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Econometric stream

ID 1568: Rajah Nasir
Co-authors: Adam Martin
Title: Do childhood ADHD symptoms affect earnings during adulthood? Evidence from the British Cohort Study

Background: Attention deficit hyperactivity disorder (ADHD) is a condition affecting 2-5% of British children and includes symptoms of inattentiveness and hyperactivity/impulsiveness. Existing studies show ADHD is associated with poorer exam performance and increased likelihood of suspension/exclusion from school. However, little is known about the longer-term consequences, including the effect of ADHD on labour market outcomes during adulthood. The British Cohort Study is tracking 17,196 individuals born in one week in 1970, to the present period. Surveys are conducted every 4 years (11 surveys to date). The BCS is unique amongst UK panel datasets, as it records childhood ADHD symptoms (n=11,295, 66%). Symptoms are reported at age 10 by a proxy-respondent (schoolteacher) on a continuous scale using 9 questions; this ranges from 0 (no symptoms) to 231 (extreme symptoms).

Methods: Mixed effects multilevel modelling is used to examine (1) the effect of childhood ADHD symptoms on labour market participation and (log transformed) annual earnings observed between age 26 and age 50; and (2) how this relationship varies by subgroups (i.e., by gender and employment type).Covariates include: higher education qualification; educational attainment in school, gender; ethnicity; geographic location; hours worked.

Results: ADHD symptoms in childhood were negatively associated with earnings throughout adulthood. The magnitude of effect increased with age. At age 38, and after accounting for differences in educational attainment, childhood ADHD symptoms 40% above the mean resulted in annual earnings of ¬£32,798; in comparison, an individual with mean symptoms earned ¬£33,662. Sensitivity analyses included imputing missing data¬ß, using alternative measures of educational attainment, and using categorises based on severity of ADHD symptoms rather than the continuous scale.

Conclusion: Ours is the first study to examine labour market consequences of ADHD and to analyse long-term effects of ADHD. We use a novel approach to capturing ADHD that focused on symptoms rather than a clinical diagnosis, which is a less reliable indicator of ADHD because of variation in diagnosis by geographic area and socioeconomic background. Our findings will provide employers and policymakers with insights into how people with ADHD can be better supported to realise their full potential in the labour market.

ID 1541: Silvana Robone
Co-authors: Dan Liu
Title: The effect of minimum wages on health in China

Since 2004 the employment regulations in China require that nominal minimum wages should be adjusted at least once every two years in all the provinces of this country. Previous literature mainly focuses on the effects of minimum wages on the employment conditions and income, however the possible effects on the health of workers have received little attention so far. A minimum wage increase might have a positive impact on health through the channel of income or income distribution. However, it might also be adversely linked to health due to a worsening of working conditions (such as the request of higher productivity and/or more working hours). Thus, a priori, the net effect of minimum wages on health is uncertain. By using data from the Wave 1 of the World Health Organization, A Study on Global Aging and Adult Health in China (2007-2010), in our study we estimate this net effect.

We use ten health and well-being domains (mobility, memory, learning, sleep, vision, pain, discomfort. depression and anxiety) as the dependent variables. Since such domains are self-reported and measured on a 5-point categorical scale, the issue of reporting heterogeneity might bias the results of our analysis (King et al. 2004). In order to address this issue, on the top of estimating standard Ordered Probit (OPROBIT) models, we exploit the vignettes, questions which are provided in the WHO dataset and we estimate Hierarchical Ordered Probit (HOPIT) models. We regress each of the aforementioned health and well-being domains on the real minimum wage, by controlling for standard socio-demographic characteristics, employment and working conditions and characteristics of the living environment (such as safety of the neighbourhood and population density). We also control for unobserved residual heterogeneity by including province level fixed effects and year fixed effects.

Results from the OPROBIT suggest that the real minimum wage is negatively and significantly related to several health outcomes. When we consider the results from the HOPIT model, the negative effect of minimum wage appears even larger. As an example, a 100 RMB increase in minimum wage decreases the likelihood of having mental health issues by 6.22%, pain by 13.22% and cognition problem by 15.63%. These negative effects are mostly found for men, for employee in the private sector and with a full time contract.

ID 1522: Juan Segura
Co-authors: Manuel Gomes
Title: Addressing missing data in health econometric evaluation with time varying confounding

Routinely-collected data (e.g. electronic health records and registers) are increasingly used to establish the effectiveness and cost-effectiveness of health interventions, particularly treatment strategies sustained over time, i.e. time-varying treatments. A central feature in these studies is that treatment status is determined at different points in time. Consequently, patient progression typically influences future treatments and outcomes, and is itself affected by previous treatments. Standard econometric techniques such as inverse probability weighting (IPW) can address this time-varying confounding by re-weighting the sample and balance confounders between comparison groups at each time point. A marginal structural model (MSM), which models the treatment-outcome relationship over time, is then applied to the re-weighted sample to estimate the treatment effect. If there are missing data in the outcome and/or confounders, IPW can additionally re-weight the sample according to the probability of observing the data. However, this can lead to biased, inefficient estimates of treatment effects, particularly when missingness affects several variables and is non-monotone (individuals with intermittent follow up data). This paper addresses this limitation by combining IPW-based MSMs with multiple imputation (MI), which is particularly suitable to address non-monotone missing data across many variables.

This study is motivated by an evaluation of alternative biologic treatments for patients with severe rheumatoid arthritis. Data from the US National Data Bank for rheumatic diseases is used to estimate long-term effect of sustained biologic treatment over 6 years on health-related quality-of-life (HRQL) and costs. About 20% of participants had missing data in the outcomes or confounders, such as smoking and baseline HRQL score. Our proposed approach, that uses IPW for the time-varying confounding and MI for the missing data, led to somewhat different treatments effects and narrower confidence intervals compared to an approach that uses IPW to address both the confounding and missingness.
Through a simulation study, we assessed more broadly the performance of the proposed approach across different scenarios with monotone (censoring) and non-monotone missingness in the outcome and confounders, and alternative proportions of missing data. Preliminary findings suggest that our proposed approach provides the lowest biases and root mean squared error compared to standard IPW-based MSMs.

ID 1516: Edward Henry
Co-authors: John Cullinan
Title: Health Spillovers from Serious Illness: Evidence from Multivariate Ordered Probit Models

People are interconnected and ill-health is rarely experienced in isolation. However, while there is extensive research on health spillovers related to caregiving, there is comparatively little evidence on how ill-health may impact non-caregiving family members. This paper employs nationally representative data on Irish adults to examine familial health spillovers from serious illness. Using propensity score matching techniques and multivariate ordered probit models, we examine five distinct dimensions of health and find evidence consistent with large mental health spillovers from serious family illness that are independent of caring responsibilities. Our modelling approach allows us to show that spillovers are not evident in other dimensions of health. We also find evidence of heterogeneity in mental health spillovers by sex and by household income. The results have a range of potential implications, including for the provision of mental health supports and services, for equity of health outcomes, as well as for health economic evaluation. For example, based on analysis of the unmatched sample, we calculate that our estimates of health spillovers are consistent with a 2% reduction in health utility for non-caregiving family members.

ID 1502: Giovanni van Empel
Co-authors: Daniel Avdic, Nils Gutacker
Title: Provider responses to technology substitution: Evidence from the expansion of cath labs in Sweden

Technological innovations that change the way in which goods or services are produced occur in many areas of economic activity, including healthcare. Providers benefit from such innovations by adapting their production technology to maintain or increase their market share, whereas those that rely on outdated technologies are likely to lose market share. This may generate incentives for supplier-induced demand especially in healthcare, where physicians both recommend and provide treatment for their patients.

To study this phenomenon, our paper exploits the relaxation of the Swedish clinical guidelines in the early 2000 that only allowed hospitals with capacity for cardiac surgery to service patients with catheter-based methods. The relaxation effectively enabled smaller hospitals without the capacity to perform surgery to include catheter-based treatments into their service portfolio. The opening of a new catheterisation laboratory (cath lab) allowed patients from the respective hospital,Äôs catchment area to receive catheter-based treatment without having to be referred to hospital with both catheter-based and surgical treatment capacity.

Our main hypothesis concerns whether patients who had indications for cardiac surgery, are more likely to receive catheter-based treatment in a hospital where surgery services are not available. For this purpose, we use detailed individual level panel data on patients, providers and treatments from a nationwide coronary angioplasty register, SCAAR. Our empirical approach adopts a difference-in-difference design, adjusting for both variation across catchment areas over time and patient case-mix to identify the effect of the introduction of a cath lab on patient treatment. We also study the indirect effect from the cath lab opening on the referral hospital that patients were previously assigned to.

Our preliminary results indicate that patients who received treatment in a hospital with catheterisation only capacity were 5 percentage points more likely to undergo catheterisation after the hospital provided such services. We attribute this effect to a reduction in the propensity for affected patients to receive surgical treatment in the hospital they otherwise would have been referred to. We conclude that healthcare providers appear to modify clinical management strategies, even in cases where clinical indications for treatment are transparent.

ID 1487: Júlia González Esquerré
Co-authors: Ranya Alakraa, Rebecca Hand, Steven Paling
Title: The unavoidable costs of being small: Understanding the drivers of patient-level costs

Aim:

This paper investigates the drivers of patient-level costs of delivering health care, using a newly-available dataset with national coverage for England. We focus on understanding which cost drivers could be considered unavoidable for small hospitals. Specifically, we aim to answer the question of whether there are additional costs associated with operating at a small scale and what the evidence is for economies of scale at the department, site and provider levels.

Approach:

Our analysis covers 121 non-specialist acute providers in England that submitted NCC PLICS data for 2018/19 at the episode level for admitted patients. The data is set out in a hierarchical structure, with every inpatient episode belonging to a department (as determined by treatment function code), each department to a site, and each site to a provider (NHS trust). Econometric modelling with HRG fixed effects is used to examine the relationship between costs per episode for admitted patients and the scale of healthcare services (measured in three levels) and other unavoidable cost drivers, whilst controlling for provider and patient-level characteristics.

Results:

We find economies to scale at the department level, and slight diseconomies to scale at the site and provider levels. These findings appear robust to alternative econometric specifications, including non-linear models.

Conclusion: Our findings suggest that reconfigurations where different activity within a provider is merged to form larger departments, without changing the overall number of patients treated within that department, could result in cost savings. Furthermore, our findings can be used to help to inform the design and implementation of sustainability funding targeted towards providers with legitimate unavoidable costs as a result of their scale, and any longer-term payment structures to support this. Given that economies to scale from absolute increases in size at the department level might be compensated by diseconomies to scale from the subsequent increase at the site and provider levels, further work needs to be done to identify providers with unavoidable costs due to their small scale. Our paper also shows the potential benefits of the PLICS data for other research purposes.

ID 1455: Timothy Powell-Jackson
Co-authors: Jessica King
Title: Healthy competition? Market structure and the quality of clinical care in Tanzania

Introduction

The private healthcare sector in many low- and middle-income countries is rapidly expanding. Private sector advocates have long argued that market competition drives private providers to become more efficient and responsive to patients but empirical studies are limited to mostly high-income settings. We examined whether healthcare competition is associated with quality and prices in Tanzania, exploiting primary data on process quality of care and patient safety, including measures from unannounced standardised patients that allowed us to compare quality across providers without confounding due to patient case-mix.

Methods

We used a cross-sectional study design, drawing on data covering 228 private for-profit and faith-based facilities. Our empirical approach exploited the fact the faith-based facilities are more insulated from the pressure of market competition, while for-profit facilities rely on patient revenue for their survival. Using data on the universe of facilities, we developed a geographical measure of competition, based on the density of competing facilities within 5 km of the study facilities. Outcomes included: correct case management, compliance with infection prevention and control (IPC) practices, patient experience of care, and prices. We used mixed effect multilevel regression models.

Results

Greater density of competitors was not associated with better quality. Compared with facilities with no competitors, those with more than five competitors had correct case management that was 2.3 percentage points higher (95%CI -9.4 to 14; p=0.698), compliance with IPC practices that was 3.8 percentage points lower (95%CI -7.7 to 0.2; p=0.060), and patient satisfaction that was 0.014 SD lower (95%CI -0.30 to 0.28; p=0.925). Competition was associated with lower prices. Compared with no competitors, facilities with more than five competitors had prices that were $2.85 per healthcare visit lower (95%CI -5.52 to -0.19; p=0.035). This relationship was driven entirely by for-profit facilities.

Conclusion

The findings suggest that patients in areas with greater competition benefit from lower prices. However, there is no evidence that competition in this setting is a potential driver of better quality. The results are consistent with the idea that patients are more sensitive to price than hard-to-observe quality.

ID 1474: Mauro Laudicella

Co-authors: Paolo Li Donni, Kim Rose Olsen, Dorte Gyrd-Hansen

Title: Age, morbidity, time to death, or something else? The residual increment of health care expenditure in a universal health care system

Background- Evidence shows that age and morbidity are the main drivers of health care expenditure (HCE), but little evidence on the residual increment (RI) of HCE that is not explained by these factors and could be due to technological progress. Evidence shows approaching time to death (TTD) prompts an exponential increment of HCE suggesting that future HCE is likely to fall as a result of increasing life expectancy. However, no evidence that delaying TTD is a free lunch.

Methods- the RI is measured in repeated cohorts of patients experiencing similar health shocks at different time points over a ten-year window. A three-parts survival-GLM model is used to decompose the part of the RI that is due to delaying TTD and the part that is due to increasing intensity of resource use. Heterogeneity analysis is conducted in a basket of diseases with the greatest gains in life expectancy in past decades. A very rich dataset is built from the Danish National Patient Register.

Results- Average HCE per person increased by 16.90 percentage points in the last eight years to 2013-14; the RI that is not explained by variation in age and morbidity is 10.28 percentage points concentrated in the first year after the health shock and gradually reducing to zero in year 2 and year 3. Patients experience a noticeable increment in survival rates over time also concentrated in the first year after the health shock. Delaying TTD explains about 1/10 of the RI one year after the health shock and 1/3 three years after. The RI of HCE is heterogeneous with respect to the specific disease that triggers the health shock: two times larger in cancer patients than in the overall population with 90% explained by delaying TTD in these patients.

Conclusions- Age and morbidity are not good predictors of increment in HCE over time in patients experiencing a health shock who absorbs 23.5% of national healthcare resources. Other factors, such as technological progress and reorganisation of services, might be important drivers of HCE. In these patients, delaying TTD can result in increasing HCE contrary to suggestions from other studies.

ID 1447: Padraig Dixon
Co-authors: Sean Harrison
Title: Genome wide association study and genetic prediction of healthcare costs

BACKGROUND
Healthcare accounts for a substantial proportion of economic activity in all industrial economies. Healthcare spending at the level of the individual can be considered as a phenotype ‚Äì that is, a trait that may exhibit some degree of heritability. Heritability refers to the proportion of variance in a phenotype that is explained by genetic factors in a population. Quantifying genetic contributions to healthcare spending may serve a number of important objectives including identifying genetic influences that predispose individuals to hospitalization and treatment, identification of interventions, and the prediction of future healthcare costs. We therefore performed the first genome-wide association study (GWAS) of healthcare costs

DATA
Our data were drawn from the UK Biobank study, a large prospective cohort study of some 500,000 adults aged between 37 and 73 at recruitment during the period 2006-2010. We modelled costs associated with episodes of inpatient hospital care and with primary care consultations. We used linkage disequilibrium regression to measure heritability and genetic correlations with other traits. We developed a prediction model using k-fold cross-validation.

RESULTS
A total of 310,913 individuals were included in the GWAS, of whom 54% were women. Three loci attained genome-wide levels of significance, none of which have previously been linked to other phenotypes. Heritability was estimated to be 0.028 (95% CI: 0.024 to 0.030). Strong genetic correlations were obtained with overall measures of health including unemployment due to ill health and BMI. Associations between healthcare cost and polygenic risk scores (PRSs) were weak, with little difference between healthcare costs for individuals in different quintiles of the PRSs. The results indicate that prediction of future healthcare costs at the level of the individual from these data would be futile, although future work will explore whether the results may be informative for group level prediction.

CONCLUSIONS
We identified three loci that increase healthcare costs. Heritability was modest, and genetic correlations were strongest with conventional indicators of health. The results suggest that genetic data may not be

helpful in predicting future healthcare costs, although this finding may be influenced in part by the good general health of the average UK Biobank participant.

ID 1512: Panagiotis Kasteridis
Co-authors: Nigel Rice, Rita Santos
Title: Characterising end of life health care expenditure

Objectives

End of life (EOL) care spending is a major component of aggregate medical expenditures. Many policy makers across the world have advocated reductions in the cost of care during the last year of life as a means to improve health care budgets. However, health spending starts to increase several years before death and focusing on such a short period maybe myopic. We characterise EOL care into profiles of expenditure during the final three years of life and we determine the drivers and characteristics that underlay such profiles.

Data

We follow individuals who died between 2012 and 2014 for a period from 36 months before death to death. We use primary care data from the Clinical Practice Research Datalink database linked to secondary care data from the Hospital Episodes Statistics database to calculate patients,Äô monthly costs for consultations, diagnostic tests, prescriptions, inpatient stays, outpatient appointments, and A&E visits.

Methods

We employ group-based trajectory models (GBTM). Based on the assumption that population is composed of a mixture of distinct groups defined by their developmental trajectories of behaviour, GBTMs identify these groups along with their trajectories.
We estimate the impact of demographic, socioeconomic, and clinical characteristics in determining membership in a trajectory group as well as the impact of various conditions in altering the shape of spending trajectories.

Results

Our analysis identified four trajectory groups: high cost with late rise, moderate cost with late rise, moderate cost, and persistent low cost. We found that most of the conditions recorded 36 months before death increase the risk of following the high cost late rise trajectory. However, the effects are small. Only the concurrent presence of morbidities results in substantial changes in the probabilities of group membership. Morbidities also alter the group trajectory with the effects being significantly larger for the high cost late rise group.

Conclusions

Identifying spending patterns of individuals over a longer period prior to death can inform policy makers where expenditure savings can best be made. For example, persistent use of high expenditure care may be associated with certain chronic conditions and functional limitations where interventions can achieve large savings.

ID 1562: Simone Ferro
Co-authors: Chiara Serra, Alessandro Palma
Title: Allowed Yet Dangerous: Prenatal Exposure to Moderate Air Pollution and Early Life Health Impact

Matching fine-grained satellite estimates of PM10 concentration to administrative longitudinal data covering birth certicates, pharmaceutical prescriptions and hospitalization records of a large Italian Region, we present novel evidence of the medium-term health effects of prenatal exposure to moderate levels of air pollution and we quantify the associated monetary costs for the National Health Service. Estimates from a two-way fixed effect model with controls for weather conditions and economic activity show that higher concentrations of PM during gestation lead to lower Apgar score, lower birth-weight, birth-length and head circumference, and to a lower incidence of breastfeeding. Results from unconditional quantile regressions show that the effects are concentrated on children already at risk. In the medium-term, we document permanent higher pharmaceuticals consumption and hospitalization rates in the first 11 years of life. Results are robust to the inclusion of mother FE. We rule out possible compositional effects showing that local fertility rates and geographical mobility of parturients do not respond to air pollution in our setting.

Results from our analysis suggest that detrimental effects of air pollution for pregnant women are sizeable even at concentration levels of PM that are relatively low and considered acceptable by the current environmental regulations. We contribute to the existing literature on several aspects. First, we employ a causal approach to investigate the effects at birth of in-utero exposure to particle pollution on a very large set of newborn's health indicators. Second we evaluate whether these effects persist after birth, looking for the first time at pharmaceutical consumption and hospitalisation costs up to 11 years after birth. Third, we provide evidence that mothers do not avoid air pollution during gestation in our setting. Finally, we provide a back-of-the-envelope calculation of the associated aggregate monetary cost. Given its effect on individual health and the associated monetary costs, more effort is needed to reduce air pollution.

ID 1483: Andrea Gabrio
Co-authors: Baptiste Leurent
Title: Linear mixed models to handle missing at random data in trial-based economic evaluations

Trial-based cost-effectiveness analyses (CEAs) are an important source of evidence in the assessment of the cost-effectiveness of health interventions. In such trials, cost and effectiveness outcomes are commonly based on measures collected at multiple time points, combined in an overall measure such as QALYs or total cost. A recurrent problem is that some individuals may drop out during the trial, and some of the observations may be missing.

The standard approach often restricts the analysis to the complete cases, therefore discarding some relevant observations, and leading to biased results when the completers are not representative of the population. Other methods, such as multiple imputation, have been recommended as they make better use of the data available and are valid under less restrictive Missing At Random (MAR) assumption. However, recent reviews have shown how practitioners are still hesitant to use these methods, perhaps because of a lack of familiarity with the approaches, computational time, or the additional analytical complexities arising from their use.

Linear mixed effects models (LMMs) offer a simple alternative to handle missing data under MAR without imputation, which have not been very well explored in the CEA context.
In this manuscript we aim to familiarise readers with LMMs and demonstrate their implementation in CEA. We illustrate the approach on a recent trial of antidepressant, and provide the implementation code in R and Stata.

To our knowledge, this is the first paper exploring the use of LMMs to handle missingness in trial-based CEA. We hope that the more familiar statistical framework associated with LMMs, compared to other missing data approaches, will encourage their implementation and move practitioners away from inadequate methods.

Evaluation stream

ID 1431: Tristan Snowsill
Co-authors: -
Title: Computationally efficient calculation of the mean, variance and higher moments of the cross-sectional sojourn time distribution in Markov cohort models

Markov cohort models are frequently used in health economic evaluations and are characterised by having a finite set of health states, discrete time steps (cycles), and the Markovian assumption that the current state encodes all necessary information to model payoffs and future transitions between states. The number of cycles that a portion of the cohort has spent in a particular state is known as the sojourn time. In each state there may be multiple portions of the cohort with different sojourn times, since arrivals may have occurred in multiple previous cycles. We term this the cross-sectional sojourn time (CSST) distribution. Markov cohort simulations typically encode no information about the CSST distribution, instead using tunnel states if sojourn time is relevant for payoffs or transitions. Tunnel states can be detrimental to the computational

efficiency of a model, but in some cases it may be desirable to relate the payoffs in a state to the mean, variance and/or higher moments of the CSST distribution. For example, if the QALYs accrued in a cycle should decrease linearly with sojourn time, the average QALY weight can be determined from the mean sojourn time.

We show that the moments of the CSST distribution can be calculated using recurrence relations in a computationally efficient manner. This is achieved by noting that the CSST distribution in one cycle is a mixture of the CSST distribution in the previous cycle (shifted right by 1) and a degenerate distribution on 1. The right-shifted CSST distribution has mean 1 greater than the original CSST distribution and identical central moments. Properties of mixture distributions are used to derive the mean, variance and higher central moments of the CSST distribution (from which raw moments and standardised moments can be calculated).

We consider a relapse remission example model with a single payoff of interest which is accrued in the relapse state, at a rate which is a sigmoid (logistic) function of sojourn time. We compare the results when no adjustment for sojourn time dependency is included against a tunnel state model and models which track the moments of the CSST distribution.

ID 1525: Helen Dakin
Co-authors: Apostolos Tsiachristas
Title: Resource allocation under multiple constraints: Extensions of existing decision support tools

Reimbursement decisions are frequently based on the results of cost-utility analysis performed on one intervention at a time that assume budget is the only constraint on the decision and use static cost-effectiveness thresholds that presumably reflect the shadow price of a quality-adjusted life-year (QALY). However, this decision framework may be unsuitable for some health interventions, including joint replacement, COVID-19 interventions, and healthcare programs for low/middle income countries. Firstly, the cost of these interventions would account for a large proportion of the healthcare budget and may therefore have a non-marginal effect on the shadow price of a QALY. Secondly, the monetary healthcare budget may not be the only constraint: for example, there may be limited numbers of intensive care beds, ventilators, surgeons, organs for transplantation or operating theatres. Decisions to invest in or expand interventions with large budget impact and/or constraints on resources may therefore require simultaneous decisions about disinvestment in existing interventions.

Using literature on rationing and reimbursement in healthcare, we identified three alternative frameworks for simultaneous decisions about investment and disinvestment under multiple constraints. Firstly, constrained optimisation naturally considers multiple constraints, although it may produce a suboptimal allocation of resources, especially when constraints are flexible. Secondly, we propose a broadening and shortening of the cost-effectiveness league table approach that enables decision-makers to make trade-offs between the proposed intervention and existing interventions close to the shadow price of a QALY, while considering additional criteria and constraints. Thirdly, we propose a modification of the standard multi-criteria decision analysis (MCDA) framework to allow for budget constraints and resource constraints as well as considering broader benefits. We use numerical examples to demonstrate how the three alternative frameworks would operate if we were considering expanding use of joint replacement within a hypothetical set of existing treatments.

These frameworks could be used in local commissioning and/or health technology assessment to supplement standard cost-utility analysis for interventions that have large budget impact and/or are subject

to additional constraints. However, they all require additional information on the costs, benefits and resource implications of interventions currently delivered in the healthcare system, which is likely to require further research.

ID 1507: Pedro Miguel Ramalho Rodrigues
Co-authors: David Meads, Silviya Nikolova
Title: Estimating costs and quality of life impact of caring for people living with frailty

Introduction: Frailty is a common clinical syndrome in older people that carries risk of poor health outcomes. Advancing frailty is associated with significant healthcare costs, morbidity and mortality. The burden of care often falls on informal caregivers which negative impacts on their productivity and quality of life (QoL). It follows that any intervention to manage frailty may have spillover benefits for caregivers.

Aim: This study aims to estimate the impact of the provision of informal care to frail people on the caregiver productivity and QoL to inform incorporation of spillovers into economic evaluations.

Methods: We reviewed currently available observational datasets in the UK and created a matrix of relevant variables to enable estimation. We performed a secondary analysis of prospective cohort data from two large nationally-representative community based studies in England: Community Ageing Research 75+ (CARE75+) study and Understanding Society. Frailty was measured using two established frailty models ,Äì the cumulative deficit model and the electronic frailty index (eFI). We used linear and non-linear methods for number of hours of informal care analysis including frailty category, sex, living alone and ethnicity as key covariates. An opportunity cost approach is used to assign a value to displaced work time of informal caregivers and estimate productivity losses. We estimate the relationship between hours of informal care provided and QoL using EQ-5D scores from Understanding Society.

Results: Initial OLS results show that the number of hours of informal care provided is higher in older frail people, females, those who are not living alone, and ethnic groups such as Asian and Black/Mixed ethnicities. It is also statistically significantly higher for people with moderate and severe frailty according to the eFI, and those categorised as vulnerable or frail according to the cumulative frailty index than in lower frailty groups.

Conclusion: The burden of informal care of frail people imposed on caregivers, translated by the number of hours spent caring, increases as people become frailer. Costs and QoL impacts may be used in future economic evaluations incorporating spillovers.

ID 1497: Sarah Bates
Co-authors: Penny Breeze, Paul Norman, Alan Brennan
Title: Validating the use of estimated intervention effects on psychological variables to predict BMI and the cost-effectiveness of a behavioural weight management intervention

Objectives: Pre-trial health economic modelling can inform the design of behavioural weight-management interventions but requires an estimated impact on weight which can be challenging to predict. However, recent research has aimed to link the content of a behavioural intervention to mechanisms of action, described as the constructs through which an intervention impacts on the outcome. This study examined the addition of psychological mechanisms of action to a health economic model to examine the feasibility of conducting pre-trial modelling based on change in mechanisms of action by testing (i) if Body Mass Index (BMI) at over 2 years can be predicted using mechanisms of action, (ii) if cost-effectiveness estimates are equivalent to those generated when treatment effect on BMI is entered directly, and (ii) if baseline levels of mechanisms of action impact cost-effectiveness.
Methods: Dietary restraint, habit strength and autonomous diet self-regulation were identified as mechanisms of action of a UK weight-management intervention (n=1,267) and were incorporated into the

School for Public Health Research microsimulation model. Estimated BMI change at years 1 and 2 and long-term cost-effectiveness were compared for three model specifications: applying mean BMI change in each treatment group (Direct), BMI change in each treatment group adjusting for demographic factors (Conditional) and treatment effect based on demographic factors and change in mechanisms of action (MoA). Eight subgroups were defined according to baseline scores on the mechanisms of action.
Results: There was no significant difference between the mean BMI at year 1 and 2 generated by the MoA model and the mean of the study data. The BMI distribution and cost-effectiveness outcomes generated by the MoA model were not significantly different from those generated by the Direct and Conditional models. Cost-effectiveness did not vary across the eight mechanisms of action subgroups.
Conclusions: Inputting observed or predicted change in these mechanisms of action may be a reliable proxy for change in BMI when estimating cost-effectiveness; this supports using mechanisms of action in pre-trial modelling to estimate change in BMI and long-term cost-effectiveness.

ID 1494: Nicola Mcmeekin
Co-authors: Andrew Briggs, Olivia Wu
Title: Conceptual model guided trial-based health economic analysis: increasing understanding and reducing variance?

Introduction

In standard health economic evaluations alongside clinical trials, study data are commonly analysed comparing costs and outcomes between treatment arms. However, as trials are rarely powered for health economic outcome differences, it is not uncommon for results of treatment-arm based analyses to be inconclusive, showing no significant difference in costs or outcomes between arms. While conceptual models are commonly advocated and developed for decision-analytic modelling-based studies, they are rarely used in the context of trial-based analyses. We propose a new role for conceptual models to further investigate and understand study data in these scenarios, extending analyses beyond treatment-arm based comparisons. We argue that conceptual model driven analyses have a number of advantages, especially for studies that are underpowered for economic outcomes.

Proposed approach

The definition of a conceptual model in this context is a visual simplification of assumed trial mechanisms driving outputs important to health economics. Mechanisms driving the conceptual model can be biological, behavioural or policy change.
The conceptual model depicts associations between key components in the trial mechanism. We propose that these associations are used to guide the conceptual model driven analysis, results of which are compared to the conventional treatment-arm based analysis. The associations are explored using regression techniques where key components in the conceptual model are differentiated into explanatory and dependent variables.

Results

from these regressions are combined to produce cost-effectiveness estimates with bootstrapping utilised to produce cost-effectiveness planes and other representations of uncertainty. The results of these analyses can confirm the validity of the conceptual model and accuracy of the mechanisms driving the study results, allowing valuable additional insight into study data beyond standard treatment-arm based analyses.
Case studies

The conceptual model guided analysis is illustrated using data from two existing trials with inconclusive results. Conceptual models were used to specify appropriate regression-based models of existing trial data. Comparing these conceptual model driven analyses to treatment-arm based analyses gave additional insights into understanding why the original studies were negative. We further demonstrate how conceptual model driven results lead to variance reduction in net-benefit, even when significance of the results remains inconclusive.

ID 1570: Houra Haghpanahan
Co-authors: Jim Lewsey, Claudia Geue, Robert Lindsay, David McAlliste, Elaine Butterly, Jesus Rodriguez Perez, Sarah Will, Peter McMeekin
Title: Developing a Scottish Type 2 Diabetes Policy Model and a Web-based Decision Aid dashboard

Policy models predict life expectancy and enable policy makers to use remaining life years and quality adjusted life years (QALYs) as metrics to assess cost-effectiveness of interventions. Global increases in diabetes prevalence and related healthcare costs from hospitalisations, prescriptions and treating complications support the need for high quality evidence on cost-effective interventions to improve Type 2 Diabetes (T2DM) outcomes. The National Institute for Health and Care Excellence in the UK have been exploring real-time models for use in their technology appraisal processes (models where changes in outputs can be seen almost instantaneously after changing inputs). Simulation models are attractive because they allow incorporation of heterogeneity in patient characteristics and interdependency, but their disadvantages include their lack of transparency and difficulty in real-time implementation due to long computational times. As an alternative we explore the use of state transition modelling employing parametric survival analysis and generalised linear modelling with restricted cubic spline functions to extrapolate outcomes . Our aim is to develop, validate and assess the performance of a T2DM policy model, and develop a web-based decision aid for real-time implementation by policy-makers, clinicians and patients.

Data were obtained from the Scottish national register of people with a diagnosis of diabetes in which socio-demographic and clinical measures are recorded linked to hospitalisation, prescription and death records at the individual level. A state transition cohort model was applied to estimate transition probabilities and quality adjusted life years (QALYs) of a cohort of people with newly diagnosed T2DM. We developed a two-state (alive-dead) parametric survival model using age, sex, socio-economic deprivation, HbA1c, HbA1c plus one-year, systolic blood pressure (SBP), SBP plus one-year, smoking status, coronary heart disease and stroke as covariates.

We use a web-based tool using Shiny R package to present model outputs in the form of a dashboard with interactive figures and tables to illustrate how changing risk factors alters remaining life expectancy, remaining QALYs, risk of T2DM complications and healthcare costs.

ID 1529: Laia Cirera Criville
Co-authors: Elisa Sicuri, Judit Vall Castelló, Joe Brew, Francisco Saúte
Title: Impact of a malaria elimination initiative on school outcomes: Evidence from Southern Mozambique

We exploit an ongoing malaria elimination initiative implemented in Magude district (Southern Mozambique) that started in 2015 as a quasi-experiment to estimate the impact of malaria on selected school outcomes. We use as control a neighbouring district (Manhica) with similar socio-economic and epidemiological characteristics. By employing a difference-in-differences (DiD) approach, we first show that malaria incidence significantly dropped due to the intervention in the treated district. We then examine whether this positive health shock had an impact on school outcomes. Using school registers, we generated a dataset on school attendance and grades for 9,848 primary-school students from 9 schools (4 in the treated district and 5 in the control district). In our main specification, a repeated cross-section analysis, we find that the elimination project led to a 28 percent decrease in school absenteeism and a 2 percent increase in student's performance. Our results are robust across different specifications, including a panel DiD individual fixed effects estimate on a sub-sample of students. These findings provide accurate evidence on the negative impact of malaria on human capital accumulation and suggest remarkable economic benefits consequent to its elimination.

ID 1528: Jenny Shand
Co-authors: Manuel Gomes, Steve Morris
Title: The impact of informal care on health and social care utilisation across five settings of care for adult residents of Barking and Dagenham

Background

Approximately 6.8 million people in the UK are informal carer, with an estimated economic value of ¬£132bn a year. The English NHS has recently committed to improving the identification and support of informal carers as a way of improving the health of people with care needs as well as reducing their reliance on formal care services. This policy assumes that informal and formal care are economic substitutes, but previous studies have failed to establish whether these are substitutes or complements. Having an informal carer may mean reduced need for formal care (e.g. nurse visits), but can equally mean improved access to additional care services in order to meet full care needs. The study of such relationship has been often limited to a specific care setting.
This study addresses this gap by exploiting a linked dataset in East London, and assessing whether individuals with a carer have different levels of health care utilisation across five distinct settings of care when compared to those who do not have a carer but have similar characteristics.

Methods
We used linked data from N=114,393 adult residents of Barking & Dagenham between April 2016 and March 2017. We matched N=1,295 individuals with a carer to individuals without a carer according to socio-demographic, economic, health and household characteristics. We estimated differences in health care utilisation between the matched groups across five care settings: primary, secondary, community, mental

and social care. We conducted a number of robustness checks according to type of matching and adjustment model.

Results

Having a carer was associated with higher total healthcare costs (¬£2,662 CI ¬£1,595, ¬£3,729) compared to the matched control group. The higher cost was found across all care settings, with social care accounting for almost 40% of the overall difference. The results remained fairly similar across a broad range of sensitivity analyses.

Implications
Our findings suggest complementary service use induced by carers is likely to dominate any substitution effect. Having a carer may be a key element in enabling access to services. As such, there may be wider inequalities in service access for people without a carer.

ID 1446: Katja Grasic
Co-authors: Luigi Siciliani
Title: Can financial incentives shift health care from an inpatient to an outpatient setting?

This paper studies the effects of a financial incentive scheme that encourages the shift from a high-cost to a low-cost setting. Specifically, we examine the effect of the Best Practice Tariff (BPT) for outpatient activity that rewards providers for treating patients in an office-based outpatient setting, rather than a theatre-based inpatient setting. The scheme, introduced across English hospitals in 2012, focuses on three procedures, of which two are high-volume diagnostic procedures (diagnostic cystoscopy, diagnostic hyteroscopy) and the third is a form of sterilisation for women (hysteroscopic sterilisation). The scheme operates by increasing the price paid for the office-based outpatient procedure and, in the case of two diagnostic procedures, by also lowering the price paid for the procedures performed in the inpatient setting. We employ difference-in-difference analysis in which we compare the changes in the proportion of patients treated in an outpatient setting for the incentivised procedures relative to the selected control procedures. Our results show that a targeted incentive scheme can result in a swift and substantial change in the choice of the treatment setting. We find a positive and significant effect of the policy on the probability to have the procedure performed in the outpatient setting for all three incentivised procedures, with the largest effect observed for cystoscopy and hysteroscopy (35.0 percentage points (pp) and 9.0-16.4 pp, respectively). The observed policy effect is smaller for sterilisation (3.7 pp). We do not observe a strong effect of the BPT policy on total volume of the incentivised procedures, nor on the inpatient waiting time for the procedure. As the outpatient procedures are performed without anaesthesia, they are associated with increased risk of pain, resulting in a premature interruption of the treatment and reschedule of the procedure at a later date. Our results show a positive, but statistically insignificant increase in the probability to have the procedure repeated within 60/90 days for hysteroscopy, while no increase was observed for other procedures. We further show that the policy had a positive and significant effect on shifting the setting for closely related, but non-incentivised procedures.

ID 1554: Marc D'elbee
Co-authors: Linda Sande, Collin Mangenah, Lawrence Mwenge, Gesine Meyer-Rath, Fern Terris-Prestholt
Title: Characterising methods to project health service costs at scale in low- and middle-income countries ,Äì the case of community-based HIV self-testing scale-up in southern Africa

Introduction

There is a dearth of evidence on methods for projecting costs at scale for programming and planning. Accounting cost functions (ACF) identify fixed and variable costs through stepwise analysis of a production process; econometric cost functions (ECF) apply statistical inference to project costs, simple cost multipliers (SCM) multiply a single unit cost by outcome quantities. While ACF/ECF drive production costs at scale, in most cases we do not have the luxury of collecting large location-specific cost data, and SCM is commonly used. This study compares and contrasts these approaches using site level cost data for community-based HIV self-testing programmes across five countries in Southern Africa including Lesotho as our case study.

Methods

Costs were collected alongside programme scale-up between August 17-April 19 in Lesotho. We observed three scale-up phases of approximately 6 months each (period 1: December 17-April 18; period 2: May 18-October 18; period 3: November 18-April 19). For SCM, we used standard costing methods (1 year observation ,Äì August 17-August 18). The same cost data set was used for the ACF. ECF was estimated using a linear regression of the log-transformed average cost variable using data collected between June 2016-April 2019 from the same implementer in 79 sites in Malawi, Zambia, Zimbabwe, South Africa and Lesotho.

Results

Over the three study periods, observed average costs are $13.4 in period 1 (12,471 kits distributed), $11.3 in period 2 (14,099 kits), and $8.9 in period 3 (25,106 kits). SCM projects $13.8 (18,271 kits). At similar scale of these observed periods, the ACF estimates $17.1, $15.9 and $11.9, whereas the ECF projects $4.4, $4.3 and $4.0, respectively. While SCM estimate costs with reasonable accuracy at similar scale of our observed period, its application might be limited at more extreme scales. ACF overestimates costs whereas ECF underestimates them. By design, ECF is more likely to capture overall programme efficiencies while ACF might ignore them, these results suggest that a combination of both approaches can potentially provide a reliable range for projected costs. Next steps are to identify simplified projection methods, accurate enough based on intended use, which do not require extensive data collection.

ID 1539: Ian Koblbauer
Co-authors: Rafael Pinedo-Villanueva
Title: Application of trial-derived relative effects to real-world baselines for cost-effectiveness analysis.

Background: Assessing cost-effectiveness of interventions in real-world populations often relies on trial-derived relative treatment effects applied to external baselines. In the context of time-to-event (TTE) data, complex hazards in baseline models as well as non-proportional hazards among comparators can make modelling of data for use in cost-effectiveness analysis (CEA) complex. The current work-in-progress provides an overview of common issues one may experience when applying trial-derived relative treatment effects to external real-world baselines and follows with suggested methods that can be used to address them.

Methods: Methods for applying trial-derived relative treatment effects to real-world baselines are explored in the context of TTE data from a previously published CEA. Scenarios assessing various methods (standard parametric models and flexible spline-based models) for fitting complex baseline hazards and applying non-proportional treatment effects are assessed in terms of the Akaike information criterion (AIC) and Bayesian information criterion (BIC), visual inspection of goodness-of-fit and extrapolation, as well as relevance for CEA in terms of life years gained (LYG).

Results: Spline-based models with higher degrees of freedom best captured time-varying treatment effects according to visual inspection, however demonstrated overfitting according to the AIC and BIC. Standard parametric models captured complex hazards seen in the baseline data poorly in terms of the AIC and BIC and visual inspection whereas spline-based models performed well. Applying time-varying relative effects to complex baseline hazards required flexible approaches. Impacts on absolute LYG were considerable between various scenarios, however incremental LYG were less sensitive.

Conclusions: The work demonstrates that applying trial-derived relative effects to real-world baselines for use in CEA can require balance between complexity of models and adequacy and appropriateness of data capture for use in CEA. Additional models for capturing TTE estimates should be explored. Further work is required to evaluate impacts in the context of fully executed cost-effectiveness models.

ID 1547: John Buckell
Co-authors: Winnie Mei, Frauke Becker, Philip Clarke, Paul Aveyard, Susan Jebb
Title: Health-Related Quality of Life (HRQoL) and BMI: An IPD Meta-Analysis of Randomized Controlled Trials

Understanding the relationship between BMI and quality of life is central to economic evaluation. Indeed, a major determinant of the cost-effectiveness of weight management interventions is the assumption made about how lowering BMI impacts on health-related quality of life (HRQoL). Many economic evaluations have assumed a direct relationship between reducing BMI and improvements in HRQoL. Currently, systematic reviews and meta-analyses of secondary data have not found consistent evidence of the association between BMI and HRQoL. The current evidence base is, however, limited insofar as estimates of the relationship are based on data from single studies or meta-analyses. Here, we advance the evidence base by meta-analysing longitudinal, individual patient data across five randomised controlled trials of intentional weight-loss. The HRQoL-BMI relationship is estimated using econometric models that control for trial-specific and individual-specific effects. Models further adjust for individual characteristics that vary over time and time. A novel approach to mapping across measures of quality of life is proposed, namely specifying a latent variable for HRQoL. We relate the latent variable to measures of HRQoL, negating the need for direct mapping. This approach also allows us to simultaneously examine associations of

physical/mental HRQoL and BMI. We find statistically significant associations between BMI and physical, as well as mental, HRQoL. The estimated relationships are larger for the BMI-physical HRQoL relationship. These results were consistent across cross-sectional and longitudinal specifications. Further results from spline regressions suggested that these relationships were non-linear, reflecting a concave down pattern of both physical and mental HRQoL over the range of BMI. Given the increased quality of data used here, the results could have major implications for economic evaluations of weight management interventions. Specifically, we provide a new value for utility change as a function of weight gain which is used in these evaluations. Further, reconsideration of previous cost-effectiveness decisions may be necessary using our updated estimate of the marginal relationship between BMI on HRQoL.

Policy stream

ID 1460: Igor Francetic
Co-authors: Jack Elliott, Soren Rud Kristensen, David Lugo, Rachel Meacock
Title: A framework to understand spillover effects in healthcare interventions: A scoping review

Background: Among researchers and policymakers, there is an increasing awareness of the potential for healthcare interventions to have consequences beyond those initially intended. These so-called ‚Äúspillover effects‚Äù result from complex features of healthcare organization and delivery. Depending on their nature, spillover effects can either reinforce or hinder the effectiveness of specific policies or interventions. Thus, the failure to properly consider them may lead to flawed evaluations and ultimately poor policy making. Despite this, attempts to account for spillover effects in health research and health policy remain limited and uncoordinated across different disciplines.

Objective: To fill this gap, we conduct a scoping review of the healthcare literature with a twofold objective. First, we aim to understand the approaches that have been taken to address spillover effects in the healthcare literature. Second, we aim to develop a comprehensive framework to identify and conceptualize spillover effects of healthcare interventions.

Methods: We searched the online EMBASE and MEDLINE databases. We identified 100 eligible studies analysing and discussing spillover effects of interventions across different areas of healthcare organization, delivery and financing.

Findings: The review of eligible studies reveals a wide range of different spillover effects. Spillover effects can be experienced by agents not originally targeted by the intervention, or capture impacts on additional outcomes for targeted agents. We find that social network interactions can lead both to multiplier effects and violation of crucial assumptions necessary for evaluation design (eg. SUTVA). Despite being profoundly different in nature, distinctions between genuine spillover effects and sources of control group contamination invalidating evaluation designs are rarely drawn in the literature. Unanticipated behavioural responses, complementarities and resource sharing in the production of healthcare also emerge as important drivers of spillover effects. Overall, we find little use of well-developed theoretical concepts ‚Äì eg. externalities - to explain the mechanisms underpinning spillover effects.

Discussion: Our scoping review highlights the need for a thoughtful consideration of the nature and mechanisms of spillover effects in healthcare, in the interest of improved policymaking. To this end, we suggest a taxonomy of spillover effects and propose a comprehensive framework suggesting relevant steps for their identification.

ID 1465: Manon Haemmerli
Co-authors: Virginia Wiseman, Tim Powell-Jackson, Catherine Goodman, Hasbullah Thabrany
Title: Poor quality for the poor? A study of inequalities in service readiness and provider knowledge in Indonesian primary health care facilities

In September 2018, the Lancet Global Health Commission published their report on what a , high-quality health care system should look like in the era of the Sustainable Development Goals (SDGs). A key finding of that report was that for many low and middle-income countries (LMICs) poor quality health care is now responsible for a greater number of deaths than insufficient access to care. This has in turn raised concerns around the distribution of quality of care in LMICs: do the poor receive lower quality health care compared to the rich? In this study, we investigate the extent of the inequities in availability of quality health services across the Indonesian health system with a particular focus on differences between care delivered in the public and private sectors. Using the Indonesian Family Life Survey (wave 5 in 2015), households in 312 communities were matched with a representative sample of both public and private health facilities available in the same communities. Quality of health facilities was assessed using both a facility service readiness score with structural indicators of diagnostic and treatment capability and a knowledge score constructed using provider vignettes. Ordinary least square regression model was used to estimate whether community SES is a determinant of quality of public and private health facilities. We found that in the public sector, inequalities in service readiness existed across poor and rich communities, as well as between urban and rural areas. This was particularly the case for auxiliary health centres (pustus). In the private sector, poor communities were more likely to have low-level, less qualified providers than richer communities. Also, empanelment with the health insurance scheme was a strong determinant of readiness in private health facilities. Indonesia has set an ambitious goal of reaching universal health coverage. As the country continues to expand coverage, priority should also be given to improving the quality of care in health facilities, especially those serving the poor in hard-to-reach communities. Measurement of not only the availability of quality care but also equity in quality of care is necessary step to assessing progress to the SDGs in LMICs.

ID 1510: Heather Brown
Co-authors: Viviana Albani
Title: Estimating the direct and indirect risks for families becoming food insecure due to the Covid-19 pandemic in the UK

Background: Lockdown measures, such as the shutting of all schools and non-essential business premises, have had profound effects on economically vulnerable families. This has been compounded by the patchy offering of alternative food sources for families in receipt of free school meals. Families who were teetering on the edge of just managing may be pushed into food insecurity, thereby experiencing hunger, reducing food consumption, and creating an inability to secure food of sufficient quality and quantity to enable good health and participation in society.

Aims: The aim of this project is to exploit the longitudinal nature of the Understanding Society Survey to understand how the Covid-19 pandemic has pushed vulnerable families over the edge into food insecurity. This will help to inform the development of interventions/policy targeting families at the edge, preventing families from falling into food insecurity.

Methods: We start with logistic models to estimate the determinants of food insecurity in waves 1 (April 2020) and Wave 4 (August 2020) of the Understanding Society Covid Survey. We then use structural equation modelling to estimate how pre-lockdown factors moderate the determinants of food insecurity we identified in the logistic models.

Results: Preliminary results show that those with lower educational qualifications, children aged 0-2 years, and those who were unemployed during the pandemic were significantly more likely to be food insecure. People living in Scotland were significantly less likely to be food insecure than people living in England, Wales and Northern Ireland. Next steps will involve estimating the structural equation models to provide further insights into the determinants of food insecurity.

Conclusion: Preliminary conclusions suggest that those who are economically vulnerable are more likely to become food insecure due to the Covid-19 pandemic, which is subsequently likely to lead to increasing health inequalities.

ID 1564: Shabana Kishwar
Co-authors: Saima Bashir
Title: Out of Pocket Health Expenditures and Impoverishment in Pakistan

Objectives: Out-of-pocket (OOP) payment is a major health financing mechanisms across developing nations such as Pakistan. Total health care expenditures made by the Government of Pakistan is almost 33%, while private expenditures are estimated to be 66%, out of which 91% are out of pocket made by the HH (NHA, 2015-16). Such high and unpredictable health care expenditures cause households to face financial risk resulting in poverty. This study aims to estimate incidence of catastrophic expenditures and impoverishment and to further evaluate the determinants of catastrophic health expenditures and impoverishment.

Methods: We used the data from the Household Integrated Economics Survey, 2015-16 and 2018-19, carried out by Pakistan Bureau of Statistics. Well known methodology developed by Wagstaff and van Doorslaer, (2002) is employed by this study for estimating incidence and impoverishment effect of catastrophic health spending. Patterns of catastrophic health expenditures is analyzed by using different threshold levels. The determinants of catastrophic health expenditures and impoverishment are identified by employing logistic regression.

Results: It is found that at 10% threshold, catastrophic health payments out of total consumption expenditures is incurred by 4.51% and 1.35% households for 2015-16 and 2018-19, respectively. Moreover, taking health payments out of non-food expenditure and changing the threshold to 40%, this percentage declines to 0.45% and 0.22%. Poverty headcount was 23.28% and 20.19% gross of health payments, whereas it turns out to be 24.68% and 21.32% net of health payments representing an increase of 1.4% and 1.13% for both the HIES data. It is more likely catastrophic health payments are borne to be by better-off households than poor.

Conclusion: Out of pocket health payments exert pressure on household,Äôs capacity to pay and push them into poverty. This paper recommends the burden of out-of-pocket expenditures borne by households should be reduced in order to prevent them falling into poverty. The policies of government should focus not only on increasing public healthcare spending but also provision on social health protection plan/social insurance against OOP health payments.

ID 1513: Mark Monahan
Co-authors: Tracy Roberts, Dion Morton, Aneel Bhangu, Stephen Taibiri
Title: Task shifting inguinal hernia repair between surgeons and non-surgeon physicians: Workforce-Modelling

The shortage in the surgical workforce represents a major challenge in Low- and Middle- Income Countries. The problem is more acute in rural areas where district hospitals have difficulty attracting and retaining surgeons. Task-shifting is a process whereby specific roles are assigned to less qualified health workers with less training. Surgery task-shifting has been used in many sub-Saharan African countries for a variety of different procedures. It has been shown to have a number of benefits including the reduced need for patient referral, higher retention of surgical staff and freeing up a surgeon,Äôs workload to do more complicated surgeries.
Untreated inguinal hernia represents a great burden to patients and society. An untreated hernia limits a patients day-to-day activities and has work related productivity loss implications. Currently, demand outstrips supply of inguinal hernia repair. It is estimated that by 2022, there will be a shortfall of 1 million hernia repair operations in Ghana.
As surgeons take many years to train, the necessity of increasing surgical volume has been increasingly met by using medical doctors who do not have formal surgical training to address the current shortfall in supply. With training, non-surgeon physicians have been demonstrated non-inferior in outcomes of inguinal hernia repair compared with surgeons.

This study aims to assess the business case of training additional non-surgeon physicians in Ghana district hospitals for inguinal hernia repair using workforce modelling. Issues around opportunity cost of time for both surgeons and non-surgeons will be explored.
The analysis will be presented as the costs and salient outcomes of a non-surgeon physicians versus a surgeon over different time horizons to give a short-term, moderate term and long-term view of the shortfall in hernia repair that can be addressed. It will also provide cost windows of how long a non-surgeon physician will need to work before there is a payoff from the training investments. Different hospital settings will be explored as capacity constraints will affect the number of operations. The preliminary economic model will inform a planned clinical trial and economic evaluation with the opportunity of updating the model estimates with primary data in the future.

ID 1491: Toby Watt
Co-authors: Miqdad Asaria
Title: Estimating the impact of racist discrimination and structural racism on shaping health outcomes in the UK

Health outcomes in the UK are patterned by race ,Äì this has been largely overlooked in the health inequalities literature in the UK where the focus has been overwhelmingly on looking at inequalities patterned by socioeconomic status. The COVID-19 pandemic and the increased prominence of the Black Lives Matter movement during the pandemic have highlighted these previously ignored racial dimensions to inequalities both in the context of UK society generally and in the context of health inequalities specifically.

In this study we look to reconcile the issues raised during the pandemic around racial determinants of health with the traditional health inequalities literature around social determinants of health. We employ causal directed acyclic graphs to theorise about the various pathways between race and health outcomes mediated by both direct discrimination and structural racism and its impact on racially patterning the social determinants of health. We refine our theoretical model through a structured consultation process with a panel of experts on race and health.

We estimate our theoretical model using the UK longitudinal studies datasets and Understanding Society longitudinal survey to capture information about race, racism and the social determinants of health. Alongside this we also analyse primary care data from the Clinical Practice Research Dataset (CPRD), secondary care data from Hospital Episode Statistics (HES) and mortality data from the Office for National Statistics (ONS) to capture racially patterned impacts on healthcare utilisation, experiences of healthcare and health outcomes.

We use our theoretical model to identify key points in the pathway between race and health where policy intervention has the potential to ameliorate the observed inequalities. We combine our theoretical model and empirical estimates to produce a framework within which to ex-ante assess policy options in terms of their effectiveness, cost-effectiveness and impacts on racially patterned health inequalities and demonstrate this framework by using it to compare to candidate policies.

ID 1484: Jacopo Gabani
Co-authors: Sumit Mazumdar, Marc Suhrcke
Title: Health financing systems impact on health system outcomes: an analysis across 124 countries, 2000-2017

INTRODUCTION: many low- and middle-income countries (LMICs) have initiated reforms to accelerate universal health coverage (UHC), increasing public health expenditure. This trend resulted in a health financing transition from health financing systems (HFS) predominantly financed by out-of-pocket (OOP) expenditure, to systems predominantly financed by government revenues or social health insurance (SHI) schemes. While the impact of public health expenditure on health outcomes has been studied extensively, public health expenditure has been rarely differentiated between expenditure via SHI and government schemes.

METHODS: a data-based approach (kmeans clustering, based on percentage of total health expenditure channelled via OOP, SHI and government schemes) was used to assign country-year observations to any of three predominant HFS, the independent variable of interest: OOP-, SHI- or government-predominant HFS. Outcomes are life expectancy, under-5 mortality, maternal mortality, immunization coverage and incidence of catastrophic health expenditure. To identify HFS impact on these outcomes, fixed effects (FE) regressions are used to control for time-invariant factors and common trends. To address endogeneity, instrumental variables (IV) are used, including weak-instrument robust tests. We control for several contextual factors (GDP per capita, education, institutions,Äô quality, and others). Most of the data come from World Bank World Development Indicators and WHO Global Health Expenditure Database.

RESULTS: transitions from OOP to government predominant health financing systems delivered improvements in life expectancy (LE) (FE: +1 year, $p<0.1$), catastrophic health expenditure (FE: -2.2 percentage points, $p<0.05$) and immunization coverage (FE: +5.9 percentage points, $p<0.1$). IV specifications broadly confirm these results. Transitions from OOP to SHI predominant health financing systems delivered mixed results (improvements in maternal mortality, worsening in under-5 mortality). These results are generally robust to a battery of robustness tests (restricting the analysis to LMICs, excluding outliers, controlling for countries,Äô fiscal space, using a lagged HFS variable, and others).

CONCLUSION: on balance, health financing transitions to government-predominant HFS delivered better results rather than transitions to SHI-predominant HFS, in line with part of the existing literature. This does not mean that government HFS are always better than SHI schemes: context matters. However, these results issue a warning: governments planning to implement SHI reforms should proceed carefully.

ID 1451: Naomi Gibbs
Co-authors: Colin Angus, Simon Dixon, Charles Parry, Petra Meier
Title: Effects of minimum unit pricing for alcohol in South Africa across different drinker types and wealth quintiles: a modelling study

Background

Drinking in South Africa is characterised by high levels of both abstinence and binge drinking amongst drinkers, leading to significant levels of alcohol related harm. Previous research in high income countries has found Minimum Unit Pricing (MUP) for alcohol to be an effective, well-targeted policy for reducing alcohol related harm. This paper aims to investigate whether this is true in the South African context and provide estimation of distributional impact across wealth quintiles.

Methods

A causal, deterministic, epidemiological South African alcohol model was built using secondary data to estimate the effects of MUP across sex, drinker types and wealth quintiles. A programme of stakeholder engagement informed model development, and included policy professionals, civil society members and local academics. The model accounts for alcohol consumption across population subgroups. We estimate price distributions for drinker types and wealth quintiles. South African price elasticities, disaggregated by drinker type, were taken from the literature. Baseline rates of mortality and morbidity, taken from institute for Health Metrics and Evaluation, were adjusted using evidence from the General Household Survey to account for existing socioeconomic inequalities in health. Outcomes prioritised by stakeholders included individual consumption, individual spend, tax revenue, retail revenue, health harms (HIV, intentional injury, road injury, liver cirrhosis and breast cancer), and hospital and crime costs. Sensitivity analysis varied key assumptions and parameters within the model.

Findings

Overall, we estimate that a MUP of R5 per standard drink of 15ml of pure alcohol would lead to an immediate reduction in consumption of 3.4% (‚àí30.3 units per drinker per year). Moderate drinkers saw the greatest percentage decrease in their drinking, followed by occasional binge drinkers then heavy drinkers (-4.5%, -3.7%, -2.5%). This translates to an absolute reduction in units per drinker per year of -11.6, -21.7 and -48.6 respectively.
Distributional results across wealth quintiles are still being finalised.

Interpretation

Interpretation is likely to include whether or not the policy is effective in reducing alcohol harm and whether the distributional results suggest the policy is progressive or regressive in terms of income and health outcomes with implications for its acceptability.

ID 1571: Shaolin Wang
Co-authors: Matt Sutton
Title: Identify and measure spillover effects using the Same Day Emergency Care BPT case study

Background: The Same Day Emergency Care Best Practice Tariff (BPT) have been gradually introduced across England since 2012/13 to promote ambulatory care management of patients who are currently admitted and stay over one or two nights. There have not been many studies evaluating the impact of the Same Day Emergency Care BPT yet. The most comprehensive analysis to date is by Gaughan et al (2019), which selected the non-incentivised conditions that were recommended for ambulatory emergency care (AEC) (BAAEC, 2014) as control. However, these AEC manageable conditions are likely to receive spillover effects, which can invalidate a key assumption for identifying counterfactuals in empirical evaluations.

Aim: To identify spillover effects of Same Day Emergency Care BPT focus on the low risk chest pain scenario.

Data: We extracted the sample from the Hospital Episode Statistics (HES) containing all emergency admissions for NHS patients aged 19 or older assigned to two HRG codes that were admitted due to low risk chest pain and potentially AEC manageable (BAAEC, 2014). Our sample period spans from April 2009 to March 2016 including three years pre- and four years post-intervention.

Methods: We used individual-level multivariate regression-based interrupted time series (ITS) analyses to evaluate within-task spillover effects on the probability of hospitals adopting same day discharge management for untargeted patients; and within-patient spillover effects on the length of stay for targeted patients who recieved traditional clinical management in hospital for more than two days.

Results: We found negative within-task spillover effects and negative within-patient spillover effects. The untargeted patients are less likely to be discharged on the same day, while the targeted patients who need to be treated in hospital for more than two days tend to have longer length of stay.

Discussion: The existence of spillovers has important consequences for evaluation design. Despite a growing literature on the spillovers of health intervensions in recent years, the identification of spillover effects has only been partial and unsystematic (Kristensen, Meacock and Sutton, 2015; Benjamin-Chung et al (2017). This study provides a case study to develop structured methodology of identifying spillover effects of changes to healthcare delivery and organisations.

ID 1553: Cecile Gayet
Co-authors: Brigitte Dormont
Title: Prohibition of balance billing for CMU-C beneficiaries in France: what are the consequences on physicians behaviour and earnings?

CMU-C is a means-tested program that provides free supplementary health insurance to low-income people in France. It was introduced in January 2000. To ensure access to care of CMU-C beneficiaries, the CMUC law does not allow doctors to charge CMUC patients balance billing. This creates a financial constraint for the physicians who can charge balance billing (sector physicians). Similarly, dentist's rates are limited by ceiling prices when they receive CMUC patients.

Our purpose is to evaluate the impact of admitting CMU-C patients on the earnings of private physicians and dentists and on their rates. Does the admittance of CMU-C beneficiaries entail a significant drop in average physician and dentist consultation fee? Or are they able to neutralise the price limitation by increasing balance billing charged to other patients ("cost-shifting" hypothesis)? Or can they induce demand and increase their volume of activity to counterbalance the price restriction?

We use longitudinal data recording the activity, fees, earnings and information on the patients of self-employed doctors and dentists in years 2005, 2008, 2011 and 2014. These data are drawn from an

exhaustive administrative source and include 59,818 general practitioners, 27,164 specialists and 35,534 dentists. Our empirical strategy consists in estimating the impact of a change in the proportion of CMU-C patients share on the fees, volume of activity and balance billing of sector 2 physicians (who are constrained on their fees for CMU-C patients only), taking as a counterfactual sector 1 physicians (who are never allowed to charge balance billing). Our specifications include physician fixed effects and we use an instrumental variable estimator to take the non-exogeneity of the variable proportion of CMU-C patients into account. Our findings show that doctors do not compensate the loss of income due to the prohibition of balance billing with a cost-shifting (increase in balance billing for other patients), suggesting that they are constrained in their price setting by a situation of monopolistic competition. Otherwise, we find that admitting CMUC beneficiaries never imply a decrease in physicians and dentists earnings. This is mostly due to supply-induced demand behaviour: the provision of more procedures compensates price restrictions.

ID 1496: Ludovico Carrino
Co-authors: Vahe Nafilyan, Mauricio Avendano
Title: Should I Care or Should I Work? The Impact of Work on intergenerational support for older people

Ageing societies face an important policy trade-off: due to increasing demand and costs, Governments are tightening access to social care services for older people, transferring care responsibilities to family and friends. Concurrently, in response to concerns about the sustainability of pension systems, governments have also raised the State Pension age to increase the labour supply of workers approaching retirement, particularly women. While increasing their employment rates, this policy may reduce their informal care supply, reducing families ability to compensate for tightening rules for access to formal care. This question has wide economic relevance, as informal care represents the majority of care provided to older people in OECD countries, it is predominantly provided by women and it generates substantial economic value. Crucially, a decline in the supply of informal care, if not compensated by other care sources, may lead to a net reduction in care coverage for older people, with possible welfare consequences linked to lower health and well-being.

We exploit a unique UK reform that increased the female State Pension-age for up to 6 years. Using data from Understanding Society with an instrumental variable approach to account for the endogeneity of labour supply, we show that an increase in women,Äôs working hours - as a result of the reform - significantly reduces the amount of care supplied to dependent older parents living outside the household: working for 30 hours/week reduces care-intensity by 6.6 hours/week, and reduces the probability of providing high-intensity care (> 20 hours/week) by 4 percentage points. These effects are concentrated among women working in physically and psychologically demanding jobs.

Using data from the ELSA study, we show that older people with daughters who are ineligible to claim their pension as a result of the reform experience a significant reduction in the care they receive from daughters, with no compensation from other sources of care.

Overall, our results provide evidence that increasing women,Äôs labour supply by raising the State Pension age decreases the intensity of informal care provided by women and the total support received by older people, which may lead to a net loss of overall welfare.

ID 1495: Veline L'Esperance
Co-authors: Hugh Gravelle
Title: Primary care mortality and the impact of funding: a national longitudinal study 2013 -2016

Background: Greater investment in primary care has been shown to improve population health outcomes. Previous studies reporting an association between primary care investment and practice-level mortality have relied on estimates of mortality.

Aim: To investigate the relationship between general practice funding and actual mortality rates in a national sample of English practices.

Design: Retrospective longitudinal study of practice-level data for the financial years 2013/14 - 2016/17.
Methods: We combined seven datasets for all English general practices (n=7310): (i) General and Personal Medical Services database, providing workforce and patient data; (ii) NHS payments to General Practice, which records payments to practices; (iii) Quality and Outcomes Framework describing performance on clinical achievement indicators in LTCs; (iv) deprivation data for each practice; (v) neighbourhood ethnicity profile for each practice; (vi) patient experience scores from the General Practice Patient Survey; and (vii) practice-level mortality. We estimate Poisson count data models allowing for unobserved practice effects and with robust standard errors to allow for over dispersion of errors.

Results: Mean total funding per patient at 2016 prices was ¬£133.66 (standard deviation ¬£39.46). Practice mortality (per 1000 patients) increased from 8.28 (SD 6.29) in 2013/14 to 8.36 (SD 6.14) in 2016/17. Premature mortality (deaths in those <75 years) increased from 2.67 (SD 1.31) in 2013/14 to 2.73 (SD 1.32) in 2016/17. Increased total funding and capitation funding were significantly associated with higher practice mortality. A higher proportion of nursing home patients was also significantly associated with higher practice mortality. Practice characteristics negatively associated with practice mortality included higher practice-list growth. Higher mortality in a year was negatively associated with mortality in the following year. There was no association between mortality and the proportion of patients with one or more chronic diseases, ethnicity distribution of the practice or deprivation.

Conclusions: Funding changes within practices demonstrated a direct relationship with mortality. Higher total mortality in a year was associated with the subsequent, compensatory reduction in mortality in the following year. This suggests that random shocks to mortality in a year may affect the most vulnerable, changing the mortality rate of the practice population in the following year.

Preferences Stream

ID 1560: Lawrence Mwenge
Co-authors: Bernadette Hensen, Lucheka Sigande, Melvin Simuyaba, Chisanga Mwansa, Mutale Kabumbu , Sian Floyd, Mwelwa Phiri, Musonda Simwinga, Kwame Shanaube, Sarah Fidler, Richard Hayes , Helen Ayles , Matthew Quaife , Fern Terris-Prestholt .

Title: Preferences for HIV and sexual reproductive health service delivery among adolescents and young people aged 15 to 24 in Lusaka, Zambia: Results from a Discrete Choice Experiment.

Introduction

There is growing recognition of the need to engage adolescents and young people in the design of interventions intended to address their healthcare needs. To finalise the design of an intervention to reach AYP aged 15-24 years with comprehensive sexual and reproductive health (SRH) services, we used a discrete choice experiment (DCE) to elicit AYP,Äôs preferences for SRH service delivery in two communities in Lusaka, Zambia.

Methods

We conducted eight focus group discussion with young people to formulate the DCE attributes. A DCE module was designed in Ngene, using a D-efficient experimental design, with 18 choice sets. We conducted a DCE among 420 young people to assess preferences for SRH service delivery. Participants made choices between two SRH service delivery models, described by six attributes: location, provider type, service type, health service differentiation by sex, presence of edutainment, and opening times. Each participant was presented with 6 choice sets. We used random parameters logit (RPL) models to estimate young people,Äôs preferences for SRH service delivery.

Results

Respondents preferred to access SRH services that combined delivery of HIV, contraceptive and other health services relative to delivery of HIV services alone (OR=2.04, p<0.01) delivered by both medical staff and peer support workers relative to medical staff alone (OR=1.97, p<0.00) at a youth-friendly spaces within the clinic (OR=1.49, p<0.01) relative to out-patient department (OPD). When the location of these services was change from the community hub relative to OPD, participants preferred the later. Male respondents had stronger preference for receiving SRH services from a lay worker whereas participants with marriage experience preferred services that were differentiated by gender. Respondents who had visited the clinic before had stronger preferred for receiving services at the community hubs which are provided by combination of medical staff and lay workers.

Conclusion

Our DCE found that AYP preferred delivery of a comprehensive package of HIV, contraceptive plus other health services, provided by both medical staff and peer supporter workers delivered through youth-friendly spaces. Further, we can deduce that where services are delivered is less important than how they are delivered when designing SRH service delivery for young people.

ID 1557: Sean Urwin
Co-authors: -
Title: Informal care and experienced wellbeing: evidence from the UK Time Use Survey

Introduction: There is considerable evidence which documents that carers have lower evaluative wellbeing than non-carers. However, there has been little examination of any possible differences in the day-to-day experienced wellbeing by caregiving status. Exploration of experienced wellbeing across different types of activities offers a different and arguably more detailed perspective than commonly used measures of evaluative wellbeing such as life satisfaction.

Aim: To understand if, and by how much, differences in daily experienced wellbeing between carer and non-carer groups are due to lower wellbeing for similar activities and/or less time spent performing more enjoyable activities.

Method: To address this aim I use the 2014 UK Time Use Survey which offers detailed episode level information on the activities and its associated wellbeing over the course of two days for each respondent. I analyse, at both episode and diary level, differences in experienced wellbeing (aggregated across the whole day and for certain activities) and in time use by caregiving status.

Results: I find weak evidence of differences in experienced wellbeing for various activity types but strong evidence of differences in time use. These results demonstrate that the composition of activities during a day, rather than lower wellbeing for the same activities is what drives differences in daily experienced wellbeing between carer and non-carer groups. Further, I show that these results are sensitive to how caregiving is defined in the diary.

Implications: This study provides new evidence on wellbeing differences by caregiving status. These results highlight that interventions and policy aimed at carers that addresses the composition of their time use may offer a route to improved day-to-day wellbeing.

ID 1555: Katie Breheny
Co-authors: Rebecca Kandiyali, Joel Glynn, Rosemary Greenwood, Charlotte Bradbury
Title: The FLIGHT trial. Whose decision matters and what matters most? Comparing QALYs, capabilities and platelets

Immune thrombocytopenia (ITP) is an autoimmune condition that presents with bleeding and bruising due to a low platelet count. First line treatment of high dose steroids has significant side effects, and when treatment ceases patients can relapse (decreased platelet count). Relapsing patients can have poor quality of life (HRQL) and fatigue, whilst subsequent therapies can be expensive and ineffective. FLIGHT is a randomised controlled trial (RCT) testing a new first line treatment approach that adds a generic second line treatment (Mycophenolate, MMF) to usual care (steroids), aiming to prevent the first ITP relapse. A within-trial cost-utility analysis (CUA) will be conducted, however the concurrent collection of capability wellbeing (ICECAP-A) will enable a comparative analysis using alternative decision frameworks.
The 12-month FLIGHT RCT compares usual care (steroids) against MMF and steroids (MMF+steroid) as first line treatment for new diagnosed ITP. Cost and outcome data (SF-36 and ICECAP-A) were collected at baseline, 2, 4, 6 and 12 months. The primary CUA will generate QALYS derived from SF-36 (SF-6D) data. Additional exploratory analyses utilising ICECAP-A data (years of sufficient capability) and ITP relapses averted will also be conducted.

120 patients were randomised, with all included in the primary outcome analysis at 12 months, although complete case SF-36 and ICECAP-A data are only available for approximately 60%. Preliminary results suggest first line MMF+steroid decreased relapses compared to steroids alone, however area under the curve analyses indicate MMF+steroid patients reported worse HRQL and capability wellbeing. Analyses of costs and cost-effectiveness are ongoing.
It was hypothesised that adding a generic drug to usual care could be cost saving, reduce relapses and improve HRQL and capability wellbeing. ITP symptoms can cause significant lifestyle restrictions, yet treatment decisions are predominantly informed by platelet count. This paper will discuss the dilemma of when clinical effectiveness, utilities and capabilities diverge, and what outcome(s) matters most, and to whom. The concurrent collection of HRQL and capabilities mean that FLIGHT is an intriguing case study to explore these challenges in economic evaluation.

ID 1548: Nikita Arora
Co-authors: Romain Crastes dit Sourd, Kara Hanson, Abiy Seifu, Dorka Woldesenbet, Matthew Quaife
Title: Does attribute non-attendance in discrete choice models matter? An example from a health workforce discrete choice experiment in Ethiopia

Introduction
When measuring preferences, discrete choice models normally assume that respondents take all available information into account when making decisions. However, an extensive literature suggests that a significant proportion of respondents only consider a subset of the available attributes; a heuristic termed attribute non-attendance. Failure to account for attribute non-attendance can bias results, potentially leading to flawed policy recommendations. Using data from a discrete choice experiment (DCE) in Ethiopia, this is the first study to explore the consequences of attribute non-attendance in a health workforce DCE.

Methods
A DCE was administered to 202 community health workers in Ethiopia. We estimated latent class logit models to investigate their job-preferences while inferring for possible attribute non-attendance patterns. We estimated models with and without mixing i.e. including random heterogeneity in preferences. Each model featured 64 latent classes in order to account for all the possible patterns of attribute non-attendance. We also explore variation in attribute non-attendance between different cadres of health workers in Ethiopia.

Results
Accounting for all possible attribute non-attendance strategies used by respondents leads to better goodness-of-fit compared to models that do not. The model without mixing reported much higher attribute non-attendance rates as well as worse goodness-of-fit than the model with mixing. After accounting for heterogeneity, our results show that 99% of community health workers considered the salary attribute, while only 9% attended to the attribute on improvement in community health outcomes.

Conclusion
We find that attribute non-attendance does matter in health workforce DCEs, and it is important to understand how respondents use different attribute processing strategies. This may particularly be the case as attributes such as salary can get prioritised at the expense of others. We illustrate that jointly accounting for attribute non-attendance and random heterogeneity in preferences leads to improved model-fit, affecting the significance and magnitude of some parameters. We aim to further investigate if semi-parametric mixtures of normal distributions can reduce inferred attribute non-attendance rates and further disentangle attribute non-attendance from extremely low preferences for a given attribute.

ID 1535: Elizabeth Goodwin
Co-authors: Colin Green, Kate Boddy , Jenny Freeman , Sarah Thomas , Jeremy Chataway , Nia Morrish , Annie Hawton
Title: Exploring the responsiveness of preference-based wellbeing measures in the context of multiple sclerosis

Background

Instruments have been developed that provide wellbeing equivalents to the health-related quality-adjusted life-year (QALY) for use in cost-effectiveness analyses (CEAs). Little is known about the implications of using these measures for assessment of treatments for multiple sclerosis (MS).

Objectives

To explore the responsiveness of two wellbeing measures ,Äì the Adult Social Care Outcomes Toolkit (ASCOT) and ICEpop CAPability measure for Adults (ICECAP-A) ,Äì in the context of MS, in comparison with two preference-based measures of health-related quality-of-life (HRQL) - the EQ-5D-3L and the Multiple Sclerosis Impact Scale,ÄìEight Dimensions (MSIS-8D).

Methods

We developed a questionnaire for people with MS to report whether or not they had experienced one or more of 27 specific illness-related events that affect the wellbeing of people with MS (identified via a literature review and involvement of people with MS) over the previous six months. This has been administered online, alongside the ASCOT and ICECAP-A, three times (September 2019, March 2020, September 2020), via the UK MS Register. Responses are linked to: age, gender, type of MS, EQ-5D-3L values, MSIS-8D values, and responses to the Fatigue Severity Scale (FSS), Hospital Anxiety and Depression Scale (HADS) and MS Walking Scale-12 (MSWS-12).

We report initial analyses of data collected in September 2019. Further analysis, to be presented in the full paper, is underway to assess the comparative responsiveness of the wellbeing and HRQL measures across the three time-points.

Results

2825 people with MS responded. Each wellbeing and HRQL measure discriminated between groups based on: MS type; published cut-offs for the FSS, HADS and MSWS-12; and incidence of 15 IREs including relapses, changes in treatment, support or employment ($p<0.0001$). Typically, absolute effect sizes were higher for the EQ-5D-3L, while standardised effect sizes were higher for the MSIS-8D and wellbeing measures.

Discussion

Our initial analyses support the use of the ASCOT and ICECAP-A measures with people with MS. However, their lower absolute effect sizes could result in less favourable outcomes when assessing treatments for MS, compared to the EQ-5D-3L. The responsiveness analyses will enable the exploration of the implications of using each of the measures in CEAs of treatments for MS.

ID 1526: Nathan Bray
Co-authors: Rhiannon Tudor Edwards
Title: Preference-based measurement of mobility-related quality of life: Developing the MobQoL-7D health state classification system

Introduction: Mobility impairment is the leading cause of disability in the UK. Individuals living with mobility impairments have unique experiences of health, quality of life and adaptation. Due to the influence of QALYs, preference-based outcomes measures are often important in informing decisions about healthcare funding and prioritisation, however generic preference-based measures often lack validity in states of impaired mobility. Inaccurate outcome measures could potentially affect the care provided to marginalised patient groups. We recently developed the MobQoL outcome measure for mobility-related quality of life. The original MobQoL tool contains 15 items, and is therefore not suited to preference-based health state valuation due to the vast number of potential health states. The aim of this study was to examine the psychometric properties of the MobQoL tool and to subsequently derive a novel health state classification system, for the purpose of preference-based measurement of states of impaired mobility.

Methods: Data were collected through online and postal surveys. Respondents were recruited through the NHS, charitable organisations and HealthWise Wales. Statistical and psychometric analyses were used to assess the validity and reliability of the MobQoL tool. A wide range of measurement properties were examined including convergent validity, floor/ceiling effects, known group validity, differential item functioning and test-retest reliability. Exploratory factor analysis and Rasch analysis were undertaken to determine dimensional structure and to eventually select the final list of items for the MobQoL health state classification system.

Results: 342 respondents completed the survey. Respondents had a wide range of different mobility impairments. Nine of the original MobQoL items demonstrated adequate validity/reliability. Exploratory factor analysis and Rasch analysis confirmed two sub-scales within the item structure: 1) physical and role functioning, and 2) mental wellbeing. Seven items were found to have adequate model fit and were retained in the final health state classification system, called the MobQoL-7D.

Conclusions: The MobQoL-7D contains seven dimensions of mobility-related quality of life: accessibility, contribution, pain/discomfort, independence, self-esteem, mood/emotions and anxiety. Production of the MobQoL-7D combined methods of de novo outcome measurement development and Rasch analysis, and illustrates the importance of involving stakeholders in the design and validation of outcome measures.

ID 1511: Elena Olariu
Co-authors: Wael Mohammed , Raluca Caplescu , Yemi Oluboyede , Luke Vale
Title: What to do when cross-validation of EQ-5D-5L models using both composite-time trade-off (cTTO) and discrete choice experiment (DCE) data is problematic?

Objective: To cross-validate for the first-time regression models (interval regression, hybrid models) that use both composite-time trade-off (cTTO) and discrete choice experiment (DCE) data to select the model for the Romanian EQ-5D-5L value set.

Methods: We collected data from 1,674 participants from the general population in Romania from November 2018 to November 2019. Interviews were face-to-face, standardized, following the most recent version of the EQ-VT protocol.

To cross-validate our models, we randomly split our data at participant level into training and validation datasets. The initial training dataset was subsequently split for 100 times into training and validation datasets. We fitted our models using the training datasets resulting from the second split and we assessed the agreement between the predicted and the observed cTTO values using the validation datasets. The performance of the models was estimated using mean squared error (MSE), Lin concordance coefficient (Lin CCC), Pearson correlation coefficient and intraclass correlation coefficient (ICC) between predicted and observed values for the health states included in the cTTO task. Mean performance indicators were estimated for all models for the 100 splits. The model with the lowest mean MSE was considered the best and its out of sample performance was estimated.

Results: Data from 1,493 participants was used. Several splits were tested:
first split: 80%-20%; second split: 80%-20%;
first split: 80% - 20%; second split: 70% - 30%;
first split: 70% - 30%; second split: 70% - 30%;
first split: 90% - 10%; second split: 70% - 30%.
For the 80_20_80_20 split, the model with the lowest average MSE was the hybrid model corrected for heteroskedasticity. Performance indicators for validation set were MSE=0.0037, 95% confidence interval (CI) 0.0037 , 0.0047; Lin CCC=0.9698, 95%CI 0.9608 , 0.9690; ICC=0.9858, 95% CI 0.9811 , 09851; Pearson r=0.9698, 95% CI 0.9635 ,0.9711.

For all other splits, validation error for all performance indicators was less than training error showing unknown fit.

Conclusion: Cross-validation on both cTTO and DCE data seems highly dependent on the split of the data. Further research is needed to understand whether this method can be used as a criterion to select a final value set.

ID 1498: Mesfin Genie
Co-authors: Mandy Ryan
Title: Keeping an eye on cost: what can eye-tracking tell us about cost attribute information processing in a discrete choice experiment?

Concern has been expressed that inclusion of a cost attribute within a discrete choice experiment (DCE) challenges the credibility of the experiment in publicly funded healthcare systems (where individuals do not pay at the point of consumption). Using split sample designs, the limited literature (four studies) suggests inclusion of the cost attribute decreases consistency (increases error variance). This may be a result of credibility (since individuals are not used to paying) or complexity (given an extra attribute is included). We use eye-tracking to provide insight into information processing in a DCE when cost is included. We use a split-sample design applied to a DCE eliciting preferences for appointments with a general practitioner: 120 subjects were randomly allocated to either a COST DCE (n=60) or NOCOST DCE (n=60). The DCE was identical in all other respects. Each subject completed 14 choice tasks. Information was also collected on perceived realism of the experiment. Respondents completed the experiment whilst having their eyes tracked. We linked subjects, choice behaviour with their visual attention, focusing on: fixation times; pupil size/dilation as a measure of cognitive requirements (complexity); and dispersion of fixations and entropy of transitions

as an indicator of information processing strategies. The average fixation time spent looking at the multi-attribute task increased by 44% in the COST DCE compared to the NOCOST DCE. Fixation time on non-monetary attributes was 22% higher in the COST compared to NOCOST DCE. Subjects who considered the cost attribute realistic in the COST DCE gave it relatively more attention. We found an insignificant effect of including the cost attribute on dilation of the pupil, suggesting the cost attribute did not make the tasks more cognitively demanding. The entropy of transitions suggests respondents explored more alternatives/options before making a choice in the COST DCE. The dispersion of fixations suggests that respondents followed a more focused or structured information search in the COST DCE. Overall our results are encouraging for the inclusion of the cost attribute in a DCE. Our finding that perceived realism increases engagement suggests practitioners should spend time explaining why the cost attribute is included.

ID 1490: Matthew Quaife
Co-authors: Mareme Diallo, Assan Jaye, Melisa Martinez-Alvarez
Title: "All the world is a bumster": The economic drivers and health consequences of Gambian men's interactions with foreign tourists

Objectives: This study aimed to describe the economic determinants and health implications of transactional sex between Gambian men and foreign tourists near tourist resorts in The Gambia. The Gambia has a thriving tourist industry, but in recent decades has developed a reputation as a destination for older, mostly female tourists to seek sexual relationships with young Gambian men. During partnerships or in return for sex, Gambian men may receive financial support or in some cases the opportunity to travel to Europe with a partner. There has been little previous research among these men on sexual risk behaviours, physical and mental health, and health service utilisation.

Methods - We conducted mixed method data collection among Gambian men who regularly interact with tourists: a cross-sectional quantitative survey and discrete choice experiment (DCE) with 208 respondents. The survey asked questions on demographic characteristics, sexual history with Gambian and tourist partners, health-seeking behaviours, and mental wellbeing. The discrete choice experiment sought to measure potential trade-offs between monetary or other rewards and risky sex.

Results - We found that sexual activity between Gambian men and tourists was prevalent but infrequent, 49% reported ever having sex with a tourist. Condom use at last sex was significantly higher with tourist partners (63%) than with Gambian partners (40% - $p<0.01$). STI symptoms in the previous 12 months were reported by 12% of participants, and HIV knowledge was notably low. Drug use in the previous three months was reported by 49% of respondents, all of whom used cannabis. Health care seeking was comparatively high for physical health conditions compared to sexual or mental health conditions. In the DCE, condom use was the largest determinant of choice, money was valued significantly and positively, and participants significantly favoured partnerships with younger women, and which presented an opportunity to travel to Europe.

Conclusion - Young men working on the beaches of The Gambia face substantial health risks linked to economic precarity, including from STIs and mental health issues. More work is needed to understand trade-offs between risk and protection choices in these relationships.

ID 1452: Aki Tsuchiya
Co-authors: Paul Dolan, Amanda Henwood
Title: The evolution of preferences at a time of crisis

BACKGROUND: The Covid-19 pandemic offers a once-in-a-lifetime opportunity to learn how people,Äôs preferences evolve as a major crisis and the various policy responses unfold. We have a unique opportunity to look at whether exogenous shocks cause shifts in preferences regarding how people trade-off different dimensions of value in their own lives (individual preferences) and for society (citizen preferences). Moreover, an understanding of preferences over different policy outcomes provide key insights to help policymakers decide which factors to prioritise.

METHODS: We have designed three discrete choice experiments (DCE). The first DCE is on individual preferences across catching Covid-19, developing depression, and the main earner of the household losing their job. Respondents are asked to indicate which outcome they would prefer for themselves. The second DCE is on citizen preferences across the same three attributes as the individual-preference DCE, but with an additional attribute on the type of job of the main earner of the household. Respondents are asked to indicate which of two imaginary people is better off. The third DCE is also on citizen preferences, but across excess deaths above age 70, excess deaths below age 35, extra number of mental health problems in those below age 35, and extra number of people losing their jobs below age 35. Respondents are asked to indicate which policy outcome government should try to bring about. All respondents answer these three DCE questions, in this order. The survey is conducted online with a panel of UK general public respondents over four waves.

RESULTS: The first wave was conducted in mid-May with a sample size of 6,153. The same individuals were re-invited to answer the same survey in late-June, with an achieved sample size of 3,998. These individuals will be re-invited to answer the same survey in late September and then again in November. Preliminary analysis indicates relatively stable preferences across the first two waves. Furthermore, the third DCE indicates a strong preference for the health and wellbeing of younger people compared to the lives of older people.

This is work in progress. The HESG paper will include analyses from the first three waves.

ID 1443: Peter Sivey
Co-authors: Anthony Scott, Susan Mendez
Title: Junior doctors specialty choice: Stated and revealed preferences over 10 years

An important health policy issue in many countries is the over-specialisation of the medical workforce. In the US, UK and Australia the proportion of doctors practising as specialists has increased markedly over the past three decades, often resulting in a shortage of general practitioners. Understanding junior doctors' preferences over characteristics of alternative specialties is crucial in designing policies to influence the medical workforce. This paper estimates individual-level preferences over characteristics of alternative specialties from a stated-preference discrete-choice experiment (DCE) of junior doctors, then follows up the junior doctors from the DCE over the following decade to compare their actual labour market outcomes with their estimated preferences.

Our results show that preferences for higher earnings are associated with choosing the specialist rather than the GP track after five years, but this effect is smaller and not statistically significant after 10 years. We document the drivers of this result, showing that a group of doctors with particularly high earnings preferences are in the specialist group after five years, but are in the GP group after 10 years. These results are valuable in designing policies to affect the distribution of junior doctors between general and specialist medical careers. In particular, the results show that while the gap in earnings between GPs and specialists

appears to impact on choices over the short-term, over the long-term these may be less significant than qualitative attributes of specialist practice compared to those of general practice.

ID 1549: Alistair Bullen
Co-authors: Peter Hall, Ewan Gray, Luis Loria Rebolledo, Mandy Ryan
Title: Agency is health care: Is the health care professional a perfect agent for the patient? An application to treatment for metastatic breast cancer

Background: To achieve a perfect agency relationship in health care, the healthcare professional (HCP) must act in the interest of the patient, recommending a treatment that the patient would choose if perfectly informed. Using a discrete choice experiment, we test for a perfect agency relationship in treatment recommendations for metastatic breast cancer (mBC). Recent years have seen a substantial increase in the number of treatments available to mBC patients, making it a relevant test bed.
Methods: We used patient interviews, literature reviews, and thematic analysis of secondary data to establish attributes of importance to patients. Six attributes were identified: fatigue, nausea, diarrhoea, overall survival, risk of urgent hospitalization, and additional side effects (including hand-foot syndrome, mucositis and peripheral neuropathy). Using a D-Efficient design, patients and HCPs were presented with 8 choice tasks. Patients were asked to imagine they were choosing the treatment for themselves and HCPs to consider treatment for a patients. An anonymous survey link was distributed to respondents: by social media engagement, distribution of posters and leaflets at NHS and supporting charity locations, and direct engagement through NHS research team members. A multinomial logit regression was used to estimate preferences. We compared relative importance (RI) of attributes and marginal rates of substitution (MRS) of overall survival across patients and HCPs.
Results: The survey was completed by 113 patients and 53 HCPs. The RI scores indicated that both patients and HCPs valued overall survival most highly. However, 31.9% of patients always chose the treatment with the higher survival benefit, compared to 10.4% of HCPs. This result was borne out in the MRS: patients were willing to trade smaller quantities of overall survival to minimise the effects of toxicities, with the exception of the additional side effects attribute.
Conclusion: Patients and HCPs preferences for mBC do not align when elicited in isolation from one another, suggesting potential for the HCP to be an imperfect agent for the patient. It is imperative that shared decision making continues to be practiced if the needs of the patient are to be effectively addressed.