VOLUME 1

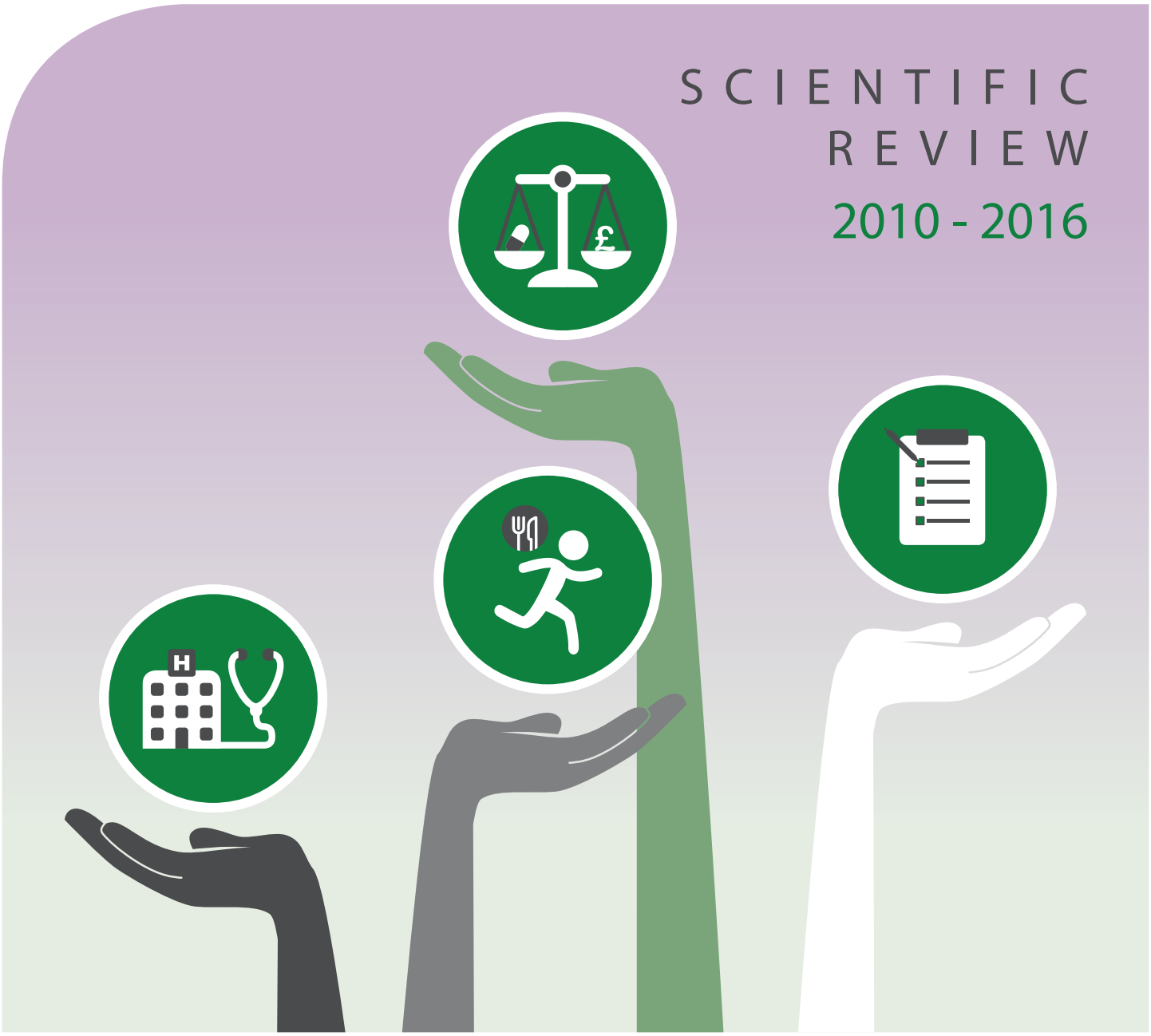
HERU

HEALTH ECONOMICS RESEARCH UNIT

Promoting Excellence in Health Economics

SCIENTIFIC REVIEW

2010 - 2016



CHIEF SCIENTIST OFFICE

HERU is supported by the Chief Scientist Office (CSO) of the Scottish Government Health & Social Care Directorates (SGHSC)

UNIVERSITY OF ABERDEEN

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preface

The Health Economics Research Unit (HERU) was established in 1977 as a centre of excellence in health economics research in Scotland with core funding from the Chief Scientist Office (CSO) of the Scottish Home and Health Department (now Scottish Government Health and Social Care Directorates (SGHSC).

HERU has become one of the leading health economics research centres internationally, with a reputation for delivering both applied and methodological work of the highest quality across a broad range of policy-relevant fields including technology assessment, workforce, person-centred care and public health. In 2012 HERU was ranked fourth among all health economics research centres in Europe with the current director, Professor Mandy Ryan, ranked the UK's leading health economist. These rankings were based on citations of published articles. HERU's reputation also reflects its contribution to policy. In the 2014 UK Research Excellence Framework feedback from the assessment panel highlighted the exceptional strength and depth of health economics at the University of Aberdeen.

CSO funds HERU to:

- Research economic approaches to health and healthcare at standards of international excellence.
- Develop and apply economic techniques to improve healthcare and population health in Scotland.
- Make available to the health service a body of expertise in health economics.
- Build and sustain capacity in the economics of health.

Historically CSO has reviewed its funding of HERU every five years. However, the current review has been delayed owing to changes at the CSO. The last review was held in May 2010, covering the period 2005–2009. The 2017 current review covers the period January 1st 2010 to October 31st 2016.

The 2017 Review involves two stages. In the first stage, the CSO reviews the strategic case for investing in a centre of excellence in health economics, and that centre being HERU. We produced a ten-page report stating the strategic case for CSO's continued investment in HERU which was sent to stakeholders for comment in September 2016. The second stage is the Scientific Review (to be held 28th – 29th March 2017), which involves a review of scientific achievements and contributions to health policy in Scotland (for the period January 2010 to end-October 2016) and future plans (until 2022). The 2017 Review will also assess how we have addressed the recommendations from our 2010 Review.

The documentation for the Scientific Review is split into two volumes. Volume 1 reports our research over the Review period, its contribution to both health policy and the development of health economics, our capacity-building activities and our engagement with policy makers and practitioners throughout the health service in Scotland and beyond. Volume 1 also reports how we have responded to the 2010 Review recommendations, and reproduces our report detailing the strategic case for CSO funding HERU, and the stakeholders' responses to this. Volume 2 provides details of our research projects and information on publications and other dissemination activities.

We hope you enjoy reading the Review documentation and look forward to discussing our activities and future plans with you.

Mandy Ryan

January 2017

Director's Overview

"We are an internationally recognised unit delivering high quality research that is policy relevant and advances the discipline of health economics with the overall focus on improving population health and wellbeing in Scotland and beyond."

SECTION 01

Director's Overview

Mandy Ryan

1.1 The Review period at a glance

Having been part of six previous CSO Unit Reviews I am delighted to be leading HERU through our 2017 CSO Review. I took up the Director's post in October 2012, initially in an acting capacity, with a formal appointment as HERU Director in April 2013. During my Directorship the demands on the Scottish health budget have continued to increase at a rate that outstrips the rate of growth of the budget. Health economics, and its input to informing the allocation of scarce health care resources, seems more important than ever. Securing value, person-centred care and ensuring sustainability are priorities for Scotland, priorities which HERU's research has informed.

If Scotland is to be successful in meeting the challenge of rising demands in the face of limited resources it is essential that HERU (i) conduct cutting edge research to inform health policy; (ii) strengthen the methodological underpinnings of our research; (iii) build health economics capacity in Scotland; and (iv) enhance engagement with the Scottish Government, NHS Scotland and the Scottish public. During my first period as Director I have sought to focus HERU's activities to ensure that the Unit made major advances in all these areas. We have:

Conducted cutting edge research to inform health policy

- We have played a central role in the development and implementation of formulae to allocate resources to GP practices and Primary Care Trusts; contributed to the evidence base to understand the determinants of health behaviours informing policy concerns around diet and food choice, physical activity, alcohol consumption, smoking and health inequalities; evaluated the cost-effectiveness of a range of health care technologies in wide use throughout the Scottish health service, including drugs, medical devices, diagnostic tests and surgical procedures; and developed and applied robust methods for identifying preferences for health services.

Strengthened the methodological underpinnings of health economics research

- Sound policy advice requires robust methodological underpinnings. We have ensured we stay at the forefront of methodological work, developing our experimental and behavioural economics research, investing in eye-tracking technology to better understand preferences, broadening our measures of value within economic evaluations, developing and applying cost-benefit analysis within economic evaluations and developing new approaches for measuring inequalities in health.
- We secured funding from the University of Aberdeen for two joint posts with our Department of Economics to support a work and wellbeing programme of research. This has strengthened the theoretical and econometric underpinnings of our research.

Built health economics capacity in Scotland

- We have introduced specialist postgraduate Masters training in health economics, the first and only centre in Scotland to offer such training; funded post-doctoral fellowships to develop the future leaders in health economics; and become key partners in the newly established Health Economics Network for Scotland (HENS) providing workshops and contributing to action-learning sets for individuals working in the NHS and Scottish Government. Our expert discrete choice experiment workshop is now presented annually, and on request internationally. Within HERU we have a formal and informal training culture, enabling all researchers to be the best they can.

Enhanced engagement with Scottish Government, NHS Scotland and the Scottish public

- We have increased engagement with NHS Scotland agencies and policy makers, e.g. we established a Policy Advisory Group to advise HERU on policy engagement; we formed a strategic alliance with Healthcare Improvement Scotland – this includes running a jointly organised annual symposium addressing an issue of relevance to NHS Scotland, providing bespoke health economics training and exploring opportunities for joint research; we now have a presence at key events, such as the annual NHS Research Scotland Conference (NRS) and the NHS Scotland Event.
- We have increased our public engagement, involving both public and patients in research applications, steering groups, advisory panels and survey development. We have led and participated in increasing public awareness of research activities such as PechaKucha events[1] *(calorie labelling; minimum unit pricing for alcohol; and nudging people to make better decisions),* Café Scientifique[2] *(Low prices, high spirits?)*, science festivals (British Science Festival[3] – *Incentives in health promotion: taxing people for unhealthy behaviours or paying people for healthy behaviours;* May Festival[4] – *NHS 2020: What will healthcare look like in five years' time?)* and European Researcher Nights[5] *(Come and be part of an eye-tracking experiment)*. We have also taken our research directly to public institutions and locations, including schools and community centres.

1.1.1 Income generation and leverage

Over the review period the CSO invested £5.8m in HERU (Annex 1). During this period research staff were involved in externally funded grants that generated research funding to a total value of £59m, with £4.9m direct to HERU (Annex 2). This total grant income included National Institute for Health Research (NIHR) funding to the value of £31.7m. Of the £59m, £34.3m was awarded to the University of Aberdeen, £16.8m to other Scottish universities and NHS Scotland organisations, and £4.6m beyond Scotland (England, Europe and internationally). In addition, the University of Aberdeen invested £2m in HERU, funding 6.4 whole-time equivalent (WTE) posts (at time of writing). This funding has enabled HERU to conduct research of the highest standard, inform health policy in Scotland and beyond, build capacity and push forward the discipline of health economics.

Further details on all our activities and achievements are presented in subsequent sections of this report.

[1] PechaKucha is Japanese for chit chat. It is a presentation style in which 20 slides are shown for 20 seconds each (6 minutes and 40 seconds in total). Only pictures/photos are used for the visual element of the presentation.

[2] Café Scientifique is hosted by the University of Aberdeen and invites leading experts to share the latest in scientific research with the public in a relaxed and friendly atmosphere where questions and discussions are encouraged.

[3] The British Science Festival has developed into the UK's largest public-access celebration of science.

[4] Showcases to a wide audience, including the public, research under way at the University of Aberdeen.

[5] European Researcher Nights bring together academics, school pupils and the public on one night across Europe to celebrate and showcase the best innovation and development taking place across the EU.

1.2 HERU: who are we and how are we organised?

At 31st October 2016 HERU comprised 21.20 WTE research staff, 10 PhD students, a business manager, assistant unit administrator, unit secretary (0.8 WTE) and information officer. Staff and PhD students are listed in Annex 3, and biographies are presented in Annex 4.

Staff and PhD students, October 2016

The market for experienced health economists remains competitive. We pride ourselves on developing our staff and training future leaders in health economics. During the Review period we have strengthened our senior research capacity, through promotion and retention of experienced researchers. Marjon van der Pol and Paul McNamee were promoted to Professor, Verity Watson, Graham Scotland and Diane Skåtun were promoted to Senior Research Fellow. Verity became leader of our Methods of Benefit Valuation research theme, Graham of our Assessment of Technologies theme and Diane of our Workforce and Organisation of Care theme.[6] We have shifted the strategic focus of CSO core funding to include our theme leads, who are our senior non-professorial researchers at the forefront of leading HERU's research activity.

Following taking up the Director's Post, the unit structure was reviewed. The appropriateness of our research and management structure to the changing external environment and requirements of NHS Scotland and the Scottish Government was evaluated and revisions made. The structure – two programmes with six themes – was reorganised into four interrelated themes. The criteria that informed this decision were:

- Enhancing the visibility of our key areas of expertise to the outside world.
- Ensuring focus in our research.
- Enhancing collaboration across themes.

The management structure of the Unit was also changed, promoting more involvement of senior staff in determining the strategic direction of the Unit and enabling collaboration across themes. Marjon van der Pol became Depute Director, offering support to the Director and enhancing leadership capacity. All key strategic and operational decisions are made by our Executive Management Group (EMG), which meets monthly. In addition, to provide a forum for discussion of strategic research-related issues, a Research Strategy Group (RSG) was formed. This group meets bi-monthly and comprises members of the EMG, theme leads, a joint post holder between HERU and the Economics Department at the University of Aberdeen and our Information Officer.

Executive Management Group

From left to right: *Anne Ludbrook, Marjon van der Pol, Paul McNamee, Mandy Ryan & Shona Christie*

[6] At the 2010 Review Verity was theme leader of our Experimental Economics theme and Diane of our Workforce theme.

1.3 Promoting a vibrant research environment

We enable all researchers to be the best they can be, thus enhancing the quality of our working environment and research. We are mindful of the importance of training and mentoring of staff and the need to provide forums to share research ideas. All staff have a line manager and annual career development review and the Unit Director operates an open door policy. Our bi-monthly internal research seminar programme provides research staff an opportunity to discuss new research ideas, as well as work in progress; our bi-weekly stated preference seminar provides a forum for researchers to discuss cutting edge methodological developments and discuss novel research ideas, and provides training to HERU staff on state-of-the art practice; and our monthly econometrics seminar series provides a friendly environment to discuss econometric challenges and questions arising in our research. Ad-hoc presentations seminars are offered for rehearsals for external presentations.

To ensure our staff flourish in their professional development we encourage and support all staff, including support staff, to attend relevant workshops and courses. We encourage and provide funding for presentation of our research at leading health economics conferences, relevant policy conferences and general economics conferences. We have an annual retreat to discuss unit strategy, and always manage a bit of fun with a team building activity.

Unit Retreat – strategic thinking

Unit Retreat – team building

We are located within a vibrant research culture where health economics is seen as a priority. Our co-location with the Health Services Research Unit (HSRU), with two joint posts, has encouraged and enabled us to conduct multidisciplinary work of the highest standard. This research is of direct relevance to health policy and practice in Scotland. HERU is part of the Institute of Applied Health Sciences (IAHS) within the School of Medicine, Medical Sciences and Nutrition (SMMSN) at the University of Aberdeen. The University of Aberdeen is part of the Farr Institute of Health Informatics Research and the IAHS hosts both Health and Data Linkage in North East Scotland (HEADLINES), a research network whose purpose is to optimise the secondary use of health data in research, and the Grampian Data Safe Haven (DaSH) which provides a safe and secure technical environment to facilitate access to linked data for health research. The IAHS has three research themes; HERU have taken the lead in shaping the 'Delivery and organisation of care' theme and we are key players in the 'Evaluation of healthcare interventions' theme – HERU is thus at the heart of the research of the IAHS. Our location within SMMSN promotes multidisciplinary research, with current collaborations including Medical Education, Psychology and the Rowett Institute. The School's strategic plan recognises the strength of health economics, identifying it as a focus for future research and for further capacity building. Our location within a medical school on a hospital campus enables collaboration with clinicians, thus helping to ensure our research is of direct relevance to the provision of patient care in Scotland and beyond.

Collaboration with the University of Aberdeen's Economics Department has further strengthened our capacity to undertake research of value to NHS Scotland and the Scottish Government with the highest theoretical rigour. Links with the Economics Department have led to joint capacity building initiatives, including teaching Economics to undergraduate Economics students and a newly introduced health pathway within an Applied Economics postgraduate Masters, and participating in the Scottish Institute for Research in Economics (SIRE), where health economics is seen as a key area of research. Success here led to the appointment of two joint posts across the Economics Department and HERU.

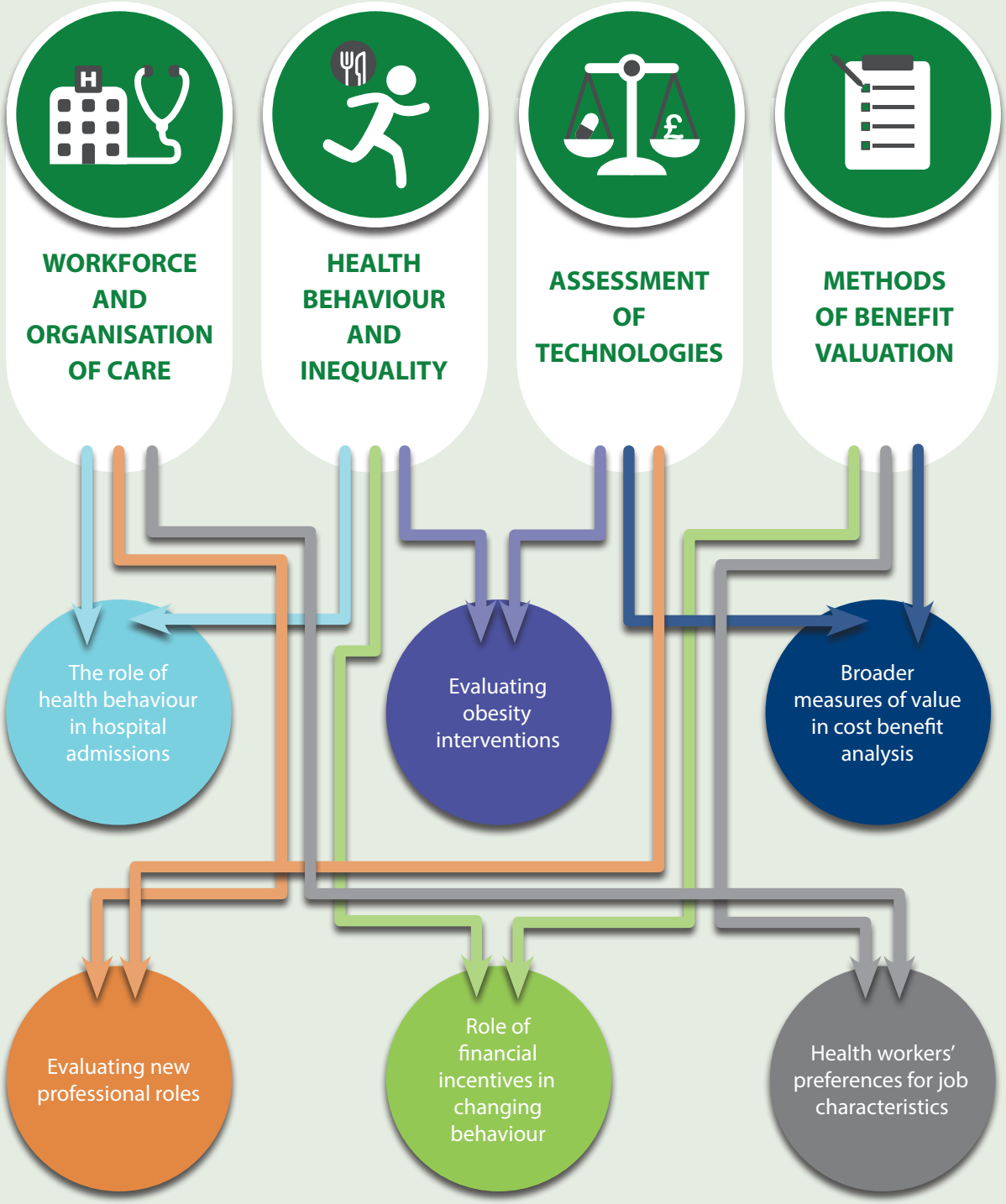
1.4 Research: what do we do?

Our research is organised into four themes, reflecting the areas in which HERU has an established reputation for excellence and where we can make the most effective contribution to the delivery of improved health services.

- Workforce and Organisation of Care – examines how financial and non-financial incentives influence the behaviour and performance of the people and the organisations delivering care and thus informs the Scottish Government's workforce vision and integration of care agenda. We are the only health economics group with a theme dedicated to researching workforce issues.
- Health Behaviour and Inequality – uses economics to understand health behaviour and evaluate health behaviour interventions, contributing to the Scottish Government priorities of improving population health and reducing health inequalities. New research is using behavioural economics to inform interventions to change lifestyle and developing rigorous methods for measuring inequalities.
- Assessment of Technologies – conducts economic evaluations to inform NHS decisions on the adoption and withdrawal/modification of health technologies and services, contributing to the Scottish Government priorities around value for money and sustainability. We lead methodological research around the development and application of cost-benefit analysis in health economics, ensuring a person-centred approach to economic evaluations.
- Methods of Benefit Valuation – develops and applies economic methods to help understand what people value, contributing to the Scottish Government aim of person-centred care. Our research developing and applying preference elicitation methods (discrete choice experiments and contingent valuation) is recognised internationally as cutting edge.

We collaborate across themes to address policy priority areas; the whole is considerably greater than the sum of the parts. This is demonstrated in Figure 1.1 where we highlight examples of cross-theme collaboration projects. More information is provided on cross-collaboration by the theme leads in subsequent sections.

Figure 1.1 Research themes and some examples of cross-theme collaborations

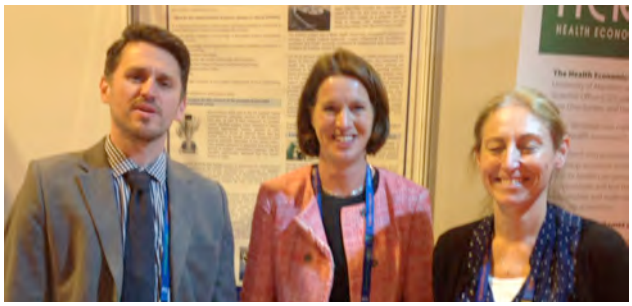


1.5 Ensuring impact and making a difference

Maximising the impact of our research is central to our activities. We have several mechanisms in place to ensure we make a difference to the health and well-being of the population of Scotland and beyond. Full details are presented in Annex 5 in the Strategic Report; in summary:

- We have enhanced engagement with policy makers by establishing a **Policy Advisory Group** who review our progress from a Scottish health policy perspective and advise on ways to communicate findings to the policy community.[7] We have **Expert Advisory Groups** for all large projects. We have continued dialogue with policy makers through the **Unit Review**, the **Unit Advisory Group**, regular meetings with **Scottish Government policy makers and economists**, and presentations at relevant policy **conferences** and **workshops**. We now have a presence at key events, such as the annual **NHS Research Scotland Conference** and the **NHS Scotland Event**. We support the work of NHS Scotland and the Scottish Government through providing **scientific advice** and support to a number of **NHS organisations and groups**, as well as being members of various **Government and NHS committees** (Annex 6). We have a new **strategic alliance** with **Healthcare Improvement Scotland** (HIS), and organise an annual conference[8] addressing key policy issues facing NHS Scotland.

Mandy and Marjon exhibiting HERU's research at the NHS Research Scotland (NRS) Annual Conference, 2015



Aileen informs Catherine Calderwood (Chief Medical Officer for Scotland) about HERU's research at the NHS Scotland Event (2016) (with Graeme MacLennan, HSRU)

Strategic alliance with HIS: joint conference 'Mobilising evidence to drive improvement' (2016)

- We are seeking to gain better public and patient understanding of what we do by engaging with the public. Our research increasingly involves including members of the general public or patients on research applications, project steering groups and advisory panels. During the review period we have gained further expertise in qualitative research methods and used these skills to engage with the public and patients in survey development. We have led and participated in a number of public dissemination activities with several informal presentations at events such as PechaKucha and Café Scientifique meetings, science festivals and European Researcher Nights. We have also taken our research directly to public institutions and locations, including schools and community centres.

[7] Members of our Policy Advisory Group include: **Dr Andrew Carnon**, NHS Dumfries and Galloway; **Neil Craig**, NHS Health Scotland; **Dr Daniel Hinze**, Health and Social Care Analysis, Scottish Government; **Dr Susan Myles**, Scottish Health Technologies Group, Healthcare Improvement Scotland; **Linda Semple**, National Lead, Sustainability and Value, Health and Social Care Directorates, Scottish Government; and **Dr Colin Tilley**, NES Education Scotland.

[8] This annual conference is organised in collaboration with HIS and two other CSO funded research units, HSRU and the Nursing Midwifery and Allied Health Professionals Research Unit (NMAHP RU).

Nicolas engages eager school children in our eye-tracking research, Explorathon, 2015

- Our dissemination strategy includes producing concise, accessible reports of the main findings of our research in our Policy Briefs series. The Policy Briefs are made available in print and online, and distributed to key targeted stakeholders such as directors of public health, hospital managers and clinicians. We make our research findings available in peer-reviewed journal articles, reports and in presentations at a range of conferences (see Volume 2). Our research and activities are publicised in regular newsletters, via social media and in specialist email discussion lists. Additionally, our newsletters and Policy Briefs are now made available within Health and Social Care news on the Scottish Government intranet and sent for internal distribution to HIS and the Health Economics Network for Scotland (HENS).

During the review period these mechanisms have ensured that the impact of our research is being maximised. Examples of impact during the review period include:

- Our research on minimum unit pricing for alcohol to reduce alcohol consumption in high-risk groups, indicating this would not place an unfair burden on low-income households or moderate drinkers, formed part of the evidence considered by the Court of Session.

- Our research showing that a Tayside Health Board initiative of financial incentives combined with behavioural support for smoking cessation in deprived areas was cost-effective was discussed in parliamentary questions and all health boards were encouraged to consider the lessons learned (http://www.ashscotland.org.uk/what-we-do/supply-information-about-tobacco-and-health/parliamentary-questions/cessation/smoking-cessation-pq-2012/).

- Our work assessing the cost-effectiveness of health technologies as part of our NIHR Technology Assessment Reviews (TARs) contract has direct impact through informing guidance and recommendations issued by the National Institute for Health and Care Excellence (NICE). Examples include a TAR leading to recommendations on the use of magnetic resonance imaging in the diagnostic pathway for prostate cancer (http://www.nice.org.uk/guidance/cg175) and a diagnostic assessment review (DAR) informing recommendations on the use of anticoagulation self-monitoring in patients with atrial fibrillation or an artificial heart valve who are taking warfarin (http://www.nice.org.uk/guidance/dg14). This DAR was consulted by the Scottish Health Technologies Group (SHTG) to inform an update of their evidence note on the use of the technology in Scotland (http://www.healthcareimprovementscotland.org/our_work/technologies_and_medicines/shtg_-_evidence_notes/evidence_note_57.aspx).

- Our research into the cost-effectiveness of health technologies has informed national and international clinical guidelines and decisions to update them (http://uroweb.org/guideline/urolithiasis/; http://www.nice.org.uk/guidance/cg168; http://www.nice.org.uk/guidance/cg156; http://www.nice.org.uk/guidance/cg85).

- Our research on the competitiveness of pay in the public sector was the subject of a REF impact case study in 2014. This reflected the body of work undertaken by HERU that includes the evidencing of the impact of local variations in the competitiveness of pay in the health sector in terms of recruitment and retention with subsequent recommendations and changes to the way funding is distributed to the NHS in England (http://impact.ref.ac.uk/CaseStudies/CaseStudy.aspx?Id=43272). Within this review period, the staff Market Forces Factor was updated based on our previous methodological research and this index is currently used to allocate revenue allocations and payment tariffs within the English NHS acute sector and in the primary care allocation formula in both England and Scotland.

- Our research on the impact of the introduction of free NHS eye examinations in Scotland stimulated discussion in the Scottish Government (http://www.parliament.scot/S4_ChamberDesk/WA20120426.pdf) and informed the Royal National Institute of Blind People (RNIB) Scotland response to the Scottish Government's 'See Hear: a strategic framework for meeting the needs of people with a sensory impairment in Scotland' document.

Further details on the impact of all our research are presented in subsequent theme sections of this report.

Marjon van der Pol

1.6 Increasing health economic capacity and developing future leaders

Reflecting the importance we place on increasing health economic capacity, we created a Director of Teaching position during this Review period. Marjon van der Pol took up this position. Our capacity building strategy is comprehensive and helps to address the continued shortage of health economists across academia (where we strive to develop the future leaders), government and the NHS. Our strategy, detailed in the strategic report (Annex 5), centres around:

- Sustaining capacity within HERU.

  We strive to attract, develop and retain research leaders of the future. The success of this policy can be seen with our current senior staff: Mandy Ryan joined HERU in 1987 as a research assistant, and now directs the Unit; Professor Anne Ludbrook, a member of our Executive Group, joined HERU in 1983 as a research fellow; our Deputy Director and Director of Teaching, Professor Marjon van der Pol, visited HERU as part of her Business Economics degree at the University of Nijmegen (Netherlands) in 1993, and took up a research fellow post on graduation (1995); two of our theme leads, Dr Diane Skåtun and Dr Verity Watson, joined HERU as research fellows following completion of their PhDs at the Economics Department; Professor Paul McNamee joined HERU as a Senior Research Fellow in 2002. Where appropriate, we explore opportunities for training non-economists: a success story we are proud of is Dr Graham Scotland (see Box 1.1).

Distance learning course students, 2013-2014.

Box 1.1 Capacity building case study: from pharmacology student to chief health economics investigator

Attracting economics students to health economics is challenging. A crucial part of HERU's capacity building strategy centres on training and mentoring individuals with different backgrounds to become leading health economists. **Graham Scotland** is one such example:

- Graham completed his BSc in Biological Science with Honours in Pharmacology at the University of Edinburgh. He then completed his MSc in Health Services and Public Health Research (2001) at the University of Aberdeen. Graham was exposed to health economics as part of the MSc *(taught by HERU staff)* and chose to do his dissertation on the costs and consequences of interventions to reduce mother-to-child HIV transmission in sub-Saharan Africa *(co-supervised by HERU staff)*. Graham was recruited to HERU as a Research Fellow in 2004. He undertook advanced training in health economics and was mentored by senior staff. He completed a PhD in Health Economics in 2011 *(supervised by senior HERU staff)*. Graham became a Senior Research Fellow and the theme lead for Assessment of Technologies in 2012. He is the lead University of Aberdeen Health Economist for Aberdeen's TAR contract for NICE. Graham was the Principal Investigator on a CSO grant 'Modelling the cost-effectiveness of adopting risk-stratified screening intervals within the national diabetic retinopathy screening programme in Scotland'. He is a grant holder on grants totalling over £11 million. Graham serves on the Scottish Medicines Consortium (SMC).

- Graham's research into the cost-effectiveness of new and in-use technology has had impact at a national and international level. To give an example, Graham's previous work in the area of diabetic retinopathy screening has helped to inform decisions to adopt automated grading and optical coherence tomography within the national diabetic retinopathy screening programme in Scotland. More recently completed work is currently being used to help inform the business case in Scotland for the implementation of extended screening intervals for groups of people with no retinopathy. Reflecting his ongoing interest and expertise in this clinical area, Graham is now involved in a major, efficiently designed, randomised controlled trial, that aims to assess the effectiveness and cost-effectiveness of a promising drug treatment for slowing the progression of diabetic retinopathy. The trial will take place within the screening programme in Scotland and relies on the excellent routine data capture and linkage facilities at the University of Aberdeen to measure costs and outcomes.

HENS Workshop delegates, 2015

Aberdeen DCE Workshop delegates, 2016

Canada DCE Workshop delegates, 2015

- Building health economics literacy amongst non-economists.

  Our postgraduate distance-learning course in health economics remains a key vehicle for increasing health economics literacy within the NHS and Scottish Government. Box 1.2 provides some examples of students who have taken this course. Over the review period a Health Economics Network for Scotland (HENS) was established and HERU are key partners, providing a new training workshop in health economics evidence for public health and contributing to the development of action-learning sets.

- Training and developing health economists.

  During the review period we launched our MSc Economics of Health, run in collaboration with the Economics Department at the University of Aberdeen. The University of Aberdeen is the first, and only, university in Scotland to provide specialist postgraduate training in health economics. In 2015 the programme was converted to an MSc in Applied Economics (Health Pathway). The review period also saw a doubling in the number of HERU full-time PhD students and we supported two HERU post-doctoral fellowships to enable early-career researchers to develop strong applications for Medical Research Council (MRC) Skills Development Fellowships. We hosted research visits by early-career researchers from France, Canada, Australia and South Africa.

- Delivering expert workshops.

  Our discrete choice experiment workshop has grown in popularity. We now present this annually in Aberdeen, and on request internationally. During the Review period we presented five DCE Workshops in Aberdeen and two in Canada (in collaboration with Dr Deborah Marshall, University of Calgary)[9] . A shortened version was presented to the Portuguese Health Economic Study Group. Two workshops in contingent valuation were presented on request, at the Berlin Centre of Health Economics Research, Technische Universität and Ludwig-Maximilians-Universität München. We introduced a workshop in health economics evidence for public health, aimed at non-economists working in the Scottish NHS (see above). This was delivered twice during the Review period. [10]

[9] These figures are for the Review period, 1st January 2010 – 31st October 2016. Our DCE Workshop was presented in Aberdeen in November 2016 and will be presented in Banff, Canada in February 2017.

[10] This figure is for the Review period, 1st January 2010 – 31st October 2016. This workshop was presented in November 2016.

Box 1.2 Building health economics capacity in NHS Scotland and the Scottish Government

NHS Scotland and the Scottish Government experience a shortage of health economists. HERU makes a crucial contribution to building health economics capacity for the Scottish Government and the NHS through:

- Training health economists who choose a career in the Scottish Government or NHS Scotland. Previous students on our MSc Economics of Health have worked as economists at NHS Ayrshire and Arran, HIS and Information Services Division (ISD) Scotland. Ewan Gray completed his PhD in HERU in 2013 and now works as an economist at HIS.
- Teaching health economics to economists based in the Scottish Government and NHS Scotland. We invite economists from Health and Social Care Analysis (HSCA), HIS and NHS Health Scotland to attend HERU's health economics course as part of the Scottish Graduate Programme in Economics. This course has been attended by several economists from HSCA and HIS.
- Training health professionals in health economics. In the review period 21 individuals from the NHS and Scottish Government completed our distance-learning course in health economics. Previous students on this course over its full history include: Robert Calderwood, Chief Executive, NHS Greater Glasgow and Clyde; Patricia Dawson, retired Associate Nurse Director, NHS Lothian and Head of Policy & Communications, Royal College of Nursing; Caroline Gardner, Auditor General for Scotland; Linda Semple, National Lead, Sustainability & Value, Health & Social Care Directorates, Scottish Government; and Jenifer Stirton, Chair, Chartered Institute of Public Relations Scotland.
- Developing and supporting the Health Economics Network for Scotland (HENS). HENS was established in 2013 and aims to facilitate collaboration between the health economics academic, policy and practice communities across the health system in Scotland. Our activities include a training workshop in health economics evidence for public health. Three workshops have been attended by 71 people from Scottish Government and NHS Scotland.
- HIS strategic alliance. We have established a strategic alliance with Healthcare Improvement Scotland (HIS) to share advice and knowledge. Activities have included providing bespoke training courses and organising a joint annual symposium.

1.7 2010 CSO Review: response to recommendations

The Conclusions and Recommendations of the 2010 Review, documented in Annex 7, focused on three areas:

- Portfolio of research: ensuring balance between breadth and focus of research, and between shorter-term, more responsive research (including work for outside agencies) and more methodological or theoretically informed research.
- Capacity building: continuing to explore the best avenues for building capacity and developing teaching modules.
- International profile: more clearly establishing HERU's international profile, leadership and collaborations.

Our responses are detailed in Annex 7 and documented throughout this report. Increasing our international profile was the recommendation that required specific attention and innovation. We enhanced our strategy for raising HERU's international profile and this led to achievements in a number of areas (see Responses to Recommendation 8). A major achievement was our success in leading a large EU-funded grant (Box 1.3), concerned with evaluating new professional health roles.

1.8 Strategic Review: responding to stakeholder responses

As the first stage of this Review, HERU produced a ten-page report stating the strategic case for CSO investment in a centre of excellence, and for that centre being HERU. This report is reproduced in Annex 5. The report was sent by CSO to stakeholders for comment. The stakeholders' responses have been summarised by Dr Tom Barlow, Senior Research Manager at CSO, and are also reproduced in Annex 5.

Stakeholders raised a number of questions regarding our process for determining research priorities and balancing our portfolio of research projects. In this report we demonstrate how we engage with stakeholders through a variety of mechanisms to understand the research requirements of NHS Scotland and the Scottish Government. In summary, we focus our research in areas of policy relevance where we have the required research expertise. Core funding allows some flexibility to adapt when new researchable policy issues emerge. Given the increased importance of impact of research within academia, conducting this policy-relevant work with potential for impact aligns with university goals. Where either our skill set or our capacity limit our ability to assist directly we utilise our extensive national and international networks of researchers to refer individuals to other health economics experts.

Stakeholders identified a number of additional areas where they considered health economics research to be important, although the need for focusing research activities was recognised. This second stage of the Review offers HERU the opportunity to report its programme of research in more detail and to demonstrate that we are undertaking research in all but one of the areas identified. That one exception is 'assessment of palliative and end-of-life care', an area where there are other health economics centres with considerable expertise.

Box 1.3 Internationalisation at HERU: securing funding from the European Union

European countries are reforming their health systems to improve healthcare delivery by changing skill mix within teams, extending the roles of existing health professions and introducing new ones.

The MUNROS project (Template WOC2.16) is undertaking a systematic evaluation of the impact of these 'new professional roles'. It is:

- Detailing the nature, scope and contribution of the new professional roles.
- Evaluating their impact on clinical practice and outcomes.
- Identifying their scope to improve the integration of care.
- Conducting economic evaluation to identify the cost-effectiveness of the new professional roles.
- Identifying optimal models for delivery of health care and the consequences of these for management of human resources and workforce planning.

Nine countries participate in the Scottish-led research. The four-and-a-half year project, which started in October 2012, is funded through the European Commission FP 7 programme to a total of €3 million. The project is coordinated by Professor Bob Elliott (HERU) and Professor Christine Bond (Primary Care) from the University of Aberdeen.

Countries were selected to capture those in the later stages of transition from highly centralised (ex-communist) systems (Czech Republic and Poland), those at the forefront of innovation of delivery systems (Netherlands, Scotland and England), and those with more established and stable systems (Germany, Turkey and Norway). Three target conditions are the focus of the research: breast cancer, type 2 diabetes and coronary heart disease.

The project sets out to answer the following policy questions:

- Have new roles been created and the roles of established professions been extended?
- Task substitution: are there tasks that used to be undertaken by medical staff that have been transferred to nurses (through extended roles) and other (new?) professions? What are these tasks?
- What drives task substitution?
- Does task substitution result in equivalent or better outcomes?
- Do new or extended roles promote/assist integrated care?
- What do the recipients of care, patients, think about task substitution?
- Does task substitution mean lower costs?
- What does task substitution mean for workforce planning?

1.9 Looking forward

Looking forward NHS Scotland will operate within an even tighter funding environment. At the time this report is being finalised Dr Peter Bennie, chairman of BMA Scotland, in his Christmas message, comments that the Scottish NHS is struggling to cope with the increasing demands being placed on it. He notes that '[*i*]*f the gap between demand and resources is going to continue, then there is no choice but to ask what the NHS in Scotland can and can't deliver in the future.*' Three crucial components of the strategy to achieve the transformational change required in NHS Scotland are (i) The National Clinical Strategy,[11] which is a blueprint for what health and social care will look like in the decades ahead; (ii) the Chief Medical Officer's annual report focusing on realistic medicine,[12] which calls for more person-centred care and shared decision making; and (iii) the National Delivery Plan,[13] containing concrete actions for the next year and beyond. Informed by these policy documents, our research activities, capacity building strategy and engagement with the Scottish Government, NHS Scotland and the Scottish public will help enable Scotland to provide the transformational change necessary.

1.9.1 Future research

We will focus on key policy areas where we have built research capacity and have internationally recognised expertise. The recent CSO Research Strategy, 'Delivering innovation through research',[14] recognised the importance both of research in the pursuit of health and social care integration and of utilising NHS electronic data for research purposes. Our research themes are mindful of such ambitions.

As well as addressing policy questions of relevance in Scotland and beyond, using cutting edge research, we will also ensure HERU continues to be at the forefront of methodological research; sound policies are based on high-quality, methodologically advanced research.

Workforce and Organisation of Care – workforce planning and the organisation of care will be of increased importance in Scotland's transformed health and social care system. There are significant problems in recruitment and retention of health workers. Increasing demands puts pressure on existing models of care; alternative ways of providing care need to be explored. Health and social care integration, and support for new ways of organising care, will have implications for workforce planning and contracts. Our expertise and skills will be applied to address such questions, informing the evidence base to deliver a health and social care system that both delivers high-quality health care and is a great place to work.

Health Behaviour and Inequality – reducing alcohol consumption and smoking and improving individuals' diet and exercise levels, with consequent reduction in obesity, are crucial. Health and social care systems that enable individuals to live well and independently by managing their conditions themselves are also a crucial component of a transformed Scottish NHS. Our research will improve understanding of health and self-management behaviours, and inform the evidence base on the value for money and sustainability of behavioural change interventions. New research is using behavioural economics to inform interventions to change lifestyles and developing rigourous methods for measuring inequalities.

Assessment of Technologies – given the gap between demand and resources decisions have to be made concerning what NHS Scotland can and can't deliver in the future. Research has focused on evaluating new technologies. We will increase our focus on evaluating in-use technologies of unproven or changing value and develop methods to model resource reallocations within clinical pathways. We will broaden the measure of value within economic evaluations, moving from the commonly used clinical measure of outcomes (Quality-Adjusted Life Years, QALYs), and take a more person-centred approach. We will lead the development and application of cost-benefit analysis in health economics.

Methods of Benefit Valuation – policy aims to ensure patients are seen as equal partners, with their health care provider working with them to arrive at care decisions that are right for them. We will remain at the forefront in developing and applying methods for people to express their preferences, notably discrete choice experiment (DCEs) and contingent valuation (CV). New applied work will explore using DCEs within a shared decision-making framework. Methodologically, we will develop our novel experimental economics and eye-tracking research to provide insight into the validity of CV and DCE responses. This research will ensure we remain international leaders in the area of preference elicitation.

[11] Scottish Government (2016) *A national clinical strategy for Scotland.* Edinburgh: Scottish Government.

[12] Calderwood, C. (2016) *Chief Medical Officer's annual report 2014–15: realistic medicine.* Edinburgh: Scottish Government.

[13] Scottish Government (2016) *National delivery plan*. Edinburgh, Scottish Government.

[14] Chief Scientist Office (2015) *Delivering innovation through research – Scottish Government health and social care research strategy. Edinburgh*, Scottish Government.

1.9.2 Future policy and public engagement strategy

We will review new methods to ensure the on-going relevance and take-up of HERU research. In partnership with our Policy Advisory Group, we are developing initiatives, such as refocusing our Policy Brief series that we introduced in the Review period. We will further explore the use of more focused meetings with Health and Social Care Analysis (HSCA) and other NHS stakeholders to improve understanding of both research and priorities. We will secure expert advice and support dedicated to knowledge exchange with NHS practitioners and stakeholders. As a first step towards this we have commissioned a stocktake of the present position regarding such interactions (commencing January 2017). This will be conducted by Dr David Steel, previously Chief Executive of NHS Quality Improvement Scotland (now HIS), and in retirement an honorary Senior Research Fellow at the University of Aberdeen, held jointly in HSRU and the Business School.

We have always placed people at the heart of our research. Alongside the policy commitment to person-centred care, it is increasingly recognised that public involvement in research is a continuum that engages patients and the public as partners in developing research ideas, in steering groups and advisory panels, and in survey development. It is also about disseminating research to the public. This current Review period has seen success in broadening our public engagement. Moving forward we aim to enhance this in a number of ways:

- Our commissioned stocktake of stakeholder engagement will include public engagement.
- We will build stronger collaborations with Professor Stirling Bryan from the University of British Columbia in his new role as the Scientific Director of the British Columbia SUPPORT Unit (bcsupportunit.ca), an initiative funded by the Canadian Institutes for Health Research (CIHR) to advance patient-oriented research. Stirling also has a post in HERU (10% WTE). We will explore what we can learn from this Canadian initiative for advancing person-centred care in Scotland.
- We will work with Dr Karen Facey, an evidence-based health policy consultant and previous chair of HTAi Interest Group for Patient and Citizen Involvement in HTA, to set up a new Health Technology Assessment international (HTAi) Sub-Group to discuss the methodological issues relating to taking a more person-centred approach in HTA, using stated-preference methods. This provides an exciting opportunity for Scotland to lead the way in taking a person-centred approach to HTA and work with leading international experts.
- We will explore opportunities for public engagement with the University of Aberdeen's Public Engagement with Research Unit (PERU), with an ambition to participate and lead public engagement events across Scotland.
- Dr Patricia Norwood, a CSO funded HERU researcher, will oversee our public engagement activities.

1.9.3 Future capacity building strategy

We will continue to train health economists along the whole career trajectory and improve the health economics literacy of health professionals. In doing this we will look for new capacity building opportunities. We will:

- Extend our health economics distance-learning programme to diploma and MSc level to provide more advanced training in health economics for health professionals.
- Contribute to the Health Economic Network for Scotland (HENS) capacity building by continuing to run our workshop on the economics evidence for public health and by developing new action-learning sets to provide hands-on health economics training to support policy development in priority areas (initially in the areas of prescribing and health and social care integration).
- Sustain HERU's dialogue with Health and Social Care Analysis, Healthcare Improvement Scotland, NHS Health Scotland and NHS Education Scotland, to identify and build health economics capacity to support NHS Scotland.
- Develop an advanced Discrete Choice Experiment workshop.
- Set up a Scottish Health Economics Study Group to support and promote the work of health economists in Scotland.[15] This will include academics, as well as economists working in the Scottish Government and NHS, and will provide junior health economists a forum to present their work in a friendly and supportive environment.
- Explore new ways of funding and attracting PhD students and post-doctoral fellows.
- Continue to welcome early-career researchers to HERU.

1.10 Summary

Over the Review period HERU's research and engagement with the Scottish Government and NHS Scotland has informed Scottish health policy and delivery. Our methodological developments have ensured that our research and policy contributions are underpinned by theoretical rigour, push the discipline of health economics forward and contribute to our international recognition as a leading centre in health economics. Our capacity building activities have contributed to the training of health economists in academia, NHS Scotland and Government.

Looking forward, the increasing demands on the health service and limited resources of NHS Scotland will ensure that health economics remains central to decision making in NHS Scotland and for the Scottish Government. The increasing demands on NHS Scotland resources have implications for how Scottish health services will be organised and provided. It is hoped that Scotland's health and social care system will be different in a number of ways: new models of care will be provided; person-centred care will be promoted; lifestyles will improve throughout the life course; patients with chronic conditions will be enabled to self-manage and live well; recruiting and retaining health workers will be enabled; and health and social care professionals will work together. HERU's future research plans, documented in more detail in subsequent sections of this report, will inform the achievement of these ambitions. Our methodological work will ensure that our research is underpinned by rigour and ensure HERU continues to be a leading health economics centre, recognised for excellence in research and methodological development. Our capacity building activities will ensure we continue to train the health economists of the future, as well as increase the health economics literacy of NHS professionals. Our guidance and advice will help inform health and social care policy. All our activities will contribute to improving the health and well-being of the population of Scotland and beyond.

[15] Whilst HENS brings together individuals with an interest in applying health economics from a variety of backgrounds, the Scottish Health Economics Study Group membership will be health economists.

Workforce and Organisation of Care (WOC)

"We are the only health economics group with a theme dedicated to researching workforce issues."

SECTION 02

Workforce and Organisation of Care (WOC)

Diane Skåtun

2.1 Introduction

Our Workforce and Organisation of Care (WOC)[1] theme aims to understand the behaviour and performance of healthcare professionals, how they are organised and the organisations they operate within. Research is organised within two broad strands: *Workforce and Organisational Behaviour and Organisation and Performance.* The workforce is core to service delivery, accounting for around 50% of NHS expenditure (excluding independent contractors such as GPs). Analysis of the economic drivers of the behaviour of that workforce is therefore key to improving the functioning of the healthcare system. Our research aims to understand the financial and non-financial factors influencing labour market decisions of the health workforce, and the impact of such factors on the organisations within which the workforce operate. In striving for the highest-quality and most efficient provision of healthcare, it is crucial that care is organised effectively and performance can be measured, monitored and evaluated. Our research also provides an evidence base to increase understanding of how care is organised and how its performance can be measured. We build on our reputation for applying labour economics to the health context, underpinned by skills in the economic analysis of labour markets and applied micro-econometrics. We utilise primary and secondary data sets, including large linked data sets, and collaborate closely with the Methods of Benefit Valuation theme. We are the only health economics centre with a theme dedicated to researching workforce issues.

2.2 Research conducted during the Review period

Research conducted within the review period addressed priority areas approved at the 2010 Review. We provided economic evidence to inform major government initiatives implemented to change the behaviour of healthcare providers, organisations and the organisation of care within the NHS. We researched the behaviour, composition and distribution of the workforce and how different ways of organising care affects the efficient provision of services.

2.2.1 Workforce and Organisational Behaviour

We investigated how healthcare professionals, and the organisations within which they operate, respond to financial and non-financial incentives and the environment that they operate within. Our focus was: regulation and the medical profession; financial incentives; and labour supply.

[1] WOC merges two themes presented at the last review: 'Workforce' and 'Organisation and Performance'. This merger was done in recognition of the strong interrelationship between the organisation of care and the workforce tasked to deliver it, and following consultation with our Unit Advisory Group.

Regulation and the medical profession

Research was conducted on two aspects of regulation: revalidation of the medical profession and prescribing guidelines. A mandatory process of revalidation was introduced, requiring medical professionals to confirm that they meet the professional standards of their regulatory body, the General Medical Council (GMC). Our research (see Volume 2, project summary **WOC1.8)**,[2] in collaboration with NHS Education Scotland and the Royal College of Physicians of Edinburgh, found no strong evidence that direct patient care by consultants would be compromised. However, pressure might be put on the time consultants spend on non-clinical administration/management activity, which includes service development, clinical governance and continuing professional development (CPD) activities.

A cross-country study with Norway, Denmark and England **(WOC1.10)** examined the influence of different organisational cultures and institutional frameworks, including clinical guidelines, and its impact on GP prescribing behaviour. GPs in different countries responded differently to information on societal costs, benefits and effectiveness of medicines, suggesting that GPs' prescribing behaviour depends on both the formal governance structure and the general environment within which they operate.

Financial incentives

We conducted research on the impact of financial incentives on both GPs' and hospitals' performance. Building on research conducted within the previous review period on the impact of the Quality and Outcomes Framework (QOF) on improving performance of General Practices, CSO-funded research **(WOC1.9)** considered the impact of modifications to the QOF. Behaviour was found to be responsive to even small changes in incentives. Building on research conducted in the previous review period that examined the early effects of the Payment by Results (PbR) policy, Department of Health (DoH)-funded research **(WOC1.5)** investigated the medium-term consequences of activity-based funding for hospitals in the English NHS. We found evidence of reductions in length of stay and increases in the proportion of day-cases as a consequence of PbR.

Supply of labour

We conducted research on: the impact of local labour markets on costs; the determinants of labour supply of consultants and nurses; and the determinants of location decisions of junior doctors.

The Market Forces Factor (MFF) is an estimate of unavoidable cost differences between healthcare providers, based on their geographical location. The MFF is used to adjust resource allocations in the NHS in proportion to these cost differences, so that patients are neither advantaged nor disadvantaged by the relative level of unavoidable costs in different parts of the country. The staff Market Forces Factor (sMFF) adjusts funding to compensate for unavoidable differences in the costs of local labour markets. Research funded by the DoH, conducted in collaboration with the Universities of Brunel/UCL, Glasgow, Manchester and York, suggests further refinements to the sMFF, providing an updated index **(WOC1.7)**. This index was used in the revenue allocations and payment tariffs within PbR in the English NHS acute sector and in the primary care allocation formula in both England and Scotland.

Work completed as part of a PhD **(WOC1.1)** considered the impact of motivation on the supply of consultant labour. An Economic and Social Research Council (ESRC)-funded study, investigating the importance of pay and non-pay aspects within the reward structure for UK nurses **(WOC1.2)**, found that individual tastes for job characteristics such as the flexibility, predictability and timing of hours have an important impact on hours of work supplied.

Several geographical areas in Scotland struggle to fill trainee doctor training posts. In collaboration with University of Aberdeen Medical Education, research commissioned by NHS Education Scotland used a discrete choice experiment (DCE) to investigate push-pull factors influencing choice of training posts **(WOC1.12** and **Box 2.1)**. DCEs have also been used to better understand location decisions of healthcare workers in low- and middle-income countries (LMIC) **(WOC1.6)**. This research has been carried out in collaboration with external collaborators (World Bank; World Health Organization; Health Economics Unit, University of Cape Town; National Centre for Global Health and Medicine, Japan). A user guide, led by Mandy Ryan, has been published by the World Health Organization to support the use of DCEs to address recruitment and retention challenges in remote and rural areas in LMIC.

[2] Hereafter only the project summary number is referred to; all project summaries are in Volume 2.

BOX 2.1

Box 2.1 Junior doctors' training: is it really location, location, location?

HERU Investigators: Diane Skåtun, Nicolas Krucien, Verity Watson.

Collaborators: Medical Education, University of Aberdeen and NHS Education Scotland (NES).

Funding: NES through the Scottish Medical Education Research Consortium (SMERC)

Outline

Junior doctors make up nearly half of all medical posts within the hospital sector and are a vital component of service provision. The medical training system gives trainee doctors a lot of choice both about the speciality they focus on and the geographic location in which they undertake their training. This flexibility is beneficial to trainee doctors. However, flexibility makes it difficult for healthcare services to plan their workforce and match the available workforce with areas of need. In the UK, several specialties and geographical areas struggle to recruit the number of doctors they need to fill training posts. Understanding the relative value trainees place on training-post characteristics is vital for the development of effective policies to enhance recruitment and retention.

In order to investigate the strength of UK medical trainees' preferences for training-post characteristics we used a DCE **(WOC1.12)**. This requires respondents to trade off various aspects of potential training posts. We focused on common push-pull factors that influence trainee doctors' choice of training post across specialties.

Key findings

- Organisations could focus on improving working conditions to a minimum standard, promote linked training positions for medical couples and provide access to career support for non-medical partners.
- Alternatively, organisations might provide monetary incentives to trainees for accepting posts that do not meet their preferred conditions. Indeed, a new policy, the Scottish Targeted Bursary Scheme (NHS Scotland, 2016), has just been introduced to provide a bursary to attract trainees to posts in hard-to-fill programmes and locations. The underlying premise of the scheme, and focus of the current pilot, is to address GP training within specific geographical areas.

2.2.2 Organisation and Performance

With increasing demands on health services, it is becoming ever more important to consider alternative ways of organising healthcare. We investigated who provides the care, where care should be provided and performance measurement.

Service organisation: skill mix

Ever increasing human resource constraints in specific healthcare sectors have led to a growing interest in examining which healthcare professionals could be delivering care, the impact on the service being delivered and the acceptability to patients. Using DCEs, we have explored preferences for increasing the role of pharmacists and nurses in the management of common ailments and extending the roles of specialist nurses and physician associates in some clinical areas **(WOC2.15)**. We found that preferences in the management of illnesses within primary care depend on the severity of illness. Research also considered what patients value in a community pharmacist service, the results having potential to increase uptake amongst those seeking help to manage minor ailments (see Box 5.2 in Methods of Benefit Valuation section). Within the secondary care setting we found that, whilst cancer survivors prefer to see a consultant in follow-up, they would accept non-consultant follow-up if compensated with changes elsewhere. Continuity of care was sufficient compensation. It was concluded that, given practicalities, costs and the potential to develop continuous care, specialist nurse-led cancer follow-up may be attractive.

A new European Commission (EC)-funded Seventh Framework programme, led by Bob Elliott ('Health care reform: the iMpact on practice, oUtcomes and costs of New roles for health pROfeSsionals', MUNROS) commenced in this review period **(WOC2.16** and **Box 1.1)**. This project examines the nature, scope and contribution of new professional roles, evaluating their impact on clinical practice and outcomes, and identifying their scope to improve the integration of care. Interim results indicate that tasks undertaken by different professional groups vary within countries and indeed between local teams. Tasks undertaken depend on attitude and the flexibility of established professionals. Where new professional roles are integrated within the service, there is evidence that throughput increases without additional costs.

In an MRC Capacity Building PhD studentship **(WOC2.3)** we extended our research on how local labour market conditions impact on the NHS workforce. Health providers faced with staff shortages but unable to adjust pay, as a means of alleviating the shortage, will find alternative ways of resolving the problem. This research examined the adjustment of skill mix, to change the relative contributions of health professionals by workforce restructuring within the nursing workforce.

Service organisation: management of care

The integration of health and social care aims to ensure care can be delivered in the home. The use of telemetry systems to provide continuous monitoring of long-term conditions has the potential to enable this. Research funded by an NHS Applied Research Programme Grant evaluated telemetric support for the monitoring of chronic obstructive pulmonary disease (COPD). The research, carried out in collaboration with our Assessment of Technology theme, suggests that, in evaluating its use, it is important to isolate the effect of the tele-monitoring communication from any changes in the underlying clinical service that might accompany it **(WOC2.4)**.

Research was undertaken in collaboration with the University of Edinburgh on a CSO-funded feasibility study on the use of Global Positioning System (GPS) satellite tracking in wandering patients with dementia as a means to prevent admission to long-term care. We found that whilst GPS tracking is perceived as both useful and acceptable to carers, the relative paucity of current deployment, variation in how it is used, difficulties in collecting social-care data and impracticality of current quality-of-life measures will challenge implementing a randomised controlled trial (RCT) **(WOC2.9)**.

Informal care is an important aspect of care provided within the home. A study investigating the feasibility of the use of direct payments for informal care **(WOC2.6)**, funded by the Scottish Collaboration for Public Health Research and Policy (SCPHRP), highlighted difficulties in identifying a relevant sample for research in this area and challenges associated with postal survey methods. These findings provide useful information for future research. The effect of informal care was considered in assessing the causal effect of volunteering on mortality **(WOC2.12)**. This research used a natural experiment that arose owing to an earthquake in Japan. It found a true and significant impact of volunteering on mortality and suggests support for volunteers could be an important policy measure amid on-going population ageing.

Performance measurement

Performance can be measured through a variety of indicators. Our research has considered the development and appropriateness of several performance measures including hospital efficiency, access to care and emergency admissions.

Work exploring statistical measures of organisational efficiency extended the traditional uni-dimensional approach to measuring hospital efficiency within Scotland to a multi-dimensional approach through data envelopment analysis **(WOC2.5)**. This broader measure of performance found a positive and significant trend of improvement over time and can be a useful addition to the use of single indicators as a guide to performance.

Access to care was examined by investigating the change in uptake following abolition of charges within the optometry and dental care setting **(WOC2.8; WOC2.10)**. While dental check-ups increased overall as a result of the policy, there was only a significant increase in eye examinations for those in higher-income groups, suggesting widening inequality in access. This indicates that policies to improve access to services should also consider the impact on inequality of access.

New work was conducted on the use of potentially preventable hospitalisation as a measure of quality in primary care **(WOC2.11)**. We were international collaborator on a National Health and Medical Research Council (NHMRC) Australia-funded project that found that it was personal sociodemographic and health characteristics, and not GP supply, that determined geographic variation in preventable hospitalisation. Building on this research a CSO-funded project on Avoidable Scottish Hospitalisations (ASH) tested the robustness of hospital admissions for ambulatory care-sensitive conditions (ACSC) as indicators of the quality of primary care in Scotland **(WOC2.14** and **Box 2.2)**. The results suggest caution in the use of crude ACSC admission rates as an indicator of primary care quality.

Box 2.2 Are admissions for Ambulatory Care Sensitive Conditions a good quality indicator of primary care performance?

HERU Investigators: Marjon van der Pol, Damilola Olajide, Maria Konstantinidou, Bob Elliott
Collaborators: University of York, University of Dundee, University of Western Sydney, and MRC/CSO Social and Public Health Sciences Unit.

Outline

Hospital admissions for Ambulatory Care Sensitive Conditions (ACSC) are those that could potentially be prevented by timely and effective disease management within primary care. ACSC admissions are increasingly used as primary care performance indicators. Emergency admissions are used as a quality indicator in the Healthcare Quality strategy of NHS Scotland. However, key questions remain about the validity of these measures. Indicators of primary care quality are integral to the Quality and Outcomes Framework (QOF). The aim of the project was to test the robustness of ACSC admissions as indicators of the quality of primary care in Scotland against indicators from the QOF **(WOC2.14)**.

The relationship between ACSC admissions and primary care performance was investigated using routinely collected data and multiple regression modelling. The analysis used hospital admissions data (Scottish Morbidity Records) to identify ACSC admissions. We selected ACSCs that are incentivised within the QOF. These are asthma; chronic obstructive pulmonary disease; diabetes complications; stroke; hypertension; angina; cardiac congestive failure; and convulsions and epilepsy. These data were linked to practice records on attainment in the QOF and with practice-level data on access, together with a range of covariates capturing characteristics of GP practices and factors that could be correlated with admissions, quality indicators and access to primary care.

Key findings

- This research showed that higher achievement in some measures of the clinical quality of primary care and better access to care are associated with reduced admissions for Ambulatory Care Sensitive Conditions (ACSC). However, the effects were small and inconsistent.
- It was also shown that ACSC admissions are associated with a range of confounding factors such as composition of the practice population and distance to hospital.
- The results of this research therefore suggests caution in the use of crude ACSC admission rates as an indicator of primary care quality.

2.3 Forward programme of research

Our forward programme recognises the central role that the workforce plays in ensuring a sustainable and integrated health and social care service. [3] It is crucial that the right workers are in the right jobs at the right time. Underpinning our work is the demographics of the workforce along with the patient base that it serves, the geographical distribution of the workforce, the impact of new contracts within the primary care sector, the continuing divergence of the national countries within the UK in terms of workforce contracts, the potential impact of 'Brexit' on the healthcare workforce and the cross-organisational synergy that the integration of health and social care promotes. We will continue to work with NHS Scotland, including NHS Education Scotland, the Information Services Division (ISD) at NHS National Services Scotland and the Scottish Government to refine the forward programme in response to policy changes. Future work will include:

Medical education and training

Building on work using DCEs to explore preferences of health workers for job characteristics, we will investigate factors underpinning the choices final-year medical students make at the start of junior doctor training **(WOC1.12)**. Applications for further stages of training by junior doctors have seen a reduction, with many places remaining unfilled. With our collaborators from Medical Education at the University of Aberdeen, along with NHS Education Scotland, we have secured funding from the Scottish Medical Education Research Consortium (via NHS Education for Scotland (NES)) for a PhD studentship to explore career decision-making in Foundation Programme doctors **(WOC1.14**).

We will apply for UK-based funding to research the current pathway of past and current students through the whole training process. Research will focus on the behaviour of the academically marginal student entering medical training, either at undergraduate or at later career-defining choice points. This research will help predict the impact of the recently announced UK government policy of expansion in medical school places and inform general workforce planning in terms of the pool and distribution of the workforce.

Skill mix

The way healthcare is delivered is under constant scrutiny. Prominent among these changes has been workforce redesign, including the skill mix of the health workforce. We will continue to explore the use and acceptability of new or alternative healthcare professionals undertaking roles and tasks traditionally undertaken by other occupational groups. Research will be completed on the EU Framework 7-funded (MUNROS) project **(WOC2.16)**. This will include an economic evaluation to identify the cost-effectiveness of the new professional roles, and will identify optimal models for delivery of healthcare and the consequences of these for the management of human resources and workforce planning. A DCE will be undertaken to investigate the acceptability of alternative providers of healthcare to patients across three separate conditions: type 2 diabetes, heart disease and breast cancer. New research will explore the impact of patients' perception of risk on preferences for follow-up care.

Funding will be sought to investigate the role of skill mix from the healthcare professional's perspective. This new research will consider whether changing the skill mix within a service delivery team, i.e. introducing new professional roles, influences job satisfaction, recruitment and retention behaviour of other healthcare professionals.

Impact of new contracts within the healthcare workforce

We will explore the implications of changes to the General Medical Services (GMS) contract for primary care, the 2004 consultant contract and the new junior doctors' contract (in England) that are anticipated to take place over the next review period. Negotiations are on-going between both the Scottish and Westminster governments and the BMA, and it is not clear what the amendments to the existing contracts will be and to what extent there will be further divergence of contracts within the national countries of the UK. However, the abolition of the pay-for-performance QOF framework within Scotland has already been announced along with an on-going review of the Scottish Allocation Formula (SAF) – this plays a dual role of providing payments to general practices through the global sum component of the GMS while also being a primary care resource-allocation mechanism.

[3] Scottish Government (2016) A national clinical strategy for Scotland. Edinburgh: Scottish Government. Scottish Government (2016) Everyone matters: 2020 workforce vision. Edinburgh, Scottish Government.

Changes in behaviour and the distribution of funding from new contracts, with associated implications for service delivery, will be explored. Funding will be sought to explore these issues using primary data collection and to extend the series of data for medical staff that we have collated over three waves (2001, 2006 and 2011). We will also seek to exploit secondary data as collated by ISD.

Supply of labour

Research will continue into the impact of local labour markets on the financing of the health service through the sMFF. Building on a body of work over the past decade, funding has been awarded by NHS Improvement and NHS England to update the sMFF **(WOC1.15)**. The current sMFF is based on estimates of spatial wage differentials using 2007–2009 Annual Survey of Hours and Earnings (ASHE) data. This new project will provide an updated sMFF index based on the latest data available from ASHE.

Based on a previous ambition to research the role of workplace conditions on a direct measure of productivity such as absenteeism, we have created a post-doctoral position to research this and to develop an externally funded post-doctoral fellowship application **(WOC1.13)**. Recent research suggests absenteeism rates attributable to mental illness are higher in the public sector than in the private sector and that employees' motivation, retention and performance are associated with their job satisfaction. Our research will explore the impact of job satisfaction and mental illness on absenteeism in the public workforce, including the health and social care sector.

Service organisation

With life expectancy increasing, questions are raised regarding how to meet the demands of an ageing population. One way of doing this is to enhance the integration of health and social care; this is a major policy aim of the Scottish Government. As part of this agenda emphasis is placed on enhancing the quality of service provision in home care. Two initiatives that have gained prominence are reablement and telecare, both developed to enable individuals to regain or maintain independent living within a home environment. Whilst a number of studies have looked into the effectiveness of reablement and welcomed the adoption of telecare, several issues remain under-researched. There is a dearth of literature on the effects of reablement and/or telecare on wellbeing amongst people with multi-morbidity. There is also a lack of consensus regarding the factors at the individual, household or service level that are associated with better reablement outcomes. Further, the role that telecare plays in reablement has not been identified. A PhD project, funded by ESRC/Scottish Government, will build up the evidence base in reablement and telecare by addressing the aforementioned research gaps using a unique, Scottish, linked health and social care data-set **(WOC2.18)**. The coordination between primary, secondary and social care is also the focus of a new project that will involve the systematic identification of those patients who place the greatest demands upon unscheduled care services in Lothian in order to focus resources on those likely to benefit from anticipatory care planning, a core feature of health and social care integration **(WOC2.19)**. Research will also continue on the risk of hospital admission as a result of a crisis for dementia patients **(WOC2.17)**. With dementia associated with an ageing population, it is recognised as a key condition where the benefits of an integrated health and social care system might be realised. This project will indicate how care professionals working with people with dementia and family carers view the relative importance of factors that could lead to crisis and therefore possible hospital admission.

2.4 Summary

Research conducted within the Review period addressed priority areas approved at the 2010 Review. We provided economic evidence to inform major government initiatives implemented to change the behaviour of healthcare providers, organisations and the organisation of care within the NHS. We researched the behaviour, composition and distribution of the workforce and how different ways of organising care affect the efficient provision of services.

Workforce planning and the organisation of care will be of increased importance in Scotland's transformed health and social care system. There are significant problems in recruitment and retention of health workers. Increasing demands put pressure on existing models of care; alternative ways of providing care need to be explored. Health and social care integration, and support for new ways of organising care, will have implications for workforce planning and contracts. Our expertise and skills will be applied to address such questions, informing the evidence base to deliver a health and social care system that both delivers high-quality health care and is a great place to work.

Health Behaviour and Inequality (HBI)

"We use economics to understand health behaviour and to design and evaluate health behaviour interventions. We lead research on behavioural economics and developing rigorous methods for measuring inequalities."

SECTION 03

Health Behaviour and Inequality (HBI)

Paul McNamee

3.1 Introduction

The Health Behaviour and Inequality (HBI) theme uses economics to understand health behaviour (diet and food choice, physical activity, alcohol consumption, smoking, self-management of chronic conditions), thereby contributing to the Scottish Government priorities of improving population health and reducing health inequalities through early intervention at all stages in the life course.

The rising levels of obesity, harmful amounts of alcohol consumption, low uptake of healthy diet, poor levels of physical activity, an ageing population with chronic health conditions remain key policy concerns within the Scottish Government (and beyond). Economics, as a behavioural science, offers insight into why individuals behave as they do, and provides a framework for considering value for money and sustainability of interventions to change behaviour. HBI aims to enhance understanding of health behaviour from an economic perspective and provide evidence regarding the cost-effectiveness and uptake of policy interventions that aim to influence health behaviour, improve health and wellbeing and reduce health inequalities. We are using behavioural economics to inform intervention design. Our evaluations are concerned with the impact of behavioural interventions on health and wellbeing. Methodological work seeks to better understand how individuals respond to time preferences, elicitation tasks and improve measures of inequality, thus ensuring more rigorous policy conclusions are reached.

At the time of the previous Review our focus was on lifestyle behaviours in the general population. It is increasingly recognised that understanding the behaviours of individuals with chronic long-term conditions is crucial if policy is to achieve its ambition of enabling people to live well and independently, thus increasing their resilience and wellbeing. Therefore, in 2014, when I became the theme leader, the focus of the theme was broadened to include self-management. Our research investigates the role of a number of factors in enabling individuals to live well independently, including lifestyles and attitudes, and motivation in other facets of life, including work, social interaction and engagement with care providers.

3.2 Research conducted during the Review period

Research conducted during the Review period focused on topics endorsed at the 2010 Review. We examined financial and non-financial factors influencing health behaviour, including the role of price, regulation, information to assist choice and personal characteristics such as education. We strengthened the evidence base relating to the cost-effectiveness of behaviour change interventions. Our research drew on existing secondary data and undertook primary data collection. The Review period saw a new and exciting collaboration with the University of Aberdeen's Rowett Institute. This included a HERU-funded post, increasing our capacity to conduct novel research relating to the economics of food choice.

3.2.1 Understanding health behaviour

Research was undertaken on the role of financial and non-financial factors in health-related choices:

- Financial incentives, such as price or tax, have been considered in relation to food choice **(HBI1.9; HBI1.12)** and alcohol **(HBI2.11)** and have been shown to affect quitting behaviour in pregnant smokers alongside other components of smoking cessation programmes **(HBI2.16, Box 3.1)**. In an exploratory study examining the relationship between food poverty and diet quality **(HBI1.11)**, certainty of income amongst low-income groups was a key influence.
- Non-financial factors also play a significant role in explaining health behaviours. For example, intergenerational or household effects **(HBI1.3; HBI1.9)**, nutritional labelling **(HBI1.9)**, food preparation skills and taste preferences **(HBI1.12)** all influence food choice. Characteristics of children and the household partly explain levels of healthy eating amongst children, although large parts of the variation remain unexplained **(HBI1.9)**. Education (English-language proficiency) affects health behaviour and health **(HBI1.10)**.

Time preferences are key parameters in economic models determining individual behaviour. Our long-standing expertise in time preference research was applied to understand health behaviours **(Box 3.2)**. Focus was also placed on interactions between health behaviours **(HBI1.1; HBI2.3)**: for example, how change in physical activity can reinforce other behaviour change, such as diet. These combinations are vital in the field of self-management, where lifestyle changes are often recommended to help manage long-term conditions. New research was completed on how beliefs and attitudes influence service take-up **(HBI1.8)**, and how this may influence the impact of chronic pain in older populations **(HBI1.5)**. These studies show the range of individual experience of living with long-term conditions, together with the level of potential demand for supported self-management strategies (e.g. level of receptiveness to new technologies and the concern people have that this substitutes for in-person care).

BOX 3.1

Box 3.1 Changing behaviour using financial incentives

HERU investigators: Marjon van der Pol, Anne Ludbrook, Shelley Farrar, Hannah Collacott
Funding: NHS Health Scotland and NIHR.

The use of financial incentives to encourage healthy behaviour is increasingly popular but remains controversial. Financial incentive schemes can be, and often are, targeted at deprived areas and therefore have the potential to reduce health inequalities. Our research has addressed several key questions in the evaluation and design of financial incentives:

- Are financial incentives for smoking cessation effective and cost-effective?

We evaluated quit4U, a financial incentive scheme for smoking cessation targeting deprived areas in Tayside. Our research showed that financial incentives, in combination with standard smoking-cessation support, are both effective and cost-effective. The results were discussed in parliamentary questions and all health boards were encouraged to consider the lessons learned **(HBI2.6)**.

- What is the relative effectiveness of financial incentives versus behavioural support for smoking cessation in pregnant women?

We conducted a discrete choice experiment to examine the potential effectiveness of a financial incentive (shopping vouchers, contingent on smoking status) and other service characteristics to support pregnant women to quit smoking. Financial incentives, daily support in the first week after quitting and having a quitting pal increased the perceived effectiveness of the smoking cessation service. Although important, financial incentives did not dominate the responses and lower financial incentives could work when combined with other effective service characteristics **(HBI2.16)**.

- Optimising the design of financial incentives for weight loss in obese men.

In an on-going project, behavioural economics is applied to optimise the financial incentive scheme for weight loss in obese men living in deprived areas. In our incentive scheme we draw on the concepts of loss aversion (losses matter more than gains) and endowment (we attach more value to goods we own) by pledging money upfront which can be guaranteed or lost over time depending on whether weight targets are met. We further optimise the design by conducting a survey of men's preferences. The incentive scheme will subsequently be tested in a feasibility trial **(HBI3.2)**.

3.2.2 Evaluating health behaviour interventions

Building on our research to understand the potential role of price in determining health behaviour, we investigated whether financial incentives combined with behavioural support for smoking cessation are cost-effective in deprived communities **(HBI2.6)**. These results were discussed in parliamentary questions and all health boards have been encouraged to consider the lessons learned **(Box 3.1)**.

Evaluations of non-price interventions have been conducted **(HBI2.1; HBI2.2; HBI2.3; HBI2.4; HBI2.8; HBI2.15)**. For example, a dietary and physical activity intervention was found to produce a 3kg weight loss at 1 year amongst an obese population **(HBI2.8)**. Area-based interventions designed to encourage more physical activity, such as the Scottish Government Smarter Choices, Smarter Places programme, were effective, e.g. individuals resident in areas that received the intervention were on average 6% more likely to meet the physical activity guidelines compared to individuals in non-intervention areas **(HBI2.4)**.

Early developmental studies conducted may lead to full-scale evaluations; these include structured reviews **(HBI2.13)**, feasibility studies **(HBI2.5; HBI2.10)** and pilot studies **(HBI2.9)**. For example, alternative data collection methods for measurement of costs and benefits were investigated in a study on weight loss **(HBI2.5)**, which were then used to inform the design of a larger study **(HBI2.8)**.

We participated in an EU Joint Programming Initiative with nine partner countries to develop and harmonise methods for the evaluation of diet, physical activity and sedentary behaviour interventions **(HBI2.18)**. This involved a rapid review of economic evaluation methods, including analysis of published economic evaluation models, and led to the formation of methods guidance. Implementation and dissemination plans were produced and are continuing to be rolled out with key stakeholders. In other international collaboration, with researchers in Sweden and Australia, we identified which costs of alcohol consumption are avoidable if behaviour changes **(HBI2.7)**, and related research estimated the unequal distribution of alcohol misuse costs **(HBI2.11)**. The latter project also modelled equity aspects of the proposed policy of minimum unit pricing (MUP) for alcohol, where it was shown that the policy would not be expected to place an unfair burden on low-income households or moderate drinkers. This research was cited in a judgment at the Court of Session with respect to whether it was possible under EU law to introduce the policy in Scotland.

We undertook several studies with a specific focus on health inequalities, using existing data from Scotland, the rest of the UK and beyond. We demonstrated that interventions to reduce the impact of deprivation on health outcomes can make a contribution to narrowing of inequality in good and very good health in the short term **(HBI1.7)**. In another study **(HBI2.3)**, the importance of health behaviour other than smoking in generating area-level inequalities in smoking-related diseases was assessed. This showed that effective interventions to address both smoking and other health behaviour have the most impact on reducing inequalities. Using data from Malawi as part of a PhD study, empirical work was undertaken on the association between child health and a range of potential influences that included individual maternal characteristics, other household variables and wider community factors **(HBI2.14)**. The mother's education and household wealth were important factors in explaining variation in infant mortality, whilst only the mother's education was important in explaining variation in healthcare-seeking behaviour.

HERU has been at the forefront of the development of appropriate methodologies that take into account the ordinal nature of measures of inequality, including self-assessed health and happiness.[2] New methodological work, carried out in collaboration with colleagues from Aix-Marseilles University, and conducted in Africa and Middle Eastern countries, found that new methods developed for comparing multidimensional distributions of wellbeing better inform the development of policies aimed at tackling socioeconomic inequalities in health **(HBI2.12)**. We also led the development of an appropriate framework for testing statistical hypotheses in relation to inequality indices for ordinal data **(HBI1.13)**. Anthropometrics (e.g. body mass, height for weight, etc.) are data that abound in demographic and health surveys. Two defining properties of anthropometrics, survival thresholds and non-monotonicity, limit their application in studying health inequality. HERU has led work developing appropriate methodologies to take into account the specific nature of anthropometrics in the analysis of health inequality **(HBI1.13)**. Such methodological findings will inform future work investigating the impact of interventions on health inequalities in Scotland.

[2] The Alphabeta family of health inequality indices developed by Ramses Abul Naga and colleagues has been cited in 81 academic papers to date. Examples include: Jones, A.M., Rice, N., Rosa-Dias, P. and Robone, S. (2011) Inequality and polarisation in health systems' responsiveness: a cross-country analysis, *Journal of Health Economics* 30, 616–25; Arrighi, Y., Abu-Zaineh, M. and Ventelou, B. (2015) To count or not to count deaths: re-ranking effects in health distribution evaluation. *Health Economics*, 24 (2), 193–205 and Dutta I. and Foster, J. (2013): Inequality of happiness in the US: 1972–2010, *Review of Income and Wealth* 59, 393–415.

BOX 3.2

Box 3.2 Seeing into the future – the role of time preference in understanding and influencing health behaviour

HERU investigators: Marjon van der Pol, Paul McNamee, Laura Dysart, Alastair Irvine, Uma Thomas

Time preferences (how present-oriented an individual is) and risk preferences (how risk-averse an individual is) are key parameters in economic models determining how much individuals invest in their health. HERU has long-standing and internationally recognised expertise in time preference research. Early research focused on how best to elicit individuals' time preferences and on informing the debate around the appropriate discount rate for health in economic evaluations. The potential role of time preference in health investments is increasingly recognised both within economics and psychology and during the Review period HERU was at the forefront of research in this area:

"Runners to your mark. Get set. Go! ... OK, come get your T-shirts."

- We tested the association between time and risk preferences and dietary and physical activity behaviours in chronic disease patients **(HBI1.2, HBI1.15)**, as well as in the general population **(HBI1.4, HBI1.21)** and found that time preferences can explain some differences in health behaviour. This suggests that interventions should focus on more immediate costs and benefits of health behaviours.
- We applied time preference concepts to novel areas, such as the transmission of smoking behaviour from parents to their offspring **(HBI1.21)**. We found that time preferences play a role in this transmission, suggesting that interventions should be targeted on the family where possible. Another novel application, part of a larger survey led by the Glasgow Centre for Population Health, examined whether time and risk preferences help explain the 'Glasgow effect'.[1] We showed that differences in risk preferences may help explain some of the unexplained mortality differences associated with risky behaviours **(HBI1.6)**.
- Three PhDs commenced during the Review period: examining how differences in time and risk preferences between doctors and patients help explain non-adherence **(HBI1.14)**; an investigation of the role of time and risk preference in the self-management of chronic conditions **(HBI1.15)**; and using insights from time preference to develop physical activity interventions **(HBI1.16)**.

[1] The 'Glasgow effect' refers to the unexplained poor health and low life expectancy of residents of Glasgow, Scotland, compared to the rest of the United Kingdom and Europe.

3.3 Forward programme of research

Looking forward, we will inform the evidence base required to achieve the transformational change required in health and social care systems in Scotland.[3] Our research on understanding health behaviour will provide insight into: changing behaviour to improve the health and diet of children; reducing the harmful impact of alcohol, tobacco and obesity; and encouraging more active and healthier lifestyles. Our work on self-management will provide insight into ways of supporting individuals to live well on their own. We will place greater focus on using behavioural economics to inform intervention development and our evaluations will include assessment of health, wellbeing and inequalities. We will explore novel applications of time and risk preferences to better understand health behaviour, and use these insights to develop health behaviour interventions. New econometric methods for analysing inequality will be explored, and where appropriate applied in research projects.

3.3.1 Understanding health behaviour

In collaboration with the Rowett Institute, we have secured funding to investigate factors affecting dietary choice and related behaviours in different population groups and life-stages. This will inform the development of dietary interventions. Three pieces of work are planned:

- Building on previous research **(HBI1.9; HBI1.12)** which found that respondents' responses to nutritional information were informed by their own interpretations and sociocultural perceptions of food choice, we will use Q-methodology to provide new insight regarding how consumers think about food and nutritional information. This will enable the identification of target groups and the creation of more personalised messages to promote healthier choices.
- Given previous research on intergenerational transfer indicating that children's health behaviours are influenced by their parents' health behaviours and attitudes **(HBI1.3; HBI1.9)**, parental and household influences on children's food choices will be investigated using Scottish data sets (Scottish Health Survey, Scottish FSA Survey of Diet among Children) and panel data sets (Growing Up in Scotland/Millennium Cohort).
- Purchasing data (Kantar World Panel) will be used to analyse habitual purchases for specific food categories.

The approaches used to investigate food choice will be extended to habitual alcohol purchasing. We will seek funding for analysis of the alcohol market, focussing on the 'bundling' of purchases by consumers and how price-based interventions impact on the price and content of a shopping basket.

Ensuring our international recognition as a leading centre in researching time and risk preferences, we will develop new research around time and risk preferences and health behaviour **(HBI1.21)**. More specifically, we will use novel eye-tracking technology to better understand how individuals respond to tasks eliciting time and risk preferences.[4] This work, carried out in collaboration with the Behavioural Science Centre at the University of Stirling, will provide insight into how best to elicit time and risk preferences, improving the theoretical rigour of our time and risk preference research.

The role of factors besides healthcare on health will be expanded to encompass spill-over effects:[5] on education, labour market outcomes and wellbeing (life satisfaction). We will conduct new research examining how early-life health status affects later-life education and labour market outcomes **(HBI1.19)**. Further, in collaboration with the University of Melbourne and the University of Wollongong, we will submit an application to the ESRC Secondary Data Initiative to research key influences on sustaining health behaviours, including the potential feedback loops between life satisfaction and health behaviours. This research will investigate the role of factors such as social networks, peer effects, risk attitudes and personality traits on health behaviours. It will consider dynamic effects between health behaviour, health and life satisfaction such that improvements in life satisfaction help to sustain health behaviours in the longer term.

[3] Scottish Government (2016) National delivery plan. Edinburgh, Scottish Government.

[4] During the review period we invested in an eye-tracker to develop our work on understanding responses to stated-preference tasks. For more on this novel economic research see Section 5 of this report (Methods of Benefit Valuation).

[5] In economics, spill-over effects are economic events in one context that occur because of something else in a seemingly unrelated context.

Development and evaluation of policies to reduce inequality requires valid statistical inference methods. Building on our expertise developing econometric methods for investigating inequalities, further methodological work will use data simulation techniques to ensure more robust ways of undertaking comparison of inequalities in ordinal data, with an increased focus on wellbeing, e.g. self-assessed health and life satisfaction. The methodological research will underpin our empirical work on reducing inequalities in health and wellbeing in Scotland and beyond.

3.3.2 Design and evaluation of interventions

A key development moving forward is the use of behavioural economics to inform the design of interventions. Behavioural economics provides important insights into how biases in decision making impact on individuals' behaviour. Whilst interventions that take these biases into account are more likely to be effective, they have not been considered when developing interventions. Examples of such biases include present bias (the enhanced significance an individual attaches to immediate outcomes) and loss aversion (where losses are valued more than gains). A PhD using insights from time preference and present bias will develop an intervention to improve adherence to exercise **(HBI1.16)** and a NIHR-funded project incorporates loss aversion in a financial incentive design for weight loss in obese men living in deprived areas **(HBI3.2)**.

In collaboration with Queen's University Belfast, research will be conducted on personalising information according to risk preferences in order to increase the uptake of cancer screening. This work is dependent upon an application to the MRC Skills Development Fellowship being successful. An application will also be submitted to the MRC Public Health Intervention Development Scheme for developing a health behaviour intervention by drawing on insights from time preference research. Interventions such as making the future and future-self more salient and making people more aware of the trade-off between costs and future benefits of health behaviours, and the potential for time-inconsistent behaviour (not following through with planned behaviour), will be explored.

Planned work in the area of obesity includes an evaluation of exercise referral for weight loss as part of cancer screening programmes, in collaboration with the Universities of Dundee, Edinburgh and Stirling. Funding has been awarded by the Scottish Government (Health Protection Division) for work to commence in 2017. In addition, we have developed an outline proposal to the NIHR Public Health Research Panel for a multi-component intervention (diet, exercise, physical activity and pain management) amongst an obese older population.

In the new area of self-management, three externally funded projects will consider behavioural interventions to improve self-management of long-term conditions and influence health and wellbeing:

- A randomised controlled trial (RCT) of cognitive behavioural therapy (CBT) and exercise to prevent chronic pain **(HBI3.1)**.
- A RCT study of CBT to lessen the impact of fatigue associated with inflammatory rheumatic diseases **(HBI3.3)**.
- A feasibility study of the value of walking interventions (local authority organised and led walking groups) to improve wellbeing amongst older adults with long-term conditions.

Part of this body of work involves understanding factors that help sustain behaviour change, including the role of social networks. The hypothesis is that changes in health behaviour can be spread or transmitted from one individual to another within a social network. Thus, the effectiveness, cost-effectiveness and uptake of self-management interventions may depend on diffusion through social networks. Building on previous HERU research that considered the role of digital health interventions for promoting behaviour change **(HBI1.8)**, we shall integrate social network methods, developed in social epidemiology, into novel economic modelling of such interventions. To date, there have been very few attempts to use such methods in economic evaluation modelling of behaviour change interventions.

Research opportunities,using natural experiments, [6] will arise over the coming Review period following policy interventions. For example, minimum unit pricing (MUP) of alcohol is currently under legal review in Scotland, but not the rest of the UK. Collaborative research to evaluate the impact of the policy is being discussed with NHS Health Scotland and the University of Sheffield, and will be undertaken if the policy is implemented. NIHR funding approval, subject to MUP proceeding, has been granted to consider the wider impacts on other non-alcohol purchasing. A further natural experiment study, in collaboration with the James Hutton Institute, will be conducted on the costs and consequences of an existing national outdoor health walks programme, subject to funding approval from the NIHR. We are exploring with Sistema Scotland using a quasi-experiment to evaluate the Big Noise project in Scotland. This project is an early-years intervention programme that uses music and participation in an orchestra to improve educational attainment, health and wellbeing of children, their families and communities.

3.4 Summary

Research conducted during the Review period focused on topics endorsed at the 2010 Review. We examined financial and non-financial factors influencing health behaviour, including the role of price, regulation, information and personal characteristics. We strengthened the evidence base relating to the cost-effectiveness of behaviour change interventions. Our new collaboration with the University of Aberdeen's Rowett Institute provided opportunities for new work on the economics of food choice. We applied our expertise in researching time and risk preferences to understand health behaviour, considering implications for behaviour change interventions. We developed new applied work around health behaviour related to self-management and new methodological work to model health inequalities.

Looking forward, understanding health behaviour, and developing and implementing cost-effective policy initiatives to encourage behaviour change, will be crucial in Scotland's transformed health and social care system. Scotland needs to ensure an improvement in the diet and health of children; a reduction in the harmful effects of alcohol, tobacco and obesity; more active and hence healthier lifestyles; support for our ageing population and for the chronically ill to live well and independently, working towards increasing their resilience and wellbeing. Our planned research will inform such ambitions. We will use insights from behavioural economics to inform the design of behavioural interventions, and our evaluations will consider the impact of such intervention on health, wellbeing and inequalities. Ensuring applied work is of the highest theoretical rigour, methodological research will investigate how individuals respond to time and risk preference tasks, and will develop and apply new measures of inequalities in health and wellbeing.

[6] A natural experiment is an empirical study in which individuals (or clusters of individuals) exposed to the experimental and control conditions are determined by policy or nature or by other factors outside the control of the researchers.

Assessment of Technologies (AoT)

"We produce high quality evidence on the value of new and in-use health technologies. We lead research on using a person-centred approach to economic evaluations."

SECTION 04

Assessment of Technologies (AoT)

Graham Scotland

4.1 Introduction

Our Assessment of Technologies (AoT) theme applies and develops economic evaluation methods to inform decisions regarding value for money and sustainability. We apply the methods of economic evaluation to support decisions across the life course of technologies, from the early technology design phase, through decisions on adoption into routine practice, to informing withdrawal or redesign of technologies and services to ensure on-going efficient use of scarce resources. The increased emphasis on the full life course ('health technology management') was the result of a strategic review of the theme held in 2012 when I took over as theme leader under the mentorship of Professor Stirling Bryan. The refocus reflects the increased importance policy makers attach to achieving better value from in-use technologies and services as well as new ones. There is a strong policy emphasis in Scotland and internationally on person-centred care. We reflect this in our economic evaluations, drawing on HERU's unique combination of strengths in economic evaluation methods and stated preferences (collaborating with the Methods of Benefit Valuation theme).

Multidisciplinary research is crucial within this theme. We have two joint posts with the Health Services Research Unit (HSRU), work closely with the University of Aberdeen's Centre for Healthcare Randomised Trials (CHaRT), and engage with clinical colleagues involved in the delivery of national services. We also collaborate with other academic centres with shared interests and have regular engagement with bodies such as the Scottish Medicines Consortium (SMC), Scottish Health Technologies Group (SHTG), Healthcare Improvement Scotland (HIS) and the National Institute for Health and Care Excellence (NICE).

4.2 Research conducted during the Review period

The programme of research proposed in the 2010 Review has been conducted successfully. At an applied level we employed economic evaluation methods to inform health policy. We receive many requests for collaboration.[1] We focused on clinical areas which reflect NHS priorities, and where we have existing research partnerships, knowledge and previous modelling experience, e.g. ophthalmology, obstetrics and gynaecology, dental care, urology, stroke and certain chronic diseases (e.g. renal disease and atrial fibrillation). Methodologically, we made progress incorporating broader measures of value into economic evaluations, and we have progressed thinking on methods to increase the focus of economic evaluation on in-use technologies and services alongside new ones.

[1] To help maintain the quality and impact of HERU's work, criteria for choice of projects are published on our website.

4.2.1 Technology Management

At a time of intense pressure on healthcare budgets, a challenge for NHS decision makers is to balance the adoption of new technologies with efforts to improve the delivery of in-use technologies and services. Our Technology Management sub-theme informs this challenge, applying economic evaluation methods across the life course of technologies (Figure 4.1):

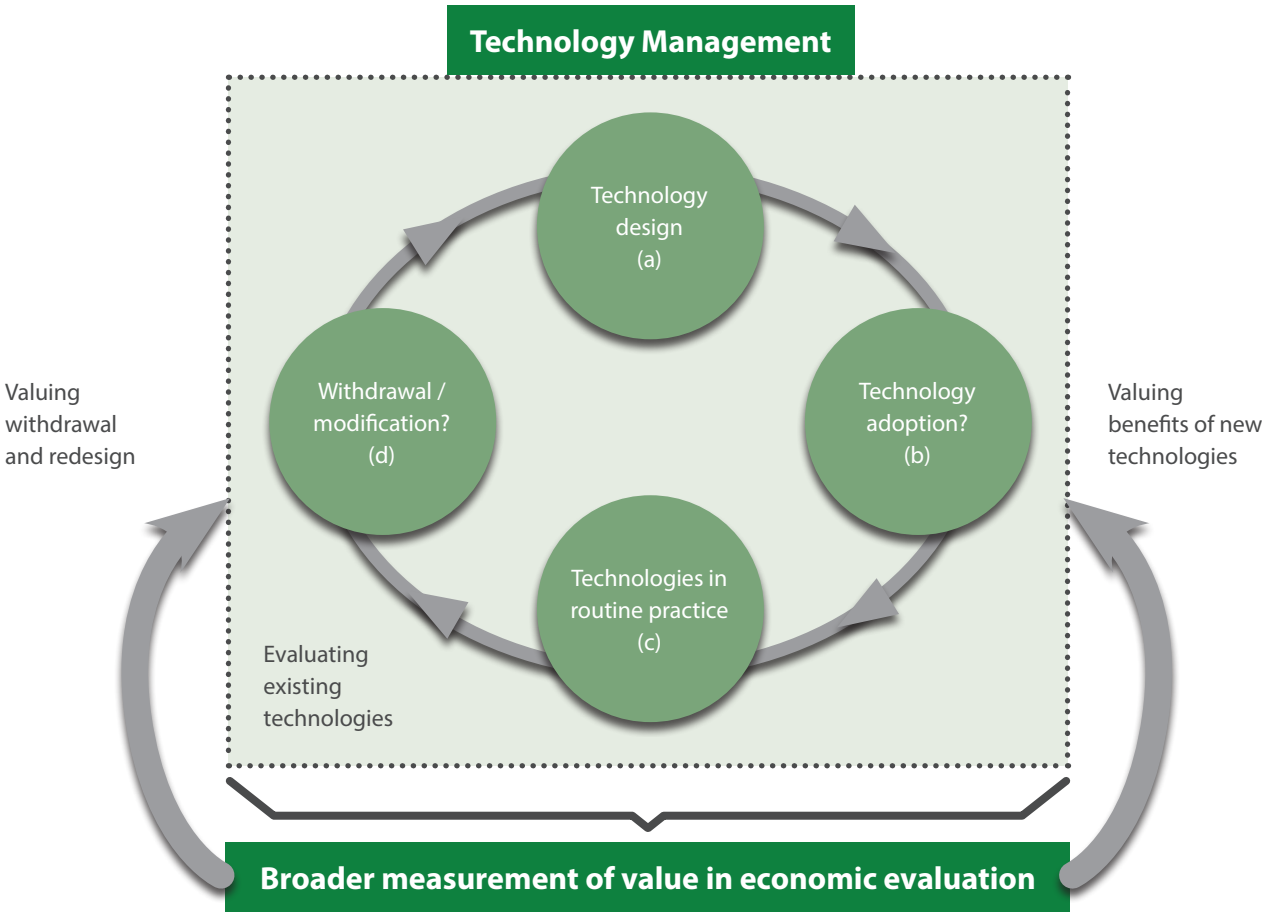
(a) Design – how technologies/services can be developed to meet the needs of the Scottish healthcare system.

(b) Adoption – which newly developed technologies/services should be adopted into widespread clinical practice?

(c) Routine practice – are technologies/services in widespread, routine use providing value?

(d) Withdrawal/modification – how can the delivery and utilisation of in-use technologies and services be improved to ensure better value?

Figure 4.1 Assessment of Technologies theme



Technology design (a)

Through involvement in the earlier phases of technology/intervention development and testing, we have provided important insights into cost-effective and sustainable delivery models, guiding questions on the value of further research. An example is the economic modelling for a proposed randomised controlled trial (RCT) on screening for open-angle glaucoma **(AOT1.2)**. This model helped identify the requisite characteristics for screening strategies to be cost-effective, informing a subsequent application for a large-scale RCT. Another example study used pilot data on the yield of undiagnosed atrial fibrillation, identified using a handheld single-lead electrocardiogram (ECG) in primary care practices in Scotland, to explore the potential cost-effectiveness of implementation models for opportunistic screening **(AOT1.8)**. We have also been involved in a number of early pilot-phase RCTs concerned with the development and feasibility testing of complex behavioural interventions to inform the value of further large-scale trials **(AOT1.3; AOT1.4; AOT1.5; AOT1.1)**.

Technology adoption (b)

Informing decisions on whether or not new technologies should be adopted widely into routine clinical practice in the NHS remains an important focus of our applied research. A substantial component of this work is delivered through the University of Aberdeen's contract to conduct Technology Assessment Reviews (TARs) for NICE and other NHS customers. TARs are used by NICE and other bodies to develop guidance and recommendations on technology use in the NHS. For TARs commissioned by NICE, the resultant guidance is mandatory in England, and certain types of assessment are also used by Scottish decision-making bodies such as the Scottish Health Technologies Group (SHTG) and the Scottish Medicines Consortium (SMC) to help inform advice and guidance for NHS Scotland.

In 2014 the theme, in collaboration with colleagues from HSRU, was successful in having the TARs contract renewed to 2021. Aberdeen is the only centre in Scotland to hold such a contract. The work involves critiquing economic evidence and models submitted by industry (to NICE) in support of their case to have new and existing medicines reimbursed by the NHS in England (single technology appraisals (STAs)), and larger technology appraisals involving rapid systematic reviews and economic modelling to synthesise cost-effectiveness comparisons between relevant alternatives. Over the Review period we contributed to six STAs (**AOT2.4; AOT2.3; AOT2.5; AOT3.13; AOT2.11; AOT2.12)** and nine larger projects assessing clinical and cost-effectiveness of diagnostic **(AOT2.6; AOT2.8; AOT2.14)**, pharmaceutical **(AOT2.9; AOT2.2)**, and other health technologies **(AOT3.11; AOT2.10; AOT2.7; AOT3.21)**.

Our TAR work has direct impact on policy. Examples include:

- Based on our cost-effectiveness modelling as part of a diagnostic assessment review (DAR), NICE recommended point-of-care coagulometers as an option for self-monitoring coagulation status in people with atrial fibrillation and heart valve disease on long-term vitamin K antagonist therapy (http://www.nice.org.uk/guidance/dg14). This DAR was consulted by the SHTG to inform an update of their evidence note on the use of the technology in Scotland (http://www.healthcareimprovementscotland.org/our_work/technologies_and_medicines/shtg_-_evidence_notes/evidence_note_57.aspx).
- Our critique of the modelling for the NICE STA on alirocumab for primary hypercholesterolaemia and mixed dyslipidaemia helped inform NICE recommendations for its restricted use in NHS England (http://www.nice.org.uk/guidance/ta393). A similar case for restricted reimbursement was then submitted to the SMC, and approved (http://www.scottishmedicines.org/SMC_Advice/Advice/1147_16_alirocumab_Praluent/alirocumab_Praluent).

We have collaborated on a number of economic evaluations alongside RCTs, informing adoption of new technologies **(AOT2.17; AOT2.22; A2.23; AOT2.19; AOT2.18; AOT2.29; AOT2.25; AOT2.15; AOT2.28; AOT2.30; AOT2.27; AOT2.31; AOT2.26)**. Some of these studies are simple trial-based economic evaluations but, where appropriate, we have added value by using decision modelling methods to extrapolate cost-effectiveness estimates beyond trial follow-up periods **(AOT2.31; AOT2.22)**.

Whilst economic evaluations based on individual RCTs have a less direct pathway to impact compared with our TAR work, many are cited in national and international guidelines. For example, the CLASS trial **(AOT2.31)**, evaluating the clinical and cost-effectiveness of different interventional procedures for varicose veins, was recently cited in the decision to update the NICE clinical guideline on this topic (http://www.nice.org.uk/guidance/cg168). The SUSPEND trial **(AOT2.25)** comparing alternative drug treatments to facilitate passage of kidney stones was cited in the European Association of Urology Guidelines for Urolithiasis (http://uroweb.org/guideline/urolithiasis/#5).

Box 4.1 Evaluating the cost-effectiveness of an in-use technology: a risk-stratified approach to diabetic retinopathy screening interval

HERU Investigator: Graham Scotland
Collaborators: NHS Grampian, University of Edinburgh, NHS Tayside and University of Dundee.

Outline

The Scottish diabetic retinopathy screening programme was established in late 2005, based on a system of annual screening of all those with diabetes aged 12 years and over. The programme screened 80.7% (199,268) of eligible people in 2013/2014. With the prevalence of diabetes rising by ~4% annually in Scotland, costs of screening for diabetic retinopathy have been rising year on year. In the context of resource constraints, the value and long-term sustainability of the current blanket approach to screening intervals is uncertain.

In this multidisciplinary project **(AOT3.12)** involving researchers and clinicians from Aberdeen, Edinburgh and Dundee, we used routine longitudinal screening data held by the Scottish Care Information-Diabetes Collaboration to model the risk of developing referable retinopathy by clinical and demographic characteristics. By utilising the derived probabilities of progression within a state transition microsimulation model, we were able to assess the cost and health impact of adopting extended screening intervals for groups of individuals identified as low-risk.

Key findings

- A shift to biennial screening for those with no retinopathy observed on two consecutive screening episodes could lead to economic resource savings worth £3.3 million over a two-year period.
- Adopting a lifetime perspective on cost-effectiveness, the cost savings greatly outweigh any slight reductions in quality-adjusted life years; conservatively estimated to be in excess of £200,000 per QALY lost.
- The study suggests that the selective approach to biennial screening should be implemented in Scotland, adding weight to the policy decision recently taken by the National Screening Committee. The results of this study have been shared with Scottish Diabetic Retinopathy Screening Collaborative and will be used to help inform a business case for implementing the policy in Scotland.

We have also conducted decision modelling studies using a combination of evidence synthesis and observational cohort data to inform technology adoption decisions **(AOT2.21; AOT2.24; AOT2.16)**. For example, the GATE study **(AOT2.24)** applied test accuracy data from a prospective cohort of 955 patients with suspected glaucoma in a decision modelling framework, and found that the use of Heidelberg Retinal Tomography as a triage test to reduce unnecessary hospital referrals could free up significant NHS resources for investment in more productive activities (i.e. over £150,000 saved per quality-adjusted life year (QALY) lost). Similarly, the ISMO study **(AOT2.16)** applied decision analytic modelling alongside a cohort study of 3,540 patients (seven UK centres) assessing the diagnostic accuracy of combinations of retinal markers for macular oedema, and estimated that inclusion of optical coherence tomography (OCT) in the screening pathway would result in substantial cost savings for no significant loss in health outcomes. The use of OCT is now recommended in HIS's Diabetic Retinopathy Screening Standards (http://www.ndrs-wp.scot.nhs.uk/?page_id=116).

In-use technology (c, d)

One of the main challenges for NHS decision makers is to identify inefficiencies in the current use of technologies and services, freeing up resources for reinvestment in new technologies of greater value. Economic evaluations have focused disproportionately on new technologies. We proposed two ways to redress this imbalance:[2] (i) to increase the focus of standard methods of cost-effectiveness analysis on technologies that are in widespread routine use, where there is reason to believe that these technologies might not be providing value at accepted standards of value-based decision making; and (ii) to adopt a broader clinical pathway perspective in evaluations with the objective of identifying reallocations within care pathways that improve system-level benefits without increasing the overall resource envelope for the clinical area.

Regarding the former, some of our work has focused on modelling changes in the use of existing screening or monitoring strategies, using observational data to inform key model parameters **(AOT3.8; AOT3.12; AOT3.4)**. For example, we used routine longitudinal data from the diabetic retinopathy screening programme in Scotland to model the cost-effectiveness of adopting extended screening intervals tailored to the individual's risk of progressing to sight-threatening disease **(AOT3.12)**. We found scope for significant cost savings for a negligible loss in QALYs **(Box 4.1)**.

A similar study used progression models based on observational data to model the cost-effectiveness of alternative strategies for monitoring patients with ocular hypertension (OHT) for progression to glaucoma **(AOT3.4)**. This study found some intensive monitoring strategies recommended by NICE to be not cost-effective versus more conservative approaches, suggesting scope to withdraw resources tied up in such activity for reinvestment in more productive alternative uses. It has informed a recent decision to update the NICE clinical guideline on the diagnosis and management of glaucoma (http://www.nice.org.uk/guidance/cg85).

Another modelling study assessed the value of a more conservative approach to the first-line management of cholecystitis or symptomatic gallstones compared with the established approach of immediate surgical intervention **(AOT3.11)**. The modelling indicated potential for conservative management to deliver cost savings but highlighted significant uncertainty in the cost-effectiveness estimates. This was driven primarily by uncertainty surrounding the health-state utility values for the alternative treatment arms and uncertainty over the future probability of requiring surgery following initial conservative management. Following submission of the report for this study, the theme contributed to a successful bid to the NIHR for a definitive trial to address these uncertainties. This trial is now in its recruitment phase **(AOT3.20)**.

Other modelling studies have assessed the cost-effectiveness of alternative post-treatment surveillance regimes for breast cancer **(AOT3.3)**, alternative imaging strategies for diagnosing minor stroke **(AOT3.7)**, and alternative diagnostic monitoring strategies for neovascular age-related macular degeneration **(AOT3.9)**. The work on the alternative diagnostic approaches in minor stroke will be considered during an update of the NICE clinical guideline on stroke (http://www.nice.org.uk/Guidance/CG68).

A further study of in-use technology, based on observational data, considered the cost-effectiveness of alternative surgical options for bladder reconstruction following removal **(AOT3.1)**. We have also further exploited the increased availability of high-quality routine observational data to explore the cost burden of current models of service provision in the areas of fertility treatment and maternal healthcare **(AOT3.10; AOT3.6)**. These projects may be used in the future to inform modelling of service reconfigurations in these clinical areas.

[2] Scotland G. and Bryan, S. Why do health economists promote technology adoption rather than the search for efficiency? A proposal for a change in our approach to economic evaluation in health care. *Medical Decision Making* June, 2016 [Epub ahead of print].

We are committed to several on-going projects evaluating changes in the use of existing technologies and reconfiguration of current services:

- A multicentre NIHR-funded trial-based evaluation of different dental recall intervals to determine if targeting more frequent recalls for those at greatest risk, and less frequent for those at lower risk, can save the NHS money whilst maintaining health outcomes **(AOT3.15)**.
- A multicentre NIHR-funded trial-based evaluation of scale and polish versus hygiene advice for preventing periodontal disease **(AOT3.15)**.
- A multicentre NIHR-funded trial of elective frozen embryo transfer versus fresh embryo transfer for in-vitro fertilisation (IVF) – there is potential for this change in approach to service provision to improve live birth rates and reduce complications, thus improving the value of IVF delivery **(AOT3.18)**.
- A decision model-based evaluation of alternative diagnostic monitoring strategies for the early detection of neovascular age-related macular degeneration in the second eye of patients who already have the condition in one eye. The modelling is being conducted alongside a multicentre NIHR-funded prospective cohort study collecting data on disease progression and diagnostic test accuracy, with the objective of identifying the most cost-effective monitoring strategy among various options currently in use **(AOT3.17)**.
- A decision model-based evaluation of alternative surveillance strategies following endovascular repair of abdominal aortic aneurism; scope exists to free up resources through the use of less invasive and resource-intensive monitoring strategies **(AOT3.21)**.
- A multicentre NIHR-funded trial-based evaluation of in-use surgical interventions for uteric stones **(AOT3.16)**.
- A multicentre NIHR-funded trial-based evaluation of in-use surgical interventions for stones in the lower-pole calyces of the kidneys **(AOT3.20)**.

4.2.2 Broader measures of value in economic evaluation

While the QALY outcome metric is the most commonly used in economic evaluation of healthcare interventions, it is increasingly recognised as being insensitive, in some contexts, to what is valued by patients and the public. We are collaborating with the Methods of Benefit Valuation (MBV) theme to progress the application of broader measures of value in the economic evaluation of health technologies within a cost–benefit analysis (CBA) framework. HERU is the leading centre for applying CBAs in health care.

Over the Review period, two studies were completed in which discrete choice experiments (DCEs) were used to incorporate broader measures of value into the economic evaluation. One study, comparing alternative surveillance regimes for individuals with ocular hypertension **(OHT) (AOT3.4)**, used a DCE to estimate monetary values for attributes of the monitoring strategies. These monetary values were incorporated in a decision analytic model within a model-based CBA, with the results compared to the more traditional cost–utility analysis (CUA). The CBA and CUA gave different policy conclusions: whilst the CBA indicated that a biennial, hospital-based monitoring strategy generated the greatest incremental net benefit, the CUA indicated that simple advice for an annual eye-pressure test was the most cost-effective strategy **(Box 4.2)**. In another study a DCE was applied in a trial-based economic evaluation of traditional haemorrhoidectomy versus stapled haemorrhoidopexy for the treatment of haemorrhoidal disease **(AOT2.26)**. The results of the CBA corroborated those of the CUA, with both favouring traditional haemorrhoidectomy.

Two PhDs focusing on broader measures of value have completed during the Review period, contributing to the development of methods for incorporating DCEs in trial- and model-based economic evaluations **(AOT4.2; AOT4.1)**. The first used a DCE to value attributes related to the provision of obstetric care and applied the derived values to assign utility weights to the actual care received by women enrolled in a trial assessing the impact of a decision aid on the management of labour. This study highlighted the need to ensure a precise match between the way DCE attributes are defined and framed and the decision context and outcomes being measured in the trial. The second PhD explored similar issues with respect to incorporating broader willingness-to-pay values in decision models and identified the challenge of matching the choices in the DCE to the reality of the decision problem being addressed in the model.

BOX 4.2

Box 4.2 Cost–benefit analysis versus cost–utility analysis: the surveillance for ocular hypertension study

HERU Investigators: Rodolfo Hernández, Luke Vale, Mandy Ryan
Collaborators: HSRU, University of Birmingham, University of Oxford, London City University, Moorfields Eye Hospital (London), Rotterdam Eye Hospital, University Hospital Nottingham, Queen Margaret Hospital (Dunfermline) and Tampere University Hospital (Finland).

Outline

Around one million people in the UK have ocular hypertension (OHT), the only treatable risk factor for glaucoma. Based on limited data, long-term monitoring of OHT by specialists in primary or secondary care was recommended by NICE. Controversy resulted, with concern that hospital eye services would be overwhelmed by following up patients at low risk of sight loss. Little was known about how the public valued the availability of OHT monitoring.

We evaluated the clinical-effectiveness and cost-utility of alternative OHT monitoring strategies of varying staff, location and frequency, and applied different glaucoma risk-prediction algorithms using an economic decision model **(AOT3.4)**. A discrete choice experiment (DCE) was also developed to assess public values for characteristics of monitoring startegies not captured in the QALY. These broader values were incorporated in a cost-benefit analysis (CBA).

Key findings

- Recommended resource-intensive monitoring strategies were not found to be cost-effective compared with less costly and more conservative monitoring approaches. Scope therefore exists to withdraw resources tied up in such activity for reinvestment in more productive alternative uses.
- The cost-utility results indicated that advising people with OHT to have an annual eye-pressure test was most likely to be the preferred follow-up strategy on grounds of cost-effectiveness.
- However, the DCE highlighted the value to the public of having an active monitoring programme, with biennial monitoring in a hospital setting providing the highest level of incremental net monetary benefit in the CBA.

NICE recently cited this study in their decision to update their glaucoma guideline: http://www.nice.org.uk/guidance/cg85.

Both PhDs noted challenges with respect to factoring in issues related to the timing and duration of outcomes in the economic evaluation and the valuation of these in the DCE.

A number of on-going trial-based economic evaluations include DCEs, allowing broader measures of value to be incorporated within a CBA. These are focused in clinical areas where QALYs based on common, generic health-related quality-of-life measures are likely to be insensitive to valued differences between the alternatives being compared, and include:

- The previously mentioned trial-based economic evaluation of scale and polish versus hygiene advice for preventing periodontal disease **(AOT3.15)**; monetary preference values elicited for patient-centred attributes of dental care will be merged with patient-level trial data on actual experience against these attributes, and compared with strategy costs in a CBA framework.
- The previously mentioned trial-based economic evaluation of standard and risk-tailored dental recall intervals **(AOT3.15)**; a similar approach to that described above will be applied, completing a trial-based CBA of the alternative check-up interval strategies.
- A trial-based economic evaluation of single-incision mini-slings versus standard mid-urethral slings in the surgical management of female stress urinary incontinence **(AOT2.39)**; monetary values for patient-centred attributes will be elicited, combined with data from the surgical trial and compared with costs to complete a CBA.

4.3 Forward programme of research

Technology management and the incorporation of broader measures of value into economic evaluation will drive our future research. These address current policy objectives of the Scottish Government, including the importance of focussing equally on service delivery alongside technology adoption, the importance of early diagnosis and prevention, and person-centred care.[3] Our work incorporating broader measures of value into economic evaluations, within the framework of a CBA, and carried out in collaboration with our Methods of Benefit Valuation theme, will ensure we remain leaders in this field.

[3] Scottish Government (2016) *A national clinical strategy for Scotland.* Edinburgh, Scottish Government.

4.3.1 Technology management

The importance of evaluating in-use technologies as well as existing technologies is likely to increase. We will give equal priority to new applied projects that address technology adoption questions and those that offer the opportunity to evaluate the use of in-use technologies and services.

We will continue to focus on selected disease areas, especially where scope exists to build on previously developed clinical and research partnerships and where we have existing decision models that can be further refined and improved. Specific clinical areas of expertise where we have on-going projects include glaucoma **(AOT1.2; AOT2.22; AOT2.24; AOT3.8)**, diabetic retinopathy **(AOT2.41)**, age-related macular degeneration **(AOT3.17)**, obstetrics and gynaecology **(AOT3.10; AOT3.6; AOT2.38; AOT3.18; AOT2.37; AOT2.34)**, dental care **(AOT4.3; AOT3.15)** and urology **(AOT2.36; AOT2.35; AOT3.19; AOT2.39)**. More recently, we have built on modelling experience in the area of atrial fibrillation by expanding a previously developed treatment/monitoring model to address questions relating to the cost-effectiveness of screening for undiagnosed disease **(AOT2.8; AOT1.8)**.

4.3.2 Broader measures of value in economic evaluation

The need for including broader measures of benefit is increasingly reflected in NHS policy[4] and recognised by bodies such as the SMC.[5] Furthermore, QALYs have limitations within some of our clinical areas of expertise (e.g. dental care, assisted reproduction), making projects in these areas suitable test-beds for development of CBA methods.

We are leading a number of trial- and model-based CBAs **(AOT4.5; AOT3.15; AOT2.29)**. Further efforts are also under way to develop CBAs in the areas of glaucoma (subject to funding) and fertility treatment. These studies will build on the theme's experience, to refine methods for merging values obtained from DCEs with patient-level data, ensuring that values elicited for DCE attributes are consistent with, and valid for, valuing the range of outcomes being collected at patient level in the respective trials.

[4] Scottish Government (2011) 2020 Vision. http://www.gov.scot/Topics/Health/Policy/2020-Vision.

[5] SMC (2014) Medicines for end of life and very rare conditions. https://www.scottishmedicines.org.uk/Submission_Process/Submission_guidance_and_forms/PACE

We will explore the incorporation of preference heterogeneity in the CBA framework. 'Realistic medicine' implies personalised care, respecting individual preferences for treatment.[6] Current economic evaluation focuses on population-averaged preferences, i.e. it does not account for preference heterogeneity. We will exploit current developments in modelling preference heterogeneity and assess potential application within a CBA. For example, comparing an invasive surgical approach with a more conservative approach to treatment, one could determine the value of the surgical approach for those who would choose it, and the value of the conservative approach for those with a preference for that route, and then assess the average costs and benefits of providing that choice in the system. This is compared to the standard approach that would evaluate the average costs and benefits of providing one or other of the two alternatives for everyone.

A further methodological consideration is the time and resources required to conduct preference elicitation exercises. This may discourage the use of broader measures of value within economic evaluations. In collaboration with the MBV theme, we will address these challenges through two PhD projects:

- An ESRC-funded PhD is exploring ways of standardising an approach for incorporating broader patient values into the HTA decision-making process for new drugs **(AOT4.4)**. This PhD aims to develop a list of generic attributes of value to patients that are unlikely to be captured in the QALY. The objective is to incorporate these attributes in a standardised instrument that can be applied across appraisals, and to develop a valuation tariff for this instrument based on discrete choice methods.
- The second, an IAHS-funded PhD, will explore the potential for using a 'benefit transfer' (BT) approach to incorporate broader measures of value in HTA **(AOT4.5)**. There are now many published studies eliciting patient and public values for broader attributes of health care. There is scope to synthesise this existing evidence using a BT approach as an alternative to carrying out a new study every time values for broader attributes are required for an economic evaluation. This thesis will examine methods for synthesising and transferring values for application in health economic evaluation.

4.4 Summary

Research conducted during the Review period successfully applied economic evaluation methods to a large number of technology assessment questions, with impact at a national and international level. We increased emphasis on evaluating technologies and services in widespread routine use and developed work incorporating broader measures of value into economic evaluations. We conducted some of the first CBAs within health economics.

Looking forward, we will contribute to the Scottish Government's commitment to increase the value from, and financial sustainability of, care by providing an evidence base to ensure the most effective use of resources. We will build on our research, conducting economic evaluation at all stages of the life course of health technologies. We will incorporate measures of value into economic evaluation that take account of what people want from their healthcare system, thus working towards the Scottish Government's aim of a transformed health and social care system that reflects people's preferences. We will develop and apply the cost-benefit analysis framework in economic evaluations, enabling the delivery of person-centred care and ensuring we remain leaders in this field.

[6] Scottish Government (2016) *A national clinical strategy for Scotland*. Chapter 5, 'The need for "realistic medicine"'.

Methods of Benefit Valuation (MBV)

"Our research developing and applying preference elicitation methods in health economics is recognised internationally as cutting edge."

SECTION 05

Methods of Benefit Valuation (MBV)

Verity Watson

5.1 Introduction

Our Methods of Benefit Valuation (MBV) theme aims to develop, refine and apply economic methods to value health and care and to apply such methods to inform policy. The theme, which I took leadership of in 2013, merges two research themes presented at the last review: Preference Elicitation and Experimental Economics. This merger, approved by our Unit Advisory Group, addresses the recommendation of the 2010 Review that our preference elicitation research should be 'enriched by evidence from experimental economics' methods. Our research builds upon HERU's long-standing, international reputation for methodological developments in the area of benefit valuation, and in particular the development of discrete choice experiments (DCEs)[1] and contingent valuation (CV)[2].

Figure 5.1 summarises the scope of the theme. An important aspect of our research is the collaborations with HERU's three other themes, ensuring the robust methods we develop are applied to inform policy. We conduct applied work to inform the delivery of person-centred care and methodological work to ensure the robustness of methods. Our methodological work ensures we are at the forefront of the development of DCEs and CV within health economics.

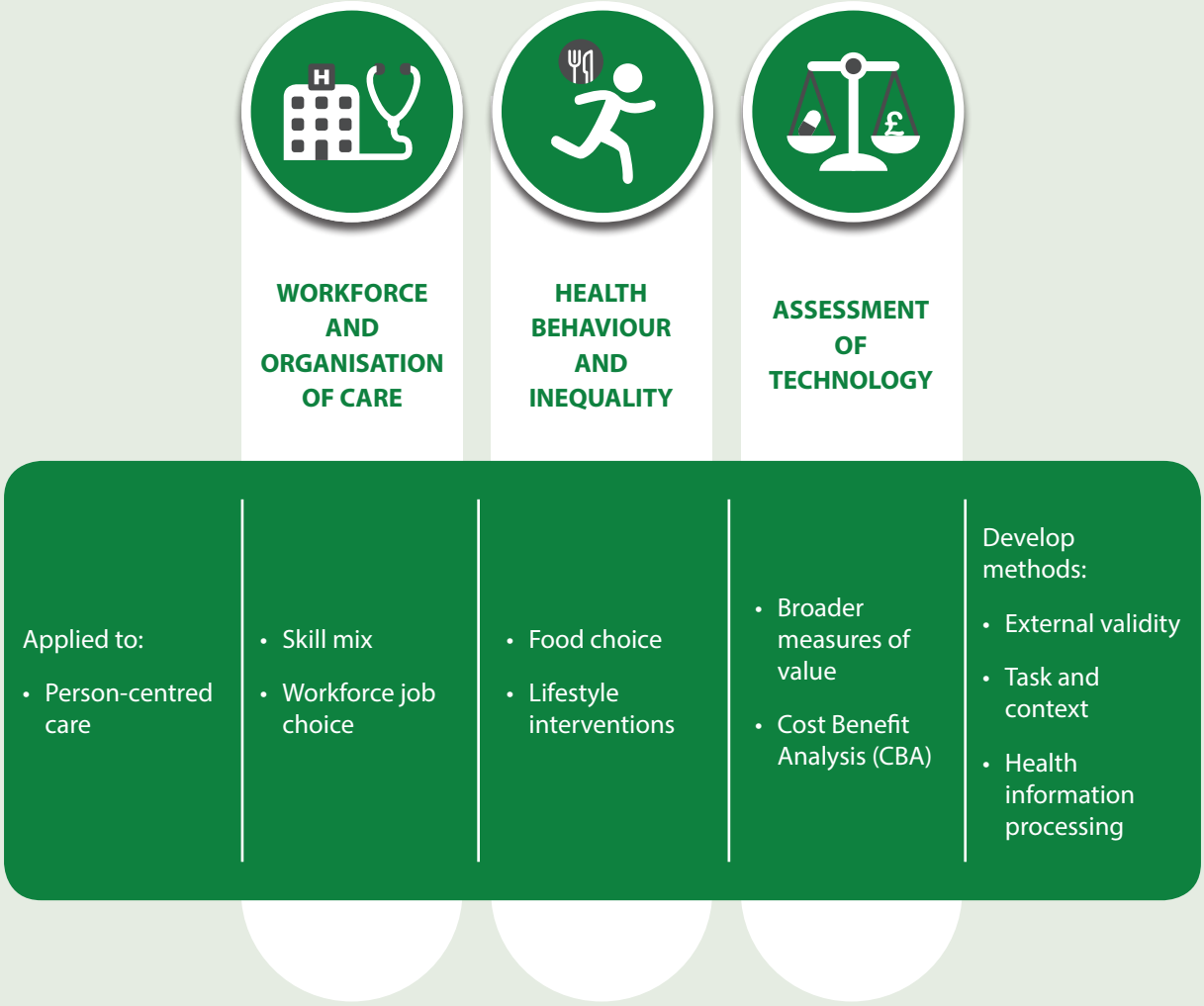
5.2 Research conducted during the Review period

The programme of research proposed in the 2010 Review has been carried out successfully. The research we undertook in the review period has: informed policy questions related to workforce and organisation of care, health behaviour and inequality, and assessment of technologies; informed the delivery of person-centred care by broadening the valuation space; used field and laboratory experiments to improve the validity of stated preference methods; provided insight into the influence of the context of the valuation task on preferences; and used novel eye-tracking work to investigate information processing when responding to DCEs.

[1] Discrete choice experiments (DCEs) are also a survey-based method. They differ from the CV method in that they are attribute based. As with CV, monetary measures of value can be generated and incorporated into a CBA. DCEs were introduced into health economics in the 1990s by research carried out in HERU by Professor Mandy Ryan and others.

[2] Contingent valuation studies elicit willingness to pay (WTP), a monetary measure of value, in a hypothetical (survey) context. Such studies inform the valuation of benefits within a cost-benefit analysis (CBA) framework.

Figure 5.1: Collaborations between Methods of Benefit Valuation and HERU's other themes



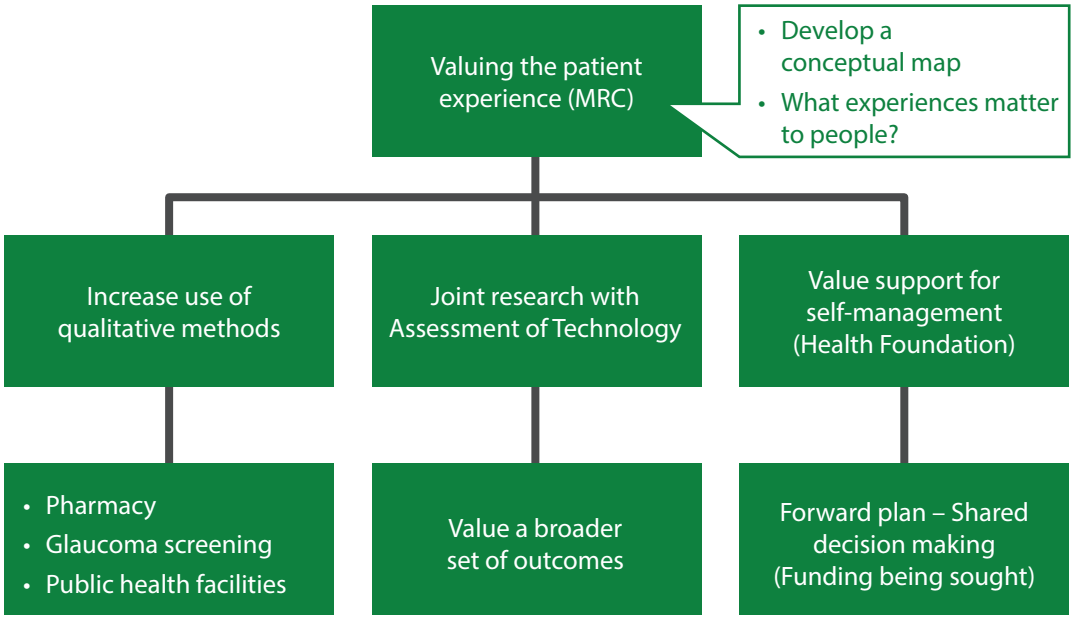
5.2.1 Collaboration with other themes in HERU

Much of our policy-relevant work is carried out in collaboration with the three other themes within HERU. Examples of joint work with Workforce and Organisation of Care include studying the push and pull factors that affect junior doctors' training post choices **(WOC1.12; Box 2.1)** and patients' preferences for the healthcare professional who delivers their care **(WOC2.15; WOC2.16; Box 1.3)**. With Health Behaviour and Inequality we have applied methods we developed to understand preferences for lifestyle interventions to reduce obesity **(HBI2.1)** and for food labelling **(HBI1.9)**. Our work with Assessment of Technologies has integrated broader measures of values within economic evaluations **(AOT2.26; AOT3.4; AOT4.1; AOT4.2; AOT4.5; Box 4.1)**.

5.2.2 Person-centred care

The valuation of person-centred care and patient experiences is an area we have contributed to for many years. **Figure 5.2** shows how we have taken this work forward during the Review period. In 2011 we completed work on an MRC Methodology Research Programme-funded research project investigating what aspects of care matter to patients and how these can be valued **(MBV1.2)**. This work was carried out in collaboration with researchers in HSRU and at the University of Dundee, and developed a conceptual map of the aspects of service provision that can be important to people. The subsequent stage found that whilst health economists have focussed on valuing process descriptors of care (e.g. waiting time, consultation time, location, continuity of care), little attention has been given to valuing how health care provision enables people to live well (e.g. ensuring individuals have meaning in life, good relationships, engage in daily activities).

Figure 5.2: Development of work on person-centred care



Box 5.1 Think pharmacy: making the community pharmacy the first port of call

HERU investigators: Mandy Ryan, Verity Watson
Collaborators: Academic Primary Care, University of Aberdeen

Background

Demand for health services continues to rise. Greater use of community pharmacy services instead of medical services for minor ailments could help relieve pressure on healthcare providers in high-cost settings. Community pharmacies are recognised sources of treatment and advice for people wishing to manage these ailments. However, increasing the public's use of pharmacy services requires an understanding of their preferences for community pharmacy – how can we encourage the public to make a pharmacy their first port of call?

To identify factors important in the delivery of pharmacy services, as well as trade-offs individuals make between different attributes of the service, we used a discrete choice experiment **(MBV3.3)**. Knowledge of these trade-offs can inform the future organisation and delivery of pharmacy services.

Key findings

- The public considered convenience – e.g. waiting time, location of pharmacy and availability of car parking – when deciding what community pharmacy to attend.
- However, when choosing a pharmacy people place highest value on a pharmacy service that will improve their understanding of symptoms and how to manage them, delivered by staff members who are friendly and approachable. That is, people need to have a positive experience when they go to the pharmacy and to come out feeling that they know more than they did when they went in.

Policy implications

- It's hard to see how community pharmacies can become more convenient, given their widespread presence across both urban and rural settings, long opening hours and the fact that people can consult their pharmacist without the need for an appointment. The way to tempt more people with minor ailments into pharmacies may lie in the customer experience. We know current interactions with pharmacists are far from perfect. Investment in staff training would therefore seem important. Ways of freeing up pharmacist time for more interaction at the counter might be investigated.

This finding informed subsequent DCEs undertaken in the Review period, which include attributes of care that are more personalised and descriptive of what a patient experiences. For example, in a Health Foundation-funded project carried out in collaboration with researchers from HSRU and Academic Primary Care at the University of Aberdeen, we valued several aspects of the personalisation of support for the self-management of chronic pain and breathlessness. We found that people with long-term conditions most value health services that pay attention to their personal situation and are oriented to what matters to them in life **(MBV1.6)**. Personalised factors were also important in understanding preferences for community pharmacies **(MBV3.3, Box 5.1)**, glaucoma screening **(AOT4.1, Box 4.2)** and public health facilities **(MBV1.3)**. We have increased use of qualitative methods (focus groups, online discussion groups and 'think aloud' interviews) to inform personalised attributes, and explored the use of online discussion boards to address personal issues **(MBV1.5; MBV1.6)**.

5.2.3 External validity

Valuation techniques in health economics largely rely on responses to hypothetical questions. A crucial question is the extent to which individuals behave in reality as they state in hypothetical tasks. We have conducted the first within-sample field experiments testing the external validity **(MBV2.4)** of contingent valuation. In a study in Thailand that elicited willingness to pay (WTP) for dental health insurance, we found differences between hypothetical and real choices. However, using respondents' level-of-choice certainty we can calibrate responses ex post and improve the correspondence between hypothetical and real choices (by only using responses of those who are certain of their WTP). To assess how far this finding could be generalised, a field experiment was carried out comparing hypothetical and real WTP for a lifestyle check in the pharmacy in Scotland, and qualitative data were collected to understand why hypothetical and real choices differ. Analysis is on-going.

The above studies focus on contingent valuation. In a PhD we are exploring the validity of responses to DCEs, using a field experiment within the context of preferences for a lifestyle check at the community pharmacy **(MBV2.5)**. This is the first field experiment to explore the external validity of DCEs. In addition to ex post certainty calibration, we are using qualitative methods and the theory of planned behaviour (a psychological theory that links beliefs and behaviour) to better understand disparities between hypothetical and real choices. Analysis is on-going.

Helping respondents resolve uncertainty may reduce the discrepancy between hypothetical values and actual payments and thus lead to more accurate policy recommendations. In collaboration with researchers in Canada (University of British Columbia and the Hospital for Sick Kids, Toronto) we found that lower self-reported certainty does not necessarily imply lower-quality responses. Certainty depends on several factors including respondents' preference certainty and the DCE task difficulty. This research will help to ensure researchers design studies with higher response certainty **(MBV2.3)**.

Our experimental economics work has also informed the external validity debate, with novel work using induced experiments providing insight into ways of improving the validity of responses. This work is being taken forward in the field **(Box 5.2)**.

Box 5.2 Using insights from experimental economics studies to improve the validity of survey responses: the honesty oath

Background

HERU was one of the first centres to apply experimental economic methods in the health context. Experiments use cash-motivated subjects to create real-world incentives and provide controls that allow researchers to separate the effects of different variables and to infer causality. We used experiments to improve the validity of DCE responses.

Research in review period

In collaboration with Dr Luchini at Aix-Marseille University, we carried out laboratory experiments comparing hypothetical and real responses to a DCE-type task. We found neither hypothetical nor real choices reliably measure preferences and that researchers should take task complexity and learning into account when designing stated preference tasks **(MBV2.1)**.

In response to these findings, and in collaboration with researchers in France and the USA, we tested the potential of an oath to improve validity **(MBV2.2)**. We replicated the above experiment but this time asked participants to sign an oath before they took part. We found that participants were willing to sign an oath, and the choices of those who were asked to sign were more valid – an honesty oath improved validity.

Looking forward

- Laboratory experiments are by their nature abstracted from the real world. We will investigate whether the results we find in the laboratory are replicated in the field **(MBV4.1)**.
- Oaths are most effective when they are voluntary, written down and signed. As such, they may be best as part of a social interaction. This raises questions about the use of oaths with postal or online survey modes. We will seek funding to explore the potential of honesty priming as an alternative to honesty oaths.

5.2.4 The valuation task and context

Work has investigated how contextual factors influence valuations; we have focused on the type of values elicited and how the values are elicited. In collaboration with colleagues at the University of Sheffield, we expanded an existing conceptual framework of the different perspectives that respondents can be asked to take in a stated preference task **(MBV3.6)**. In a large multidisciplinary project funded through the UK National Ecosystem Assessment **(MBV3.4)** we identified the importance of deliberation in eliciting social values. A PhD studentship that commenced in September 2015 is taking this work forward, eliciting community preferences using deliberation methods within a citizen's jury in the context of breast cancer screening **(MBV3.10)**.

Data collection is increasingly moving online, raising questions about representativeness of samples and quality of data across modes of data collection. In an MRC Methodology Research Panel-funded project we tested how the survey mode (interview, mail survey or internet panel) affects sample composition and preferences elicited in a DCE about pharmacy care **(MBV3.3)**. Across the different modes, none of the samples of respondents were representative of the general population – while mail survey respondents were older, on average, than the general population, respondents to the internet panel surveys were younger and in poorer health. Although respondents' preferences and values differed across modes, the differences were small.

Recently, the best worst scaling (BWS) approach has been proposed as an alternative to DCEs to value multi-attribute goods, particularly within the context of developing alternatives to EQ-5D as a utility measure (e.g. Investigating Choice Experiments for Preferences of Older People, ICEPOP). BWS asks respondents to select both the best and the worst aspects in a choice set. Little is known about how people respond to BWS tasks and how valid the values elicited are. We found that DCE and BWS lead to different results; DCE responses are more consistent with models of consumer choice in economics; and BWS choices are affected by ordering and labelling effects **(MBV3.5)**. Our results suggest caution when using BWS methods.

5.2.5 Health information processing

In previous Review periods, we have investigated the underlying axioms of utility theory (whether individuals behave as economic theory assumes) using quantitative and qualitative research methods. Work in this Review period has focused on the axiom around which there has been most debate – continuity of preferences (whether individuals' choices are consistent with compensatory decision making).[3] We have also explored information processing more generally. Our research has demonstrated the challenges of using inferred data (econometric) or respondent statements about decision making to understanding compensatory decision making and information processing (MBV4.1). We have shown that novel eye-tracking methods are informative in understanding information processing strategies. [4] Evidence was found of: (i) top-to-bottom, (ii) left-to-right and (iii) first-to-last order biases in processing multi-attribute information. Experimental factors – whether attributes are defined as 'best' or 'worst', choice task complexity and attribute ordering – also influence information processing **(MBV4.3)**. Our results have implications for both the design and the analysis of preference elicitation tasks, which we will explore further in the next Review period.

[3] Our research in previous Review periods has shown that other axioms of utility theory are satisfied (completeness, stability, transitivity, monotonicity).

[4] During the Review period we invested in an eye-tracker to develop our work on understanding responses to stated preference tasks.

5.3 Forward research programme

Our forward work plan builds on, and takes forward, the activities of previous Review periods. We will continue to work with HERU's research themes to inform policy-relevant questions and to broaden the valuation space of economic evaluation within a cost-benefit analysis (CBA) framework. Our applied research is closely aligned with the Scottish Government's aim to provide person-centred care, including the Chief Medical Officer's annual report focusing on realistic medicine.[5] Our methodological work will explore the robustness of stated preference methods, using novel methods such as laboratory experiments and eye-tracking. Our forward plans will ensure that applied preference studies conducted in HERU provide robust results to be used by policy makers and our methodological work will remain at the forefront of research on the application of DCEs in health economics.

5.3.1 Collaboration with other themes in HERU

Methods we develop will be used by HERU's other themes to address policy-relevant questions. For example, our Workforce and Organisation of Care theme will use DCEs to understand push-pull factors in medical careers decision-making **(WOC1.12; WOC1.14)**, as well as preferences for different healthcare professional in the delivery of health care **(WOC2.15; WOC 2.16)**. Our Health Behaviour and Inequality theme will use DCEs to inform research on food choice **(HBI1.12)** and the design and evaluation of interventions to encourage healthy lifestyles **(HBI3.2)**. Assessment of Technologies will incorporate CV and DCEs into future economic evaluation within a CBA framework **(AOT4.5?; AOT3.15; AOT2.29)**, ensuring a more person-centred approach. This cross-theme collaboration ensures that policy questions are addressed with theoretical rigour.

5.3.2 Person-centred care

When considering the application of DCEs to elicit people's preferences in the delivery of health care we will always consider the role of attributes that enable individuals to live well **(MBV1.7)**. This will inform the very limited evidence base on the value of such personalised care.

DCEs provide a method to incorporate broader measure of value, therefore it is important to ask why they are not used more in economic evaluations and RCTs? A possible deterrent is the cost of primary data collection. In collaboration with HERU's Assessment of Technologies theme, two PhD candidates will address this issue. An on-going ESRC-funded PhD will investigate the feasibility of developing a generic set of domains that capture broader benefits of health care **(AOT4.4)**. An IAHS-funded candidate who started in Autumn 2016 will investigate the feasibility of using the results from existing valuation studies in different contexts, i.e. can the value of reducing waiting time be transferred across different clinical settings **(AOT4.5)**. Benefits transfer is a new research area in health economics; if proven it will reduce the need for new valuation studies in areas with a lot of existing evidence and it will make better use of existing data.

New research will explore the use of DCEs to facilitate shared decision making (SDM) during the clinical encounter. Effective SDM requires patients to be informed about treatment options and trade-offs. DCEs present individuals with attribute-based choices, highlighting such trade-offs. Whilst they have been used extensively to value patient experiences, to date they have not been used to facilitate SDM. We are currently applying to Pharmacy Research UK to fund a feasibility study, within a pharmacy context, which will explore using a DCE as a decision aid tool. We hope to take this forward to a definitive RCT. Whilst our proposed study focusses on the management of chronic pain within a pharmacy setting, it is anticipated that the developed tool will be transferable to other clinical areas and practice settings.

[5] Calderwood, C. (2016) *Chief Medical Officer's annual report 2014–15: realistic medicine.* Edinburgh: Scottish Government.

5.3.3 External validity

We will use laboratory experiments to develop new ex ante methods to improve robustness. We have shown how oaths improve validity in the laboratory. Given that an oath is based on social commitment theory, it may work best as part of a social interaction, and be less effective in survey settings such as postal or online surveys. Together with researchers in France and the USA, we will seek funding to explore the potential of honesty priming tasks as an alternative to honesty oaths. Priming asks the respondent to complete a simple, quick task before the survey. These typically ask people to unscramble five words to form a proper sentence. In honesty priming tasks such sentences will refer to the idea of honesty.

We will use field experiments to test the methods developed in laboratory experiments and compare these to existing methods shown to improve validity. Within the context of dental care, a PhD is comparing three ex ante correction methods (the honesty oath from our laboratory experiment; a cheap-talk script that describes the problem of validity to respondents and asks them to provide valid answers; and stressing consequentiality, which emphasises to respondents that their answers will inform policy decisions and urges them to provide valid answers) and two ex post calibration methods (respondents' self-reported certainty and dissonance minimisation (which allows respondents to provide less ambiguous responses, such as being in favour of care but not being willing to pay)) **(AOT4.3)**.

From January 2017 a post-doctoral researcher funded by the EU Marie Curie mobility scheme will join HERU to work on methodological projects developing DCEs. Taking forward our research on preference certainty, a planned project will explore the role of preference certainty, as well as choice difficulty and decision time, on the validity of DCE responses. The results will have implications for measuring data validity and inform ways to improve data quality.

5.3.4 The valuation task and context

Our research has shown that elicitation tasks have potential to elicit many different values or perspectives, but the way values are elicited matters, and therefore the use of different contexts may lead to different policy recommendations. Together with health economists and a social psychologist from the University of Sheffield, we are seeking MRC funding to test people's ability to answer social value stated preference questions. Social value questions are relevant to a range of policy areas, including: valuing end-of-life care; value-based pricing for technologies; and priority setting within a health service. We will explore the use of online surveys and how the absence of an interviewer affects the elicited values. We will compare two explanations for any differences: (i) respondents are less engaged in online surveys; and (ii) online surveys enable respondents to follow their own motivation rather than answering from a social perspective.

5.3.5 Health information processing

Our research has shown that people do not always process health information in the ways economic models assume. We have also shown that eye-tracking technology can provide useful insights for the design and analysis of elicitation tasks. In the next Review period we will explore information processing with respect to two common attributes: cost and risk.

- The cost attribute is central to the calculation of monetary values from DCE results. If cost information is not processed appropriately then using the DCE estimates may lead to unjustified policy recommendations. We are seeking external funding for a post-doctoral research fellowship to explore issues around the cost attribute in DCEs using a mixed methods approach that includes qualitative methods, eye-tracking and econometric modelling.
- Risk is an important part of healthcare decision making – many decisions involve risks of complications or adverse events. It is known that people find risk difficult to understand and this may undermine informed, shared decision making. In the context of maternity care, we will collaborate with researchers from the University of Stirling to combine qualitative research with eye-tracking to better understand how women trade off the risks associated with different models of maternity care. We will consider whether the way risk information is presented as text, pictures or infographics affects the way it is understood.

Economic methods assume that individuals maximise utility – an alternative decision strategy is that individuals minimise regret. Using eye-tracking and econometric modelling we will explore decision-making strategies within the areas of cancer and infertility treatments **(MBV4.4)**.

5.4 Summary

Research conducted within the Review period addressed areas approved at the 2010 Review. We collaborated across HERU's themes to inform policy questions, e.g. factors influencing medical students' and junior doctors' career choices; patients' preferences for the healthcare professional who delivers their care; preferences for lifestyle interventions that reduce obesity and how the presentation of nutritional information influences food choice. We informed the delivery of person-centred care by broadening both the valuation space in economic evaluations and the interpretation of person-centred care. We helped to improve the validity of stated preference methods through the results of field and laboratory experiments; research into the influence of context on study results; and novel eye-tracking studies of information processing.

Person-centred care is at the heart of Scotland's transformed health and social care system[6]. People will be equal partners with the health professional, working with them to arrive at decisions about care that is right for them; they will be supported to reflect on and express their preferences. Our expertise and skills will be applied to inform the evidence base to deliver person-centred care. Our collaborations with HERU's other three themes will inform the evidence base necessary for delivering the transformational change required in NHS Scotland. Our methodological work will ensure rigour in all our applied work, and maintain HERU at the forefront of research developing methods for eliciting people's preferences.

[6] Scottish Government (2016) National delivery plan, Edinburgh, Scottish Government.

CSO Core Grant Financial Statement 2010–2016

ANNEX 01

CSO Core Grant Financial Statement 2010–2016

Expenditure:	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	Total
Salaries	571,932	571,745	584,502	584,448	584,732	584,732	584,732	**4,066,823**
Indirect Costs (20%)	114,386	114,349	116,900	116,890	116,946	116,946	116,946	**813,363**
Travel & Subsistence	30,572	30,000	23,869	35,414	29,977	30,000	30,000	**209,832**
Stationery, Photocopying & Postage	5,071	3,631	1,845	2,201	3,191	3,626	3,626	**23,191**
IT Costs	17,779	17,572	17,538	16,028	18,323	17,000	17,000	**121,240**
Specialist Publications	4,900	6,028	4,324	2,436	2,307	1,800	1,800	**23,595**
Publishing Costs	6,284	5,200	5,520	7,024	8,943	3,600	3,600	**40,171**
Miscellaneous	7,256	6,800	16,135	6,468	6,485	13,200	13,200	**69,544**
Director's Discretionary	61,212	62,996	64,545	64,545	64,545	64,545	64,545	**446,933**
TOTAL	**£819,392**	**£818,321**	**£835,178**	**£835,454**	**£835,449**	**£835,449**	**£835,449**	**£5,814,692**

ANNEX 02

External Research Funding and University Investment, 2010–2016

ANNEX 02

External Research Funding and University Investment, 2010–2016

Awarding Body:	Total Awarded	HERU Share
Research Councils	2,538,940	425,646
Charities	3,187,763	284,363
National Institute for Health Research (NIHR)	31,670,761	1,638,084
Government and NHS (Excl. NIHR)	18,236,295	1,580,989
UK Commercial	128,175	82,247
European	2,377,311	370,580
Other	876,758	558,746
Total Research Grant Income	**59,016,003**	**4,940,655**
University of Aberdeen Investment		**2,081,876**
TOTAL INCOME	**£59,016,003**	**£7,022,531**

External Research Funding 2010 - 2016 (Completed or In Progress)

Funding Body	Research Project Title	Principal Investigator	HERU Investigator/s	Total Amount of Research Grant Award	HERU Applicant/s Share	Start Date	Duration of Project	Completed (C) or In Progress (P)	Project Template number
BUPA and Research Councils UK (RCUK)	OTIS: Prospective collaborative study of patients with intestinal segments transposed into urinary tract following surgery for bladder cancer or benign end-stage bladder disease.	J. N'Dow (HSRU, University of Aberdeen)	R. Hernández	£179,857	£13,972	Dec 04	9 years	C	AOT3.1
Economic and Social Research Council (ESRC) and Chief Scientist Office (CSO) CORE	A study of nurse labour markets: preferences for pecuniary and non-pecuniary rewards.	D. Skåtun (HERU)	D. Skåtun, R. Elliott, D. Ikenwilo	£116,505	£116,505	Jan-06	5 years	C	WOC1.2
Medical Research Council Clinical Fellowship via University of Edinburgh and University of Aberdeen	Prognosis and management of intercranial vascular malformations and non-traumatic intracerebral haemorrhage in adults.	A-S. Rustam (University of Edinburgh)	P. McNamee, Z. Quayyum	£575,105	£5,280	Jan-06	5 years	C	AOT3.2
National Prevention Research Initiative (NPRI) and Chief Scientist Office (CSO) CORE	An economic evaluation of obesity prevention for UK adults.	M. Sutton (University of Manchester)	M. Ryan, D. Olajide, A. Ludbrook, D. Yi	£495,656	£272,273	Jul-06	4 years	C	HBI2.1
Division of Applied Health Sciences (DAHS), University of Aberdeen Studentship and University of Aberdeen	PhD: Personal and professional motivation and the supply of health care.	Y. Feng (PhD Student, HERU)	Y. Feng, S Farrar, A. Ma	£39,000	£39,000	Oct-06	39 months	C	WOC1.3
National Institute for Health Research (NIHR), Health Technology Assessment (HTA) Programme and Chief Scientist Office (CSO) CORE	The Catheter Trial: Types of urethral catheter for reducing symptomatic urinary tract infections in hospitalised adults requiring short-term catheterisation: multicentre randomised controlled trial of antibiotic- and antiseptic-impregnated urethral catheters.	J. N'Dow (HSRU, University of Aberdeen)	M. Kilonzo	£1,173,470	£50,630	Jul-07	33 months	C	AOT2.15
National Institute for Health Research (NIHR), Health Technology Assessment (HTA) Programme, University of Aberdeen and the Chief Scientist Office (CSO) CORE	Improving the value of screening for diabetic macular oedema using surrogate photographic markers.	J. Olson (Biomedical Physics, University of Aberdeen)	G. Scotland, P. McNamee	£464,949	£16,448	Aug-07	42 months	C	AOT2.16
Chief Scientist Office (CSO) and University of Aberdeen	Cost-effectiveness of exercise training in older patients with heart failure.	M. McMurdo (Ninewells Hospital & University of Dundee)	M. van der Pol, D. Boyers	£213,465	£12,518	Sep-07	3 years	C	AOT2.17
Chief Scientist Office (CSO) and Chief Scientist Office (CSO) CORE	FOCCUS: Pragmatic multicentre randomised trial of (1) routing postoperative ICU care and/or (2) pre-operative fluid loading in high-risk surgical patients undergoing major elective surgery and urgent surgery.	B. Cuthbertson (Sunnybrook Health Services Centre, Toronto)	R. Hernández, D. Boyers	£225,817	£8,707	Sep-07	30 months	C	AOT2.18
Arthritis Research Campaign (ARC) and University of Aberdeen	MUSICIAN: Managing Unexplained Symptoms (chronic widespread pain) In primary Care: Involving traditional and Accessible New approaches.	G. Macfarlane (Population Health, University of Aberdeen)	P. McNamee, G. Scotland	£376,406	£1,530	Oct-07	3 years	C	AOT2.19

Funding Body	Research Project Title	Principal Investigator	HERU Investigator/s	Total Amount of Research Grant Award	HERU Applicant/s Share	Start Date	Duration of Project	Completed (C) or In Progress (P)	Project Template number
European Renal Association - European Dialysis and Transplant Association (ERA-EDTA) Registry, Amsterdam Medical Centre and Chief Scientist Office (CSO) CORE	EVEREST: Explaining the variation in epidemiology of renal replacement therapy (RRT) outcomes through expert opinion, secondary data sources and technology adoption.	FJ. Caskey (North Bristol NHS Trust, University of Bristol)	R. Elliott	£16,000	£16,000	Jan-08	3 years	C	WOC2.2
National Institute for Health Research (NIHR), Health Technology Assessment (HTA) Programme and the Chief Scientist Office (CSO) CORE	CLASS: Project extension: Comparison of Laser, Surgery and foam Sclerotherapy: randomised controlled trial comparing foam sclerotherapy, alone or in combination with endovenous laser therapy, with conventional surgery as a treatment for varicose veins.	J. Brittenden (School of Medicine and Dentistry, University of Aberdeen)	G. Scotland, E. Tassie	£152,156	£11,254	Jan-08	10 years, 6 months	P	AOT2.31
Department of Health	Payment by results: key outcomes and variations across HRGs, providers and patients in 2006/07 and 2007/08.	S. Farrar (HERU)	S. Farrar	£293,696	£280,120	Jul-08	2 years	C	WOC1.5
Department for International Development (DFID) and Australian Government Overseas Aid Program (AusAID)	Improving maternal, neonatal and child survival: a partnership approach to achieve millennium development goals in Bangladesh.	J. Hussein (IMMPACT, University of Aberdeen)	Z. Quayyum	746,600 US$	£63,830	Jul-08	5 years	C	AOT2.20
Department of Health – NHS Executive Health Technology Assessment (HTA) and Research Council UK (RCUK)	Screening for disorders of glucose regulation in cystic fibrosis.	N. Waugh (Population Health, University of Aberdeen)	R. Hernández	£111,572	£11,230	Jul-08	30 months	C	AOT2.21
National Health Service (NHS) Grampian and Chief Scientist Office (CSO) CORE	Local evaluation of keep well in Aberdeen city community health partnership.	A. Ludbrook (HERU)	A. Ludbrook	£41,009	£41,009	Aug-08	21 months	C	HBI2.2
Medical Research Council (MRC), Chief Scientist Office (CSO) CORE and Research Council UK (RCUK)	GPS: Developing the intervention and outcome components for a proposed RCT on screening for open-angle glaucoma.	A. Azuara-Blanco (HSRU, University of Aberdeen)	R. Hernández	£408,886	£21,597	Sep-08	2 years	C	AOT1.2
National Institute for Health Research (NIHR), Health Technology Assessment (HTA) Programme	The clinical effectiveness and cost-effectiveness of different surveillance mammography regimes after the treatment of primary breast cancer.	F. Gilbert (Clinical Services, University of Aberdeen)	L. Vale, L. Ternent, R. Hernández	£241,532	£69,101	Sep-08	18 months	C	AOT3.3
Medical Research Council ((MRC) (Capacity Building PhD Studentship), University of Aberdeen and Chief Scientist Office (CSO) CORE	PhD: Economic analysis of dietary and physical activity behaviours: consequences for obesity interventions (MRC Capacity Building PhD).	F. Becker (PhD Student, HERU)	F. Becker, A. Ludbrook, B. Eberth	£58,645	£58,645	Oct-08	42 months	C	HBI1.1
Research Council UK (RCUK) Fellowship, University of Aberdeen and the Chief Scientist Office (CSO) CORE	PhD: Broadening the valuation space in health technology assessment: the case of monitoring individuals with ocular hypertension.	R. Hernández (PhD Student, HERU)	R. Hernández, M. Ryan	£125,000	£125,000	Oct-08	6 years, 6 months	C	AOT4.1
Medical Research Council ((MRC) (Capacity Building PhD Studentship) and Chief Scientist Office (CSO) CORE	PhD: NHS staff skills mix and local labour markets: the role of reward structures, shortages and competition in determining the mix of the NHS workforce.	J-B. Combes (PhD Student, HERU)	J-B. Combes, R. Elliott, D. Skåtun	£59,863	£59,863	Nov-08	4 years	C	WOC2.3
Medical Research Council (MRC), National Prevention Research Initiative (NPRI) and Chief Scientist Office (CSO) CORE	Economic appraisal of the choice and targeting of lifestyle interventions to prevent disease in deprived populations.	A. Ludbrook (HERU)	B. Eberth, A. Ludbrook, D. Olajide	£261,319	£237,370	Nov-08	36 months	C	HBI2.3

Funding Body	Research Project Title	Principal Investigator	HERU Investigator/s	Total Amount of Research Grant Award	HERU Applicant/s Share	Start Date	Duration of Project	Completed (C) or In Progress (P)	Project Template number
Scottish Government (Sustainable Travel Demonstration Communities), Chief Scientist Office (CSO) CORE and University of Aberdeen	Smarter choices, smarter places programme.	J. Anable (School of Geosciences, University of Aberdeen)	A. Ludbrook, S. Farrar, P. Norwood	£738,863	£11,319	Nov-08	48 months	C	HBI2.4
Medical Research Council (MRC) (Trials Grant)	EAGLE: Effectiveness, in Angle-closure Glaucoma, of Lens Extraction.	A Azuara-Blanco (HSRU, University of Aberdeen)	G. Scotland, M. Javanbakht	£1,514,769	£33,847	Nov-08	7 years, 2 months	C	AOT2.22
Medical Research Council (MRC) (via the University of Dundee) and Chief Scientist Office (CSO) CORE	Weigh Well: MRC IES Platform Grant, scoping and feasibility preparation for an RCT on postpartum weight loss.	A. Anderson (University of Dundee)	A. Ludbrook, L. McKenzie	£193,576	£28,860	Dec-08	18 months	C	HB12.5
Medical Research Council (MRC)/Economics and Social Research Council (ESRC) Interdisciplinary Postdoctoral Fellowship and University of Aberdeen	MRC/ESRC Postdoctoral Fellowship: Applying discrete choice experiments in pharmacy: applied and methodological issues.	M. Tinelli (Student, HERU)	M. Ryan, M., Tinelli	£140,092	£140,092	Dec-08	41 months	C	MBV1.1
University of Aberdeen and Chief Scientist Office (CSO) CORE	Demand revelation in a multi-attribute discrete choice task.	V. Watson (HERU)	V. Watson	£5,400	£5,400	Jan-09	55 months	C	MBV2.1
Department of Health, Health Technology Assessment (HTA), University of Aberdeen, Chief Scientist Office (CSO) CORE and Research Council UK (RCUK)	Optimal surveillance regimes for individuals with ocular hypertension (OHT): modelling and economic evaluation.	A. Azuara-Blanco (HSRU, University of Aberdeen)	M. Ryan, R. Hernández, L. Vale	£357,236	£42,761	Feb-09	20 months	C	AOT3.4
NHS Applied Research Programme Grant and University of Aberdeen	Telemetric support self-monitoring of long-term conditions.	B. McKinstry (University of Edinburgh)	M. van der Pol	£930,277	£3,888	Mar-09	51 months	C	WOC2.4
Medical Research Council (MRC) Methodology Research Panel	What healthcare experiences matter to patients and how can we assign value to them for policy-making purposes?	M. Ryan (HERU)	M. Ryan, P. Kinghorn	£237,671	£121,629	Mar-09	2 years	C	MBV1.2
National Health Service (NHS) Health Scotland, University of Aberdeen and Chief Scientist Office (CSO) CORE	An evaluation to assess the effectiveness of 'Quit 4 U', a smoking cessation service in Dundee combining financial incentives and behavioural support.	C. Martin (Scottish Centre for Social Research)	M. Van der Pol, A. Ludbrook	£135,000	£43,072	Apr-09	3 years	C	HBI2.6
National Institute for Health Research (NIHR), Health Technology Assessment (HTA) Programme	PROSPECT: Clinical and cost-effectiveness of surgical options for the management of anterior or posterior vaginal wall prolapse, pragmatic evaluation by multicentre randomised controlled trial – PROlapse Surgery, Pragmatic Evaluation and randomised Controlled Trial.	C. Glazener (HSRU, University of Aberdeen)	M. Kilonzo, D. Boyers	£2,866,992	£64,438	May-09	6 years	C	AOT2.23
Medical Research Council (MRC) (Strategic Grant) and University of Aberdeen	Development of practice-based, pharmacist-led management of chronic pain in primary care for evaluation by a randomised controlled trial.	C. Bond (Academic Primary Care, University of Aberdeen)	P. McNamee, A. Neilson	£337,123	£10,423	Jun-09	4 years	C	AOT1.1
Medical Research Council (MRC) Early Career Fellowship	MRC Early Career Fellowship: The intergenerational transfer of eating habits, physical activity, behaviour and body composition, evidence from the UK.	H. Brown (HERU)	H. Brown	£127,308	£127,308	Aug-09	2 years	C	HBI1.3

Funding Body	Research Project Title	Principal Investigator	HERU Investigator/s	Total Amount of Research Grant Award	HERU Applicant/s Share	Start Date	Duration of Project	Completed (C) or In Progress (P)	Project Template number
National Patient Safety Agency (NPAS) via the Office of Health Economics, Chief Scientist Office (CSO) CORE and University of Aberdeen	Investigation of the value placed on the National Clinical Assessment Service services by referrers in the National Health Service.	J. Sussex (Office of Health Economics)	V. Watson, M. Ryan	£78,200	£38,238	Aug-09	1 year	C	MBV3.2
Medical Research Council ((MRC) (Doctoral Training Grant) and Division of Applied Health Sciences (DAHS), University of Aberdeen	PhD: Time preference for future health events.	E. Gray (PhD Student, HERU)	E. Gray, M. van der Pol	£54,647	£54,647	Oct-09	3 years	C	HBI1.4
National Institute for Health Research (NIHR)	TAR Project: Imatinib at escalated doses of 600mg/day or 800mg/day for the treatment of people with unresectable and/or metastatic gastrointestinal stromal tumours whose disease has progressed on treatment with imatinib at a dose of 400mg/day: systematic review and economic evaluation.	J. Hislop (HSRU, University of Aberdeen)	Z. Quayyum	£146,640	£8,000	Oct-09	5 months	C	AOT2.2
Department of Health and Chief Scientist Office (CSO) CORE	STA: Eltrombopag for the treatment of chronic idiopathic (immune) thrombocytopenic purpura (ITP): a single technology appraisal.	D. Boyers (HERU)	D. Boyers, L. Vale	Part of the TARs contract – See entry for AOT2.1	–	Oct-09	10 months	C	AOT2.3
Medical Research Council (MRC) National Prevention Research Initiative (NPRI) and Chief Scientist Office (CSO) CORE	BeWel: The impact of a body-weight and physical activity intervention on adults at risk of developing colorectal adenomas.	A. Anderson (University of Dundee)	A. Ludbrook	£1,167,404	£36,958	Jan-10	48 months	C	HBI2.8
Chief Scientist Office (CSO)	Screening and brief interventions for alcohol misuse delivered in the community pharmacy setting: a pilot study.	M. Watson (University of Aberdeen)	A. Ludbrook	£49,782	£5,957	Jan-10	1 year	C	HBI2.9
Department of Health and Chief Scientist Office (CSO) CORE	The staff market forces factor component of the resource allocation-weighted capitation formula.	R. Elliott (HERU)	R. Elliott, D. Skåtun	£68,983	£50,277	Feb-10	8 months	C	WOC1.7
Medical Research Council (Strategic Grant), Chief Scientist Office (CSO) CORE and University of Aberdeen	EOPIC: Engaging with older people to develop and deliver interventions for the self-management of chronic pain.	B. Smith (University of Dundee)	P. McNamee, D. Boyers	£1,058,605	£75,757	Feb-10	54 months	C	HBI1.5
NHS Health Scotland (via University of Dundee) and Chief Scientist Office (CSO) CORE	Scoping study of the economic impact on the alcohol industry of pricing and non-price policies to regulate the affordability and availability of alcohol in Scotland.	D. Petrie, (University of Melbourne)	A. Ludbrook	£15,941	£4,450	Feb-10	8 months	C	HBI2.10
Department of Health	STA: Denosumab for the prevention of osteoporotic fractures in postmenopausal women (single technology assessment for NICE).	N. Waugh (Warwick University)	G. Scotland, P. McNamee	£146,640	£8,000	Feb-10	3 months	C	AOT2.4
The Scottish Collaboration for Public Health Research and Policy (SCPHRP), Chief Scientist Office (CSO), CORE and University of Aberdeen	Feasibility study of use of direct payments for informal care.	A. Ludbrook (HERU)	A. Ludbrook, P. McNamee	£19,737	£19,737	Mar-10	1 year	C	WOC2.6
NHS Grampian and Chief Scientist Office (CSO) CORE	FEST: feasibility study for a trial of proactive telephone support for breastfeeding women in disadvantaged areas provided by a specialised FEeding Support Team.	L. Craig (Institute of Applied Health Sciences, University of Aberdeen)	D. Boyers	£28,322	£1,882	Mar-10	1 year	C	AOT1.3

Funding Body	Research Project Title	Principal Investigator	HERU Investigator/s	Total Amount of Research Grant Award	HERU Applicant/s Share	Start Date	Duration of Project	Completed (C) or In Progress (P)	Project Template number
Department of Health	STA: Pazopanib for the first-line treatment of patients with advanced and/or metastatic renal cell carcinoma: a single technology appraisal.	N. Waugh (Warwick University)	M. Kilonzo	Part of the TARs contract – See entry for AOT2.1	–	Apr-10	10 months	C	AOT2.5
National Institute for Health Research (NIHR), Health Technology Assessment (HTA) Programme and Research Council UK (RCUK) and University of Aberdeen	GATE: Glaucoma Automated Test Evaluation: comparative study of new imaging technologies for the diagnosis of glaucoma.	A. Azuara-Blanco (NHS Grampian)	R. Hernández	£368,857	£21,162	Apr-10	44 months	C	AOT2.24
Chief Scientist Office (CSO) Health Services and Population Health Research Committee and University of Aberdeen	Scottish cervical cancer prevention programme: assessing and modelling the impact of HPV 16/18 immunisation on the performance of current cervical screening and the effectiveness of alternative screening strategies to optimise cancer prevention in the HPV immunisation era.	M. Cruickshank (HSRU, University of Aberdeen)	A. Neilson	£450,000	£8,550	Apr-10	60 months	C	AOT3.5
Royal College of Physicians of Edinburgh (RCPE) and Chief Scientist Office (CSO) CORE	Impact of revalidation on clinical and non-clinical activity.	B. Frier (Royal College of Physicians of Edinburgh)	D. Skåtun, D. Ikenwilo	£110,622	£95,397	Jun-10	30 months	C	WOC1.8
National Institute for Health Research (NIHR), HTA Programme and University of Aberdeen	SUSPEND: Spontaneous Urinary Stone Passage Enabled by Drugs, use of drug therapy in the management of symptomatic stones in hospitalised adults: a multicentre, placebo-controlled, randomised trial of calcium channel blockers (nifedipine) and alpha blockers (tamsulosin).	S. McClinton (HSRU, University of Aberdeen)	M. Kilonzo	£1,452,458	£51,525	Jun-10	4 years, 5 months	C	AOT2.25
The Scottish Government, Chief Scientist Office (CSO) and CSO CORE	An examination of changes introduced in the Quality and Outcomes Framework in 2006/07 and their effects on the delivery of primary care in Scotland.	A. Ma (HERU)	A. Ma, D. Skåtun	£49,132	£43,322	Jul-10	12 months	C	WOC1.9
National Institute for Health Research (NIHR), Health Technology Assessment (HTA) Programme and University of Aberdeen	eTHoS: eiTher Haemorrhoidectomy or Stapled Haemorrhoidopexy for haemorrhoidal disease: a pragmatic, multicentre, randomised controlled trial comparing stapled haemorrhoidopexy to conventional excisional haemorrhoidectomy.	A. Watson (NHS Highland)	M. Kilonzo	£1,214,388	£108,865	Jul-10	6 years, 3 months	P	AOT2.26
National Institute for Health Research (NIHR), Health Technology Assessment (HTA) Programme via University of Newcastle, Chief Scientist Office (CSO) CORE and University of Aberdeen	STITCH – Surgical Trial In Traumatic interCerebral Haemorrhage.	A. Mendelow, (University of Newcastle)	D. Boyers, P. McNamee	£2,328,920	£97,784	Sep-10	42 months	C	AOT2.27
Chief Scientist Office (CSO) via the University of Edinburgh and the Chief Scientist Office (CSO) CORE	Clinical and short-term NHS costs of maternal obesity for maternity services in Scotland.	F. Denison, (University of Edinburgh)	G. Scotland, P. Norwood	£37,679	£13,353	Sep-10	1 year	C	AOT3.6
The Scottish Government, Chief Scientist Office (CSO)	Socioeconomic inequalities in health and behaviour: application of novel approaches to identify health inequalities in Scotland and England to inform policy.	B. Eberth (HERU)	B. Eberth, A. Ludbrook, R. Hernández	£94,311	£94,311	Oct-10	36 months	C	HBI1.7
National Institute for Health Research (NIHR)	TAR Project: Elucigene FH20 and LIPOchip for diagnosis of Familial Hypercholesterolmia.	P. Sharma (HSRU, University of Aberdeen)	D. Boyers, M. Kilonzo and P. McNamee	Part of the TARs contract – See entry for AOT2.1	–	Oct-10	10 months	C	AOT2.6

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National Institute for Health Research (NIHR), Health Technology Assessment (HTA) Programme, Chief Scientist Office (CSO) CORE and University of Aberdeen	IQUAD: Improving the QUAlity of Dentistry: a randomised controlled trial comparing oral hygiene advice and periodontal instrumentation for the prevention and management of periodontal disease in dentate adults attending dental primary care.	J. Clarkson (University of Dundee)	M. van der Pol, D. Boyers	£704,357	£90,303	Oct-10	6 years, 3 months	P	AOT3.14
National Institute for Health Research (NIHR), Health Technology Assessment (HTA) Programme and Chief Scientist Office (CSO) CORE	ROMEO: Systematic reviews and integrated report on the quantitative and qualitative evidence base for the management of obesity in men.	A. Avenell (HSRU, University of Aberdeen)	D. Boyers	£25,413	£2,775	Jan-11	20 months	C	HBI2.13
National Institute of Health Research (NIHR) , Health Technology Assessment (HTA) Programme, Chief Scientist Office (CSO) CORE and University of Aberdeen	Assessment of the cost-effectiveness of magnetic resonance including diffusion-weighted brain imaging in patients with transient ischaemic attack and minor stroke.	J.M. Wardlaw, (University of Edinburgh)	P. McNamee, G. Scotland	£264,260	£57,860	Jan-11	18 months	C	AOT3.7
Wellcome Trust, UK Department for International Development (DFID), Health research capacity strengthening for Malawi and the University of Aberdeen	PhD Studentship: Government purchasing of health care from not-for-profit providers: a review of service level agreements in Malawi.	G. Manthalu (PhD Student, HERU)	G. Manthalu, S. Farrar	£55,520	£3,000	Mar-11	3 years	C	WOC2.7
Welcome Trust, UK Department for International Development (DFID), Health research capacity strengthening for Malawi and the University of Aberdeen	PhD Studentship: An economic perspective of the social determinants of health and health equalities in Malawi.	D. Nkhoma (PhD Student, HERU)	D. Nkhoma, B. Eberth, R. Abul-Naga	£55,500	£3,000	Mar-11	3 years	C	HBI2.14
GHK Consulting Ltd and Chief Scientist Office (CSO) CORE	Study to analyse and evaluate the health, social, economic, and environmental impact of a possible EU initiative on the protection of workers' health from risks related to exposure to environmental tobacco smoke at the workplace.	A. Ludbrook (HERU)	A. Ludbrook	£6,000	£6,000	Mar-11	6 months	C	HBI2.15
Scottish Government (Rural and Environment Science and Analytical Services Division (RESAS), via (The) University of Aberdeen Rowett Institute and Chief Scientist Office (CSO) CORE	Analysis of choice behaviour and potential mechanisms for change.	P. Morgan ((The) University of Aberdeen Rowett Institute)	A. Ludbrook, S. Farrar, L. McKenzie, D. Olajide. P. Norwood, N. Krucien	£5,645,000	£234,725	Apr-11	5 years	C	HBI1.9
Scottish Government, Chief Scientist Office (Health Service and Population Health Research Committee) and the Chief Scientist Office (CSO) CORE	Help for hay fever: can a goal-focussed intervention delivered in Scottish community pharmacies improve outcomes for people with intermittent rhinitis? A pilot randomised controlled trial.	T. Porteous (University of Aberdeen)	G. Scotland	£145,745	£15,977	Apr-11	12 months	C	AOT1.4
Department of Health, NIHR	Technology Assessment Reviews (TARs) contract (2011–2016).	M. Campbell (HSRU, University of Aberdeen)	G. Scotland, D. Boyers, M. Javanbakht, M. Kilonzo, E. Tassie	£2,125,564	£242,790	Apr-11	5 years	C	AOT2.1
National Institute for Health Research (NIHR), Health Technology Assessment (HTA) Programme, Chief Scientist Office (CSO) CORE and University of Aberdeen	INTERVAL: Investigation of NICE Technologies for Enabling Risk-Variable-Adjusted-Length dental recalls trial (pilot and follow-on study).	N. Pitts (University of Dundee)	M. van der Pol, D. Boyers	£2,865,946	£95,884	May-11	7 years, 4 months	P	AOT3.15

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Chief Scientist Office (CSO) (Health Service Research Grant Scheme) and Chief Scientist Office (CSO) CORE	Eye care service in Scotland: did the Scots get it right?	A. Zangelidis (Economics, University of Aberdeen Business School (UABS))	V. Watson, D. Ikenwilo, P. Norwood	£43,035	£21,518	Jul-11	1 year	C	WOC2.8
Chief Scientist Office (CSO) (Health Service Research Grant Scheme) and University of Aberdeen	The use of global position satellite tracking in wandering patients with dementia: feasibility study.	B. McKinstry (University of Edinburgh)	M. van der Pol	£46,685	£1,139	Jul-11	12 months	C	WOC2.9
University Research Bergen (Norway) and Chief Scientist Office (CSO) CORE	Attitudes to regulatory guidelines among clinicians in three countries: the UK dimension.	B. Carlsen (University of Bergen)	D. Skåtun	£7,580	£7,580	Aug-11	24 months	C	WOC1.10
Arthritis Research UK (ARUK) and University of Aberdeen	Maintained physical activity and physiotherapy in the management of distal arm pain	G. Jones (Other Applied Health Sciences, University of Aberdeen)	P. McNamee, A. Neilson	£533,197	£41,977	Sep-11	54 months	C	AOT2.28
National Institute for Health Research (NIHR), Health Services Research (HSR) Programme and Research Council UK (RCUK)	Frequency of visual-field testing when monitoring patients newly diagnosed with glaucoma.	D. Crabb (City University)	R. Hernández	£295,082	£2,597	Oct-11	22 months	C	AOT3.8
National Institute for Health Research (NIHR)	TAR Project: Systematic review of the diagnostic accuracy and cost-effectiveness of magnetic resonance spectroscopy and enhanced magnetic resonance imaging techniques in aiding the localisation of prostate abnormalities for biopsy.	G. Mowatt (HSRU, University of Aberdeen)	G. Scotland, E. Tassie	Part of the TARs contract – See entry for AOT2.1	–	Nov-11	9 months	C	AOT2.7
Department of Health Research and Development	BIBS: Benefits of Incentives for Breastfeeding and Smoking cessation – a platform study for a trial.	P. Hoddinott (University of Stirling)	A. Ludbrook, S. Farrar	£248,582	£22,842	Feb-12	20 months	C	HBI2.16
National Institute for Health Research (NIHR), Health Technology Assessment (HTA) Programme and Research Council UK (RCUK)	nAMD: Systematic review and economic modelling of optical coherence tomography (OCT) for the diagnosis, monitoring and guiding of treatment for neovascular Age related Macular Degeneration.	G. Mowatt (HSRU, University of Aberdeen)	R. Hernández	£222,425	£20,261	Feb-12	22 months	C	AOT3.9
Medical Research Council (MRC) (Methodology Research Panel) and Chief Scientist Office (CSO) CORE	Spending wisely: investigating survey mode effects in discrete choice experiment responses.	V. Watson (HERU)	V. Watson, M. Ryan	£232,152	£232,152	Feb-12	30 months	C	MBV3.3
British Society for Rheumatology and University of Aberdeen	BSRBR-AS: British Society for Rheumatology Biologics Register in Ankylosing Spondylitis.	G. Macfarlane (Institute of Applied Health Sciences, University of Aberdeen)	P. McNamee, A. Neilson	£822,587	£55,876	Apr-12	68 months	P	AOT2.32
NHS Grampian Endowments (Endowment Funds) and the Chief Scientist Office (CSO) CORE	Cost-effectiveness of fertility diagnosis and treatment in women of different BMI groups.	S. Pandey (Other Applied Health Services, University of Aberdeen)	G. Scotland	£7,486	£2,691	Apr-12	12 months	C	AOT3.10

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Chief Scientist Office (CSO) Health Services and Population Health Research Committee and University of Aberdeen	Can eliciting and addressing health-related goals improve asthma control and asthma-related quality of life? Feasibility phase II RCT of a brief intervention.	G. Hoskins (University of Stirling)	M. van der Pol	£176,956	£7,409	May-12	15 months	C	AOT1.5
NHS Grampian (Endowment Fund) and the Chief Scientist Office (CSO) CORE	SIMS – Pilot: Single incision mini-slings versus standard midurethral slings in surgical management of female stress urinary incontinence.	D. Boyers (HERU)	B. Boyers, M. Kilonzo	£1,000	£1,000	May-12	6 months	C	AOT2.29
Birmingham City University as part of a Natural Environment Research Council grant and Chief Scientist Office (CSO) CORE	Integrating monetary and non-monetary approaches to assessing shared, plural and cultural values of ecosystems.	M. Pinard (School of Biological Sciences, University of Aberdeen)	V. Watson, M. Ryan	£323,012	£5,000	May-12	19 months	C	MBV3.4
NHS Grampian (Endowment Fund and the Chief Scientist Office (CSO) CORE	PETER-FEST: ProactivE Telephone caRe for breastfeeding women delivered by a dedicated FEding Support Team in a rural community.	P. Hoddinott (University of Stirling)	D. Boyers	£28,332	£1,318	Jul-12	12 months	C	AOT1.6
National Institute for Health Research (NIHR)	TAR Project: Clinical and cost-effectiveness of cholecystectomy versus observation/ conservative management for preventing recurrent symptoms and complications in adults presenting with uncomplicated symptomatic gallstones or cholecystitis.	M. Brazelli (HSRU, University of Aberdeen)	M. Kilonzo, P. McNamee	Part of the TARs contract – See entry for AOT2.1	–	Aug-12	6 months	C	AOT3.11
European Commission FP7	MUNROS: healthcare reform: the iMpact on practice, oUtcomes and costs of New roles for health pROfeSsionals.	R. Elliott (HERU)	R. Elliott	£2,369,731	£363,000	Oct-12	54 months	P	WOC2.16
Scottish Government (Rural and Environment Science and Analytical Services Division (RESAS)) via (The) University of Aberdeen Rowett Institute and Chief Scientist Office (CSO) CORE	PhD: Economic aspects of food choice and its association with health inequalities in Scotland and the UK.	L. McMorrow (PhD Student, HERU)	L. McMorrow, A. Ludbrook, D. Olajide	£65,965	£65,965	Oct-12	54 months	P	HBI1.12
National Institute for Health Research (NIHR), Health Technology Assessment (HTA) Programme and University of Aberdeen	Does oral sodium bicarbonate therapy improve function and quality of life in older patients with chronic kidney disease and low-grade acidosis? A randomized controlled trial.	M. Witham (University of Dundee)	P. McNamee	£136,108	£57,713	Oct-12	90 months	P	AOT2.33
ESRC Scottish Graduate School of Social Sciences (SGSSS) – Doctoral Training Centre (Health Pathway) PhD Studentship and the Chief Scientist Office (CSO) CORE	PhD: Exploring the role for patients' values in health technology assessment: a mixed methods approach.	A. Tockhorn-Heidenreich (PhD Student, HERU)	A. Tockhorn-Heidenreich, M. Ryan, G. Scotland	£54,489	£54,489	Oct-12	6 years	P	AOT4.4
Institute of Applied Health Sciences (IAHS), Flagship PhD Studentship and the Chief Scientist Office (CSO) CORE	PhD: Do I care of do I not? – An empirical assessment of decision heuristics in discrete choice experiments.	S. Heidenreich (PhD Student, HERU)	S. Heidenreich, M. Ryan, V. Watson	£76,871	£76,871	Oct-12	4 years	C	MBV4.1
National Institute for Health Research (NIHR), Health Technology Assessment (HTA) Programme and University of Aberdeen	VUE: Vault or Uterine prolapse surgery Evaluation: two parallel randomised controlled trials of surgical options for upper-compartment (uterine or vault) pelvic organ prolapse.	C. Glazener (HSRU, University of Aberdeen)	M. Kilonzo	£1,426,242	£47,680	Nov-12	7 years	P	AOT2.34

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National Institute for Health Research (NIHR), Health Technology Assessment (HTA) Programme and University of Aberdeen	TISU: Therapeutic Interventions for Stones of the Ureter: a multicentre randomised controlled trial of extracorporeal shockwave lithotripsy, as first treatment option, compared with direct progression to ureteroscopic retrieval, for ureteric stones.	S. McClinton (NHS Grampian)	M. Kilonzo	£1,412,800	£49,715	Dec-12	72 months	P	AOT3.16
National Institute for Health Research (NIHR)	TAR Project: Point-of-care coagulometers (the CoaguChek XS System and the INRatio2 PT.INR monitor) for self-monitoring coagulation status in people in long-term vitamin K antagonist therapy who have atrial fibrillation of heart valve disease.	P. Sharma (HSRU, University of Aberdeen)	G. Scotland, E. Tassie	Part of the TARs contract – See entry for AOT2.1	–	Apr-13	12 months	C	AOT2.8
National Institute for Health Research (NIHR), Health Technology Assessment (HTA) Programme and University of Aberdeen	OPAL-Optimal PFMT for Adherence Long-term: multicentre randomised trial of the effectiveness and cost-effectiveness of basic versus intensive, biofeedback-assisted, pelvic-floor muscle training for female stress or mixed urinary incontinence.	S. Hagen (Glasgow Caledonian University)	M. Kilonzo	£1,895,338	£56,657	Apr-13	4 years, 8 months	P	AOT2.35
NHS Education for Scotland, Chief Scientist Office (CSO) CORE and University of Aberdeen	Understanding push-pull factors in medical careers-decision making.	J. Cleland (Medical Education, University of Aberdeen)	D. Skåtun, V. Watson, N. Krucien	£29,292	£17,575	May-13	48 months	P	WOC1.12
Astellas Ltd and Chief Scientist Office (CSO) CORE	Patients' preferences for treatment of the lower urinary tract system: a discrete choice experiment.	V. Watson (HERU)	V. Watson, D. Ikenwilo, M. Ryan, S. Heidenreich	£72,247	£72,247	Jun-13	9 months	C	MBV1.5
National Institute for Health Research (NIHR), Health Technology Assessment (HTA) Programme and University of Aberdeen	MASTER: Male synthetic sling versus Artificial urinary Sphincter Trial for men with urodynamic stress incontinence after prostate surgery: Evaluation by Randomised trial.	P. Abrams (North Bristol NHS Trust)	M. Kilonzo	£1,625,275	£62,499	Jul-13	6 years	P	AOT2.36
Gilead Sciences and University of Aberdeen	Is utilisation of a community pharmacy for provision of direct-acting antivirals: A feasible delivery model for hepatitis c in substance misusers.	A. Radley (NHS Tayside)	M. van der Pol	£49,928	£4,000	Aug-13	16 months	C	AOT1.7
National Institute for Health Research (NIHR)	TAR Project: Collagenase clostridium histolyticum for treating Dupuytren's contracture.	M. Brazelli (HSRU, University of Aberdeen)	E. Tassie, P. McNamee, R. Hernández	Part of the TARs contract -– See entry for AOT2.1	–	Aug-13	18 months	C	AOT2.9
Chief Scientist Office (CSO), Health Service and Population Health Research Committee, University of Aberdeen and the Chief Scientist Office (CSO) CORE	ASH: Avoidable Scottish Hospitalisations.	M. van der Pol (HERU)	M. van der Pol, B. Elliott, D. Olajide, M. Konstantinidou	£187,821	£170,804	Sep-13	24 months	C	WOC2.14
National Institute for Health Research (NIHR), Health Technology Assessment (HTA) Programme	HEALTH: Hysterectomy or Endometrial AbLation Trial for Heavy menstrual bleeding. A multicentre randomised controlled trial comparing laparoscopic supracervical hysterectomy with second-generation endometrial ablation for the treatment of heavy menstrual bleeding.	K. Cooper (NHS Grampian)	G. Scotland	£1,331,697	£48,441	Oct-13	42 months	P	AOT2.37

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National Institute for Health Research (NIHR), Health Technology Assessment (HTA) Programme	Got-it-trial: a pragmatic, adaptive, sequential, placebo-controlled, randomised trial to determine the effectiveness of glycerine triturate for retained placenta.	F. Denison (University of Edinburgh)	G. Scotland	£1,679,448	£18,765	Oct-13	42 months	P	AOT2.38
Chief Scientist Office (CSO) and Chief Scientist Office (CSO) CORE	Modelling the cost-effectiveness of adopting risk-stratified screening intervals within the national diabetic retinopathy screening programme in Scotland.	G. Scotland (HERU/HSRU)	G. Scotland	£81,657	£55,489	Oct-13	12 months	C	AOT3.12
Commonwealth Scholarship Commission UK and Chief Scientist Office (CSO) CORE	PhD: Assessment of the external validity of discrete choice experiment: an application in pharmacy.	G.N. Chua (PhD Student, HERU)	G.N. Chua, M. Ryan	£80,514	£15,000	Oct-13	38 months	P	MBV2.5
Medical Research Council (MRC) and Chief Scientist Office (CSO) CORE	DEDIPAC: DEterminants of DIet and Physical ACtivity.	A. Ludbrook (HERU)	A. Ludbrook, A. Neilson	£26,290	£26,290	Dec-13	3 years	P	HBI2.18
National Institute for Health Research (NIHR), Health Technology Assessment (HTA) Programme, University of Aberdeen and Chief Scientist Office (CSO) CORE	SIMS Trial: Adjustable anchored Single-Incision Mini-Slings versus standard, tension-free mid-urethral slings in the surgical management of female stress urinary incontinence; a pragmatic, multicentre, non-inferiority, randomised controlled trial.	M. Abdel-Fattah (Other Applied Health Sciences, University of Aberdeen)	M. Kilonzo, D. Boyers	£1,470,020	£48,736	Dec-13	66 months	P	AOT2.39
NHS Grampian and University of Aberdeen	Implementation of a psychosocial programme of support and training for people with dementia and their family care givers.	P. McNamee (HERU)	P. McNamee	£4,920	£4,920	Jan-14	6 months	C	HB12.17
University of Aberdeen, Carnegie Trust, and Scottish Institute for Research in Economics, Scottish Economic Society	The socioeconomic status and integration of immigrants in the UK: the role of language skills.	Y. Aoki (HERU)	Y. Aoki	£3,120	£3,120	Feb-14	36 months	C	HBI1.10
Health Foundation, Chief Scientist Office (CSO) CORE and University of Aberdeen	A discrete choice experiment to value the personalisation of support for self-management of chronic pain.	C. Burton (Centre of Academic Primary Care, University of Aberdeen)	M. Ryan, N. Krucien	£159,812	£10,580	Jul-14	16 months	C	MBV1.6
NHS Scotland/Community Food and Health (Scotland) and Chief Scientist Office (CSO) CORE	The nature and extent of food poverty/insecurity in Scotland.	F. Douglas ((The) University of Aberdeen Rowett Institute)	L. McKenzie	£25,000	£7,462	Aug-14	7 months	C	HBI1.11
National Institute for Health Research (NIHR)	TAR Project: Clinical and cost-effectiveness of open-mesh repairs in adults presenting with a clinically diagnosed unilateral, primary inguinal hernia who are operated on in an elective setting.	M. Brazelli (HSRU, University of Aberdeen)	D. Boyers, R. Hernández	Part of the TARs contract – See entry for AOT2.1	–	Aug-14	6 months	C	AOT2.10
Institute of Applied Health Sciences (IAHS) and University of Aberdeen	PhD: The role of time preference in the medical-decision making context.	A. Irvine (PhD Student, HERU)	A. Irvine, M. van der Pol	£49,800	£49,800	Oct-14	3 years	P	HBI1.14
National Institute for Health Research (NIHR), Health Technology Assessment (HTA) Programme	EDNA: Early Detection of Neovascular Age-related macular degeneration.	U. Chakravarty (Queen's University, Belfast)	G. Scotland	£863,799	£74,630	Jan-15	66 months	P	AOT3.17

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National Institute for Health Research (NIHR), Health Technology Assessment (HTA) Programme	Gatekeeping in intensive care: understanding and improving the decision-making process surrounding admission to the intensive care unit.	C. Bassford (University of Warwick)	M. Ryan, N. Krucien	£703,118	£104,435	Jan-15	3 years	P	MBV3.9
College of Life Sciences and Medicine (CLSM), University of Aberdeen/HERU PhD Studentship and University of Aberdeen	PhD: Applying economic methods to optimise self-management.	L. Dysart (PhD Student, HERU)	L. Dysart, P. McNamee, M. van der Pol	£82,398	£82,398	Feb-15	3 years	P	HBI1.15
Arthritis Research UK (ARUK) and University of Aberdeen	MAmMOTH: MAintaining MusculOskeleTal Health study.	G. McFarlane, (Other Applied Health Sciences, University of Aberdeen)	P. McNamee	£809,403	£27,598	Feb-15	54 months	P	HBI3.1
National Institute for Health Research (NIHR)	STA: Ezetimibe for treating primary (heterozygous-familial and non-familial) hypercholesterolaemia (single technology assessment for NICE).	G. Scotland (HERU/HSRU)	G. Scotland, M. Javanbakht	Part of the TARs contract – See entry for AOT2.13	–	Jun-15	3 months	C	AOT3.13
Health Economics Research Unit	HERU Postdoctoral Fellowship: Impact of job satisfaction, mental illness and absenteeism in the public sector.	Z. Ejebu (HERU)	Z. Ejebu	£77,000	£77,000	Aug-15	2 years	P	WOC1.13
National Institute for Health Research (NIHR), Health Technology Assessment (HTA) Programme and Chief Scientist Office (CSO) CORE	E-FREEZE: A randomised controlled trial evaluating the clinical and cost-effectiveness of a policy of freezing all embryos followed by thawed frozen embryo transfer, compared with a policy of fresh embryo transfer in women undergoing in-vitro fertilization.	A. Mahashwari (NHS Grampian)	G. Scotland	£1,353,359	£68,279	Aug-15	4 years	P	AOT3.18
Gavin Mooney Studentship, (via the University of Aberdeen Development Trust), University of Sydney and Chief Scientist Office (CSO) CORE	PhD: Healthcare preferences and deliberation: the citizen's perspective.	R. Sakowsky (PhD Student, HERU)	R. Sakowsky, M. Ryan	£65,820	£62,820	Sep-15	3 years	P	MBV3.10
Scottish Government/ESRC, University of Aberdeen and Chief Scientist Office (CSO) CORE	PhD: Enhancing quality in social care through economic analysis.	K. Momanyi (PhD Student, HERU)	K. Momanyi, P. McNamee, D. Skåtun	£54,096	£54,096	Oct-15	3 years	P	WOC2.18
Institute of Applied Health Sciences (IAHS) and University of Aberdeen	PhD: Using insights into time preference and present bias to develop an intervention to improve adherence to exercise.	U. Thomas (PhD Student, HERU)	U. Thomas, M. van der Pol	£35,142	£35,142	Oct-15	5 years	P	HBI1.16
National Institute for Health Research (NIHR)	STA: Alirocumab for treating primary hypercholesterolaemia and mixed dyslipidaemia (single technology assessment for NICE).	G. Scotland (HERU/HSRU)	G. Scotland, M. Javanbakht, A. Neilson.	Part of the TARs contract – See entry for AOT2.13	–	Oct-15	3 months	C	AOT2.11
National Institute for Health Research (NIHR), Health Technology Assessment (HTA) Programme and University of Aberdeen	The PUrE RCT: the clinical and cost effectiveness of surgical interventions for stones in the lower-pole calyces of the kidney.	S. McClinton (NHS Grampian & University of Aberdeen)	R. Hernández	£1,839,269	£54,948	Dec-15	60 months	P	AOT3.19
Digital Health Institute, University of Aberdeen and Chief Scientist Office (CSO) CORE	A model-based cost-effectiveness analysis of opportunistic screening for identifying (undetected) atrial fibrillation (AF).	A. Neilson (HERU)	A. Neilson, G. Scotland, E. Tassie	£33,476	£33,476	Jan-16	9 months	P	AOT1.8

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Chief Scientist Office (CSO) and University of Aberdeen	Vitamin K supplementation to reduce falls in older people – a multicentre trial.	M. Whitman (Ninewells Hospital)	P. McNamee	£213,493	£22,483	Jan-16	32 months	P	AOT1.9
NHS Grampian and Chief Scientist Office (CSO) CORE	Long-term follow up of the SIMS – Pilot study: Single incision Mini-Slings versus standard mid-urethral slings in surgical management of female urinary incontinence.	D Boyers (HERU)	D. Boyers	£1,500	£1,500	Jan-16	1 month	C	AOT2.30
NHS Lothian and University of Aberdeen	Health economic evaluation of the Lothian high-demand service.	R. Steel (NHS Lothian)	P. McNamee	£50,000	£50,000	Apr-16	12 months	P	WOC2.19
Scottish Government (Rural and Environment Science and Analytical Services Division – RESAS) via (The) University of Aberdeen Rowett Institute and Chief Scientist Office (CSO) CORE	Food culture and dietary choice.	P. Morgan ((The) University of Aberdeen Rowett Institute)	P. Norwood, A. Ludbrook	£7,799,958	£419,000	Apr-16	5 years	P	HBI1.17
National Institute for Health Research (NIHR)	Technology Assessment Reviews (TARs) contract (2016–2021).	C. Ramsay (HSRU, University of Aberdeen)	G. Scotland	£2,624,984	£246,915	Apr-16	5 years	P	AOT2.13
Department of Health – National Institute for Health Research (NIHR), Health Technology Assessment (HTA) Programme and University of Aberdeen	C-GALL: A randomised controlled trial comparing the clinical effectiveness and cost-effectiveness of laparoscopic cholecystectomy compared with observation/conservative management for preventing recurrent symptoms and complications in adults with uncomplicated symptomatic gallstones.	I. Ahmed (NHS Grampian)	R. Hernández	£1,397,962	£55,967	Apr-16	54 months	P	AOT3.20
National Institute for Health Research (NIHR), Health Technology Assessment (HTA) Programme and Chief Scientist Office (CSO) CORE	REBALANCE: REview of Behaviour And Lifestyle interventions for severe obesity: AN evidenCE synthesis.	A. Avenell (HSRU, University of Aberdeen)	D. Boyers	£530,873	£30,411	May-16	20 months	P	AOT2.40
National Institute for Health Research (NIHR), Health Technology Assessment (HTA) Programme and University of Aberdeen	Feasibility study of how to best engage obese men in narrative SMS (short message system) and incentive interventions for weight loss, to inform a future effectiveness and cost-effectiveness trial.	P. Hoddinott (University of Stirling)	M. van der Pol, H. Collacott	£490,970	£83,077	Jun-16	27 months	P	HBI3.2
National Institute for Health Research (NIHR)	STA: Radium-223 dichloride for treating hormone-relapsed prostate cancer with bone metastases (men who have not received docetaxel and for whom docetaxel is contraindicated or not suitable) (NICE re-consideration of current Cancer Drug Fund (CDF) technologies under the new proposed CDF criteria).	G. Scotland (HERU/HSRU)	G. Scotland, R. Hernández	Part of the TARs contract – See entry for AOT2.13	–	Jun-16	1 month	C	AOT2.12
National Institute for Health Research (NIHR)	TAR Project: Multiple frequency bio-impedance devices (BCM – Body Composition Monitor, BioScan 920-II, BioScan touch i8, InBody S10, and MultiScan 5000) for fluid management in people with chronic kidney disease having dialysis.	M. Brazelli (HSRU, University of Aberdeen)	G. Scotland, E. Jacobsen	Part of the TARs contract – See entry for AOT2.13	–	Jun-16	6 months	P	AOT2.14
National Institute for Health Research (NIHR)	TAR Project: Surveillance following endovascular aortic aneurysm repair.	M. Brazelli (HSRU, University of Aberdeen)	G. Scotland, R. Hernández	Part of the TARs contract – See entry for AOT2.13	–	Jun-16	6 months	P	AOT3.21

Funding Body	Research Project Title	Principal Investigator	HERU Investigator/s	Total Amount of Research Grant Award	HERU Applicant/s Share	Start Date	Duration of Project	Completed (C) or In Progress (P)	Project Template number
Health Economics Research Unit	HERU Postdoctoral Fellowship: Methodological advancement of discrete choice experiments.	S. Heidenreich (HERU)	S. Heidenreich, M. Ryan, V. Watson	£77,047	£77,047	Jun-16	24 months	P	MBV4.5
NHS Improvement	MFF 2: Updating the staff market forces factor.	D. Skåtun (HERU)	D. Skåtun, B. Elliott, Z. Ejebu	£70,755	£23,088	Jul-16	7 months	P	WOC1.15
Arthritis Research UK (ARUK) and University of Aberdeen	LIFT: Lessening the Impact of Fatigue: Therapies for inflammatory rheumatic diseases.	N. Basu (NHS Grampian)	P. McNamee	£735,536	£41,124	Aug-16	42 months	P	HBI3.3
National Institute for Health Research (NIHR)	LENS: Lowering Events in Non-proliferative retinopathy in Scotland.	D. Preiss (University of Oxford)	G. Scotland	£1,789,595	£80,728	Oct-16	6 years	P	AOT2.41
National Institute for Health Research (NIHR)/Medical Research Council (MRC), efficacy & mechanism evaluation programme and University of Aberdeen	RAACENO: Reducing Asthma Attacks in Children using Exhaled Nitric Oxide as a biomarker to inform treatment strategy – a randomised controlled trial.	J. Norrie (HSRU, University of Aberdeen)	A. Neilson	£1,534,562	£48,659	Oct-16	48 months	P	AOT2.42
Institute of Applied Health Science (IAHS), Flagship PhD Studentship	PhD: Using existing data to incorporate broader measures of value in economic evaluation.	E. Tassie (PhD Student, HERU)	E. Tassie, V. Watson, G. Scotland, S. Bryan	£77,668	£77,668	Oct-16	4 years	P	AOT4.5

ANNEX 03

Unit Staff and Students, October 2016

ANNEX 03

Unit Staff and Students, October 2016

Staff are 100% WTE unless stated otherwise.

CSO CORE-Funded Staff

Anne Ludbrook (40% WTE)	Professor
Dwayne Boyers	Research Fellow*
Attakrit Leckcivilize	Research Fellow
Lynda McKenzie (50% WTE)	Research Fellow
Patricia Norwood	Research Fellow
David Burns	Information Officer
Shona Christie	Business Manager
Lesley Innes (80% WTE)	Unit Secretary
Mandy Ryan	Professor
Stirling Bryan (10% WTE)	Professor
Graham Scotland	Senior Research Fellow*
Diane Skåtun	Senior Research Fellow
Verity Watson	Senior Research Fellow

**Joint post with HSRU*

University of Aberdeen-Funded Staff

Aileen Neilson	Research Fellow
Ramses Abul Naga (50% WTE)	Reader**
Yu Aoki (50% WTE)	Lecturer**
Bob Elliott (40% WTE)	Professor
Rodolfo Hernández	Research Fellow
Nicolas Krucien	Research Fellow
Paul McNamee	Professor
Marjon van der Pol	Professor

*** Joint post with Department of Economics, University of Aberdeen*

Externally Funded Staff

Michail Bitzios	Research Fellow
Hannah Collacott	Research Assistant
Ourega-Zoe Ejebu	Postdoctoral Research Fellow
Shelley Farrar (40% WTE)	Research Fellow
Sebastian Heidenreich	Postdoctoral Research Fellow
Alison Horne	Administrative Assistant
Elisabet Jacobsen	Research Assistant
Mary Kilonzo	Research Fellow
Daniel Kopasker (80% WTE)	Research Fellow
Debbie McLaggan (20% WTE)	FP7 Project Administrator
Chris Spoor (12% WTE)	Senior Teaching Fellow

PhD Students

Gin Nie Chua

Laura Dysart

Alastair Irvine

Liam McMorrow

Kevin Momanyi

Luis Enrique Loria Rebolledo

Ruben Sakowsky

Emma Tassie

Uma Thomas

Antje Tockhorn-Heidenreich

ANNEX 04

Staff and PhD Student Biographies

ANNEX 04

Staff and PhD Student Biographies

Ramses Abul Naga

PhD, MSc

Ramses joined the University of Aberdeen as a SIRE Reader in October 2010. This is a joint appointment between the Business School and the Health Economics Research Unit. His research interests are centred in the areas of public economics, health economics, micro-econometrics and the measurement of inequality and wellbeing.

At HERU, Ramses undertakes methodological research on the following topics, the measurement of social welfare and inequality in relation to both ordered response data and anthropometric data; and the development of inferential tools (specifically, sampling distributions and hypotheses tests) for indices of welfare and inequality, especially in the context of anthropometric data but also for ordered response data. Ramses is also interested in the utilisation of such methodologies to inform health policy in the context of developing countries.

Ramses holds an MSc and a PhD in economics from the London School of Economics. He has held earlier appointments at the University of Lausanne and the University of Bath.

Yu Aoki

PhD, MSc, MA, BA

Yu is Assistant Professor in Economics in the Business School and the Health Economics Research Unit, and a Research Affiliate at the Institute of Labour Economics, Germany. Yu completed her MSc and PhD in Economics at the University of Warwick. She is an applied micro-econometrician working in the fields of labour and health economics. She is currently investigating the effects of (i) English language skills on education, health and fertility of immigrants in the UK, (ii) English language skills on economic and residential segregations, and (iii) education on youth crime. She is a lecturer of the modules in the MSc Economics of Health.

Michail Bitzios
PhD, MSc, BSc

Michail joined HERU as Research Fellow in October 2016 and currently contributes to the Health Behaviour and Inequality Theme. He holds a PhD in Agri-Environmental Economics from the University of Kent and an MSc in Agricultural Economics from the University of Reading. He is involved in research projects investigating potential changes in food culture, social norms and dietary choice towards a more sustainable, balanced and healthy diet and lifestyle.

Dwayne Boyers
PhD, MSc, BComm

Dwayne joined the University of Aberdeen (HERU) as a research assistant in October 2009 after completing a MSc in economic policy evaluation and planning (National University of Ireland, Galway). In October 2011, Dwayne took up a joint post between HERU and HSRU. Dwayne has been involved in a number of Health Technology Assessments for NICE, as well as economic evaluations alongside RCTs. Dwayne is currently involved in providing health economic support to the PROSPECT, IQUAD and INTERVAL trials and is undertaking a part-time PhD looking at the use of discrete choice experiments in dental care.

Stirling Bryan
PhD, MSc, BSc

Stirling is a part-time Professor of Health Economics at HERU. His PhD (Economics) was obtained from Brunel University (UK), following a Masters (Health Economics) from the University of York (UK). For over 25 years he has been a university-based practising health economist with extensive engagement to the policy- and decision-making world. His career began in London (appointments at St Thomas' Hospital Medical School and then Brunel University), with subsequent positions in Birmingham (senior lecturer and then full professor at the University of Birmingham). His research track record reveals a long-standing goal of informing policy and practice, demonstrated, in part, through an extensive involvement with the UK National Institute for Health and Care Excellence (NICE). He emigrated to Canada in 2008 (Professor in University of British Columbia's School of Population and Public Health, and Director of the Centre for Clinical Epidemiology and Evaluation, Vancouver Coastal Health Research Institute) and continues a focus on policy-relevant research. His work at HERU is primarily within the Assessment of Technologies theme.

David Burns
MSc, PG Dip

David joined the Health Economics Research Unit in 2013 as Information Officer. He holds a Postgraduate Diploma in Library and Information Studies and an MSc in Social Research Methods. Before joining HERU he worked as Site Librarian at Scotland's Rural College in Aberdeen and prior to that he held different roles in the library sector in NHS Greater Glasgow and Clyde. He also worked as Information Officer at the National Centre for Prosthetics and Orthotics at the University of Strathclyde for two years.

Gin Nie Chua
MPharm, MPharm (Clinical)

Gin Nie joined HERU in October 2013 and began her PhD, entitled 'Assessment of the external validity of discrete choice experiments: an application in pharmacy' under the joint supervision of Professor Mandy Ryan, Professor Christine Bond and Dr Terry Porteous. She was awarded a PhD scholarship by the Commonwealth Scholarship Commission United Kingdom.

Her research interests are related to the area of pharmacy practice, patient-reported outcome and preference research. She graduated with a pharmacy degree from the University of Strathclyde, Glasgow in 2006. Following the completion of her Masters of Pharmacy in Clinical Pharmacy at the Universiti Sains Malaysia in 2010, she joined the Discipline of Social and Administrative Pharmacy, School of Pharmaceutical Sciences, Universiti Sains Malaysia as a lecturer.

Shona Christie

Shona joined HERU in 2001 and is the Unit Business Manager. She has worked in the University for over 30 years and, prior to her joining HERU, worked as a Direct Cost Accountant in the College of Life Sciences and Medicine at the University of Aberdeen. In her current role, her areas of responsibility include the management of finance, human resources, IT, dissemination and grant applications and she is responsible for all non-research administration. Shona provides personal assistance to the Director of HERU, is a member of HERU's Executive Group and manages the support staff.

Hannah Collacott
MSc, MA

Hannah joined HERU in April 2016 as a research assistant working within Health Behaviours and Inequality. Hannah holds an MSc in Economics and Health Economics from the University of Sheffield and an MA in Economics from the University of Dundee. Her MSc thesis explored the relationship between maternal employment and the probability of childhood obesity, using both probit and IV analysis. Hannah is currently involved in a project looking at how best to engage obese men in incentive interventions for weight loss, using a discrete choice experiment (DCE).

Laura Dysart
BSc, MSc

Laura joined HERU in January 2015 and is pursuing a PhD in Health Economics under the joint supervision of Professor Paul McNamee and Professor Marjon van der Pol. The focus of her doctoral research will be the role of time and risk preference in self-management for long-term conditions. She was awarded a PhD studentship by the Health Economics Research Unit. Laura holds a Masters in Health Economics from the University of York and a Masters in Health Research Methodology from McMaster University.

Zoé Ourega-Ejebu
PhD, MSc, MA

Zoé joined HERU in February 2014 after completing her PhD in Economics from the University of Aberdeen. Her PhD thesis investigated the effect of comparison income on individual debt in the UK. She is currently a Postdoctoral Research Fellow. Zoé also holds an MSc in Financial Economics from the University of Glasgow. She is currently working on HERU projects associated with the Health Behaviour and Inequality theme. Since January 2015 she has also been involved in projects in the Workforce and Organisation of Care theme.

Bob Elliott
FRSE, MA, BA

Bob is a Professor in the Health Economics Research Unit at the University of Aberdeen. He joined HERU as Director in December 2001, a post he held until September 2012. He is a Fellow of the Royal Society of Edinburgh and between 2007 and 2015 was a Commissioner on the Low Pay Commission, which sets the UK minimum wage. He has held visiting positions at several universities in the USA, Europe and Australia and has acted as consultant and adviser to the Police Federation, HM Treasury, the European Commission and the Organisation for Economic Co-operation and Development. Bob coordinates the EC Framework 7 research project MUNROS – Health Care Reform: The iMpact on practice, oUtcomes and costs of New roles for health pROfeSsionals. He is conducting research into potentially preventable hospitalisation in conjunction with researchers in Aberdeen and the University of Western Sydney in Australia. He leads research Theme C, Researching the Delivery of Care within the Institute of Applied Health Sciences at the University of Aberdeen.

Shelley Farrar
PhD, MSc, MA, Dip

Shelley joined HERU in 1991 and is currently a Research Fellow. She graduated from the University of Strathclyde with a BA in Economics in 1989 and joined HERU after working at the Scottish Office as an Economic Assistant. She has since gained an MSc in Economics from Glasgow University and a PhD in Economics from the University of Aberdeen. Her research interests are primarily on the impact of incentives on the provision of healthcare, healthcare users and health behaviours. Her research focus is currently on behaviours during pregnancy and food choices. Shelley is coordinator of the Postgraduate Certificate in Health Economics.

Sebastian Heidenreich,
PhD, MSc, BSc

Sebastian is a Research Fellow at the Health Economics Research Unit. He joined HERU in 2012 as a PhD Student after graduating with an MSc Economics from the University of Edinburgh (Scottish Graduate Programme in Economics) and a BSc from Nuertingen-Geisslingen University in Germany. In 2016 he joined HERU as a Research Fellow. Sebastian's research is concerned with applied econometrics in the area of discrete choice modelling; the understanding of decision-making processes in discrete choice experiments (DCE); general issues around monetary valuation in DCEs and the use of qualitative methods alongside DCEs (mixed method approaches). Since 2015, Sebastian has also been a member of the council of the Scottish Economic Society.

Rodolfo Hernández

PhD, Lic, MSc

Rodolfo joined HERU in 2002 after completing an MSc in Health Economics (University of York). In addition, he has a first degree in economics (UNLP, Argentina). Between 2008 and 2013 Rodolfo was a RCUK Research Fellow holding a joint post between HERU and the Health Services Research Unit (HSRU). In 2016 he completed a part-time PhD looking at how to use discrete choice experiment-generated willingness-to-pay measures within decision analytic models using the monitoring of individuals with ocular hypertension at risk of developing glaucoma as a case study. Currently, Rodolfo is working on two RCTs (PUrE, C-GALL) and Technology Assessment Reviews and he is exploring opportunities to develop further methodological work from his PhD.

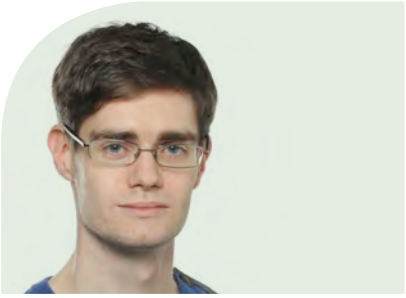
Alison Horne

BA

Alison joined HERU as Administrative Assistant in 2009. From 2001 she worked for the University of Aberdeen, Estates Facilities; Careers and Appointments (in 2002); and Student Recruitment (2004). Alison left the University in 2006 to work in Edinburgh for the NHS as an Interviewer/Analyst. In her current role she undertakes a wide variety of administrative tasks including grant applications, organising conferences and events. Alison recently completed a BA in Business Management.

Lesley Innes

Lesley joined HERU in March 2011 as Unit Secretary and is responsible for provision of secretarial and administrative support for the unit. Prior to joining HERU Lesley worked in various local government offices.



Alastair Irvine
MSc, MA

In October 2014 **Alastair** began his PhD at the Health Economics Research Unit on the topic Time and Risk Preferences, funded by the Institute of Applied Health Sciences. He is being supervised by Professor Marjon van der Pol and Professor Euan Phimister. The research will explore patient and practitioner time preferences and how these interact. In August 2014 he completed his MSc in Economics at the University of Edinburgh as part of the Scottish Graduate Programme in Economics, with a dissertation sponsored by the Scottish Government that compared linear and non-linear forecasting. Prior to this, he gained his MA (Hons) in Economics at the University of St Andrews, graduating with a First in June 2012.

Elisabet Jacobsen
MSc, MA

Elisabet started working as a research assistant at the Health Economics Research Unit in June 2016. She joined the Assessment of Technologies theme and is currently involved in an economic evaluation comparing stapled haemorrhoidopexy to traditional haemorrhoidectomy, by developing a health-economic model alongside the randomised controlled trial. She graduated from the University of Aberdeen in 2014 with a MA (Hons) in Economics, and an MSc in Economics of Health in 2015. Her MSc thesis was on the use of value-of-information analysis for healthcare technology decision-making, using a case study of the most cost-effective inguinal hernia repair strategy in the UK (comparing open pre-peritoneal mesh repair and laparoscopic hernia repair to Lichtenstein mesh repair).

Mary Kilonzo
MSc, BA

Mary is a Research Fellow in the Health Economics Research Unit. She holds a BA in Economics and German Language from the University of Nairobi and an MSc in Health Economics from the University of York. Her main research interests include developing and applying economic evaluation methodology in trials and systematic reviews and the use of discrete choice experiments in health benefit measurement.

Daniel Kopasker
PhD, MSc, MA

Daniel joined HERU as a Research Fellow in October 2016 after submitting his PhD thesis at the University of Aberdeen. He is an applied econometrician whose work focusses on the intersection of health and labour economics. Daniel also holds an MSc in Economics from the University of Edinburgh, and an MA (Hons) in Economics from the University of Dundee. He is currently working as part of the MUNROS research project.

Nicolas Krucien
PhD, MSc, BSc

Nicolas joined HERU as Research Fellow in November 2013. He completed his MSc and PhD in Health Economics at the University of Paris 11 (France). He is an applied micro-econometrician working in the fields of choice modelling and health economics. Nicolas contributes to the Methods of Benefit Valuation theme and has been involved in a number of research projects about stated preferences methods. He is currently involved in projects using an eye-tracker to investigate how participants in choice experiments process information about medical services.

Attakrit Leckcivilize
PhD, MSc, MA

Attakrit joined the Health Economics Research Unit as a Research Fellow in October 2016. Prior to HERU, he was a Research Fellow at the Institute of Labour Economics, Leibniz University of Hannover. His research interests are labour economics, applied econometrics and health economics, with particular application to developing countries. At Thailand Development Research Institute he worked with researcher teams in several projects concerning the role of healthcare financing in poverty reduction in Thailand. Currently, he is working for the Health Behaviour and Inequality and Workforce and Organisation of Care themes. Attakrit holds a Master of Science and a PhD in economics from the London School of Economics and Political Science.

Luis Enrique Loria Rebolledo
MSc, BSc

Luis is pursuing a PhD in Economics under the joint supervision of Dr Takahiko Kiso and Professor Euan Phimister from the Economics Department in the Business School, and Dr Verity Watson from HERU. His research aims to investigate willingness to pay for low-emission public transportation, using stated preference methods. As part of his thesis he is using a discrete choice experiment to assess whether there is a value attached to reducing emissions from diesel-engined buses in Aberdeen. He is particularly interested in emissions that cause climate change (greenhouse gases) and pollutants linked to health issues (nitrogen dioxides and particulate matter). Luis obtained a BSc in Civil Engineering from the Instituto Tecnológico y de Estudios Superiores de Monterrey (Mexico). He then worked in the environment sector before completing an MSc in Environmental Economics and Environmental Management at the University of York.

Anne Ludbrook
MSc, BA

Anne is a graduate of the University of York. After working at Grampian Health Board, she joined the Health Economics Research Unit in 1983. Since then she has been involved in a range of research activities and in consultancy work. Her current research interests are focussed around the use of economics in health improvement, with a particular interest in alcohol, obesity and smoking. She led the review of the health and economic impacts of smoking in public places that supported the introduction of smoke-free legislation in Scotland. Other recent studies have focussed on minimum unit pricing for alcohol; inequalities in the distribution of alcohol-related harms; economic factors influencing food choice; and the use of incentives for quitting smoking.

Lynda McKenzie
MSc, BA

Lynda first joined HERU in 1987 and holds a BA in Economics and an MSc in Transport Engineering and Operations, both from the University of Newcastle. She worked as a transport economics research officer at the University of Oxford before joining the Centre for Health Economics at the University of York as a research assistant. She worked at HERU between 1987 and 1989, and 1991 and 1992, before re-joining in 1996. Her current interests include the evaluation of interventions to improve wellbeing, especially diet and physical activity post-partum, economic and demographic factors associated with food poverty, and alcohol purchases in relation to price.

Debbie McLaggan
PhD, BSc

Debbie joined HERU in June 2013 as 50% FT project administrator for the FP7 'MUNROS' project coordinated by Christine Bond and Bob Elliott. In her current position she is responsible for managing, coordinating and delivering the administrative and financial functions required to complete the MUNROS European Commission Project within the agreed timetable.

Liam Mc Morrow
MSc, H.dip, BA

Liam started his PhD in October 2012. His PhD thesis is examining the determinants of food choice in Scotland and has involved both primary and secondary data analysis. The Scottish Health Survey was utilised to examine the relationship between perceived barriers to healthy eating and a healthy diet. Primary data collection was necessary to observe associations between time preferences and diet quality. A discrete choice experiment was undertaken to investigate framing effects in snack food choices. He has been awarded a PhD studentship by the University of Aberdeen Rowett Institute. The PhD is supervised by Professor Anne Ludbrook and Jennie Macdiarmid.

Paul McNamee
PhD, MSc, MA

Paul joined HERU as a Senior Research Fellow in October 2002 and is now Professor of Health Economics. His current research interests include the study of economic aspects of healthy ageing and social care, and the development of methods to design and evaluate self-management strategies in long-term conditions. He is the lead for the Health Behaviour and Inequality theme. Paul holds an MA Honours degree in Economics from the University of Aberdeen, an MSc in Health Economics from the University of York and a PhD from the University of Newcastle. Prior to his present appointment, he was a Research Associate then Lecturer in Health Economics at the University of Newcastle.

Kevin Momanyi
MSc, BSc

Kevin joined HERU in October 2015 and is working on an ESRC/Scottish Government-funded PhD entitled 'Enhancing quality in social care through economic analysis' under the Health Behaviour and Inequality theme. He holds an MSc in Health Economics and Policy and a BSc in Economics and Statistics, both from the University of Nairobi. His research interests include econometric modelling, health policy analysis and economic evaluation in health care.

Aileen Neilson
MSc, BSc

Aileen joined the Health Economics Research Unit as a Research Fellow in October 2013. Her role is to expand and enhance health economics research within the Division of Applied Health Sciences (DAHS). She is working with staff within DAHS to develop new research collaborations in current areas of strength within the Division.

Aileen has experience in conducting and managing health outcomes research and economic evaluation studies in the UK NHS setting and in other European countries. She holds a BSc in Science with Management Studies (Napier University, Edinburgh) and an MSc in Operational Research (Strathclyde University, Glasgow). Aileen has worked in various clinical areas including oncology, orthopaedics and trauma surgery, intensive care, stroke and diabetes. She has over 20 years of research experience, in academia (e.g. Universities of Nottingham, Dundee, St Andrews and York), the NHS (Lothian – Primary and Community Care Division) and in healthcare consultancy roles.

Patricia Norwood
PhD, Msc, Lic

Patricia Norwood holds an honours degree in Economics from the University of Evora and an MSc in Economic Policy from the University of Minho, Portugal. Her MSc dissertation investigated the introduction of DRGs in Portuguese hospitals and she was awarded her PhD at the University of Aberdeen, looking into the effects of rurality and remoteness on hospital costs in Scotland. Patricia is currently working on projects associated with the Health Behaviour and Inequality theme.

Marjon van der Pol
PhD, MA, Dip

Marjon is the Depute Director of HERU. She joined HERU as a Senior Research Fellow in May 2004. She holds a MA in Business Economics from the University of Nijmegen (Netherlands) and a PhD in Economics from the University of Aberdeen. She worked in HERU from 1995 to 2001 as a Research Fellow and at the University of Calgary (Canada) from 2002 to 2004 as Assistant Professor. Marjon is also an honorary Professor at the Behavioural Science Centre at the University of Stirling.

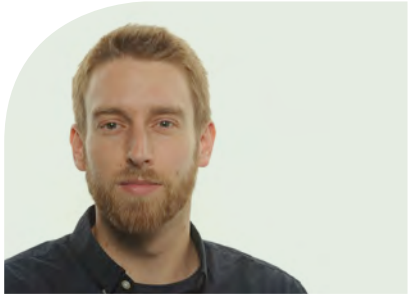
Marjon's main research interest is in the relationship between time and risk preferences and health (behaviours). Current research focuses on the role of time preferences in the education-health relationship, the role of time preference in the intergenerational transfer of health behaviours and whether differences in time and risk preferences can help explain the Glasgow effect. Marjon also conducts research into the cost-effectiveness of health interventions. Research focuses on interventions that have an important behavioural component including smoking cessation, dental care and self-management of chronic conditions.

Marjon is also the director of teaching in HERU and the course coordinator of the health economics option on the Scottish Graduate Programme in Economics.

Mandy Ryan
FRSE, PhD, MSc, BA

Mandy is the Director of the Health Economics Research Unit. She joined HERU in 1987 after graduating from the University of Leicester with a BA (Hons) in Economics and the University of York with an MSc in Health Economics. In 1995 she graduated from the University of Aberdeen with a PhD in Economics concerned with the application of contingent valuation and discrete choice experiments in health economics. In 1997 Mandy was awarded a five-year MRC Senior Fellowship to develop and apply discrete choice experiments in health care; in 2002 she was awarded a Personal Chair in Health Economics by the University of Aberdeen; and in 2006 she was elected as a Fellow of the Royal Society of Edinburgh. She took up the Directorship of HERU in April 2013.

Mandy has worked with academics, government and the pharmaceutical industry and has published widely in the field of health economics generally, and monetary valuation more specifically. She has extensive teaching experience, and currently contributes to HERU's annual expert Discrete Choice Experiment Workshop. In 2012 Mandy was ranked amongst the top health economists in the world, placed 21st on the list of the top 100 health economists, based on a measure of health economics publications and the number of times they have been cited, making her the top-ranked health economist in the UK.



Ruben Sakowsky
MSc, BA

Ruben joined HERU in September 2015. His PhD in Health Economics is supervised by Professor Mandy Ryan (HERU) and Professor Vikki Entwistle (HSRU). His research is funded by the Gavin Mooney Studentship and focuses on evaluating normative aspects of decision-making schemes for resource allocation in health care. He will also be investigating whether, and if so how, deliberative models of preference evaluation can inform the framework of policy makers. Ruben is interested in matters of deliberative democracy, justice theory, questions concerning democratic representation and inclusion, and the relationship between community values, individual interests and utility maximisation in health care.

Ruben holds a BA in Political Science and Philosophy from Freiburg University and a Masters in Philosophy and Ancient History from the University of Göttingen. He spent a Fulbright year at the University of Colorado at Boulder, and an Erasmus year at the Roma Tre University in Rome, Italy. He is an alumnus of the German National Academic Foundation.

Graham Scotland
PhD, MSc, BSc

Graham is a Senior Research Fellow and leads the Assessment of Technologies theme in HERU. He joined HERU in 2004 and has since 2012 held a joint appointment between HERU and the Health Services Research Unit (HSRU). His current research interests span both model- and trial-based economic evaluation, with specific areas of interest including the evaluation of technologies in widespread routine use, the use of patient-level data to inform decision models, and the valuation of outcomes within economic evaluation. Graham graduated from the University of Edinburgh in 1998 with BSc (Hons) in pharmacology, and following this undertook an MSc in Health Services and Public Health Research at the University of Aberdeen. After completing his MSc he worked at the Dugald Baird Centre for Research in Women's Health, University of Aberdeen, where he undertook research into economic aspects of maternal healthcare delivery in developing countries. Since his appointment in HERU he has gained over 10 years' experience working in the area of health technology assessment. In 2012 he completed a part-time PhD on methods for incorporating broader measures of value into economic evaluation in the area of reproductive healthcare.

Diane Skåtun
PhD, MSc, MA

Diane is currently leader for the Workforce and Organisation of Care theme. Her current work focuses on healthcare personnel and how financial and non-financial incentives influence the behaviour of the healthcare workforce. Diane graduated with an MA (Hons) in Political Economy from the University of Glasgow and then joined the Scottish Doctoral Programme in Economics and gained an MSc in Economics. She continued on the Scottish Doctoral Programme and graduated from the University of Aberdeen with a PhD entitled 'Econometric bias and the estimation of male-female wage differentials'.

Chris Spoor
MSc, BSc, Dip

Chris is a tutor on the HERU distance-learning Certificate in Health Economics. He graduated with a BSc in Economics from the University of Edinburgh, and also holds a Diploma in Education from the University of Aberdeen and an MSc in Health Technology Assessment from the University of Sheffield. He has held full- or part-time roles at HERU since the 1980s, when he first taught on and managed the certificate course, and is currently Part-time Senior Teaching Fellow.

Chris has taught courses in economics or health economics at the universities of Maryland, Aberdeen, Dundee and Leeds, and is currently Principal Lecturer in Economics at Leeds Beckett University. Interests include evaluation of complex interventions, health labour markets and the role of incentives in health professionals' decision making.

Emma Tassie
MSc, BA

Emma joined the Health Economics Research Unit as a full-time PhD student in October 2016. Her PhD aims to incorporate broader measures of value into economic evaluation through the use of existing data. She has been awarded a studentship by the Institute of Applied Health Sciences, which is supervised by Dr Verity Watson (HERU), Dr Graham Scotland (HERU) and Professor Stirling Bryan (joint position in HERU and University of British Columbia). Emma graduated from University College Cork in 2010 with a BA (Hons) in Economics and Sociology, and in 2011 with an MSc in Health Economics. Prior to beginning her PhD, Emma worked as a research assistant in HERU where she conducted economic evaluations alongside randomised controlled trials and developed health economic models to accompany systematic reviews.

Uma Thomas
MSc, BSc

Uma joined HERU as a part-time PhD student in October 2015 after completing an MSc in Health Economics, also at HERU. The title of her PhD is 'Using insights into time preference and present bias to develop an intervention to improve adherence to exercise'. It is a cross-disciplinary project with Professor Marjon van der Pol as the primary supervisor and Dr Julia Allan from Health Psychology as second supervisor. The PhD is funded internally by the Institute of Applied Health Sciences and aims to develop and test an interactive web-based tool that improves an individual's adherence to exercise by taking into account their time preference. The project combines Uma's interests in behavioural economics with her interest in the benefits of exercise on health. Uma graduated from Dundee University with a degree in Maths and Statistics and worked as a computer analyst programmer prior to studying health economics.

Antje Tockhorn-Heidenreich

MSc, BSc

Antje began her part-time PhD with the topic 'Exploring the role for patients' values in health technology assessment: a mixed methods approach' at the beginning of October 2012. Her research is supported by the Economic and Social Research Council and is supervised by Professor Mandy Ryan and Dr Graham Scotland (HERU) and Professor Vicki Entwistle (HSRU).

Verity Watson

PhD, MSc, MA

Verity leads the Methods of Benefit Valuation research theme. Her research focusses on non-market valuation, experimental economics and applied labour economics. Verity has applied stated preference methods to value health, healthcare and environmental amenities. In doing this, she has worked with academics from many different disciplines, the government and the pharmaceutical industry.

ANNEX 05

Strategic Report and Summary of Stakeholders' Responses

05

ANNEX 05

Strategic Report

1. Strategic value to the Scottish Government and NHS Scotland from CSO investing in health economics research and a centre of excellence

1.1 Introduction

The Scottish Government is committed to high-quality publicly funded health and social care services for the people of Scotland, as set out in its 2020 Vision for Health and Social Care. [1,2] These services directly contribute to Scottish economic growth by ensuring that the people of Scotland live longer, healthier and more productive lives either at home or in a homely setting.[2] The health budget exceeds £12 billion but demands on that budget continue to increase at a rate that outstrips the rate of growth of the budget. Securing value, person-centred care and ensuring sustainability are priorities for Scotland.[3] The discipline of health economics provides the analytical framework required to identify ways of achieving these multiple objectives.

CSO core funding has enabled HERU to build and sustain a critical mass of experienced researchers who have a deep understanding of Scottish health institutions and policies, and the challenges they face. HERU has:

- Made major contributions to Scottish smoking and alcohol policy: the ban on smoking in public places and the proposed minimum unit pricing of alcohol.
- Played a central role in the development and implementation of formulae to allocate resources to Scottish hospitals, GP practices and Primary Care Trusts and now commissioning groups in England.
- Evaluated the cost-effectiveness of a wide range of healthcare technologies in wide use throughout the Scottish health service, including drugs, medical devices, diagnostic tests and surgical procedures.
- Developed and applied robust methods for identifying preferences for health services and worked with Scottish health boards, NHS Grampian and NHS Dumfries and Galloway, to employ them in order to develop priority-setting frameworks.
- Applied its expertise to understand the determinants of health behaviours informing policy concerns around diet and food choice, physical activity, alcohol consumption, smoking and health inequalities.

1.2 Strategic value

Health economists study and inform the allocation of finite health care resources. At the heart of the analytical framework of health economics is the concept of opportunity cost – the benefit or value of something that must be given up to acquire or achieve something else. This concept is central to informing the best way to spend limited resources to improve the health and well-being of the people of Scotland.

The Chief Scientist Office (CSO) of the Scottish Government has recognised the excellence of the Health Economics Research Unit (HERU) through repeated funding based on rigorous independent reviews. This funding has built world-leading research capacity in health economics, establishing HERU internationally as a centre of excellence. Our research excellence was evidenced in the 2008 UK Research Assessment Exercise, where staff from HERU made a major contribution to the University's submission to Unit of Assessment 7, Health Services Research. The Health Services Research return was the highest-scoring return for the University of Aberdeen and was joint first in the UK. In the 2014 UK Research Excellence Framework (REF 2014) feedback from the assessment panel explicitly highlighted the exceptional strength and depth of health economics at the University of Aberdeen. In REF 2014 the impact of research was also assessed. One-third of the Impact Case Studies submitted by the Institute of Applied Health Sciences (IAHS) resulted from research undertaken in HERU, and a further third from research undertaken in collaboration with our IAHS colleagues.[4] At our last CSO scientific review HERU was recognised as 'a leader in the United Kingdom and as one of the best health economics groupings in Europe'. The HERU director, Professor Mandy Ryan, is ranked as the UK's leading health economist and the Unit is ranked 4th in Europe, both based on ranking of published articles and their citations.[5] Two HERU professors (Mandy Ryan and Bob Elliott) are Fellows of the Royal Society of Edinburgh.

HERU is based in the Institute of Applied Health Sciences (IAHS) within the School of Medicine, Medical Sciences and Nutrition at the University of Aberdeen. This co-location with other world-leading health research units (the Health Services Research Unit and (The) University of Aberdeen Rowett Institute) has established Aberdeen's formidable strength in internationally excellent applied health research with direct relevance to the NHS in Scotland and the Scottish Government. HERU's location within the medical school and its collaborations with the economics department at the University of Aberdeen have further strengthened its capacity to undertake research of value to NHS Scotland and the Scottish Government. The School's recent strategic plan identifies health economics as a focus for future research and for further capacity building. The School currently funds 6.4 full-time equivalent (FTE) posts in HERU.

CSO core funding enables HERU to leverage research income from other sources, increasing the volume and quality of research in Scotland. Over the Review period (1st January 2010 – 31st October 2016), the CSO invested £4.9m in HERU, currently funding 7 WTE research staff and 2.8 WTE support staff. During this period HERU research staff were involved in externally funded research grants that generated research funding to a total value of £51.3m, including National Institute for Health Research (NIHR) funding to the value of £18.2m. Of this £51.3m, £30.5m was awarded to the University of Aberdeen, £16.2m to other Scottish universities and NHS Scotland organisations, and £4.6m beyond Scotland (England, Europe and internationally). Over the period, HERU secured funding to support its research to a total value in excess of ten times the investment made by the CSO.

HERU has built research capacity that can respond flexibly and adapt to emerging Scottish policy priorities. Researchers are recognised as a source of expertise and provide advice, support and collaborative opportunities to health care professionals and policy makers at all levels in Scottish Government, NHS Scotland and public health and health service research communities in Scotland. Core funding enables HERU to build coherent research programmes ensuring sustained support in critical policy areas.

HERU currently has 22.2 FTE research staff and 8 PhD students. Our research is organised into four interrelated themes, all of which contribute to Scottish Government and NHS Scotland policy priorities:

- *Workforce and Organisation of Care* – examines how financial and non-financial incentives influence the behaviour and performance of the people and the organisations delivering care and thus informs the Scottish Government's workforce vision and integration of care agenda.
- *Health Behaviour and Inequality* – uses economics to understand health behaviour (diet and food choice, alcohol consumption, self-management of chronic conditions), contributing to the Scottish Government priorities of improving population health and reducing health inequalities through early intervention at all stages in the life course.
- *Assessment of Technologies* – conducts economic evaluations to inform NHS decisions on the adoption and withdrawal/modification of health technologies and services, contributing to the Scottish Government priorities around value for money and sustainability.
- *Methods of Benefit Valuation* – develops and applies economic methods to help understand what patients value, contributing to the Scottish Government aim of person-centred health and social care.

We collaborate across themes to address policy priority areas (see examples below); the whole is considerably greater than the sum of the parts. Our research themes emphasise both the application and the development of strong methodology, and methodological work underpins all themes.

[1] Scottish Government (2011) *Achieving sustainable quality in Scotland's healthcare: a 20:20 vision*. Edinburgh: Scottish Government.

[2] Scottish Government (2013) *A route map to the 2020 vision for health and social care.* Edinburgh: Scottish Government.

[3] Scottish Government (2015) *Scotland's spending plans and draft budget 2016–17*. Edinburgh: Scottish Government.

[4] REF 2014 Impact Statements: *Improved Public Health: Smoke free legislation in Scotland and Local Pay Analysis: Applications to NHS Hospital Funding. HERU contributed to 'Influencing national and international breastfeeding care through the generation of high quality evidence' and 'Making in-vitro fertilisation (IVF) safer'.*

[5] Wagstaff, A. and Culyer, A.J. (2012) 'Four decades of health economics through a bibliometric lens', *Journal of Health Economics,* 31 (2), pp 406–439.

2. HERU's contribution to addressing Scottish health and social care priorities (2010–2016)

Our contribution to addressing Scottish health and social care priorities in the review period falls into three broad headings: research, ensuring impact (including advisory roles) and capacity building.

2.1 Research

We have mechanisms in place to ensure we understand Scotland's health and social care policy issues and priorities and can match these to our skills and expertise including:

- Our quinquennial Unit Review, including consultation with stakeholders (strategic review) and a scientific review, which agrees a forward programme and research priorities.
- Advice between reviews from:
  - Our Unit Advisory Group of representatives from the Scottish Government, the NHS and academics who advise on our proposed research programme.
  - Our Policy Advisory Group of representatives from the Scottish Government and NHS Scotland who advise on policy engagement.
- Meeting regularly with economists from Health and Social Care Analysis (HSCA, previously Analytical Services Division) in the Scottish Government.
- Presenting at policy conferences and facilitating regular information exchange between NHS practitioners, policy makers and HERU researchers.
- Project-specific advisory groups on which policy makers and practitioners are prominent.
- Membership of numerous working groups and advisory committees within the Scottish Government and NHS Scotland (see below).

During the review period the policy aims for NHS Scotland were set out in the '2020 Vision for Health and Social Care' policy document.[1,2] Our research addressed questions central to the main policy aims: (1) improving the quality of care with a focus on integrated person-centred care; (2) improving the health of the population; and (3) securing the value and financial sustainability of services. In the review period we completed 121 projects, 55 new projects received external funding, and at time of writing we have over 60 projects in progress. Below we provide examples of current research contributing to this agenda. Further details on all our research can be found at www.abdn.ac.uk/heru.

2.1.1. Organisation of care and workforce

Our research has addressed economic questions about the organisation of different parts of the healthcare sector, including its workforce. We have researched the influence of employment contracts on the behaviour, composition and distribution of the workforce and researched interactions between different parts of the sector. Examples include research into:

- The introduction of free NHS eye examinations in Scotland and the enhanced use of optometrists within the community setting that has succeeded in getting more people to have their eyes tested. However, the benefits have not been shared equally, with socio-economic differences suggesting that the policy has not reached the more vulnerable segments in society. This has implications for understanding whether new services should be universal or promote more targeted use of resources, and stimulated discussion in the Scottish Government.
- Admissions for Ambulatory Care-Sensitive Conditions (ACSC). ACSC conditions are those that could potentially be prevented by timely and effective disease management within primary care. As such they are increasingly used as NHS performance indicators. However, our research showed the link with quality of primary care on such admissions was small and inconsistent, suggesting caution in the use of crude ACSC admission rates as quality indicators.
- The Quality and Outcomes Framework (QOF) was an expensive and elaborate performance-related pay scheme for General Practices. Our research showed that it did stimulate some improvements in quality of care within GP Practices. The decision on whether these benefits were sufficient given the bureaucratic nature of the framework has since been made and the QOF has been withdrawn as part of the General Medical Services contract.
- Changing the way care is organised through the use of telemetry systems. Such systems have the potential to improve the quality of control for patients with long-term conditions but their direct benefit is not clear. Our research showed the importance of isolating the effect of the tele-monitoring communication from any changes in the underlying clinical service that might accompany it. This has important implications for Health Boards in the promotion of telemetry systems to support care within the home.
- The new revalidation requirements for doctors to confirm their fitness to practise. Predictions that they would not compromise the time consultants spend on direct patient care were confirmed but it was found that specialty and associate specialist (SAS) doctors may find it more difficult to protect direct patient care. Research concluded that time for continuing professional development activity needs to be protected.
- Medical shortages in areas of Scotland. Several geographical areas struggle to recruit the number of doctors they need to fill training posts. Research concluded that doctors in training are willing to be compensated financially if training posts do not meet their preferences. Alternatively organisations with hard-to-fill training places should focus on improving working conditions, promote linked training positions for medical couples and provide access to career support to non-medical partners. This has implications for NHS Education Scotland in their role to support the training of the medical workforce including the new Scottish Targeted Bursary Scheme to attract trainees into hard-to-fill posts.
- The appropriateness and estimation of the staff Market Forces Factor, the index used to adjust funding for the unavoidable differences in staff costs across geographic locations. The current index, which we developed, is being utilised in Scotland within the primary care sector and in England in both the acute and primary care sectors.

2.1.2. Health and well-being of the population

Scottish health policy has sought to encourage and incentivise more healthy lifestyles. Our research has explored the motivators of key individual health behaviours such as alcohol consumption, smoking, diet and physical activity. We have also assessed the effectiveness and cost-effectiveness of life-style interventions and addressed how best to narrow health inequalities in Scotland. Examples include research:

- On Minimum Unit Pricing for alcohol, to reduce alcohol consumption in high-risk groups. The results revealed this would not place an unfair burden on low-income households or moderate drinkers. HERU's research contribution has formed part of the evidence considered by the Court of Session.
- Showing that a Tayside Health Board initiative of financial incentives combined with behavioural support for smoking cessation in deprived areas was effective and cost-effective. These results were discussed in parliamentary questions and all health boards were encouraged to consider the lessons learned (http://www.ashscotland.org.uk/what-we-do/supply-information-about-tobacco-and-health/parliamentary-questions/cessation/smoking-cessation-pq-2012/).
- Showing that interventions which reduce the impact of deprivation on health outcomes can make a contribution to narrowing inequality in good and very good health in the short term. This suggests health behaviour interventions targeted amongst poorer households can help to reduce health inequalities. The results provide support for the use of various anticipatory care interventions by Scottish Health Boards alongside longer-term policies to reduce inequalities in income, education and employment.
- Estimating the influence of time and risk preference to help explain the so-called 'Glasgow effect' (i.e. the additional levels of poor health experienced over and above those explained by greater socio-economic deprivation). We showed that differences in risk preferences, rather than time preferences, may help explain some of the differences in mortality associated with risky health behaviours such as drug and alcohol use.

2.1.3 Person-centred care

Person-centred care is a key deliverable for NHS Scotland. We have undertaken research into the delivery of person-centred care and developed economic methods for eliciting population and patient preferences. Examples include research into:

- Patient preferences for alternative service configurations. One way to provide a sustainable healthcare service is to change the skill mix within teams delivering healthcare by extending the roles of existing health professions and introducing new ones. Our research suggested that whilst consultant-led care was preferred in secondary care, and GP-led care was preferred in primary care, improvements in other aspects of care (longer appointments, shorter waiting times, better continuity of care) could compensate for the use of alternative providers (junior doctor, specialist nurse or physician associate).
- Increasing levels of obesity pose a major challenge to NHS Scotland. Our research suggested challenges to reducing obesity – people preferred their current lifestyle, to manage their weight by exercising rather than dieting (even though the latter is more effective), and did not value personal behaviour-change support. The research also showed that individuals needed to be compensated financially to change their behaviour. Such a policy may be controversial and challenging.
- The outcomes that patients value. Across many clinical areas patients required large symptom improvements to compensate for treatment side-effects. Our research reinforces the message of realistic medicine.

2.1.4 Cost-effectiveness of new and existing technologies

Securing value for money from NHS resources is an issue central to many of HERU's research projects. Our research assesses the cost-effectiveness of new and existing technologies and services in priority areas. Our work assessing the cost-effectiveness of health technologies as part of our NIHR TARs contract often has direct impact through informing guidance and recommendations issued by NICE. Examples include a diagnostic assessment review informing recommendations on the use of anticoagulation self-monitoring in patients with atrial fibrillation or an artificial heart valve who are taking warfarin (https://www.nice.org.uk/guidance/dg14); a technology assessment review leading to recommendations on the use of magnetic resonance imaging in the diagnostic pathway for prostate cancer (https://www.nice.org.uk/guidance/cg175); and critiques of pharmaceutical industry submissions to NICE which have influenced decisions on the reimbursement of new drugs by the NHS in England (https://www.nice.org.uk/guidance/ta393; https://www.nice.org.uk/guidance/ta385). Whilst the guidance and recommendations of NICE do not carry legal status in Scotland, the supporting HTA reports co-produced by HERU are available for consideration by analogous decision-making bodies in Scotland such as the Scottish Health Technologies Group (SHTG) and the Scottish Medicines Consortium (SMC). The SMC further benefits from HERU's experience in critiquing pharmaceutical industry submissions to NICE through our representation on the SMC appraisal committee.

The findings of further externally funded health technology assessment work, on which HERU has collaborated, also continues to have impact through informing national and international clinical guidelines and decisions to update them

(http://uroweb.org/guideline/urolithiasis/; https://www.nice.org.uk/guidance/cg168; https://www.nice.org.uk/guidance/cg156; https://www.nice.org.uk/guidance/cg85).

In the review period, we have begun to place a particular emphasis on ensuring the cost-effective utilisation of technologies/services already in widespread routine use in Scotland. This identifies inefficiencies in the way technologies and services are currently delivered, and where there is scope to release resources for reinvestment in new technologies of greater value. Examples include research:

- Assessing the impact of adopting risk-stratified screening intervals within the national diabetic retinopathy screening programme in Scotland – findings support the move to extended screening intervals for those at low risk of progressing to sight-threatening diabetic retinopathy.
- Determining the most efficient set of surrogate photographic markers to screen for diabetic macular oedema – findings support the continued use of the current combination of markers used in Scotland over more sensitive but less specific combinations.
- Identifying a lack of clear benefit from recommended resource-intensive monitoring strategies for people with ocular hypertension, compared with less costly and more conservative biennial hospital-based monitoring.

2.2 Ensuring impact

We maximise the impact of our research through sustained engagement with policy makers and practitioners. This is achieved through a range of mechanisms including representation on key committees (see below), informal meetings with policy makers and practitioners, and submission of research evidence to parliamentary committees. Our dissemination strategy includes policy briefs (short non-technical summaries of research findings and their implications) distributed to key stakeholders such as Directors of Public Health or hospital managers and clinicians, HERU newsletters, social media, peer-reviewed journal publications, reports and presentations at a range of conferences.

2.2.1 Advisory roles

HERU support the work of NHS Scotland and the Scottish Government through scientific advice. During the review period, we have provided intensive support to a number of NHS organisations and groups, as well as being members of various Government and NHS committees:

- Technical Advisory Group on Resource Allocation (TAGRA), including active involvement in subgroups (Mental Health and Learning Difficulties, the Acute Care Programme and the Remote and Rural subgroup) undertaking research to maintain and develop the resource allocation formula that distributes funding throughout the health boards in Scotland.
- Scottish Medicines Consortium (SMC), providing health economics expertise through membership of the SMC committee, which meets once a month to make decisions on whether new medicines should be made available in the NHS in Scotland.
- Scottish Health Technologies Group (SHTG), which involves considering the strength of existing health economics evidence relating to health care diagnostic devices, tests and procedures, and provision of written advice to inform the funding decisions of health boards and other stakeholders.
- Health Economics Network for Scotland (HENS), leading the development and delivery of new health economics training to meet the needs of decision makers in health boards.
- Advisor to Scottish Government policy groups, including dementia (national Dementia Demonstrator sites) and to Scottish Government-funded chronic pain service improvement group based in NHS Grampian.
- A strategic alliance with Healthcare Improvement Scotland (HIS), providing advice and sharing knowledge, including providing bespoke training courses and organising a joint annual conference.
- Improvement Science Methods Advisory Group of the Scottish Improvement Science Collaborating Centre (SISCC), providing advice on health economic methods for evaluations of health improvement projects.
- Membership of: Research and Evaluation Sub-Group of the Ministerial Working Group on Tobacco Control; Health Inequalities Tool for Scotland Steering Group; Steering Group of the Analysis, Intelligence and Modelling (AIM) for Workforce Programme; Evaluation Group for the Links Worker In Deep End Practices project; and providing scientific advice for Monitoring and Evaluating Scotland's Alcohol Strategy (MESAS).
- Membership of various grant-awarding panels in Scotland and beyond, including: Scottish Government/Royal Society of Edinburgh Personal Research Fellowships Committee; CSO Health Improvement, Protection and Services Research Committee; various Medical Research Council (MRC) and NIHR panels, and the European Commission Horizon 2020 Funding Panel.

HERU also provide advice beyond Scotland. Examples include: contributing to the work of the National Institute for Health and Care Excellence (NICE) in updating evidence underpinning guidance on preventing harmful drinking and through membership of programme guidance groups on Personal and Social Health Education and on Tobacco harm; evaluating the impact of smoke-free legislation on the hospitality sector for the Department of Health; and presenting findings from our alcohol research at a Cabinet Office workshop that informed the development of alcohol policy in England.

2.2.2 Public engagement

We are broadening the impact of our research by engaging with the public. Activities include stimulating public debate with several informal presentations at events such as PechaKucha[6] *(calorie labelling; minimum unit pricing for alcohol; and nudging people to make better decisions)*, Café Scientifique[7] *(Low prices, high spirits?),* science festivals (British Science Festival[8] *– Incentives in health promotion: taxing people for unhealthy behaviours or paying people for healthy behaviours;* May Festival[9] *– NHS 2020: What will healthcare look like in five years' time?)* and European Researcher Nights[10] *(Come and be part of an eye-tracking experiment).*

2.3 Capacity building

There is a shortage of health economists in Scotland and beyond. CSO core funding enables HERU to build health economics research skills,[11] and to attract and retain leading international researchers to work in Scotland. HERU builds Scottish health economics capacity through a strategy aimed to increase understanding of the contribution of economics to health-decision making, stimulate interest in becoming a health economist and provide the required training at all levels. The strategy takes the following form:

Building health economics literacy amongst non-economists

- Delivering a postgraduate distance-learning course in health economics to Scottish, UK and international students. The course aims to increase understanding of the usefulness and application of health economics. Over the review period 168 students have completed the course. This includes 21 NHS professionals currently working in Scotland.
- Teaching expert workshops on discrete choice experiments and health economics evidence for public health. Over the review period 139 participants have completed one of six workshops.
- Teaching health economics as part of a range of University non-economics degree courses.
- Developing understanding and skills in health economics across Scotland through research collaborations with researchers at the Universities of Dundee, Edinburgh, Glasgow, Stirling and Strathclyde and at NHS Education Scotland (NES), Information Services Division (ISD) Scotland and the Scottish Collaboration for Public Health Research & Policy (SCPHRP).

6 PechaKucha is Japanese for chit chat. It is a presentation style in which 20 slides are shown for 20 seconds each (6 minutes and 40 seconds in total). The format uses only pictures/photos.

7 Café Scientifique is hosted by Aberdeen City and invites leading experts to share the latest in scientific research with the public in a relaxed and friendly atmosphere where questions and discussions are encouraged.

8 The British Science Festival has developed into the UK's largest public-access celebration of science.

9 Showcases to a wide audience, including the public, research under way at the University of Aberdeen.

10 European Researcher Nights bring together academics, school pupils and the public on one night across Europe to celebrate and showcase the best innovation and development taking place across the EU.

11 Capacity building was recognised as a key function of CSO core-funded units in the recent CSO Research Strategy: Chief Scientist Office (2015), *Delivering innovation through research – Scottish Government Health and Social care research strategy*. Edinburgh, Scottish Government.

Stimulating interest in health economics amongst economics undergraduates

- Teaching health economics on the MA in Economics (University of Aberdeen). Several students completing this course have gone on to study for an MSc in Health Economics.
- Our summer internship scheme introduces economics undergraduates to working as a health economist and encourages careers in health economics. HERU pioneered health economics internships in the UK; several health economics units now run similar programmes. HERU interns have gone on to posts within Scottish government, local government and further academic studies within health economics, including Masters and PhD programmes.

Delivering advanced training in health economics

- Postgraduate training for economics graduates is offered as an MSc in Applied Economics (Health Pathway). Previous students on HERU's postgraduate courses work for NHS Scotland, including at Healthcare Improvement Scotland and NHS Ayrshire and Arran.
- Teaching postgraduates and practising health economists, including those working in Scottish Government, through a number of economics Masters courses, including the Scottish Graduate Programme in Economics. Students from this course have trained in health economics by studying for a PhD and working as Research Assistants in HERU and other Scottish health institutions.
- PhD student training and supervision. In the review period, seven students completed PhDs, of whom five were supported by studentships secured from highly competitive external funding sources such as the MRC, Economic and Social Research Council (ESRC) and the Wellcome Trust/Department for International Development. There is a recognised shortage of economics graduates who study for a PhD, and a more acute shortage in health economics. Despite this, we have supervised 21 PhD students over the last 10 years and are currently supervising eight students.
- HERU funded two post-doctoral fellowships to enable early-career researchers to develop strong applications for MRC Skills Development Fellowships.
- HERU has hosted research visits by early-career researchers from France, Canada, Australia and South Africa.

3. Looking forward

The immediate future is likely to see NHS Scotland operate within a much tighter funding environment. This will necessitate challenging choices between competing claims on these increasingly scarce resources. The skills of economists are central to enabling the Scottish Government and NHS Scotland to make informed, evidence-based decisions at this time. HERU can continue to support this challenge by providing an established body of expertise with a well-honed understanding of the Scottish policy context.

We will focus on core areas of research activity which have both essential and immediate application to the NHS in Scotland and Scottish Government, and in which we have built research capacity and expertise. 2020 Vision for Health and Social Care will continue to guide policy in the coming review period, as reflected in The Chief Medical Officer's (CMO) Annual report on Realistic Medicine and the publication of the National Clinical Strategy for Scotland. [12,13] Our research will provide evidence to facilitate transformational change in the way services are organised and delivered through the health and social care integration agenda. Core funding allows some flexibility to adapt if new researchable policy issues emerge over the funding period. We will continue to use a variety of mechanisms (as outlined in section 2.1) to monitor policy priorities.

[12] Calderwood, C. (2016) *Chief Medical Officer's annual report 2014–15: realistic medicine.* Edinburgh: Scottish Government.

[13] Scottish Government (2016) *A national clinical strategy for Scotland*. Edinburgh: Scottish Government.

3.1 Organisation of care and its workforce

The on-going integration of health and social care provides great opportunities for synergy between sectors, but crucial to its success is a sustainable workforce. Our research will build on an understanding of the demographics of the Scottish healthcare workforce and the patient base that it is serving. It will conduct research into the geographical distribution of the workforce, the impact of new contracts within the primary care sector and the crucial role that primary care plays within the health and social care integration model and the consequences of the continuing divergence between the constituent countries of the UK in terms of workforce contracts. Specific examples of future work include:

- Investigating the flow of the healthcare workforce through education and training to ensure the health care workforce supply meets the demand.
- Modelling the implications of staffing on vacancies, the use of locum and agency staff and their distribution across Scotland including the urban/rural divide.
- Exploring the implications of the new Scottish Allocation Formula/General Medical Services contract within primary care.
- Exploring the expansion of alternative models of skill mix as a means to deliver sustainable services.
- Enhancing the quality of social care through economic analysis – this project will draw on linked health, social care and housing data, to understand the nature and impact of community-based interventions, such as telecare and the delivery of social care interventions such as reablement, on the probability of future hospital admissions.

3.2 Improving health and well-being of the population

Rising levels of obesity, current levels of alcohol consumption and continuing inequalities in health remain key policy concerns. The increase in patients with chronic health conditions means there is also an increased focus on self-management. Our research will improve understanding of health and self-management behaviours, and will focus on using this knowledge to inform the design of more effective interventions. We will take forward new research to understand the role of social networks in health behaviour. Priority areas for research will be strengthening the evidence base on behaviours that are the main contributors to obesity (food choice and physical activity), on alcohol consumption and on self-management of chronic conditions. Taken together, and given the social patterning of health behaviours, this research will contribute to the policy aim of narrowing health inequalities. Specific examples of future work include:

- Understanding the way in which nutritional information is used by consumers and the implications this has for interventions such as food labelling and other public health campaigns.
- Understanding how habitual purchasing behaviour affects consumer choices around food and alcohol and how this impacts on responses to price-based interventions.
- Identifying factors influencing children's food choices and potential interventions to improve children's diet.
- Using insights from the time and risk preferences literature to inform policy, including lifestyle choices amongst patients with chronic health conditions and increasing physical activity in the population.
- Evaluation of behavioural interventions to inform and change health behaviour and improve health and well-being, including studies of cognitive behavioural therapy (CBT) and other therapies to prevent chronic pain and lessen the impact of fatigue associated with inflammatory rheumatic diseases.
- Development and refinement of behavioural interventions to reduce male obesity.

3.3 Person-centred care

Scotland's CMO's annual report on 'Realistic Medicine' calls for healthcare that focuses on outcomes that patients value and defines waste as interventions that do not add value for patients.[12] We will continue to conduct research to better understand what the public and patients value about health care and the best ways to measure this. More specifically, we will:

- Develop economic methods to include broader values into the economic evaluations. The focus will be on areas in which health outcomes do not capture the outcomes that patients value and we will focus instead on the outcomes that matter to people.
- Develop methods to elicit public values to support the Scottish Government's aim to empower communities. [14]
- Use patient values to establish preferences for alternative models of follow-up care across chronic conditions (cancer, diabetes Type 2, heart disease).

3.4 Cost-effectiveness of new and existing technologies

HERU will continue to synthesise available research evidence and undertake prospective evaluations of clinical interventions of key policy relevance. At a time of intense pressure on healthcare budgets the challenge for those making investment decisions and managing technology is disinvestment in low-value technologies and reinvestment in higher-value alternatives. There is an imbalance between the evaluation of new and existing technologies in widespread routine use, which we will address by increasing our focus on in-use technologies of unproven or changing value and by developing methods to more explicitly model reallocations of resources within clinical pathways. Future work will focus on improving the value of existing services and reducing unnecessary waste of healthcare resources. Examples include evaluations of:

- Alternative approaches to in-vitro fertilisation (IVF) – there is potential to improve live birth rates and reduce treatment complications, thus improving the value of IVF delivery.
- Conservative management compared with immediate laparoscopic cholecystectomy for uncomplicated symptomatic gallstones – scope exists to reduce costs whilst maintaining health outcomes.
- Alternative diagnostic tests and monitoring intervals for detection of neovascular age-related macular degeneration – the objective is to identify the most cost-effective monitoring strategy from the various options currently in use.
- Modelling costs and effects of HPV (human papilloma virus) 16/18 immunisation as part of a new national cervical screening programme, to offer evidence-based recommendations on which screening strategies are most cost-effective.
- Different dental recall intervals, to determine if targeting more frequent recalls at those with greatest risk can save the NHS money whilst maintaining health outcomes.

[14] Community Empowerment (Scotland) Act 2015 (asp 6).

3.5 Sustaining and enhancing impact

We will develop new methods to ensure the on-going relevance and take-up of HERU research. In partnership with our Policy Advisory Group, we are developing initiatives such as refocusing our Policy Brief series, introduced in the Review Period. We will further explore the use of more focussed meetings with Health and Social Care Analysis and other NHS stakeholders to improve understanding of both research and priorities. We will create a post dedicated to knowledge exchange with NHS practitioners and stakeholders. We will enhance our use of social media and involvement in the STEM[15] curriculum to improve our impact and public engagement.

In an advisory role we will continue to provide health economics expertise through membership of both existing and new key Scottish Government Health and Social Care Directorate and NHS Scotland policy committees and groups. We will continue to provide:

- Advice regarding resource allocation, currently through membership of TAGRA.
- Support to the Health and Social Care Analysis team in the Health and Social Care Directorate.
- Advice regarding reimbursement of new medicines through continued membership of the SMC, new technologies through continued membership of SHTG, and evaluation of health improvement through continued advisory work for SISCC.
- Input to HIS through our strategic alliance, offering advice, bespoke training courses, seminars and contributing to an annual conference.

3.6 Capacity building

We shall enhance our capacity building activities by:

- Extending the reach and contribution of our health economics distance-learning programme by building in both a diploma and an MSc component.
- Introducing a new online Continuing Professional Development course in health economics.
- Developing Action-Learning Sets in collaboration with HENS to provide hands-on health economic training to support the development of policy in relation to priority areas (prescribing and health & social care integration).
- Developing an advanced discrete choice experiment workshop.
- Setting up a Scottish Health Economics Study Group to support and promote the work of health economists in Scotland.
- Exploring new ways of funding and attracting PhD and post-doctoral students.

HERU is a world-leading research unit, making a critical and central contribution to Scottish health policy and delivery. Our research, advice and capacity building activities will inform and support Scottish health policy, ensuring a cost-effective, person-centred, and sustainable Scottish health service.

Professor Mandy Ryan
HERU Director
22nd September 2016

[15] STEM is a curriculum based on educating students in science, technology, engineering and mathematics in an interdisciplinary and applied manner. STEM Ambassadors get involved in a wide range of activities, from giving careers talks or helping at careers fairs to devising or delivering practical STEM experiments or demonstrations.

ANNEX 05

Summary of Stakeholder responses

Written by Tom Barlow, Senior Research Manager, CSO

The Chief Scientist Office (CSO) circulated the strategic statement produced by Health Economics Research Unit (HERU) to stakeholders who are users of HERU research and asked for responses to the questions below.

Responses were received during the course of October and November 2016 from key representatives from: Scottish regional NHS Boards and the special NHS Boards – NHS Education for Scotland, NHS Healthcare Improvement Scotland (which includes the Scottish Health Technologies Group and Scottish Medicines Consortium) and NHS Health Scotland; Scottish Government Health and Social Care Directorates; and academia. An unattributed summary of responses is set out below.

1. Is there significant strategic value to the Scottish Government and to NHS Scotland from CSO investing in health economics research and a centre of excellence in this discipline? What are the benefits of this investment?

   All respondents agreed there is strategic value to the Scottish Government and NHS from CSO investment in health economics research. Many highlighted the importance of the opportunities that a centre of excellence provides as a source of high quality health economics evidence, advice, and expertise, and to support capacity building, given the demand for, but limited availability of, health economics expertise in the wider system.

   The importance, in a constrained health and social care funding environment, of an established independent authoritative centre that can provide robust high quality health economics evidence to inform: the organisation and delivery of health services; quality improvement programmes; new and existing therapeutic and prevention/improvement interventions; analytical frameworks for the allocation of resources; and policies to improve population health was universally acknowledged.

   Respondents noted that a centre of excellence in Scotland provides opportunities to address questions directed towards increasingly distinct Scottish approaches to the provision of health and social care and public health policy. It allows the development of longer-term relationships between policy makers and practitioners and hence greater understanding of the contexts of, and needs for, evidence and advice that can facilitate more bespoke analyses. It also facilitates longer-term programmes of research, including on new methods, and in the development of expertise and leverage of research funding from sources outside Scotland, hence contributing to wider recognition of the quality of Scottish science.

   Respondents noted that without core funding, health economics expertise may necessarily be driven to a greater degree by the need to generate income from highly competitive teaching and grant awards. Given the grant awarding opportunities available from UK funders, this could lead to a narrowing of the range of research undertaken (e.g. towards trials and health technology assessment) to the detriment of other policy-focussed research programmes and to maintaining broader expertise, capability and capacity and thus to the provision of a wider range of expert advice and analyses for policy and practice.

2. What is the nature of your past interaction with HERU and what are your views on the relevance and value of the work of HERU?

All respondents had direct and valued interactions with HERU in one or more of a wide-range of contexts around:

- production of health economics evidence;
- development and use of health economics methods;
- expert advice and analysis to inform policy development;
- clinical guidance development;
- identification of evidence needs, and hence, research priorities;
- research collaborations;
- health economics input into research studies;
- health economic appraisal of interventions, including 'second opinion' advice on contentious technical aspects of appraisal;
- health economics training;
- knowledge exchange activities, including for continuous professional development.

Academia-based respondents considered the current themes to be highly relevant to present health and care challenges. Similarly all the non-academia-based respondents indicated that activities in one or more of HERU's four current research themes are of direct relevance and importance to their programmes of work and activities.

Research findings from each of the four current research themes were relevant and valued by more than one of these respondents and the high quality of the evidence and advice was noted. The Workforce and organisation of care, Health behaviour and inequality and Assessment of technologies themes were more heavily cited than the Methods of benefit valuation theme. A few respondents were less clear about the utility and/or application of the research within the Methods of benefit valuation theme for the development of policy and practice.

Many respondents noted positive and productive engagement with HERU. Some noted that for University-based units such as HERU there can be a tension between the demands of the academic host institution in terms of publication volume and production of original academically valued research and the demands for policy- or practice-relevant research and that it is not clear how HERU balances these potentially competing demands. Similarly, given the demands for health economics skills and expertise to support a wide range of research studies and the constraints of the resource available within HERU, it is not clear how HERU makes decisions and explains those decisions when approached by others about its involvement in research, analysis or other activities (e.g. those represented by the bullet points above). Some respondents wondered whether HERU, when it is constrained by available resources, has processes to signpost those that need health economics support to other sources of health economics research expertise.

3. What are your views on the relevance and importance of the future programme of research and other activities proposed by the Unit for the Scottish Government and/or NHS Scotland and what are the opportunities for future engagement with HERU?

All respondents were highly supportive of the themes of future research identified by HERU, noting the relevance of the themes to health and care challenges – the themes could be mapped onto health strategies and the direction of travel of the NHS in Scotland. Together the themes provide balance across different aspects of health economics research.

No respondent indicated that the research activities proposed within the themes are irrelevant or unimportant. However, some noted that the health and well-being theme is heavily weighted towards health rather than wellbeing and wondered whether this reflected the balance of policy priorities, and how the examples of work proposed in this theme might contribute to the policy aim of narrowing health inequalities. Similarly, it is unclear how the person-centred care theme may inform or contribute to health policy or practices.

While acknowledging the need to focus research activities and the inherent risk posed by widening the scope of activities to dilute efforts and restrict the depth of research that can be conducted, respondents nevertheless suggested additional areas where they considered health economics research to be important and which might be encompassed within one or more of the identified themes:

- the sustainability of new models of care and NHS workforce;
- better understanding of incentives and patient preferences and cost effectiveness modelling in relation to health and social care integration, for example to prevent unnecessary hospital admission, improve the quality of care, and promote greater financial stability of the care system;
- assessment of palliative and end-of-life care;
- addressing multi-morbidity and frailty within health economic assessments;
- assessment methods for care quality improvement;
- assessment of the wider determinants of population health and health inequalities, and interventions to influence these determinants;
- cost-benefit analyses and trade-offs that take account of, or compare, potential population differences relating to deprivation, rurality and protected characteristics.

Respondents considered there to be continued importance for early and closer engagement with evidence users in Scottish Government and the NHS on health economics input both in evidence generation and advisory capacities and to facilitate the generation of evidence products and advice that can be readily and directly translatable into decision and policy making.

One respondent noted that whilst there are differences between the NHS in Scotland and elsewhere in the UK, there are many common issues and therefore the potential for valuable collaborations between HERU and health economics groups outside Scotland. Opportunities for a greater degree of collaboration with analogous units elsewhere in the UK could be explored.

There was broad support for the sustaining and enhancing impact and capacity building activities, including the establishment of a Scottish Health Economics Study Group.

Received via email from:

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Chief Scientist Office
Scottish Government Health Directorates
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November 2016

ANNEX 06

Committee Membership

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ANNEX 06

Committee Membership

Ramses Abul Naga	Member of the Economic and Social Research Council (ESRC) Peer Review College. Previously member of the joint ESRC and Department for International Development Peer Review Panel
Bob Elliott	Member, Economics of Social and Health Care Research Unit (ESHCRU), Steering Group 2012 to present Member, Department of Health Subpanel for award of Policy Research Units, Round 1, 2009–2010; Round 2, 2012 Member, National Institute for Health Research (NIHR) Clinical Scientist Panel 2010 Member, ESRC/MRC/NIHR Panel for award of Early Career Postdoctoral Fellowship in Economics of Health, 2008–2010 and NIHR panel for Research Studentships, 2011 Member, Scottish Government/Royal Society of Edinburgh Personal Research Fellowships Committee, 2012 Member, International Assessment Board for the 2012 Irish Research Council for the Humanities and Social Sciences Government of Ireland Collaborative Research Projects Scheme and the 2013, 2015 and 2016 Postdoctoral Fellowships Convenor, Heads of Health Economics Units in UK, 2006–2012 Member, Technical Advisory Group on Resource Allocation (TAGRA), Health Finance Division, Scottish Government, 2008–2012 Member and Treasurer, Interim Executive Committee, European Health Economics Association (EuHEA), 2012–2014 Independent Commissioner, Low Pay Commission, 2007–2015 Adviser, Scottish Police Federation 2013–2014 Member, Sub-Panel 2, Research Excellence Framework 2014 Economic Adviser to Constables Central Committee of Police Federation of England and Wales, 1986–2016 Member, Board, Finance Committee, and Executive Committee, international Health Economics Association (iHEA) 2010–2014
Shelley Farrar	Member of NIHR Service Delivery and Organisation SDO Programmes 'Commissioning & Diverse Providers' commissioning group, 2007 to present
Sebastian Heidenreich	Council member of the Scottish Economic Society, 2015 to present
Mary Kilonzo	College of Experts for the NIHR Health Technology Assessment programme and Public Health Research programme

Anne Ludbrook	Member of Research Advisory Group for European study on Quantifying the Utility of Investment in Protection from Tobacco (EQUIPT), European Commission FP7 project, 2013 to present Member of Evaluation Group for the Links Worker In Deep End Practices project, NHS Health Scotland, 2013 to present Member of National Institute for Health and Clinical Excellence (NICE) Evidence Update Advisory Group on Alcohol Use Disorders: Preventing Harmful Drinking, 2013–14 Member of the NIHR Public Health Research Funding Board, 2011–15 Member of the Scientific Committee for World Congress of Epidemiology, 2011 Scientific Adviser for Monitoring and Evaluating Scotland's Alcohol Strategy (MESAS), NHS Health Scotland, 2010–2016 Member of the Research and Evaluation Sub-committee of the Ministerial Working Group on Tobacco Control, Scottish Government Health Directorates, 2009–2015 Member of Health Inequalities Tool Steering Group, Scottish Government Health Directorates, 2008–2011 Member of NICE Programme Guidance Development Group on Alcohol Use Disorders Prevention, 2008–2010 Member of NICE Programme Guidance Development Group on Personal and Social Health Education, 2008–2011
Paul McNamee	Scientific Committee, 3rd Joint Collège des Economistes de la Santé (CES) and Health Economists' Study Group (HESG) conference, Aix-en-Provence, France, 2011–12 Member, NIHR Applied Programme Grants Funding Panel, 2011 Member, Scottish Health Technologies Group, 2011 to present Member, Scottish Medicines Consortium (SMC), 2009–2015 Member, NIHR College of Experts, 2009 to present
Patricia Norwood	Member, TAGRA: Remote and Rural Subgroup, Scottish Government, 2012
Mandy Ryan	MRC Methodology Research Panel, 2011–2015 MRC Strategic Skills Fellowships Panel, 2012–2015 Scottish Government/Royal Society of Edinburgh Personal Fellowships and Research Support Fellowships Committee, 2008–2011

Graham Scotland	SMC, Appraisal Committee member, 2015 to present Expert reviewer for the NIHR Health Technology Assessment (NIHR HTA) Programme 2005 to date
Diane Skåtun	Member, TAGRA Committee, Health Finance Division, Scottish Government, 2012 to present Member, TAGRA Sub-group Committee Acute Care Programme, Scottish Government, 2013 to present Member, Steering Group, The Analysis, Intelligence and Modelling (AIM) for workforce programme, NHS Education for Scotland, 2011 to present
Marjon van der Pol	MRC Skills Development Panel, 2016 to present Member of the Programme Development Group for the NICE public guidance on Tobacco Harm, 2011–2013 Member of Collaborative Applied Research Grants committee, Health Research Board Ireland, 2012 Member of Sub-Panel, NIHR Programme Grants for Applied Research, 2009–2011 Member of the scientific committee of Joint UK Health Economists Study Group and French Health Economics Meeting, 2012
Verity Watson	Health Improvement, Protection and Services Research Committee, Chief Scientist Office of Scottish Government Health Directorate

ANNEX 07

Summary of HERU's Responses to the 2010 Review Recommendations

ANNEX 07

Summary of HERU's Responses to the 2010 Review Recommendations

Recommendation 1	The Unit should continue carefully to balance work that is shorter-term, more responsive and opportunistic with theoretically informed work with a strong focus on methods. Unit advisory groups should be used to help with strategic planning.
HERU Action	Shorter-term, more responsive and opportunistic requests are considered by the relevant theme lead. Criteria considered are: • Is the project within our areas of research interest/priority? • Potential for benefit within the NHS. • Potential to result in internationally excellent output. • Capacity to take on the project. Discussion takes place at the Research Strategy Group meeting, ensuring a common strategic direction and enabling us to monitor the balance between different types of projects. The refocussing of our Assessment of Technologies theme (see below) was undertaken to help prioritise requests around technology management in areas where we have expertise in specific clinical areas. We are thus more likely to take on shorter-term responsive work if it is in a clinical area where we already have a model we can adapt and build on. When a decision is made not to contribute the theme lead will discuss the project with the person who requested the work, offer advice and, where possible, refer on to other health economists who may be able to help. Methodological work continues to be a key focus for HERU, with new and exciting work commencing during the Review period. Examples include developments with our experimental economics (MBV2.1; MBV2.2) and time preference work (HBI1.4; HBI1.6; HBI1.14; HBI1.16; HBI1.21); new research around eye-tracking (HBI1.9; MBV4.3); developing measures of inequality (HBI1.13; HBI2.12) and development of cost–benefit analysis within economic evaluation (AOT4.2; AOT4.3; AOT4.1).
Recommendation 2	There is huge breadth to the Unit's work. This breadth has positive aspects and helps spread risk but could result in the Unit's work becoming too thinly spread, potentially damaging quality and depth. So far this balance between breadth and focus has been managed very well but the Unit should keep monitoring this, as well as utilising strategic collaborations to bring in a wide range of skills and knowledge. Once again, Unit advisory groups should be used to help with strategic planning.

HERU Action	We have continued to monitor the breadth of our research. The mechanisms we have used include: • Introduction of a Research Strategy Group which meets bi-monthly to discuss the strategic direction of our research and new research opportunities. The group consists of the Executive Management Group, theme leaders, the senior joint post with economics and the Information Officer. • Restructuring of our research into a smaller number of themes to ensure focus and to enhance the visibility of our key areas of strength (see Recommendation 3). • Refocussing of the Assessment of Technologies theme to better manage the balance between breadth and depth (see below). • Presenting an overview of our research at the annual meeting of the Unit Advisory Group. HERU have a number of on-going and new strategic collaborations that bring in a range of complementary skills and knowledge, thus increasing research capacity. Examples include skills and knowledge in: • *Health services research* – collaboration with the Health Services Research Unit (HSRU), including the Centre for Healthcare Randomised Trials (CHaRT), at the University of Aberdeen, to research the cost-effectiveness of new and in-use technologies. • *Nutrition* – a new collaboration with the Rowett Institute at the University of Aberdeen to research the economics of food choice. • *Epidemiology* – collaborating with the Epidemiology Group within the Institute of Applied Health Sciences (IAHS) at the University of Aberdeen to research self-management and ageing. • *Mainstream economics* – collaborating with the Economics Department at the University of Aberdeen, where we have two joint posts (Dr Ramses Abul Naga and Dr Yu Aoki) and joint PhD supervision. • *Behavioural economics* – a new collaboration with the Behavioural Science Centre at the University of Stirling to research the use of behavioural economics to understand lifestyle choices. • *Psychology* – collaborating with the Department of Psychology at Lincoln University to research the use of eye-tracking in stated preference and collaborating with the Health Psychology group at the University of Aberdeen to research physical activity interventions. • *Medical education* – a new collaboration with Medical Education, at the University of Aberdeen, to research push-pull factors in medical careers-decision making. In addition to the above, we have collaborations with a number of national and international economic, health economic and health services research centres (including centres at the universities of Sheffield, Manchester, Glasgow Caledonian, Newcastle, York, Oxford, Sydney, Calgary, British Columbia, Cape Town, Erasmus, Bergen, Technische Universität Berlin, Università Cattolica del Sacro Cuore, Warsaw, Economic Policy Research Foundation of Turkey) where we research a range of topics across our four themes.

Recommendation 3	The current programme structure should continue, although on some occasions the work of the programmes may be better presented to outside audiences without particular reference to the internal structures.
HERU Action	Following Professor Mandy Ryan taking up the post of Director in 2013 the unit structure was reviewed to ensure that our research continues to be organised in the most optimal way. A decision was made to remove the programme structure and organise our research into four interrelated themes (rather than six themes previously). This decision was based on: • Enhancing the visibility of our key areas of expertise to the outside world. • Ensuring focus in our research (see also recommendation 2). • Enhancing collaboration across themes. The themes are: • *Workforce and Organisation of Care (WOC)* • *Health Behaviour and Inequality (HBI)* • *Assessment of Technologies (AoT)* • *Methods of Benefit Valuation (MBV)* This new structure was agreed with our Unit Advisory Group.
Recommendation 4	The Review Team endorsed the proposed work plan of the Behaviour, Health and Health Systems programme (BHHS). It was interesting, relevant and of high quality. Some further attention to engaging with the NHS on broader notions of quality and its measurement was encouraged.
HERU Action	We have engaged on broader notions of quality and its measurement over the Review period as follows: • HERU contributed to the development of the quality indicators for the new healthcare quality strategy for NHS Scotland as part of a consultation. • HERU also contributed to quality improvement with a jointly organised (HERU/HSRU/HIS) symposium on quality improvement. • Dr Graham Scotland is an advisor to the Scottish Improvement Science Collaborating Centre (SISCC). • We conducted both national and international research on a commonly used quality indicator of primary care, namely hospital admissions for Ambulatory Care Sensitive Conditions (WOC2.14). • Research was conducted on other aspects of quality including access to services (WOC2.8; WOC2.10), patient preferences for care (MBV1.2; MBV1.3; MBV1.4; MBV1.5; MBV1.6; MBV1.7) and efficiency and productivity measurement (WOC2.5).

Recommendation 5	The Review Team was also impressed with work of the Preference Elicitation and Assessment of Technologies (PEAT) Programme. It supported the long-term plans for the programme, including collaboration with others on priority setting, and noted that, in line with Recommendation 1, work for outside agencies should be kept under review. The Team was particularly pleased that the valuation work is now moving into the real world and informing policy and decision makers and that it was being further enriched by the introduction of experimental economics.
HERU Action	Work for outside agencies has been reviewed on an on-going basis. A relatively large commitment is our Technology Assessment Reviews (TARs) contract with NICE which was due for renewal in 2016. Before applying for a further five years' funding consideration was given to the strategic value of this work. It was noted that our TARs work has direct impact on policy and contributes to internationally leading research papers. More specifically, the 2011–2016 contract resulted in seven papers submitted to the 2014 Research Excellence Framework (across HERU, HSRU and the IAHS groups). The contract also leads to stable funding to help build a critical mass of expertise in health technology assessment across the IAHS. Dr Graham Scotland took over as AoT theme leader in March 2012, under the mentorship of Professor Stirling Bryan. A strategic theme review was conducted which also addressed prioritisation of requests and projects. A decision was made to focus, where possible, on defined clinical areas, reflecting existing expertise and research partnerships.
Recommendation 6	The Review Team commended the University of Aberdeen's supportive stance towards the Unit. The University provides a good environment for the Unit's work and the University is urged to continue to invest in and, if necessary, protect the Unit in the future.
HERU Action	The University has continued to support HERU. At 31st October 2016 6.4 WTE staff within HERU were funded by the University (compared to 4.0 WTE in December 2009). Included in this funding is support for Dr Rodolfo Hernández (following completion of his Research Councils UK Fellowship) and two Scottish Institute for Research in Economics (SIRE) posts held jointly across HERU and the Economics Department (Dr Ramses Abul Naga and Dr Yu Aoki). When Professor Mandy Ryan took up the post of Director the University funded a Research Fellow (Dr Nicolas Krucien) to enable her to continue her high level of research. HERU is based within the School of Medicine, Medical Sciences and Nutrition (SMMSN). The School's recent strategic plan identifies health economics as a focus for future research and for further capacity building. During the Review period the University funded seven PhD studentships through various schemes (including IAHS studentships, Development Trust and the Rowett Institute). The University is developing an international partnership with Curtin University (Perth, Western Australia), with health economics as one of the priority areas. To help take this forward the SMMSN have funded an Aberdeen-Curtin PhD studentship, with the student commencing studies in January 2017.

Recommendation 7	The Review Team recommends that collaboration with others in the Division of Applied Health Sciences continue, particularly with the Health Services Research Unit, and also within the wider School of Medicine and Dentistry. Existing and evolving collaborations with the Aberdeen Business School, particularly via joint appointments and developments in experimental economics, should be encouraged. These new developments should deepen and accelerate. They should encourage economists' interest in health topics. Developing some teaching modules (as opposed to large teaching programmes) could provide a useful income stream and helpful experience for more junior academics.
HERU Action	See responses to Recommendation 2, both continuing and new strategic collaborations with colleagues within the Institute of Applied Health Sciences (IAHS), the wider School of Medicine, Medical Sciences and Nutrition and the Economics Department have been developed and enhanced. During the Review period we have significantly increased our teaching contributions. We (re)introduced a number of modules in our teaching at the University of Aberdeen, including health economics for medical students; we offered a health economics option on the Scottish Graduate Programme in Economics (SGPE); and introduced a course on the use of economics evidence in public health as part of the training offered by the newly established Health Economics Network for Scotland (HENS). We have increased the frequency of our discrete choice experiment workshop, and presented it internationally (by request). We also introduced specialist postgraduate training in health economics (see Recommendation 9). Expanding our teaching portfolio has enabled us to address our capacity building remit, provided opportunities for early-career researchers to gain teaching experience and generated income.
Recommendation 8	The Review Team recommend that over the next Review period the Unit more clearly establish its international profile, its international leadership and collaborations. This emphasis should be underpinned by success in obtaining international funding and should be enhanced by utilising wider support from the University.

HERU Action	Internationalisation is a valued concept underpinning HERU's vision to be recognised as a worldwide centre of excellence. Our internationalisation strategy recognises the interconnectedness of global and national issues, thus providing opportunities to develop productive academic collaborations, and capacity building activities. Examples of activities over the Review period include: • Leading a large EU-funded multi-country research study evaluating the impact of 'new professional roles' in healthcare (WOC2.16) • International collaborations: continuing and developing new collaborations (AOT2.27; AOT2.22; HBI2.18; HBI1.20) and employment of Professor Stirling Bryan from the University of British Columbia on a 10% post. • International capacity development, including: (i) Running expert workshops in areas of recognised expertise (our discrete choice experiment (DCE) course was attended by 29 non-UK students and was delivered twice in Canada to increase international reach). (ii) Supervising international PhD students (for example, Dr Gerald Manthalu who is now Deputy Director of Planning, Ministry of Health, Malawi). (iii) Training students across the world in health economics (during the Review period 54 non-UK students have completed our distance-learning course in health economics). (iv) Participating in a University international partnership with Curtin University (Perth, Western Australia) – an Aberdeen-Curtin PhD student will commence studies in January 2017. • International conferences: organising international conferences and sessions at international conferences (see Volume 2). This includes co-organising the 1st and 2nd Economics of the Health Workforce Conference in Sydney 2013 and Milan 2015. • International health economics associations: making an important contribution to health economics organisations. Professor Bob Elliott was a member of the founding Executive Committee of the recently established European Health Economics Association (EuHEA). • International visiting scholarships: obtaining competitive scholarships, including an International Visiting Scholar Award at the Peter Wall Institute for Advanced Studies, University of British Columbia, Vancouver and an Australian Bicentennial Fellowship in Canberra. • Invited presentations: presenting invited talks at international conferences and invited seminars at international universities (see Volume 2).
Recommendation 9	The Unit has made great efforts to build capacity in health economics, against a background of national and international problems in terms of supply. We commend its innovative work and recommend that it continues with current directions while continuing to explore the best avenues for furthering this important aspect of its remit.

HERU Action	Capacity building has continued to be one of HERU's key priorities. We created a Director of Teaching position to give more prominence to, and ensure strategic overview of, our capacity building activities. We have increased our activities as follows: • We have introduced specialist postgraduate training in health economics, the first and only centre in Scotland to provide such training. This is currently offered as an MSc Applied Economics (Health Pathway). • We have been key partners within the newly established Health Economics Network for Scotland (HENS), teaching an annual course on the use of economic evidence in public health attended by NHS and Scottish Government staff. We are also a key partner in developing action-learning sets which provide hands-on health economics training to support policy development in priority areas (prescribing and health and social care integration). • We increased the frequency of our DCE course. • We created two postdoctoral fellowships which allow recent PhD graduates to position themselves for competitive fellowships, such as the MRC Skills Development Fellowship. • We have increased the number of PhD students. • We have conducted an in-depth review of our Postgraduate Certificate in Health Economics by distance learning (for health professionals) and will extend this to Diploma and MSc level in 2017/18.

glossary

ACSC	Ambulatory Care Sensitive Condition
AoT	Assessment of Technologies (HERU)
ASD	Analytical Services Division (Scottish Government) (now HSCA)
ASH	Avoidable Scottish Hospitalisations
ASHE	Annual Survey of Hours and Earnings
BHHS	Behaviour, Health and Health Systems (HERU)
BMA	British Medical Association
BT	Benefit Transfer
BWS	Best Worst Scaling
CBA	Cost–Benefit Analysis
CBT	Cognitive Behavioural Therapy
CHaRT	Centre for Healthcare Randomised Trials (University of Aberdeen)
CIHR	Canadian Institutes for Health Research
CLSM	College of Life Sciences and Medicine (University of Aberdeen)
CMO	Chief Medical Officer (Scottish Government)
COPD	Chronic Obstructive Pulmonary Disease
CPD	Continuing Professional Development
CSO	Chief Scientist Office
CUA	Cost–Utility Analysis
CV	Contingent Valuation
DAHS	Division of Applied Health Sciences (University of Aberdeen)
DAR	Diagnostic Assessment Review
DaSH	Data Safe Haven (Grampian)
DCE	Discrete Choice Experiment
DoH	Department of Health
EC	European Commission
ECG	Electrocardiogram
EMG	Executive Management Group (HERU)
EQ-5D	Euro-Qol 5 Dimensions
ESHCRU	Economics of Social and Health Care Research Unit
ESRC	Economic and Social Research Council
EU	European Union
EuHEA	European Health Economics Association
FRSE	Fellow of the Royal Society of Edinburgh
FSA	Food Standards Agency
FTE	Full-Time Equivalent
GMC	General Medical Council
GMS	General Medical Services
GP	General Practice/Practitioner
GPS	Global Positioning System
HBI	Health Behaviour and Inequality (HERU)
HEHTA	Health Economics and Health Technology Assessment (University of Glasgow)
HENS	Health Economics Network for Scotland
HESG	Health Economists' Study Group
HIS	Healthcare Improvement Scotland
HPV	Human Papilloma Virus
HSCA	Health and Social Care Analysis (Scottish Government)
HSRU	Health Services Research Unit (University of Aberdeen)
HTA(i)	Health Technology Assessment (HTA international)
IAHS	Institute of Applied Health Sciences (University of Aberdeen)
ICEPOP	Investigating Choice Experiments for Preferences of Older People
iHEA	international Health Economics Association
ISD	Information Services Division (NHS National Services Scotland)
IVF	In-Vitro Fertilisation
LMIC	Low- and Middle-Income Countries
MBV	Methods of Benefit Valuation (HERU)
MESAS	Monitoring and Evaluating Scotland's Alcohol Strategy (NHS Health Scotland)
MFF	Market Forces Factor
MRC	Medical Research Council

MUNROS	iMpact on practice, oUtcomes and costs of New roles for health pROfeSsionals
MUP	Minimum Unit Pricing (of alcohol)
NES	NHS Education for Scotland
NES AIM	NHS Education for Scotland, Analysis, Intelligence and Modelling
NHMRC	National Health and Medical Research Council (Australia)
NHS	National Health Service
NICE	National Institute for Health and Care Excellence
NIHR	National Institute for Health Research
NIHR SDO	National Institute for Health Research Service Delivery and Organisation
NMAHP RU	Nursing Midwifery and Allied Health Professionals Research Unit
NPRI	National Prevention Research Initiative
NRS	NHS Research Scotland Conference
OCT	Optical Coherence Tomography
OECD	Organisation for Economic Co-operation and Development
OHT	Ocular Hypertension
PbR	Payment by Results
PEAT	Preference Elicitation and Assessment of Technologies (HERU)
PERU	Public Engagement with Research Unit (University of Aberdeen)
QALY	Quality-Adjusted Life Year
QOF	Quality and Outcomes Framework
QuEST	Quality and Efficiency Support Team (Scottish Government)
RCT	Randomised Controlled Trial
RCUK	Research Councils UK
REF	Research Excellence Framework
RESAS	Rural and Environment Science and Analytical Services Division (Scottish Government)
RNIB	Royal National Institute of Blind People
RSG	Research Strategy Group (HERU)
SAF	Scottish Allocation Formula
SAS	Specialty and Associate Specialist (doctor)
SCPHRP	Scottish Collaboration for Public Health Research and Policy
SDM	Shared Decision Making
SGHSCD	Scottish Government Health and Social Care Directorates
SGPE	Scottish Graduate Programme in Economics
SHTG	Scottish Health Technologies Group
SIRE	Scottish Institute for Research in Economics
SISCC	Scottish Improvement Science Collaborating Centre
SMC	Scottish Medicines Consortium
SMERC	Scottish Medical Education Research Consortium
sMFF	staff Market Forces Factor
SMMSN	School of Medicine, Medical Sciences and Nutrition (University of Aberdeen)
STA	Single Technology Appraisal
STEM	Science, Technology, Engineering and Mathematics
TAGRA	Technical Advisory Group on Resource Allocation
TAR	Technology Assessment Review
TLCC	Traffic Light Colour Coding
UCL	University College London
WOC	Workforce and Organisation of Care (HERU)
WTE	Whole-Time Equivalent
WTP	Willingness-to-Pay

HERU

HERU

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