating both deaths and catastrophic health expenditures averted we can flexibly produce suggested benefits packages with varying degrees of emphasis on each objective. This study demonstrates the usefulness of mathematical optimization to formally (and flexibly) consider multiple competing objectives and a budgetary constraint.

How Is Employer-Sponsored Health Insurance Changing in Response to an Aging Workforce?

PRESENTER: **Dr. Alice Zawacki**, U.S. Census Bureau
AUTHORS: Joelle Abramowitz, Kristin McCue, Britni Wilcher

The strong positive association between age and health-care utilization poses a challenge to employers' ability to provide health insurance coverage that simultaneously satisfies the preferences of younger and older workers. Rising health care costs and an aging workforce are both likely to make that challenge more acute.

One potential response is for employers to discontinue offering ESI, but alternatively they may change the kinds of plans they offer to adapt to the age distribution of their workforce. The question of how employers adapt ESI to age differences is related to an existing literature that looks at the effects of heterogeneity in worker characteristics on employers' health plan choices,[1] but here we focus more specifically on the age dimension.

One barrier to understanding how shifts in the age distribution affect ESI choices is that few datasets include detailed information on both workforce demographics and health plan offers. In this paper, we use a newly developed data set that combines detailed information on employers' health insurance plan offerings from the Medical Expenditure Panel Survey-Insurance Component (MEPS-IC) with employer-specific workforce age-by-gender distributions derived from Census's Longitudinal Employer-Household Dynamics database.

The MEPS-IC collects comprehensive data on up to four ESI health plans, including costs (premiums, deductibles, and co-insurance), eligibility and enrollments, and plan design (type, health savings accounts, prescription drug coverage). The MEPS-IC also contains information on employer characteristics (number of employees, geography, retiree health insurance). While MEPS-IC survey questions do ask about some employee characteristics, they are fairly general (e.g. the share of workers aged 50 or older) so the linked data provide substantially more detail.

In addition to age-by-gender distributions, our dataset also incorporates employer-specific measures of earnings and turnover rates by age which we use as additional controls to better understand the effects of age. Our data span the years 2002-2014, a period over which the share of the workforce age 55 to 64 rose from 11 percent to 17 percent (U.S. Bureau of Labor Statistics).

By modeling ESI benefit offerings as a function of worker ages along with covariates measuring health plan, employer and other employee characteristics, we answer questions on how employers' ESI decisions relate to the health risks of their workers and respond to heterogeneity in employee preferences for coverage.

We use these data to address the following questions:

1. Has ESI coverage fallen more among firms with primarily older workers? Or among employers with substantial numbers of both older and younger workers?
2. Are plan cost-sharing provisions influenced by workforce age distributions? For example, consumer-directed plans with lower premiums and higher out-of-pocket costs are likely to hold greater appeal for younger, healthier workers, and thus less likely to be

offered by firms with mostly older employees.

Does the number and breadth of ESI offers differ by workforce age distributions? In particular, do employers with greater age diversity in their workforce provide a wider range of ESI options?

[1] See for example, Moran, Chernew, and Hirth (2001) and Bundorf (2002).

Private Provider Incentives in Health Care: The Case of Birth Interventions

PRESENTER: **Serena Yu**, Centre for Health Economics Research and Evaluation (CHERE), University of Technology, Sydney (UTS)
AUTHORS: Denzil Gwydir Fiebig, Rosalie Viney, Vanessa Scarf, Caroline Homer

Private provider incentives in health care: the case of birth interventions

Background: In Australia's mixed public-private provision of maternity care, women are entitled to universal care delivered in public hospitals, but may choose to pay for private care. Under private care, women receive care from their private obstetrician of choice, delivered in either public or private hospitals. Private physicians and hospitals face incentives to intervene in the process of childbirth because they are employed, paid and insured differently from their public counterparts. Private providers may intervene in childbirth in order to reduce the risk of litigation, maximise fee revenue, or optimise use of time and convenience. While private obstetric care has been associated with higher intervention rates, it is unclear to what extent this is attributable to selection effects, whereby women preferring intervention may opt for providers with a greater propensity to intervene.

Objective: This study examines the impact of receiving private maternity care on birth intervention rates. We explore the impact on caesarean sections, instrumental delivery, epidural analgesia use, and induction of labour.`

Data and Method: Using administrative birth data on over 280,000 births in Australia, we implement an instrumental variables framework to account for the endogeneity of choice of care. We exploit each woman's differential distance to her nearest private and public hospital to instrument for choice of care. We also exploit Australia's institutional framework – which allows a private doctor to deliver a baby in a public hospital – to examine the differences in doctor-level and hospital-level incentives.

Results: We find that receiving care from private obstetricians results in higher intervention rates compared to receiving public care. Giving birth in a private hospital raises the probability of intervention further. The results also indicate that the doctor-level effects are large relative to additional hospital-level effects. The results also highlight the importance of accounting for both observed and unobserved differences in the women choosing each care type, with significant differences in estimates based on whether or not the model accounts for endogeneity.

Conclusions: Our results show that after purging the impact of differences in patient preferences and clinical need, there remains significant variation in birth intervention rates driven solely by supply-side factors. This variation can be deemed unwarranted as it is likely attributable to incentives faced by both private doctors and private hospitals, which arise due to differences in how private providers are employed, insured, and paid. The burden of these unnecessary interventions falls on the already-overstretched health system, taxpayers whose tax dollars are directed towards a more affluent segment of the population, and the women who receive these interventions without express clinical need or desire.

1:00 PM –2:30 PM WEDNESDAY [Demand & Utilization Of Health Services]

Universität Basel | Kollegienhaus – Hörsaal 119

Demand and Utilization of Mental Health Services by Young People: Preferences, Barriers and Disparities

SESSION CHAIR: **John Cullinan**, NUI Galway

Mental Health Disorder Misidentification in Children: Quantifying Magnitude and Long-Term Consequences

PRESENTER: **Ms. Jill Furzer**, University of Toronto
AUTHORS: Claire de Oliveira, Elizabeth Dhuey, Prof. Audrey Laporte

Some mental health disorders, like ADHD, may be at greater risk of misdiagnosis due to the subjectivity of the diagnosis process. The size of this issue, and whether under- or over-diagnosis occurs, is not fully understood. Furthermore, there is limited research on the long-term socioeconomic consequence of misidentification or late identification. Machine learning offers an opportunity to address these questions through improvements prediction capabilities for underlying disorder risk. We employ ensemble decision tree methods, along with classical econometric approaches to determine ADHD risk. This is done using a rich nationally-representative longitudinal survey in Canada on the health and education of children and youth, as assessed by themselves, their parents and their teachers. Assessing how the identification of mental health disorders in early schooling years falls along the ADHD risk gradient, as determined by eventual diagnosis, provides insight into the magnitude of over- or under-diagnosis and allows for the study of heterogeneous selection in diagnosis. Prediction using classic prediction methods show gender and income to be strong drivers of diagnosis, independent of clinical need. Importantly, ADHD diagnosis is

27% less likely for girls meeting the ADHD DSM-5 symptom severity criteria than for boys. We take advantage of machine learning approaches to incorporate a large covariate set and non-linearity in estimated disorder risk and degree of misclassification. We consider if differences in machine learning prediction and recorded diagnosis differ due to misidentification or to decision-making based on unobservable features. Measurement error inherent in health survey data is also taken into consideration. We assess the impacts of misdiagnosis or late diagnosis on the rate of drop-out, grade failure and in-school discipline through counterfactual simulations. This work has strong policy implications regarding the appropriate use of medical resources for children and the long-term impact on socioeconomic inequality.

Modelling Student Preference Heterogeneity for the Design of Campus Counselling Services

PRESENTER: **Dr. John Cullinan**, NUI Galway

AUTHORS: Darragh Flannery, Brendan Kennelly, Sharon Walsh

Mental health problems are highly prevalent among young people, with a variety of adverse consequences for individuals, families, caregivers and society. Addressing the mental health needs of young people in higher education is particularly important, since evidence suggests that students may be at greater risk of mental health problems than non-students, with implications for both the individuals themselves and for higher education institutions. Moreover, although demand for campus counselling services has risen substantially in recent years, studies have found that many students are reluctant to engage with formal service providers. In order to facilitate greater student engagement, and to help design more effective services, it is important to understand what aspects of counselling service provision are most valued by students. In this context, we present results from a discrete choice experiment (DCE) using a survey of more than 6,000 students enrolled in higher education in Ireland. Applying latent class and generalised multinomial logit models, we find that attributes such as shorter waiting times, extended opening hours and increased information provision are highly valued, while students prefer a counselling service that operates a drop-in booking system. We also find evidence of considerable heterogeneity in willingness-to-pay for attributes across students. For example, shorter waiting times are more highly valued by those with experience of mental health problems and services, while increased information provision is particularly important for first year students and those from lower social classes. We use our findings to make recommendations about how to improve the design of counselling services to help improve engagement, while we also discuss how better services could be financed through a ring-fenced student levy. Finally, our results show that students with no current or previous need for counselling are willing to pay for mental health services, which could be explained by the presence of caring externalities and/or use values among this group.

The Influence of ACOs on Care for Medicaid-Enrolled Children with Behavioral Health Conditions

PRESENTER: **Prof. Marisa Domino**, University of North Carolina-Chapel Hill

AUTHORS: Paula Song, Deena Chisolm, Wendy Xu

Accountable Care Organizations (ACOs), are groups of providers that take responsibility for the care of a defined population and share in savings associated with improved quality and efficiency. One of the key assumptions of the ACO model is that the alignment of financial and quality incentives will result in improved patient outcomes and efficiency, although this has not been consistently found in the growing evidence base on ACOs. We use difference-in-differences models to estimate the effect of ACO enrollment of Medicaid-enrolled children with behavioral health diagnoses in Ohio on measures of health services use relevant for children with behavioral health conditions: access to primary and specialty care, use of the emergency department, and use of psychotropic medications. We used data on similar children in other regions of the state, where managed care but not ACO-model care was implemented on the same date in 2013, as controls.

Children in the ACO region (n=38,568) had a modestly lower rate (1.8% points lower; $p<0.05$) of annual access to primary care. We also find a lower rate of use of specialty mental health services use (-3.4% points; $p<0.01$) and a higher rate of ED service use (2.4% points; $p<0.05$) after ACO implementation. We found no difference in the proportion of the sample that had filled prescriptions for antidepressant, antipsychotic, ADHD or antianxiety medications. ACOs are continuing to grow in use in state Medicaid programs, but the incentives for care may need to be better aligned for children with behavioral health conditions.

Frequent Job Loss and Mental Health Service Utilization Among Korean Young Adults

PRESENTER: **Tae-Jin Lee**, Seoul National University

AUTHOR: Healim Kim

Precarious employment has increased over a few decades. Young adults are most directly affected by these labor market changes. Although there have been many studies on the impact of precarious employment on health, few studies have explored the impact on the utilization and costs of mental health service particularly among young adults. The purpose of this study is to examine the effect of frequent job loss on mental health service utilization among Korean young adults.

The National Health Information Database (NHID) was used to identify frequent job loss and mental health service utilization. We retrospectively followed a cohort of 537,375 young adults (ages 19 to 38) who were first employed in 2010 until the end of 2016.

We used a two-part model in which the probability of using mental health service and the costs of mental health service were modeled separately. The independent variable, frequent job loss, was defined based on the number of job losses for two years after the first employment. To overcome the problem of reverse causality, we excluded those who had been diagnosed as having mental and behavioral disorders within seven years before their first employment and those who had mental disabilities at the time of the first employment. The control variables included age, gender, disability, cancer treatment within one year before the first employment, healthcare costs for one year

before the first employment, the first monthly wage of the first job, number of employees at the first job, industry and location of the first job. We also conducted subgroup analysis by gender.

Descriptive analysis showed that 32.5% of the study subjects did not experience job loss for two years after their first employment, 47.0% experienced one job loss, and 20.5% experienced two or more job losses. The regression analyses showed that more frequent job losses were significantly associated with higher risk of mental health service utilization and higher costs.

These findings were consistent in subgroup analysis by gender, though the magnitude of association between frequent job loss and mental health service costs was greater for male than female. Our findings suggest that policies to improve employment stability can help not only improve mental health of young adults but also reduce national health expenditure.

1:00 PM –2:30 PM WEDNESDAY [Production Of Health, Health Behaviors & Policy Interventions]

Universität Basel | Kollegienhaus – Hörsaal 120

Organized Session: Social Determinants of Health: Role of Education, Social Security Expansion, and Income Disparities

SESSION CHAIR: **David Meltzer**, University of Chicago

Addressing Unmet Social Need for Patients at Increased Risk of Hospitalization: Initial Results of Pilot Study

PRESENTER: **David Meltzer**, University of Chicago

Background: Because health care costs are highly concentrated, interventions to population health must address the needs of high-cost patients. We have previously found that a Comprehensive Care Physician (CCP) model in which patients at increased risk of hospitalization receive care from the same physician in and out of the hospital improves patient experience, health outcomes and reduces hospitalizations. However, a substantial fraction of eligible patients do not engage in care. We developed the Comprehensive Care, Community and Culture Program (C4P) to test whether adding systematic screening for unmet social needs (USN), a community health worker, and community-based arts and culture programing to a CCP program could increase patient engagement and further improve outcomes and studied this through a pilot study with the aim to obtain data and operational experience to inform a definitive trial.

Methods: From 2016-2018 we recruited Medicare patients at the University of Chicago at increased risk of hospitalization and randomized them to C4P, CCP or standard care (SC) with different physicians in and out of the hospital. All subjects were interviewed at baseline and quarterly for up to 2 years. Patterns of USN were assessed in 17 domains using a measure developed by Health Leads and analyzed for patterns relevant for program design. Outcomes between the arms were compared to inform design of the planned larger trial.

Results: 460 patients were recruited with comparable baseline numbers and attributes between the 3 arms. Subjects averaged 5 USN at baseline but USN were very unevenly distributed with 59% having 0-2 needs and the remaining 41% accounting for 87% of needs, with 67% of needs concentrated in 24% of the population with 5+ needs. USN were closely correlated with increased hospitalization rates, including length of stay. Every USN constituted a small fraction of all USN. Given the diversity of and concentration of needs and patient reports of difficulty engaging with multiple organizations to address USN, latent class analysis was done and identified 5 patterns of USN: 1) multiple needs (typically 10+), 2) healthy living (nutrition, exercise, social connection), 3) financial issues, 4) child and legal issues, and 5) few needs. About 2/3 of C4P participants engaged in the arts/culture programming. Despite the absence of differences at baseline, USN paradoxically increased in the C4P group shortly after randomization while C4P subjects reported higher general health status, mental health status and quality of life than CCP patients. Self-reported hospitalization was also lower for C4P vs CCP, but not significantly so. Ratings of physicians did not differ.

Conclusions: Rates of USN are high among patients at increased risk of hospitalization and likely higher than patients initially report. The concentration of USN suggests that interventions must be designed to address clusters of needs. C4P shows promising effects on patient reported outcomes. We are now adapting C4P to focus on clusters of needs as we extend our pilot work in anticipation of a definitive trial that would be powered to examine a broader set of outcomes, including hospitalization rates and total costs of care.

Social Disparities in Exposure to Second-Hand Smoking at Home Among Women in Contemporary China

PRESENTER: **Prof. LEI Jin**, The Chinese University of Hong Kong

China is world's largest producer and consumer of cigarettes. Previous research found that smoking in China mostly concentrates in adult men and men of low socioeconomic status (SES) are more likely to smoke than their high-SES counterparts. Moreover, as the rate of male smoking declined moderately in the most recent cohorts, the SES gaps in male smoking widened considerably. Although the rate of smoking is very low among women, the SES gaps in male smoking may still be an important contributor to health inequalities among women through second-hand smoking, since low-SES men tend to live with low-SES women. Few past studies have rigorously assessed SES gaps in exposure to second-hand smoking in China or the trends in the gaps. This study seeks to fill the gaps. Moreover, we adopt the life course approach to examine how SES gaps in exposure to second-hand smoking among women changed across individual life course and birth cohorts.

We used data from eight waves of a national longitudinal survey spanning 21 years from 1991 to 2011 in China. The analytical sample consists of 69,914 person-year entries representing 22,140 unique individuals. We applied linear and negative binomial growth curve models to examine the trends in SES gaps in the proportion of resident household members who were smokers and the number of cigarettes smoked by resident household members across women's life course for different cohorts.

Preliminary findings suggest that women of low education (<junior high school for pre-1945 birth cohorts and <high school for post-1945 cohorts) were exposed to more smoking at home. The educational gaps in proportion of smokers at home widened for the most recent cohorts of women. The educational gaps can be attributed to the fact that higher proportion of resident household members tend to have low education for low-education women. Our study shows that the negative externalities of make smoking is especially severe for low-SES women. Future policies may need to pay more attention to these vulnerable groups.

Income Inequality As a Social Determinant of Opioid Use Disorder

PRESENTER: **Dr. Zhuo Chen**, University of Georgia

Background: In 2015, there are 251.3 opioid use related inpatient hospitalizations per 100,000 population in the US. Over 33,000 Americans lost their lives due to overdoses from opioids in the same year (National Academies of Sciences, 2017). We explore the association between income inequality and opioid use disorder as a test of the income inequality hypothesis (IIH) in the social epidemiology literature.

Data: We obtained the hospital discharge data from the Agency for Healthcare Research and Quality's National Inpatient Sample 2011 collected among participating hospitals and states in the US. We selected a sample of adult patients aged 18 or over for analysis. Opioid use disorder is defined as having at least one of the following conditions, opioid abuse, adverse effects of opioids, opioid dependence and unspecified use, and opioid poisoning. The individual-level data were linked with income inequality measurements calculated at the state-level using the American Community Survey five year estimates.

Statistical Method: Multilevel linear regression was used. We choose to use linear probability model due to the simplicity in interpretation of its results and the computation burden associated with the large number of observations. Confounding factors include age, sex, rurality, and quartiles of zip-code mean income.

Result: A ten percent point increase in Gini coefficient (measure of income inequality) is associated with 0.9% increase in the probability of opioid use disorder in 2011.

Conclusion/Discussion: We find evidence of income inequality as a social determinants of opioid use disorder. Potential causal mechanisms of IIH include stress induced due to social comparison, reduced social capital, and differences in social polices associated with higher income inequality across states. Further research will explore the association between zip-code level income inequality and opioid use disorder in multiple years.

Income-Based Inequality of Youth Obesity

PRESENTER: **Alfredo Paloyo**, University of Wollongong

EXECUTIVE SUMMARY

This paper investigates the magnitude and drivers of income-based inequality of youth obesity. Using the Household, Income and Labour Dynamics in Australia, a concentration index is calculated and is used to highlight an income-based youth obesity inequality of –0.1225. This is shown to have increased over time. Decomposition analysis shows that one of the greatest contributors to inequality in youth obesity rates is maternal obesity, indicating that the strong heritability of body mass perpetuates income-based inequality of youth obesity rates.

OBJECTIVE

The objective of this paper is to estimate the inequality of youth obesity rates in Australia, and to use a decomposition analysis to examine the drivers of such inequity. Estimating concentration indices achieves this goal. Such a methodology allows for a population-level estimate of the magnitude of inequality that is comparable over time (Wagstaff et al. 2011). In addition, concentration indices can be decomposed to investigate the factors contributing to the estimated inequality (van Doorslaer et al. 2004).

DATA

Data are drawn from nine waves (2006–2014) of the Household, Income and Labour Dynamics in Australia (HILDA) survey. For further information about HILDA, see Summerfield et al. 2015. Although the World Health Organisation (2016a) defines adolescents as young people aged 10–19 years, HILDA is for household members who are 15 years old or above, so our sample of adolescents are restricted to ages 15 to 19. Information on BMI was collected from Wave 6 onwards. After adjusting for pregnancies at the time of the interview, missing information, and non-cohabitation with parents, our final, unbalanced panel consisted of 2,772 adolescents.

METHODS

The concentration index for adolescent obesity can be decomposed to estimate the impact that individual variables have on determining the inequality (Costa-Font & Gil 2013). Importantly, this will allow for an examination of the contribution that maternal obesity makes to

socioeconomic inequality of adolescent obesity. A benefit of using a concentration index for decomposition is that it allows for an estimation of the influence that maternal obesity has on income-related inequality of adolescent obesity at an individual level (Walsh & Cullinan 2015). Other decomposition techniques, such as the popular Blinder–Oaxaca method, require the computation of the influence that factors have on contributing to the inequality between two distinct groups, such as men and women (Walsh & Cullinan 2015).

CONCLUSION

The concentration index for the pooled sample highlights substantial evidence of pro-poor adolescent obesity in Australia, with an estimated value of –0.1225. Estimating concentration indices for the first year of available data (Wave 6 in 2006) and the latest year (Wave 14 in 2014) illustrates that income-based inequality of youth obesity in Australia has doubled over this eight-year period. Furthermore, decomposition of this index allows for an estimate of the contribution and relative importance of a variety of factors to the perpetuation of inequality in youth obesity rates. This represents the first explicit estimate of the contribution of maternal obesity to socioeconomic inequality of adolescent obesity.

1:00 PM –2:30 PM WEDNESDAY [Specific Populations]

Universität Basel | Kollegienhaus – Seminarraum 208

Determinants of Health in Ageing

SESSION CHAIR: **Nasim B. Ferdows**, University of Southern California

Air Pollution and Elderly Cognition: Evidence from Taiwan

PRESENTER: **Ya-Ming Liu**, National Cheng Kung University

AUTHORS: Yen-Ju Lin, Miaw-Chwen Lee

The adverse health effect from air pollution has been wildly acknowledged. Given the longer exposure to polluted air for the elderly, the factors affecting seniors' health could turn into a chronic and even fatal infection for older people. As the proportion of older persons within the whole population keep growing globally in developing or developed countries, the environmental health problem of emerging air pollution-related diseases becomes an important public policy issue.

This study investigates the effect of air pollution on cognition by using Taiwan Longitudinal Study on Aging (TLSA). In the TLSA data, there is a Short Portable Mental Status Questionnaire (SPMSQ) to assess organic brain deficit in elderly patients. This study uses the scores derived from SPMSQ to measure the cognitional function of the elderly. Only these elderly who lived in the city/county at least four years are included in our sample.

We obtain weather variables from 60 general air quality monitoring station sites operated by Environmental Protection Administration (EPA) in Taiwan. These monitoring sites provide the data regarding the concentration of pollutants include PM10 (ug/m3), SO_2 (ppb), NO_2 (ppb), and CO (ppm), as well as atmosphere temperatures, rainfall, and wind speed. Based on the guidance developed by USEPA (2016), we compute the sub-index for each pollutant, and average the sub-indices to construct an air quality index (AQI) as a proxy for air pollution.

In order to estimate the causal effect of air pollution on elder cognition, we need to find instrumental variables that is related to air pollution, but not correlated with elder health or location of residence. Because wind speed is arguably uncorrelated with elderly cognition, the influx of pollution due to variation of wind speed tends to be a randomly determined event uncorrelated with factors related to cognition or residence choices. Thus, the IV estimation can use the as-if random assignment of variation in wind speeds to estimate the causal effect of air pollution.

We find that when the AQI increases 1 unit, the SPMSQ decreases 0.12 points in the OLS estimation and 0.29 points in the IV estimation respectively, implying that air pollution decreases elderly cognition in the long run. Thus, air pollution control policy may entail potentially considerable benefits in terms of elderly mental health.

How Does Retirement Impact Elderly Health: What Role Does Social Network Play?

PRESENTER: **Dr. Wen You**, Virginia Polytechnic Institute and State University

AUTHOR: Asal Pilehvari

In US, by 2020, there will be more Americans over the age of 65 than under 15 years old. Population aging will inevitably lead to increasing burden to health services and Social Security. Therefore, the most direct and effective policies are those targeting elderly health promotion and delaying or mitigating aging health impacts. One of the biggest transitions in life as people aged is retirement since social contacts are a side product of employment that help workers to be mentally and physically active (Börsch-Supan and Schuth 2014). However, relatively few economics studies have addressed this question instead majority of attentions are on the health impact on retirement decisions. Moreover, there are no unified views on the impact of retirement on various aspects of health within the limited literature (Coe and Lindeboom, 2008, Coe and Zamarro, 2011, Insler, 2014, Dave et al., 2008, Behncke, 2012, Sahlgren, 2012).

A fundamental empirical challenge in identifying causal effects of retirement on health is the endogeneity of retirement due to potential reverse causality. The most common instrumental variable used is the official retirement age however it is limited in its correlation with

actual retirement status (i.e., weak instrument problem). Furthermore, in order to examine different degree of retirement influences (i.e., fully retirement, partial retirement etc.) we need more instruments to satisfy the identification conditions. Hence, this study will develop a structural model of retirement decision that considers health production function, social capital accumulation and time and money resource allocation. The model will not only provide theoretical guidance in the search of good instruments but also will enable us to paint the health influencing pathways of different degree of retirement. Specifically, we will examine the following questions: First, the effect of retirement on health outcomes (physical and mental). Second, the effect of retirement on social network. Third, the mediation effect of social network on the retirement's health impact.

We use a newly released nationally representative longitudinal data: The National Social Life, Health, and Aging Project (NSHAP) dataset. This is a population-based panel study of different health outcomes and social life of adults aged 57-85 years.

Preliminary results utilizing temporal exogeneity suggest that the influence of prior retirement status has statistically significant negative effects on individual's health outcomes (both physical and mental health) and prior partial retirement status results in relatively less negative impact on subsequent period's depression symptoms. The social network density and size are showing expected signs and significance in the retirement decisions and mediating health outcomes. We are expected to have the structural equation estimation results ready before the meeting and those structural parameters will help identify the most effective policy target and subgroups aiming at improving elderly health.

Why Older People's Subjective Well-Being Did Not Change After the Great Recession?

PRESENTER: **Nicolas Sirven**, LIRAES (EA 4470)
AUTHOR: Dr. Clémence Bussière

The term "subjective well-being" (SWB) has been used to describe a state of satisfaction with life and emotional equilibrium. It conceptualizes mental health as a state in which 'the individual realizes his or her own abilities, can cope with the normal stresses of life, can work productively and fruitfully, and is able to make a contribution to his or her community'(according the definition of the WHO).

After exploring variations of SWB across time, we investigate the reasons for the potential paradox that the 2009 Great recession was not followed by a change in subjective well-being, with a special attention to older people. Our main assumption is that individuals adapted their preferences under unfavourable circumstances; they gave different weights to the areas of well-being that matter to them so that the overall value of subjective well-being remained unchanged over time.

We propose the CA as an alternative theoretical framework to standard theory and other theoretical approaches that acknowledge adaptive preferences. The empirical model is based on the assumption that capabilities are multidimensional and unobservable, and that they may be measured through observables *functionings*. The CA focuses less on what the individual is made to prefer under the event of deprivation, than what he would prefer under the absence of such deprivations. As a consequence, change in the valuation of the components of SWB (the vector of *functionings*) may indicate a change in the level of well-being, even though the overall level of SWB remain constant.

We use a sample of 12,509 Europeans fromm two waves of the SHARE panel data survey. Our dependent variable, the CASP index, is a standard measure of eudemonic well-being that aims to capture positive aspects for later life. Four dimensions of well-being are considered: *Control*, *Autonomy*, *Self-realisation* and *Pleasure*. We explore the complexity of the relationships among variables using a structural equation modeling (SEM) to conduct simultaneous tests of all relationships and to assess latent capabilities, taking into account measurement errors. In our conceptual *capability model* three types of capabilities (*societal capabilities, health-related capabilities and behavioral capabilities*) are measured (through CFA) according their respective indicators (*functionings)*, and relationships between these capabilities are modeled (within the structural part) as well as their impact on the CASP-12 index, from both SHARE waves.

Our first results provide evidence that change in average SWB is very modest. The first-difference estimates (fixed effects model) suggest that some CASP domains seems to contribute to a worsening in the overall measure of SWB, while change in other domains seem to contribute to an increase in SWB. The two effects contradicting each other could explain why the overall effect remained unchanged. Then, results demonstrate that the impact of capabilities is different between the two waves; After the crisis, *health-related capabilities* are less weighted by agents whereas societal capabilities are more important. Furthermore, after the crisis, having more bad behaviors significantly increase the SWB. The implications extend to the evaluation of policies (health and social programs).

The Impact of Long-Term Care on Mental Health: Evidence from the Survey of Health, Ageing and Retirement in Europe

PRESENTER: **Ludovico Carrino**, King's College London
AUTHORS: Erica Reinhard, Mauricio Avendano

In Europe, publicly funded, home-based, long-term care [LTC] services, including health, personal, and domestic care services, are often provided free or low cost to older people who meet eligibility criteria for physical and cognitive functional limitations. As mental health problems and functional limitations are mutually reinforcing in older age, LTC services may provide additional benefits for mental health among older people. This study examines whether receiving domiciliary LTC impacts mental health among older people by exploiting variation in the legislation that determines individual eligibility for publicly subsidized LTC services across 7 European countries. The sample comes from the Survey of Health, Ageing, and Retirement in Europe (n = 19696), which provides longitudinal data on individuals' use of long-term care services as well as measures of depressive symptoms and feelings of loneliness. We determine whether individuals are eligible for publicly funded, home-based LTC according to the criteria in their country of residence by using self-reported data on mobility

restrictions, cognitive impairment, health conditions, and limitations in the activities and instrumental activities of daily living. As LTC need and utilization are endogenous to mental health, we implement a 2 stage least squares instrumental variable approach with fixed effects, which exploits country-specific eligibility for LTC as an exogenous source of variation in use of LTC services and provides an estimate of the impact of receiving LTC on mental health among older people that is free from bias due to reverse causality, measurement error, and time-invariant confounding. The interaction between individual health conditions and country/region specific legislation is the trigger for causal identification; the individual LTC eligibility status varies both because of different health conditions across subjects and because of different assessments of LTC eligibility for the same health conditions across countries. We also implement several strategies to address both the potential endogeneity of informal care to the instrument and the issue of using in cash services, rather than in kind LTC services. Results thus far suggest that 11.3% of the sample is eligible for home-based long-term care, and eligibility for home-based LTC based on country of residence predicts a 12% increased likelihood of receiving LTC services in the previous year. Second stage instrumental variable estimates of the impact of receiving LTC on depressive symptoms and loneliness are forthcoming. We hypothesize that receiving home-based, LTC improves mental health among older people through several pathways. We therefore expect results to have important public policy implications and to support calls for more inclusive eligibility criteria for home-based LTC.

1:00 PM –2:30 PM WEDNESDAY [New Developments In Methodology]

Universität Basel | Kollegienhaus – Seminarraum 209

Interventions on Risky Health Behaviors

SESSION CHAIR: **Gavin Surgey**, Health Economics and HIV and AIDS Research Division (HEARD), University of KwaZulu-Natal

Impact of Lottery Vs Fixed Incentive on Health Behavior

PRESENTER: **Dr. Bhagyashree Katare**, Purdue University

Background: Only about half the adult population in the US is involved in regular physical exercise and only about 20% meet the Center for Disease Control's physical activity standard. Hence, it is important to study the effect of various interventions on motivating individual physical activity behavior. One of the biggest challenges for interventions to motivate physical exercise is the high cost involved in their implementation.

Objectives: I compare the effect of two experimental interventions designed to increase physical exercise: a direct economic payment in the form of a certain/fixed financial incentive and a behavioral economic incentive in the form of a lottery based financial incentive. The lottery incentive was designed to be a low-cost intervention and the results will be compared with the fixed incentive, a considerably higher cost intervention. The hypothesis is that the lottery incentive will have a modest positive effect in motivating physical exercise in students as compared to a certain/fixed financial incentive.

Data and Methods: The interventions were conducted in spring 2018 at a large public university in the Midwest, US. The intervention spanned for 8 weeks from January to March 2018. 1486 freshmen were recruited during their student orientation to participate in the research project. They were randomly assigned to the three treatment groups and a control group. The three treatment groups were 1) fixed incentive group that received a fixed amount for each visit to the recreation center in a week, 2) high lottery incentive group, the participants were entered in a high payout low probability lottery for every visit to the recreation center in a week, and 3) low lottery incentive group, the participants were entered in a low payout high probability lottery for every visit to the recreation center. All the three treatment group payouts had the same expected value. Participants in the treatment groups received an email every Monday morning over the eight-week period reminding them about their chance of winning the lottery or the fixed payment. The probability of winning the lottery remained same over the period of the intervention. Treatment group students received their payout at the end of every week in the form of an online gift card.

To proxy for physical activity, the outcome variable is attendance at the student recreation center. I collected weekly recreation center data for the participants and their university residency roommates for the academic year (September 2017-May 2018). Student demographic information and their residency hall characteristics along with the de-identified information about their roommates was collected from the university residencies.

Results and Conclusions: I use two different kinds of financial incentives to encourage freshmen exercise at the university recreation center. I compare the outcomes from a low-cost lottery intervention and a high-cost certain/fixed payout financial incentive. These interventions combine a financial incentive with behavioral economics principles. Preliminary results show that lottery incentive was successful in motivating positive behavioral change. These results are important to stakeholders and policymakers, as they are looking for cost-effective interventions for motivating healthy behavior.

Testing an Information Intervention: Experimental Evidence on the Effect of Jamie Oliver on Fizzy Drinks Demand

PRESENTER: **John Gibson**, University of Waikato

AUTHOR: Steven Tucker

The focus of policymakers and researchers concerned about health effects of sugar-sweetened beverage (SSB) consumption has been mainly on fiscal measures, like soda taxes, rather than on information interventions. Over 20 countries now have some form of soda tax and the World Health Organization argues that taxes to raise retail price of SSBs at least 20% will reduce consumption proportionately. Yet much less attention is paid to information interventions, such as health warnings, despite the evidence from tobacco control that such warnings can promote smoking cessation and discourage youth uptake. Notably, at least in one setting (Berkeley, CA) media coverage of impacts of excessive SSB consumption, in the context of a ballot measure on local soda taxes, appears to have shifted demand from regular soda to diet soda even while prices were unchanged, and this may reflect a consumer response to new information.

While there have been a few studies of effects of information interventions on intended SSB consumption, these tend to rely on hypothetical situations, where the answers to questions have no real behavioural consequences. In order to provide firmer evidence, we carried out an experiment to see how an information intervention affects SSB demand. Subjects in our experiment initially made five rounds of purchases, for 14 beverages (energy drinks, colas, and lemonades) selected from a stratified sample of retailers. Subjects faced seven pricing environments, reflecting baseline prices, two *ad valorem* taxes, two specific taxes, and *ad valorem* and specific price cuts to reflect retailer discounting. Subjects then watched a video presentation by celebrity chef Jamie Oliver that highlighted adverse effects of SSBs. The five rounds of choices were then repeated, so this design generate within-subject before and after demands that allow estimates of the causal effects of the information intervention. Our use of the term “experiment” follows standard use in economics, because we rely on directly observable behavioural responses, rather than answers to hypothetical questions. Subjects faced real consequences for their choices, with one of the ten rounds and one of the seven price structures randomly chosen to pay out on the experimental demands. Thus, many subjects left our laboratory carrying drinks that resulted from their choices; this field specificity makes this a *framed field experiment* in the taxonomy of Harrison and List (*Journal of Economic Literature*, 2004).

The results show that quantity bought fell by up to 50% for some SSBs after exposure to the information intervention. Demand for one sugar-free option, *Diet Coke*, rose 36% after the intervention. The impacts under baseline prices were little different to those seen in conjunction with tax-induced price rises. The effects of the information intervention in reducing SSB demand were equivalent to those of a specific tax of $0.50 per litre. Effects of the information intervention were larger for females, for the young, for the less educated, for those usually spending more on soft drinks, and for those who usually ignore sugar content when making purchases.

Simulation of Tobacco Tax Policies in Risaralda, Colombia

PRESENTER: **Sergio Hernández**

AUTHORS: Mr. William Garcia, Carlos H. Arango, Dr. Norman Maldonado, Sandra Marcela Camacho MD, Enriqueta Cueto, Blanca Llorente

Tobacco consumption turnsout in development of Non Communicable Diseases (NCD) such as lung cancer, COPD and cardiovascular disease. As tobacco epidemic moves onward from developed to developing countries, costs related to diseases due to tobacco consumption are expected to grow. In Colombia, tobacco direct treatment costs amount to US$ 2.26 billion. Though efforts have been made towards lowering tobacco consumption, such as increasing tax rates in 2017 (from COP 700 per pack to COP 1,400) and 2018 (COP 2,100), there is still a road ahead. This paper's purpose is to produce ex-ante evaluation of tobacco tax policies effects in health, revenue and treatment costs, in the region of Risaralda, Colombia. We use a microsimulation model composed of three modules: a demographic module for sociodemographic and consumption modelling; a health module interacting with individual's consumption and habits; and health care utilization and costs module. The demographic module determines each individual's sociodemographic characteristics such as income. These characteristics define each indiivual individual behavior in risk factors including tobacco consumption. Using individual epidemiological models, diseases are modelled from risk factors. From risk factors and disease status, mortality risk and death is determined. Simulation of the virtual population under a policy scenario of COP 1,400 tobacco tax in 2017 show reductions in incidence, prevalence and age initiation of smoking, as well as subsequent effects on decreasing incidence on non-communicable diseases and mortality on a time horizon from 2017 to 2050. A simulation scenario of no tax against holding a COP 1,400 tax, shows in 2050 a reduction of 11% in tobacco prevalence and half a year in age initiation. COPD mortality is reduced by 31.5% and lung cancer by 33.4%. In addition to fiscal revenue from the excise tax, that reaches COP 13 billion from 2017 to 2050, reduction in morbidity contributes to the long-term financial sustainability in Risaralda's health expenditure.

1:00 PM –2:30 PM WEDNESDAY [Supply Of Health Services]

Universität Basel | Kollegienhaus – Seminarraum 212

Medical Technology Innovation and Costs

SESSION CHAIR: **David Howard**, Emory University

The Impact of Mode of Drug Administration on Health Care Costs

PRESENTER: **Ms. Anna-Katharina Boehm**, Hamburg Center for Health Economics

AUTHORS: Tom Stargardt, Udo Schneider

Objectives:

Fixed dose combinations (FDC) are drugs that contain multiple active components in a single dosage form. They facilitate drug use through a simpler medication regimen and thus increase medication adherence. However, they lack flexibility in individual dose titration, may increase the risk of adverse events and enhance polypharmacy. Little is known about their effect on economic outcomes. While an increase in medication adherence may raise pharmaceutical spending, costs may be offset by improved health outcomes. Also copayments may be affected. Hence, we examine the effect of FDC vs. lose dose combinations (LDC) in the treatment of type 2 diabetes mellitus on costs in Germany, and investigate potential channels contributing to differences in expenditures.

Methods:

This non-experimental, retrospective, population-based cohort study is based on administrative claims data from the Techniker Krankenkasse, Germany's largest sickness fund. We included T2DM patients who have received monotherapy during a 12 months pre-index period and switched in 2014 to either FDC (intervention group) or LDC (control group). Patients were followed up for 36 months. Costs are defined i) from the payer's perspective, and divided into pharmaceutical, inpatient and outpatient spending and ii) as copayments for the patients. In order to remove confounders, a two-step risk adjustment was applied: We first used entropy balancing controlling for socio-demographic variables, comorbidities and prescription drug groups to eliminate differences in observable characteristics. Second, we applied Difference-in-Difference estimators for each outcome to account for potential time-invariant unobservable heterogeneity. Subsequently, we compared the expenditure between both groups. In order to analyze channels through which FDCs and LDCs may impact expenditure, we calculate adherence as the proportion of days covered, health care resource utilization in terms of physician visits and hospitalizations, as well as disease-specific comorbidities.

Results:

1307 individuals were included into the analysis of which 805 belong to the FDC and 502 to the LDC cohort. In both cohorts, a combination of metformin plus sitagliptin was the preferred antidiabetic dual combination. Entropy balancing created highly balanced distribution of baseline characteristics between groups. Preliminary regression results suggest no significant differences in total pharmaceutical spending, but higher T2DM-related pharmaceutical costs for the FDC group ($p<0.01$). Copayments for patients are lower if treated with a single-pill combination ($p<0.01$). No significant differences in inpatient and outpatient costs were found between both groups.

Discussion:

Preliminary results suggest an increase in diabetes-related pharmaceutical costs if treated with FDC. One explanation may be a higher medication possession through increased medication adherence, or the patent status of the innovative drug. Lower copayments of FDCs may be explained by their single package advantage. No significant differences were found in inpatient and outpatient costs, potentially indicating similar health effects of both administration forms. Further analyses are needed to show whether results are stable, and to investigate the overall effect on cost. So far, there is no strong evidence for incentivizing the use of FDC or LDC from an economic perspective.

Worldwide Pharmaceutical Introduction－Effects of Technology and Price Control in Japan

PRESENTER: **Mr. Tomofumi Anegawa**, Keio University, KBS

Background: The number of new drug introduced in developed countries had declined sharply in the period of 1990-2006, since then it has increased in the period of 2007-2017. Japan has experienced the same trend with delayed speed compared with other countries. This study analyzes the timing of drug introduction in each country and estimate the effects of affecting timing of introduction. For most drugs, the U.S. is the fastest in the timing of new drug introduction among all countries (Schweitzer, et al. 1996). Countries with lower drug prices and smaller market size tend to be late in drug introduction (Danzon et al.， 2003). The U.S. experienced faster introduction in biotechnology drugs and anti-cancer drugs (Graboswki et al. 2006). Japan has been slow in introduction of therapeutically important drugs (Tsuji et al. 2008). We focus on the effects of drug approval regulation and price levels of each country, R&D decisions of individual, profiles of products. We expect that longer and more expensive R&D process, shortage of research resources, lower rates of return on R&D, and slow approval process may account for the decline of introduction up to 2006, while the countries with successful regulatory reform combined with higher price level affect positively on pharmaceutical introduction.

Data and Method: This study analyzes stylized pattern of drug introduction worldwide from 1982 to present. Using IMS lifecycle and other data base, this study constructs data set of 1500 some new drugs approved worldwide. To identify drugs, we use information on ingredient, CAS registry number, and class code (Anatomical Therapeutic Code). By combining patent data, licensing, price, regulatory data, and R&D data, we identify firms, inventors, licensors, licensees, dates, and countries, R&D history. Speed of R&D and introduction are measured by the days between the "priority date" of a relevant patent and the starting date of R&D phase, and the date of approval. By estimating the relationships of introduction, we examine hypotheses.

Results： In the early 1980s, there was large time differences in new drug introduction in the U.S., Japan, and European countries. In the 1990s, the time lag had disappeared between the U.S. and European countries where drug has come to be introduced simultaneously. Products introduced first in Japan have been approved in the U.S. and European countries within one year, while products first introduced in the U.S.and European countries has time lag before they are introduced into Japan. Although introduction lag into Japan has disappeared in the period 1998-2005, certain products are not introduced into Japanese market. The surge of new products since 2006 is associated with new technology and higher prices in developed countries.

Conclusions and limitations: European countries have caught up the U.S. due to coordinated regulatory reforms including the European Medicine Agency. The lag of introduction in Japan is caused by the adoption of tighter new pharmaceutical regulation in 1997. Due to capacity of New technology combined with price control contributed to slowness of introduction in Japan.

Regional Innovation Systems of Medical Devices in Europe

PRESENTER: **Ms. Rucha Vadia**
AUTHOR: Katharina Blankart

Background

The emergence of medical devices and the underlying innovative capacity of enterprises and research institutions has hardly been studied in Europe. As innovation is not uniform across space, variation in innovative capacity of regional innovation systems (RIS) could explain clustering of medical technology hubs. Identifying the determinants of knowledge production function of RIS remains of interest as well.

Objective

We aim to identify RIS for medical devices and determinants of innovative capacity in Europe at technology level. We subsequently analyze the role of private and public funding sources in creating knowledge output across RIS.

Methods

To capture innovative capacity, we describe a knowledge production function of research ideas that is dependent on variations in regional innovation & production environment, academic research and inventory firm activities, public administration and the national environment.

The body of knowledge is captured using the number of publications by Medical Subject Headings (MeSH) for medical devices from the US National Library of Medicine. We identify location of a research idea by analyzing author's affiliations at NUTS-level-3. European RIS may include multiple regions accounting for their geospatial proximity.

Second, we perform regression analyses to determine the influence of public funding programs such as Framework Programme 7, Horizon 2020, European Investment Bank, European Regional Development Fund and Europe Fund for Strategic Investment.

Third, based on the results of quantitative analysis, we conduct qualitative interviews with representatives of SMEs and corporations to understand role of private funding influencing knowledge output in respective RIS.

Results

First results in Germany between 2012 and 2016 suggest that knowledge production is unevenly distributed across MeSH-terms and regions. 302 of the 402 regions showed research activity with a median number of publications 2.11 per region. Average number of publications per MeSH-term was 697 across all regions; average number of publications per MeSH-term per region was 7.

In maximum, 162 regions contributed to research on "Prosthesis Design". Also for "Pedicle Screws", "Bone Screws", "Bone Plates" and "Bone Nails", we identified a high activity of regions, 140 regions for each. Most actively contributing regions were Munich, Berlin, Heidelberg, Hamburg and Freiburg-im-Breisgau with 201, 198, 175, 162 and 149 types of devices researched respectively.

Publication activity was highest in the regions of Munich, Berlin, Hannover, Aachen with 29,498; 19,021; 17,377; 11,231; 8,412 articles, respectively. It was lowest in the regions of Ansbach, Schwabach, Uckermark, Kyffhaeuserkreis, Saalfeld-Rudolstadt, each for 1 article.

Further classification per device categories provides a varied insight. Munich, highest for total articles, and Hamburg, highest for total number of devices to perform research, have only 0-1 number of articles per 100,000 population for "casts, surgical" category.

Conclusion

Identifying European RIS of medical devices allows to understand the role of funding activities enhancing financial capacity of RIS to generate innovation output of medical devices.

The Role of Physician Social Networks in Receipt of Pharmaceutical Industry Payments

PRESENTER: **Justin Trogdon**, University of North Carolina-Chapel Hill
AUTHORS: Aaron N Winn, Aaron P Mitchell, Nicole Fergestrom, Joan M Neuner

Background/Objectives

Financial relationships between physicians and the pharmaceutical industry are common. A large body of research demonstrates that these financial relationships influence prescribing. However, relatively little is known about factors associated with receiving payments from industry. Prior research has demonstrated that physicians form informal networks through shared patients (i.e., patient referrals) that provide opportunities to share information and influence physician behavior. This study aims to assess whether network factors may influence physician financial relationships with industry. We hypothesize that physicians' social networks may influence physicians receiving industry

money via several potential mechanisms. First, physicians may be more likely to accept industry money if their peers also accept industry money due to social norms. Alternatively, physicians who accept money from industry may choose to work in physician groups that encourage such practices (i.e., homophily). Second, if physicians are important within a network, then industry may target them to influence their peers. We hypothesize that importance can be proxied by the centrality of the physician in the network and, further, that the attractiveness of a physician as a target of industry is larger in a dense, tightly connected network because the influence of a central physician is likely large.

Methods

The primary outcome for this study was the receipt of any payments from industry and receipt of payments of $100 or more from industry in 2015. We used publicly available data from Centers for Medicare & Medicaid Services (CMS) databases. First, we used CMS data that records shared patients between all physicians serving Medicare patients in 2015 to construct networks of physicians based on shared patients between physicians. We then merged these networks on the physician level with data that recorded physicians' receipt of payments from pharmaceutical companies in 2015 from CMS Open Payments data. We then examined how network-related factors such as importance within a network, number of connections, density of the network, and proportion of direct connections that receive payments from industry influence the likelihood of receiving payments from industry. We used a modified Poisson model to estimate the adjusted relative risk between network characteristics and receipt of payments, adjusting for gender, specialty, time since graduation, practice size, and practice setting (teaching hospital vs. not) as well as hospital referral region level fixed effects.

Results

Men, older physicians, those in smaller practices, and those that provided care at a teaching hospital were more likely to receive payments. Among network characteristics, we found a large, significant association between peers receiving payments and the physician receiving a payment (aRR = 1.57, 95%CI=1.51-1.64). Physicians' centrality within a network was associated with receiving payments, and this relationship strengthened as the network density increased. However, network density alone was negatively associated with receiving payments. Additionally, we did not find an association between the number of connections and receiving payments.

Conclusions/Implications

Our results suggest that physicians' network characteristics may be an important determinant of whether physicians receives industry payments and should be considered when regulating industry contact with providers.

1:00 PM –2:30 PM WEDNESDAY [Health Care Financing & Expenditures]

Universität Basel | Vesalianum – Grosser Hörsaal EO.16

Organized Session: Strategic Purchasing of Sexual and Reproductive Health Services on the Path to Universal Health Coverage in Low- and Middle-Income Countries

SESSION CHAIR: **Lauren Suchman**, University of California San Francisco

PANELISTS: **Maria Eufemia Chan Yap**, ThinkWell; **Hasbullah Thabrany**, Thinkwell; **Joanne Ondera**, ThinkWell

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2:45 PM –3:45 PM WEDNESDAY [Special Sessions]

Universitätsspital Basel | ZLF – Gross

Closing Plenary: Making Health Economics Matter – Stories from the Frontlines

PANELISTS: **Lise Rochaix**, Paris School of Economics - University Paris 1 Pantheon-Sorbonne; **Joseph Kutzin**, World Health Organization