Health Economics Research Centre

HERC news

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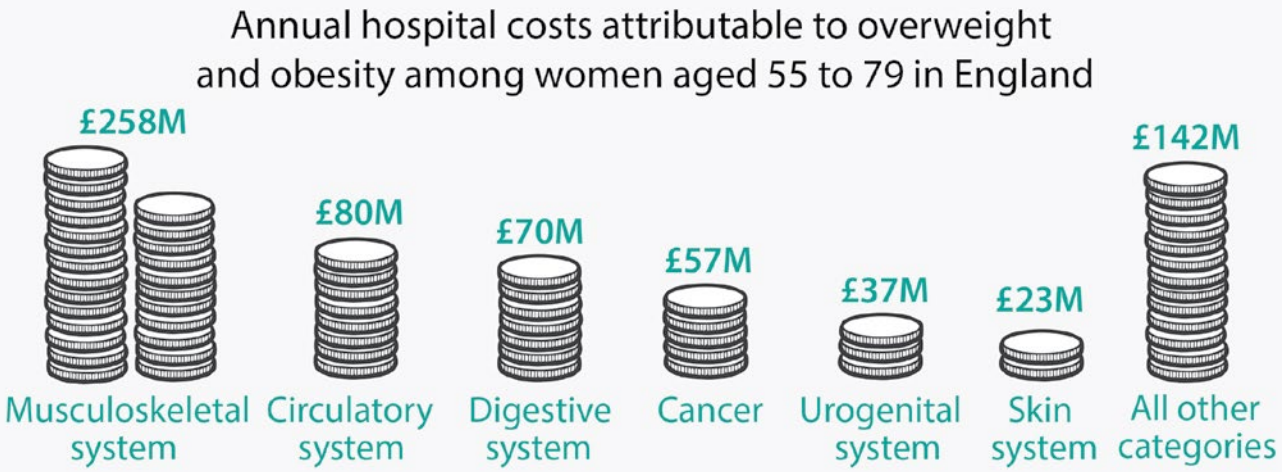


Healthcare costs and body mass index

Project team: Seamus Kent, Boby Mihaylova, Alastair Gray, Francesco Fusco

Following large increases in the prevalence of overweight and obesity in recent decades, more than 60% of adults in Western populations including the UK are overweight or obese. Excess weight is a leading cause of death and disability globally, and is also expected to increase healthcare expenditure.

In collaboration with researchers from the Cancer Epidemiology Unit and Nuffield Department of Primary Care Health Services, we undertook a systematic review, published in *Obesity Reviews*, of studies using individual participant data to estimate the impact of body mass index on healthcare costs. Compared to healthy weight individuals, overweight and obese individuals had 12% and 36% higher total annual healthcare costs, respectively. These associations were strongest for medications, followed by inpatient care, and ambulatory care. Most studies used data from the USA, and were based on small-to-moderate numbers of participants.

In a second study, published in the *Lancet Public Health*, we analysed hospital admissions of over 1 million women in England aged 55-79 years (the Million Women Study). The rate of admissions ranged from 320 per 1,000 person-years, at an annual cost of £570 per person for those at healthy weight, to 530 admissions per 1,000 person-years and an annual cost of £1,220 for women with severe obesity. **Every 5kg increase in weight is associated with a 5.2% increase in annual admissions and 7.4% increase in annual costs.**

Among all women aged 55-79 years in England, 15% (£662 million) of hospital costs was due to overweight or obesity. **40% of these excess costs were due to musculoskeletal conditions**, in particular knee replacement surgeries for women with osteoarthritis. Diabetes, circulatory and digestive system diseases, and cancers also contributed significantly.

These results highlight the healthcare services where excess weight is likely to have the greatest impact, and may be useful for policy making and commissioning. The results underscore the need for greater investment in cost-effective interventions to reduce weight or prevent weight gain.

For more information: HERC

> “Every 5kg increase in weight is associated with a 5.2% increase in annual admissions and 7.4% increase in annual costs”

Single or bilateral internal mammary artery grafting: do costs differ?

Project team: Alastair Gray, Jacqueline Murphy

Coronary artery bypass grafting is a high volume procedure with around 16,000 first-time surgeries performed annually in England and Wales. Most surgeries involve three bypass grafts (one for each of the major coronary arteries) and surgeons have a choice of whether to use a single internal mammary artery (SIMA) graft or bilateral internal mammary artery (BIMA) grafts. BIMA grafting is technically more challenging and there are concerns it may increase surgery-related complications. However, there is limited large-scale evidence in the medical literature comparing the two techniques.

The Arterial Revascularization Trial (ART) was set up by researchers in Oxford, led by Professor David Taggart (Nuffield Department of Surgical Sciences, University of Oxford), to compare the long term clinical and cost outcomes of the two procedures in a large international study population. HERC researchers are conducting a number of economic analyses alongside the trial, with a recent publication in *BMJ Heart* looking at resource use and costs over 12 months after surgery.

BIMA was associated with approximately 9% higher costs than SIMA, mainly because procedures took longer and patients remained in hospital for longer after surgery. There were also higher costs of managing key complications, specifically sternal wound infections, in the BIMA group. The largest costs in both groups were for the surgical procedure, followed by in-hospital stay, with costs after discharge representing the smallest proportion of overall costs.

So far the clinical results of the ART trial suggest that BIMA and SIMA have similar outcomes in terms of mortality and the rate of cardiovascular events, but there were more sternal wound complications with BIMA up to 5 years after surgery. The trial is still ongoing and will ultimately provide robust evidence about the long-term clinical and economic outcomes after surgery.

For more information: HERC

> BIMA was associated with higher costs than SIMA, mainly because procedures took longer and patients remained in hospital for longer after surgery

Economic evaluation of factorial randomised controlled trials

Project team: Helen Dakin, Alastair Gray

Studies assessing cost-effectiveness alongside clinical trials are increasing in number. Whereas most clinical trials randomly allocate patients to one of two treatment groups, factorial trials randomly assign patients to one of four (or more) treatments (e.g. no treatment, treatment A, treatment B and both treatments A and B together). This type of study can assess the effectiveness and cost-effectiveness of multiple treatments alone and in combination and test whether treatments interact.

HERC researcher Helen Dakin has recently explored the additional challenges that factorial trials raise for studies assessing cost-effectiveness alongside the trial as part of her DPhil (PhD) work. A key challenge is that interactions may occur more commonly for costs and QALYs than for clinical endpoints. In addition, economic endpoints raise challenges for transformation and regression analysis, and both factors must be considered simultaneously to assess which treatment combination represents best value for money.

An article recently published in *Statistics in Medicine* discussed the issues associated with factorial trials that include assessment of costs and/or cost-effectiveness, described the methods that can be used to analyse such studies and made recommendations for health economists, statisticians and trialists. We used a hypothetical worked example to illustrate the challenges and demonstrate the different ways in which cost-effectiveness can be assessed in factorial trials, and how these methods affect the results and conclusions.

The analysis shows that ignoring interactions introduces bias, which could mean that policymakers adopt a treatment that is not the best use of healthcare funds. Conversely, taking account of all interactions avoids bias but means that results are calculated less precisely. The paper provides code and data to enable readers to apply different methods for personal study or to assess cost-effectiveness alongside other factorial trials, and offers recommendations for planning, analysing and reporting economic evaluations based on factorial trials.

For more information: HERC

> A key challenge is that interactions may occur more commonly for costs and QALYs than for clinical endpoints

Is it cost-effective to use genomic information to guide treatment decisions?

Project team: James Buchanan, Sarah Wordsworth

Genomic testing hit the headlines earlier this summer when it was the subject of the NHS England Chief Medical Officer's annual report ("Generation Genome"). Genomic tests can simultaneously scrutinise multiple genes and their inter-relationships and may improve the stratification of patients to receive new therapies, compared to genetic tests that are targeted solely at specific genes of interest. However, the use of expensive targeted therapies can impact on the cost-effectiveness of these tests.

HERC researchers, together with clinical and scientific collaborators in Oxford, have recently completed an economic evaluation of the use of genomic testing to guide ibrutinib treatment decisions in chronic lymphocytic leukaemia (CLL) in the NHS, and this work has now been published in *PharmacoEconomics.*

Two forms of economic evaluation – cost-effectiveness and cost-utility analysis – were undertaken from an NHS and societal perspective. Five testing and treatment strategies were evaluated across several age groups using Markov modelling: three strategies that reflected varying current genetic testing practice and two configurations of genomic testing (including ibrutinib treatment).

Genomic testing strategies yielded the most life-years and QALYs per patient, but were not cost-effective compared to a threshold of £30,000 per life-year/QALY gained. However, there was some uncertainty surrounding this result: sensitivity analyses indicated that a genomic testing strategy would become the most cost-effective option if a higher 'end-of-life' threshold of £50,000 was applied, a societal costing perspective was considered (particularly for younger patients), or the cost of ibrutinib treatment falls. Given these findings, the study concludes that stratifying CLL patients to ibrutinib treatment using genomic testing is unlikely to represent a cost-effective use of limited NHS resources.

The analyses reported in this paper form part of a wider body of work considering issues related to the economic analysis of genomic technologies (see link below). Future publications will consider whether alternative approaches (including cost-benefit analysis) would change the conclusions of this economic evaluation.

For more information: HERC

HERC at iHEA

Between 9th-11th July, HERC researchers delivered a number of presentations at the 12th International Health Economics Association World Congress in Boston, USA.

Alastair Gray: *Estimating the quality of life impact of disease diagnosis using retrospective population self-reports: the example of Coeliac Disease in the UK.*

Elizabeth Stokes: *Can routine administrative datasets reliably provide resource use data for the purposes of economic evaluation?*

Filipa Landeiro: *Can delayed discharges be reduced through interventions to alleviate social isolation?*

Jacqueline Murphy: *Developing a mapping algorithm to predict EQ-5D utilities using Oxford Shoulder Score responses.*

James Buchanan: *Managing complications in HIV-infected adults in lower income settings: a cost-effectiveness analysis of itraconazole versus amphotericin B for induction therapy of talaromycosis in Vietnam.*

Joel Smith: *Illusive benefits and treatment effect heterogeneity in randomized experiments.*

José Leal: *The impact of hospital costing methods on cost-effectiveness analysis.*

Iryna Schlackow: *Methods for temporal extrapolation from clinical trial data to inform economic evaluations: a taxonomy.*

Mara Violato: *Family income and exposure to norovirus in childhood: findings from the UK Millennium Cohort Study.*

Richéal Burns: *Economic burden of cardiovascular diseases across the European Union: trends over the last decade.*

Sarah Wordsworth: *Can leveraging 'Big Data' make economic assessment more precise? Costing rare disease care using linked data from the UK 100,000 Genomes Project.*

Seamus Kent: *Use and costs of primary care In relation to body mass index in middle-aged and older women in England: A prospective cohort study.*

Sophie Diarra: *A longitudinal study of child respiratory disease in the United Kingdom: the effect of income and other risk factors.*

Thomas Rouyard: *Trade-off between behavior change and health outcomes: An analysis under prospect theory.*

Spotlight on MI JUN KENG

I joined HERC in October last year, as part of the team conducting economic evaluation work as part of the REVEAL trial. REVEAL is a large international randomised trial coordinated by the Clinical Trial Service Unit in Oxford that is assessing the effect of anacetrapib in combination with statin treatment to prevent vascular diseases in patients with pre-existing cardiovascular conditions. Our aim is to evaluate the economic impact of anacetrapib from the perspective of the UK and USA healthcare systems.

My academic background is in Mathematics, and I received my Bachelor's Degree in Mathematical Sciences from the Nanyang Technological University in Singapore. I then pursued a Master's Degree in Operational Research at the London School of Economics, where I had the opportunity to work with social policy researchers involved in the Collaboration for Leadership in Applied Health Research and Care (CLAHRC) North Thames project on redesigning the care pathway for diabetic patients. As part of this project, I developed a model to evaluate the effect of diabetes prevention schemes, including the diabetes prevention programme rolled out in the UK last year. This work provided me with a first glimpse into the area of healthcare, and piqued my interest in applications of mathematical models within the field.

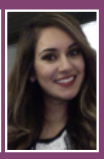
Though I have only been with HERC for a short time, I have benefited immensely from the training opportunities provided and from learning on the job. In the future, I hope to further explore the subject and ultimately develop my own research interests in this field.

staff • visitors • students • publications • presentations • seminars

Staff News – Welcome to:


Mark Pritchard (L) and **Isaac Ghinai** (R) are public health registrars, Mark will be working on the ATLAS project with José Leal, and Isaac will be working on ROADMAP alongside Filipa Landeiro, Jane Wolstenholme and Alastair Gray.

Ravi Lukha is a public health registrar, based at the John Radcliffe Hospital. He will be working on the Oxford Vascular study (OXVASC) with Ramón Luengo-Fernandez.

Elsbeth Nye (L) and **Seher Mughal** (R) are foundation doctors on a 4-month rotation with HERC. They will be working with Filipa Landeiro, Jane Wolstenholme and Alastair Gray on the ROADMAP project looking at real world outcomes across the Alzheimer's disease spectrum for better care.

Farewell to:


HERC says a fond farewell to MSc students **Pengfei Zhu** (L) and **Muriel Levy** (R) who started their placements with HERC in May. Pengfei worked with Boby Mihaylova and Iryna Schlackow looking at developing a cardiovascular risk score for people with chronic kidney disease. Muriel, also co-supervised by Boby, worked on an evaluation of effective healthcare delivery in China using electronic medical records in the China Kadoorie Biobank.

Filipa Fonseca, from the Nova School of Business and Economics, Lisbon, visited HERC from May to July 2017 to undertake work on the quality of life of cardiothoracic patients alongside Filipa Landeiro and José Leal.

Presentations by members of HERC

4th International Clinical Trials Methodology Conference, Liverpool, May 2017
Apostolos Tsiachristas & Richéal Burns
Understanding and interpreting health economic evaluation alongside clinical trials.

Richéal Burns
A systematic review of analytical methods applied for discarded organs in kidney and liver transplantation research on the findings of the systematic literature review alongside one of the COPE trials on organ preservation.

Iryna Schlackow
Methods for extrapolation from clinical trial data to inform economic evaluations: a taxonomy.

A lifetime disease model based on an RCT: development, validation and applications.

Department of Economics at University of Bergen, Norway, May 2017
Peter Eibich
Retirement and mammography use: The role of organized screening programs.

International Conference in Integrated Care Dublin, May 2017
Apostolos Tsiachristas
Cost-effectiveness of an Integrated Care Home Support Service in England.

Economic evaluation of integrated care: considerations and developments.

Evaluating the cost-effectiveness of population health interventions alongside literature reviews: the case of the comprehensive geriatric assessment.

Fellows Symposium, Oxford, May 2017
Apostolos Tsiachristas
Value for money of mental health services.

Health Economics and Policy Analysis Centre (HEPAC), NUI Galway, Ireland, June 2017
Apostolos Tsiachristas
Cost-effectiveness of an Integrated Care Home Support Service in England.

Health Economics Research Unit (HERU), University of Aberdeen, June 2017
Sarah Wordsworth
Economics and whole genome sequencing.

School of Social and Community Medicine, University of Bristol, June 2017
Helen Dakin
Uncertainty within trial-based economic evaluations extrapolated using patient-level simulation models.

2nd Annual UK & Ireland PROMs Research Conference, Oxford, June 2017
Helen Dakin
The Arthroplasty Candidacy Help Engine - Using PROMs data to identify thresholds for referral in hip and knee replacement surgery.

Lucy Abel
Evaluation of adherence to the MAPS Reporting Statement in recently published studies mapping to EQ-5D from clinical or patient-reported outcome measures.

Ines Rombach
To impute or not to impute? A comparison of statistical approaches for analysing missing longitudinal patient reported outcome data in randomised controlled trials.

MRC Doctoral Training Programme Symposium Oxford, June 2017
Sophie Diarra
A longitudinal study of child respiratory disease in the United Kingdom: the effect of income and other risk factors.

Health Economists' Study Group Meeting (HESG), University of Aberdeen, June 2017
Elizabeth Stokes
Modelling the cost-effectiveness of diagnostic tests in the absence of a gold standard: a case study of cardiac surgery clotting tests.

Precision Medicine Policy Network, Calgary, Canada, June 2017
Sarah Wordsworth
The use of health economics and precision medicine.

School of Health and Related Research (ScHARR), University of Sheffield, July 2017
Helen Dakin
Uncertainty within trial-based economic evaluations extrapolated using patient-level simulation models.

International Health Conference 2017, St Hugh's College, Oxford, July 2017
Borislava Mihaylova
Are statin-based therapies cost-effective in Chronic Kidney Disease?

HERC Seminars

Convenor: Brett Doble

HERC runs a series of seminars with invited speakers from the health economics community who talk on a wide range of applied and methodological topics.

In May, **Caroline Vass** (Research Fellow, Manchester Centre for Health Economics, The University of Manchester) visited to present her work on: *Using discrete choice experiments to understand benefit-risk trade-offs.*

Also in May, **Christopher Ruhm** (Professor of Public Policy and Economics, Frank Batten School of Leadership and Public Policy, University of Virginia and National Bureau of Economic Research) gave a presentation on: *Macroeconomic Conditions and Opioid Abuse.*

In June, **Ian White** (Professor of Statistical Methods for Medicine, University College London) visited to present his work on: *Missing data in randomised trials: beyond missing at random.*

Details of forthcoming talks can be found on the HERC website: **http://www.herc.ox.ac.uk**. To be added to our mailing list for future seminars, email us at **herc@dph.ox.ac.uk**

Publications

1. **Buchanan J**, **Wordsworth S**, et al. *Using Genomic Information to Guide Ibrutinib Treatment Decisions in Chronic Lymphocytic Leukaemia: A Cost-Effectiveness Analysis.* PharmacoEconomics. 2017. doi: 10.1007/s40273-017-0519-z.

2. Chisholm J, **Wordsworth S**. (chapter) *The Economics of Sequencing.* Chief Medical Officer Annual Report 2016: Generation Genome. Published July 4 2017.

3. Clayton G, Smith I, et al. [includes **Mihaylova B**, **Lokuge K**]. *The INVEST project: Investigating the use of evidence synthesis in the design and analysis of clinical trials.* Trials. 2017. 18:219.

4. Creswell C, **Violato M**, et al. *Clinical outcomes and cost-effectiveness of brief guided parent-delivered cognitive behavioural therapy and solution-focused brief therapy for treatment of childhood anxiety disorders: a randomised controlled trial.* Lancet Psychiatry. 2017. 4(7):529-539. doi: 10.1016/S2215-0366(17)30149-9.

5. **Doble B**, **Wordsworth S**, et al. *What Are the Real Procedural Costs of Bariatric Surgery? A Systematic Literature Review of Published Cost Analyses.* Obes Surg. 2017. 27:2179–2192. doi: 10.1007/s11695-017-2749-8.

6. Ganesh A, **Luengo-Fernandez R**, et al. *Time Course of Evolution of Disability and Cause-Specific Mortality after Ischemic Stroke: Implications for Trial Design.* J Am Heart Assoc. 2017.6:e005788. doi: 10.1161/JAHA.117.005788.

7. Hayward GN, Hay AD, et al. [includes **Wolstenholme J**]. *Effect of Oral Dexamethasone Without Immediate Antibiotics vs Placebo on Acute Sore Throat in Adults: A Randomized Clinical Trial.* JAMA. 2017. 317(15):1535-1543. doi: 10.1001/jama.2017.3417.

8. **Kent S**, **Fusco F**, et al. [includes **Gray A**, **Mihaylova B**]. *Body mass index and healthcare costs: a systematic literature review of individual participant data studies.* Obes Rev. 2017. 18(8):869-879. doi: 10.1111/obr.12560.

9. **Landeiro F**, Roberts K, **Gray AM**, **Leal J**. *Delayed Hospital Discharges of Older Patients: A Systematic Review on Prevalence and Costs.* The Gerontologist. 2017. doi: 10.1093/geront/gnx028.

10. **Landeiro F**, **Barrows P**, **Nuttall Musson E**, **Gray AM**, **Leal J**. *Reducing social isolation and loneliness in older people: a systematic review protocol.* BMJ Open. 2017. 7(5):e013778. doi:10.1136/bmjopen-2016-013778.

11. Leijten FRM, Struckmann V, et al. [includes **Tsiachristas A**]. *The SELFIE framework for integrated care for multi-morbidity: Development and description.* Health Policy. 2017. doi: 10.1016/j.healthpol.2017.06.002.

12. Morrell L, **Wordsworth S**, Rees S, Barker R. *Does the Public Prefer Health Gain for Cancer Patients? A Systematic Review of Public Views on Cancer and its Characteristics.* PharmacoEconomics. 2017. doi: 10.1007/s40273-017-0511-7.

13. Rose TC, Adams NL, et al. [includes **Violato M**]. *Socioeconomic status is associated with symptom severity and sickness absence in people with infectious intestinal disease in the UK.* BMC Infect Dis. 2017. 17(1):447. doi: 10.1186/s12879-017-2551-1.

14. **Tsiachristas A**, Gittins M, Kitchener H, **Gray AM**. *Cost-effectiveness of strategies to increase cervical screening uptake at first invitation (STRATEGIC).* J Med Screen. 2017. doi: 10.1177/0969141317704679.

15. You J, Wang S, **Roope L**. *Intertemporal deprivation in rural china: income and nutrition.* J Econ Inequal. 2017. doi: 10.1007/s10888-017-9352-z.

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