

Institution: University of Aberdeen
Unit of Assessment: UoA 2 Public Health, Health Services and Primary Care
<p>1. Unit context and structure, research and impact strategy</p> <p>CONTEXT AND STRUCTURE</p> <p>This submission includes 32 (30.15 WTE) researchers from the University of Aberdeen's Institute of Applied Health Sciences (IAHS) within the <i>School of Medicine, Medical Sciences and Nutrition</i> (henceforth <i>the School</i>). The principal research groups are our two internationally renowned research units, the Health Economics Research Unit (HERU) and the Health Services Research Unit (HSRU), our Centre for Healthcare Randomised Trials (CHaRT) and our Medical Statistics Team. We are committed to international excellence, innovation and relevance. Significant achievements during this REF period include:</p> <ul style="list-style-type: none"> • Delivery of research that has had demonstrable influence on policy and practice, with nine impact case studies returned across four Units of Assessment. • CHaRT supporting 51 multicentre trials across 1712 study centres, with 36,343 participants from three continents. • Through our National Institute for Health Research (NIHR) Technology Assessment Reviews contract, publication of over 35 assessments, directly informing changes in clinical guidance for the management of millions of NHS patients. • Delivery of research informing the introduction of Minimum Unit Pricing for alcohol in Scotland (the first nation to do so). • Research informing the update of the staff Market Forces Factor, ensuring current labour market conditions inform hospital and primary care funding in England. • Development of a suite of online prediction tools for In-vitro fertilisation (IVF) success to inform clinical reasoning and help patients shape expectations around IVF treatment in the UK and USA. • Being at the forefront of methodological work to understand how individuals respond to preference elicitation tasks. • Publication of over 800 peer-reviewed publications, including in our top Journals (NEJM, Lancet, Journal of Health Economics and Health Economics). • Establishment of Trial Forge (an international initiative to promote efficiency in trials) by Treweek, which won the international Cochrane-REWARD Prize for reducing research waste. • Treweek being included in the 2019 world's most highly cited researchers list. • Campbell's work on the reporting of cluster trials rated by the Annual Review of Public Health as the most influential development to date in the field of group randomised studies. • Award by the Marie Curie Alumni Association for our public engagement activities. • Award of the Queen's Anniversary Prize for Higher and Further Education for sustained research excellence. The Queen's Anniversary Prize is the most prestigious form of national recognition open to a UK academic institution and has a focus on innovation and practical benefit to society. <p>Realising the strategic commitments outlined in our REF2014 submission, we have: applied our expertise in clinical trials and evidence synthesis to inform policy and practice; undertaken innovative methodological research in the areas of preference elicitation and the design and conduct of clinical trials; employed our expertise in labour economics to address new policy challenges in health workforce and resource allocation; extended the frontiers of research in the development and evaluation of behavioural interventions; and built capacity in mixed-methods research and statistical expertise.</p>

RESEARCH STRATEGY

Our research aims to improve population health and wellbeing by strengthening the health services research evidence base, developing innovative methods to address difficult evaluation problems, training the next generation of health service researchers and influencing health policy and practice. We work in close partnership with our colleagues in the School and wider University. We have extensive collaborations with other high-profile researchers and research groups throughout the UK and internationally including the NHS; community, voluntary sector and patient organisations; policy makers and guideline development groups; and industry.

Our research is structured around three interconnected themes. The principal activities of these themes over the current REF period are outlined below.

1. Evaluation of Healthcare Interventions

Our research and innovation in this area is a recognised strength from previous assessment submissions and continues to make a major contribution to healthcare practice and policy. We employ efficient, novel study designs, which are patient-focused and at the forefront of best practice. We focus on long-term global clinical problems in discrete clinical areas where we have developed world-class expertise (e.g., surgery, critical care, women's health, urology and dentistry). We maximise impact through the iteration of evidence synthesis (including modelling and mixed methods) informing new primary research (principally large-scale clinical trials with integrated process evaluations). An exemplar of this approach is our work on surgical interventions for women with stress urinary incontinence. We conducted the first Cochrane systematic review of these procedures during RAE 2008 before any sufficiently large trials had reported. In this REF period **MacLennan, Kilonzo** and **Boyers** completed the largest multicentre UK randomised controlled trial in this area. Subsequently **Brazzelli** and **MacLennan** undertook a complex evidence review that brought together 120 studies, including 21,598 women from over 25 countries. The review provided the National Institute for Health and Care Excellence (NICE) and Scottish Government with up-to-date evidence on the safety and efficacy of mesh procedures. This approach has been expanded into ophthalmology, critical care and general surgery throughout this REF period. For example, our syntheses of technologies for monitoring neovascular age-related macular degeneration (**Hernández, Ramsay**) led to our large-scale publicly funded early detection of neovascular age-related macular study (NIHR, **GBP2.2m**) and our industry funded study observing novel eye characteristics after treatment for macular degeneration (Novartis, **GBP2m**).

Our large-scale healthcare evaluations are primarily conducted by our UK Clinical Research Collaboration (UKCRC) registered clinical trials unit, **CHaRT**, led by **MacLennan**. CHaRT has conducted 51 trials since 2014, with 28 ongoing. We have the longest pedigree of undertaking surgical trials in the UK. Examples in this REF period include surgical management of: varicose veins (**CLASS, Cotton, Ramsay, Scotland, Campbell, MacLennan**); knee arthroplasty (**TOPKAT, MacLennan, Campbell**); haemorrhoids (**eTHos, Kilonzo**); vaginal prolapse (**PROSPECT, Kilonzo, Boyers, MacLennan**); uterine prolapse (**VUE, Boyers, Kilonzo**); and heavy menstrual bleeding (**HEALTH, Scott, Scotland, MacLennan, Hernández**). Ongoing surgical trials include: management of stress urinary incontinence (**SIMS**); endometriosis (**REGAL**); glaucoma (**TAGS**); kidney stones (**PURE**); cholecystitis (**C-GALL**); and bladder cancer (**PHOTO**). Our strategic approach has enabled us to focus on the long-term impact of interventions. For example, we are completing the longest prospective follow-up (20-years) of any NIHR trial in the UK with our knee arthroplasty trial. In addition, recognising the complexity of designing critical care trials of surgical interventions, **Campbell** and **MacLennan** designed the first Bayesian trial for the NIHR HTA programme (**REBOA**). **Ramsay** leads the largest portfolio of dental primary care pragmatic trials in the UK, specialising in evaluating interventions for routine care of patients in primary care settings. We completed the largest ever trials evaluating the use of scale and polish and dentist advice and patient recall intervals (**IQuaD** and

INTERVAL, **Ramsay, van der Pol, Boyers**). Three NIHR funded dental trials are in progress, investigating the effectiveness of various interventions for managing caries in primary care: prescribing high dose fluoride toothpaste (REFLECT) and investigating two novel tooth interventions - selective removal (SCRIPT) and pulpotomy (PIP).

Ramsay, Brazzelli, Scotland, Boyers, Aucott and **Scott** lead our significant portfolio of technology assessments, primarily for NICE, via our competitively awarded Technology Assessment Reviews contract (NIHR, **GBP3.2m**). During this REF period we have published over 35 assessments, resulting in changes in clinical guidance for the management of millions of NHS patients, including people with common conditions, such as high cholesterol and diabetes, as well as patients with high-risk cancers. We were recently awarded a new contract running until 2027. We collaborate with our clinical colleagues locally, nationally and internationally, to conduct large-scale researcher-led evidence synthesis projects, for example, studies on interventions for obesity and smoking cessation. Methodologically complex and novel, these projects involve mixed-method approaches (**Avenell, Skea, Boyers, MacLennan, Duncan**) and novel meta-analysis methods such as component and Bayesian meta-analyses (**Scott, MacLennan**).

2. Improving Research Practice

Sound policy advice requires robust methodological underpinnings. We undertake cutting-edge research aimed at improving research methodology, producing innovations in research and leading to change in research practice.

Eliciting the preferences of patients, health professionals and the public is central to policy on how health services should be provided and how they are valued. Discrete choice experiments (DCEs), a principal method for eliciting preferences, was introduced into health economics by **Ryan** 30 years ago. This current REF period has seen an exponential growth in the use of the method across health service research to address a broad range of policy questions. We continue to be at the forefront of developing methodology and applying DCEs in health and healthcare. **Ryan** and **Watson** employed eye-tracking technology and laboratory experiments to understand how individuals respond to preference elicitation tasks. They have explored the validity of different approaches to asking choice questions and analysing response data. Their methodological research continues to inform best practice. We apply DCEs to inform policy, for example: delivery of person-centred care (**Ryan, Entwistle**); understanding professional preferences (**Ryan, Skåtun**); development of behavioural interventions (**Avenell, Campbell, Farrar, Ludbrook, MacLennan, van der Pol**); and recruitment and retention of health professionals (**Locock, Watson, Skåtun, Ryan**). Our trials in dentistry and women's health incorporate DCEs to value benefits beyond health outcomes (where the commonly used Quality Adjusted Life Year (QALY) is insensitive). Our international reputation for leading development of the DCE methodology is reflected in attendance at our DCE workshops. Run annually, the workshops are always oversubscribed and have attracted over 200 people from a variety of backgrounds and across six continents during this REF period.

Evidence-based healthcare is undermined by poor design, conduct and reporting of research. We have a substantial portfolio of research addressing these issues in trial research. We lead global efforts to improve trial recruitment and retention (**Gillies, Treweek**), sample size calculations and surgical learning curves (**Ramsay**) and the use of placebo in surgery through development of the Applying Surgical Placebo In Randomised Evaluations guidelines (**Campbell, Gillies**). **Ramsay** developed the international ROBINS-I tool, used by Cochrane for assessing bias in non-randomised studies. Leading the international imperative to improve trial efficiency, **Treweek** set up Trial Forge to improve the evidence for how trials should be efficiently conducted, focusing on recruitment and retention. We are internationally recognised as leading

developments in the principal methodology for generating evidence on different ways to conduct trials – Studies Within A Trial (SWATs). The centrality of patient and public involvement (PPI) to research motivates a body of research into the theory and practice of PPI in research. **Locock** has researched both patient partner and researcher perspectives, drawing on sociological theory to examine issues of power and epistemic authority. Integrity of research is crucial for transparency. **Treweek's** work on the inclusion of ethnic minority groups in COVID-19 trials has been adopted as NIHR policy; and **Avenell** leads innovative international collaborative research into research misconduct which led to the retraction of multiple trials on vitamin D. Ongoing research includes: an MRC Partnership grant for a trial methodology network; providing evidence on how effort is invested in primary and secondary outcome data collection in trials (CSO Scottish Government funded); using behavioural science to understand and improve participation in clinical trials (Canadian Institutes of Health Research funded); and investigating if co-design methods can be translated from health to social care (NIHR Health Services and Delivery Research funded).

By adopting and/or evaluating our methodological innovations within our primary studies, we ensure our applied research is both robust and innovative. For example, introducing new methodological innovations like SWATs, new recruitment and retention approaches and broadening the valuation space in our clinical trials ensures we remain at the cutting edge of our field.

3. Designing Better Healthcare

This theme takes an interdisciplinary approach to assessing and improving care. The perspectives of patients and families, NHS staff and the public are considered.

Our research is at the frontier of the interface between labour economics and health economics. **Skåtun** leads research bringing the theoretical concepts and empirical techniques of labour economics to the analysis of health labour markets. Projects include investigation of the consequences of geographical wage variation and NHS wage setting for the recruitment and retention of nurses (**Elliott, Skåtun**), the implications of changing patterns of wage variation on the formulae that allocates funds to the NHS in England (**Skåtun, Elliott, Kopasker**), the impact of new and changing roles for health professionals on health outcomes and costs (**Elliott, Kopasker**) and the application of economic agency theory to inform the delivery of person-centred care (**Skåtun, van der Pol**). Building on our long-standing expertise in researching interventions to promote change in health professional behaviour, we have utilised interdisciplinary approaches with health psychology, medical statistics and health data science. This approach has produced innovative, large-scale, impactful studies applying audit and feedback approaches in primary care (**Duncan, Ramsay, Treweek**) to change dentists' and general practitioners' prescribing and test requesting practices. **Duncan**, in collaboration with The Healthcare Improvement Studies (THIS) Institute, is researching the use of such approaches to improve antibiotic stewardship. We have applied our expertise to design and evaluate behaviour interventions to promote behavioural change in patients and the public (**Avenell, Campbell, D'Ambruso, Farrar, Lee, Ludbrook, MacLennan, Treweek, van der Pol**). Ongoing work includes assessing the effectiveness and cost-effectiveness of text message and endowment incentives for weight management in men with obesity (NIHR Game of Stones trial) and the impact of a lifestyle intervention for women attending NHS breast screening clinics (Scottish Government funded ActWELL trial).

As healthcare strives to be more people-centred, **Locock** and **Entwistle** lead research to improve experiences of care. **Locock** leads a portfolio of qualitative research into understanding and improving patient experiences of illness and care services. Given the growing evidence that patient and staff experiences are closely associated, this work includes a focus on staff

perspectives, including staff use of patient experience data (**Locock, Skea**). In collaboration with THIS, **Campbell** and **Locock** are exploring patient feedback on Care Opinion for quality improvement. **Entwistle** integrates qualitative research with philosophical reasoning to understand the practical and ethical challenges of improving healthcare, focusing on relationships between healthcare professionals, patients and family members.

The patient journey through the healthcare system generates large-scale routine data. During the REF period, investment by the University of Aberdeen (in partnership with the NHS) in the new **Aberdeen Centre for Health Data Science** has enabled a step-change in the quality and volume of our studies utilising routine data. We use innovative modelling methods to interrogate routine data to improve service delivery, for example, the geographic configuration of trauma centres (**Campbell**) and screening intervals in the Scottish National Diabetic Screening Programme (**Scotland**). **Fielding** and **Lee** have analysed millions of person-years data from the renowned Royal College of General Practitioners Oral Contraception registry and nationwide Danish data to explore paradoxes of cancer risk with female contraception. **McLernon** leads international research developing clinical prediction tools to inform treatment decisions and manage expectations for infertile couples. We also use large observational data alongside trials to inform the delivery of healthcare. Exemplars include: our trial of multi-professional training for maternity staff (THISTLE), where outcomes were routinely collected data from Scottish Morbidity Records; our long-term follow-up trial (STOPPIT) investigating the use of progesterone in the prevention of pre-term birth in twins; and our portfolio of dental trials, which use routine dental treatment data from across the UK.

ACHIEVING IMPACT

The delivery of world leading research with direct and measurable impacts is central to our research culture. We have strong and well-established relationships with healthcare users, healthcare professionals and policy makers in national and international settings whom we involve, where appropriate, at all stages of our research. On grant applications and project steering groups we actively include the public, service users and health professionals as co-investigators.

Our submitted impact case studies (ICSs) exemplify the success of our impact strategy. For example, the ICS for **Ludbrook** reflects research over a period of 12 years that has influenced the development and implementation of minimum unit pricing (MUP) for alcohol in Scotland. We were involved in the initial conception, the passage of legislation through the Scottish Parliament and the defence against legal challenges. The submitted ICS associated with the work of **Ramsay** illustrates the strategic value of aligning methodological strengths in evaluating surgical innovations with clinical academic areas of strength, in this case urology. Co-location with the Academic Urology Unit enabled us to maximise potential research impact through direct links with national and international opinion leaders and clinical and patient networks. This was further enabled through direct working links with NICE, the European Urology Association guidance development panels and the Scottish Health Technology Assessment Group.

The success of our impact strategy is demonstrated by the way our research has influenced policy, practice and guidelines during the REF period, including contributing to nine ICSs across four Units of Assessment (UoA). Examples include:

- Informing 26 NICE clinical guidelines, two Scottish Intercollegiate Guidelines Network guidelines and 16 international guidelines (e.g., European Association of Urology Guidelines, International Incontinence Society Guidelines, Canadian Urology Association Guidelines, Cancer Care Ontario Guidelines).

- Our rapid review of reopening dental services after COVID-19 lockdown has informed UK guidelines, WHO has shared it with their Chief Dental Officers in 280 Countries across the world and it has been downloaded 50,000 times (**Ramsay**).
- Providing the evidence base for funding a weight loss programme for obese men delivered by professional football clubs in Scotland, England, Germany, the Netherlands and Portugal (**Treweek**).
- Providing key evidence to underpin weight management guidance and practice for adults with obesity, in the UK and internationally (**Aucott, Avenell, Boyers, Campbell, MacLennan, Skea**). *ICS for UoA-1, Clinical Medicine*.
- Research on point-of-care coagulometers to support warfarin patients self-monitoring their coagulation status led NICE to recommend the technology for patients with atrial fibrillation and heart valve disease on long-term vitamin K antagonist therapy (**Scotland, Brazelli**). *ICS for UoA-17, Business and Management Studies*.
- Our clinical trial of different medical treatments for ureteric colic from kidney stones prompted national and international guideline agencies to change their clinical guidance on the management of ureteric colic (**Thomas**).
- Enabling the Department of Health and Social Care and NHS Improvement to update the staff Market Forces Factor, ensuring current labour market conditions inform resource allocation to hospitals and primary care organisations in England (**Skåtun, Elliott**).
- Providing expert evidence to support representations to the NHS Pay Review Body exploring the effects of pay restraint on NHS Scotland staff groups within the Agenda for Change pay system (**Skåtun**).
- The Senegalese Health Ministry introduction of a new rural assignment policy to ensure retention of health workers (**Ryan**).
- Our work on configurations of trauma systems informed Scotland's National Planning Forum's consideration on whether and how to introduce major trauma centres and was used by the US Colorado Health Department to review their provision (**Campbell**).
- Developing a decision support tool recommended by NICE in their COVID-19 rapid guideline on adult critical care (**Ryan**).
- Our research on person-centred approaches to healthcare, reflected in the development of NHS Scotland training and service development programmes being delivered across the UK by the Year of Care partnerships (**Entwistle**). *ICS for UoA-30, Philosophy*.
- Informing development of support services and educational materials for young people with Huntingdon's disease, in Scotland and internationally, as well as influencing the practice and training of healthcare professionals (**McKee**). *ICS for UoA-1, Clinical Medicine*.
- Leading the Scottish Government to provide new funding to develop the Scottish Service Model for Chronic Pain (**McNamee**). *ICS for UoA-1, Clinical Medicine*.
- Our research on the introduction of free eye tests informing the Royal National Institute of Blind People Scotland response to the Scottish Government's strategic framework for meeting the needs of people with a sensory impairment (**Watson**). *ICS for UoA-17, Business and Management Studies*.

SUPPORTING INTERDISCIPLINARY RESEARCH

Interdisciplinary working is at the heart of our research. Our recruitment policy supports building interdisciplinary capacity (see **Section 2**). The structures we have created to support and promote interdisciplinary research have enabled us to generate novel and innovative ways of designing and conducting our research. We have brought together researchers with expertise in clinical trials, statistics, evidence synthesis, qualitative methods, mixed-methods, sociology, psychology, philosophy, health economics and data science. Co-location of staff from different disciplines and our cross-disciplinary seminar series, workshops and training events ensures integration of research activities across disciplines. We collaborate closely with other colleagues

within the IAHS, the Institute of Medical Science (IMS) and the Rowett Institute (submitted to UoA-1, **Clinical Medicine**). Examples include: women's health (*Abdel Fatteh, Bhattacharya*); musculoskeletal conditions (*MacFarlane, Jones, Hollick, Martin*); primary care (*Murchie*); urology (*N'Dow, MacLennan*); kidney disease (*Black*); and health psychology (*Allan*). We also encourage collaboration across Schools. Examples include: healthcare design (*Zangelidis* returned in UoA-17, **Business and Management**); mental health and job insecurity (*Montagna* and *Bender* returned in UoA-17); strengthening the livelihoods and resilience of farmers in Ethiopia (*Phimister* returned to UoA-17); using eye-tracking to understand responses to preference elicitation tasks (*Hermens*, returned to UoA-4, **Psychology, Psychiatry and Neuroscience**); and funeral practices in the time of COVID-19 (*Crozier*, returned to UoA-15, **Archaeology**; *Arnason*, returned to UoA-22, **Anthropology and Development Studies**; *Thornton*, returned to UoA-30, **Philosophy**). We also have extensive international interdisciplinary collaborations working with world leading researchers (see **Section 4**).

FUTURE STRATEGY

Health services research is a priority area for sustained investment and development within the University and has been identified as an area where we can make a significant impact on the world around us. Our future research strategy closely aligns with the University of Aberdeen's 20-year strategic vision, *Aberdeen 2040*. It commits to addressing the challenges of our time by offering interdisciplinary and innovative solutions. We will extend and further strengthen our international and interdisciplinary collaborations and our strategic partnerships and working relationships to maximise relevance, innovation and impact. A post-COVID-19 world will present substantial challenges to the NHS. Our research themes have clear objectives for the next five years that will inform these challenges.

Our **Evaluation of Healthcare Technologies** theme will:

- Lead world-class evaluations of healthcare interventions where evaluations are known to be complex and where our expertise in innovative design will excel. Planned research includes deepening our surgical evaluation portfolio. For example, in 2021 we will become the British Association of Urological Surgeons' UK dedicated trials unit (following open competition), and we now provide the methodological oversight for the newly set up Royal College of Surgeons England Robotic and Digital Surgery (RADAR) Initiative, advising on evaluation design for new surgical developments including robotics, artificial intelligence (AI) and other digital innovations. This includes the design and delivery of the planned pan-NHS evaluation of robot-assisted surgery, which must accommodate service-level, surgeon-level and patient-level complexities. We will also increase our dedicated portfolio in women's health, an area of global importance and a key strategic priority for the University.
- Develop our growing portfolio of research into the use and evaluation of digital technology to enhance healthcare provision. Planned work includes assessment of home health monitoring technologies and the evaluation of secondary care digital consultation approaches.
- Expand methodological approaches to complex evidence syntheses. Planned work includes new individual patient data meta-analyses, mixed-methods approaches to evidence syntheses and delivering specialised health technology assessments, which directly impact on national health policy.

Our **Improving Research Practice** theme will:

- Expand our innovative developments at the forefront of preference elicitation in health economics. Planned work includes extending novel eye-tracking research to understand how individuals process cost and risk information within a DCE (crucial for the application of DCEs within an economic evaluation), developing analytical methods to estimate

preferences at the individual level, informing shared-decision-making and person-centred care and exploring scope to synthesise and transfer DCE values from one context to another.

- Develop our world-leading work for improving efficiency in trials. Planned work includes improving representation within trials, especially of ethnic minority groups (where we are leading national initiatives together with NIHR) and improving how trial teams communicate and engage with potential and actual trial participants. This work brings together strengths in guideline development, clinical trials and ethics to explore supporting people making decisions about participation in clinical trials.
- Lead novel developments in study design for complex intervention assessment. Planned research includes ethical design of studies, N-of-1 studies, registry-based trials, interrupted time series designs and surgical learning curves in medical device evaluation.
- Strengthen and expand our PPI research by improving and developing methodologies to enable patients and the public to enhance their contribution and to frame our research agenda. Planned research includes developing methods of involving the public in numerical aspects of studies, the role of citizen science approaches in applied health, improving diversity, and leading the development of new ways for the public to be involved in core outcome set development.

Our **Designing Better Healthcare** theme will:

- Apply labour economic theories and thinking to inform health policy. Planned research includes: the impact of mental health and wellbeing on retention of healthcare professionals; how personal and environmental factors influence the choice of specialty and the training location at key gateways within the medical training pathway; the impact of the new general practitioner (GP) contract on behaviour; GPs' risk and time preferences and clinical decision-making; skill-mix and the impact on job satisfaction; and recruitment and retention behaviour of healthcare professionals.
- Deepen understanding of what matters for improving experiences of care. Planned research includes: interdisciplinary approaches to understanding personal experiences of health, illness and care; supporting self-care and person-professional relationships; improving care pathways to reflect a person-centred approach, including the role and experience of new digital approaches; the provision of care in rural communities; and new approaches to encourage the use of safer, more (cost-)effective interventions.
- Extend our portfolio of research using routine NHS data to inform the delivery of person-centred healthcare. We will focus on radically changing the way in which evidence-based and personalised medicine is pursued, exploring N-of-1 approaches, optimising prediction models for infertile couples and exploring and evaluating novel applications of AI.
- Extend the internationalisation of our work to different contexts including low- and middle-income countries (LMIC) and increase our focus on addressing key UN Sustainable Development Goals; particularly 2 (Zero Hunger) and 3 (Good Health and Wellbeing). A recent example is **Watson's** Global Challenges Research Fund (GCRF) funded (GBP0.99m) research on strengthening the livelihoods and resilience of farmers in Ethiopia. We will extend our work using participatory theory and methods, including verbal autopsy, with our partners in South Africa (**D'Ambruso**, MRC GBP0.7m). We will also use our recent Memorandum of Understanding with São Paulo University, Brazil, to generate new technological solutions for multimorbidity in LMICs.

Our future research ambitions will be underpinned by an increasing focus on widening collaborations with industry partners to ensure maximum relevance of our work. A springboard for this is our partnership with the Industrial Centre for Artificial Intelligence Research in Digital Diagnostics (**iCAIRD, GBP15m**), bringing together a national collaboration of 15 partners from across academia, the NHS and industry (including Canon Medical Research (radiology) and Royal Philips (digital pathology)) to explore the potential for AI in the delivery of healthcare.

We will also respond to shorter-term health service, policy and funder needs. Our ability to react quickly is demonstrated by our COVID-19 research. Current projects include: the role of asynchronous consultations in reshaping secondary care post COVID-19 (**Ramsay, Locock**); exploring remote working practices for PPI in research (**Watson**); public preferences for government responses to the pandemic (**Ryan, Watson**) and vaccine uptake (**Watson**); narrative accounts of primary care practitioners (**Locock**); ensuring COVID-19 trials consider ethnicity (**Treweek**); funeral practices in the time of COVID-19 (**Entwistle, Locock**); time and risk preferences and lockdown compliance (**van der Pol**); using N-of-1 studies to understand the clinical trajectory of COVID-19 patients admitted to ICU (**Vieira**); and the impact of long COVID-19 on the health and wellbeing of NHS staff (**Skåtun**) and the wider population (**Locock**).

SUPPORTING AN OPEN AND ETHICAL RESEARCH ENVIRONMENT

The University has an overarching research governance structure ensuring our research meets the highest ethical standards and we are committed to open access of our research outputs (see **Section 3** and **REF5a**). Our commitment to openness goes beyond the requirements. We vigorously promote a climate of generosity and collegiality. Work-in-progress is regularly discussed and presented in a spirit of constructive criticism. We are proud of our open research culture, which also promotes engagement with stakeholders and discussion of impact. We are active participants in *Ask for Evidence*, a public campaign that holds individuals, companies, organisations and public bodies to account. **Avenell** leads innovative international research into research misconduct.

2. People

STAFFING STRATEGY AND STAFF DEVELOPMENT

Our staff and students are our most important asset, and our personalised development strategy is designed to realise their full potential. We have a proud history of developing and nurturing our staff to become future leaders in health services research. Many of the staff exemplify the success of our staffing strategy. For example, with a background in biochemistry, **Gillies** joined HSRU as a trials manager and subsequently pursued a career in applied health research, initially through a competitively awarded CSO postdoctoral fellowship. During this REF period she was awarded an MRC Methodology Research Fellowship, was promoted to Senior Research Fellow and became Director of the Healthcare Assessment Programme within HSRU. She is now an internationally renowned leader of trials methodology research, a lead of the MRC's Trials Methodology Programme and has a substantial portfolio of chief investigator led studies. With a background in pharmacology, **Scotland** completed our MSc in Health Services and Public Health Research and joined HERU as a Research Fellow, where he completed his PhD in Health Economics. This REF period, he was promoted to Senior Research Fellow and then to Reader. He is an internationally recognised health economist working in HTA. **McLernon** joined our Medical Statistics Team as a Research Fellow and was awarded our inaugural Backett Weir Russell Career Development Fellowship. During this REF period he completed a CSO Postdoctoral Fellowship and was promoted to Senior Research Fellow. He is recognised internationally for his research on infertility prediction modelling. **Aucott** and **D'Ambruso** were promoted to Senior Lecturer, **Brazzelli** to Reader, and **MacLennan**, first to Reader then to Professor. **Lee, Ramsay** and **MacLennan** were appointed Directors of IAHS, HSRU, and CHaRT respectively. **Campbell** was appointed Dean for Research and Knowledge Exchange and then to Vice-Principal/Pro-Vice Chancellor (Research). Many of our previous researchers are in leadership positions around the world. Examples from this REF period include: Dr Jan Jansen, Director, University of Alabama Centre for Injury Science; Professor Jonathan Cook, lead statistician with the Oxford Clinical Trials Research Unit; Dr Gordon Prescott, Reader and Deputy Director of the Lancashire Clinical Trials Unit; and Professor John Norrie, Director of Edinburgh Clinical Trials Unit.

We have invested in new posts to support our future research strategy. Strategic appointments during the REF period include: **Entwistle** (joint with Philosophy) and **Locock** to enhance leadership and expertise in our research on improving experiences of care; the appointment of **Nath** to provide statistical expertise in mixed modelling of high-volume and high-dimensional datasets; and **Vieira** underpinning a personalised medicine approach via use of N-of-1 studies and complex meta-analysis.

Our staffing strategy promotes interdisciplinary research through joint appointments. For example, between: HERU and HSRU (**Scotland**); HSRU and the Department of Philosophy (**Entwistle**); HERU and the Business School (*Aoki* and *Abul Naga*, returned to UoA-17, **Business and Management Studies**); and HSRU and the Business School (*McKee*). *Douglas* and *Cornulier*, both members of our Medical Statistics Team, are returned to UoA-7 (**Earth Systems and Environmental Sciences**).

The University supports and actively implements the Concordat for the Development of Researchers, supporting and developing staff at all stages of their career (see **REF5a**) and enabling researchers to be the best they can. All staff have an academic line manager, an annual development review and are offered a mentor. An Institute Staff Development Fund supports all staff to attend workshops, courses, conferences and public engagement events. The University offers staff training and development courses in a range of areas (e.g., supervisor, IT, equality and diversity, ethics, data handling, public engagement (see **REF5a**)). The University has a range of policies to support staff wellbeing (see **REF5a**) and is a recipient of the “HR Excellence in Research” award from the European Commission.

Staff work in teams led by senior researchers, ensuring senior researchers have leadership opportunities, facilitating succession planning and guaranteeing early career researchers (ECRs) are mentored and receive appropriate on-the-job training. ECRs are given the opportunity to work across different areas and are encouraged and supported to undergo research specific and career development training, apply for fellowships, attend conferences, publish and to undertake a PhD. ECRs who have a PhD are encouraged to be part of a PhD supervisory team. We have a successful strategy of developing and supporting our staff to full independence through external prestigious fellowships. Examples this REF period include CSO Postdoctoral Fellowship (**Gillies, McLernon**), MRC Methodology Research Fellowship (**Gillies, Cook**) and Health Foundation Fellowship (**Duncan**).

We provide multiple forums to share research ideas. Examples include:

- Our IAHS Seminar Series where we showcase research ideas, ensuring integration of research activities across disciplines.
- Our University-wide “Grants Academy” seminars provide support for grant development and writing, supplemented by “Sandpit” and “Conversations on” events, highlighting opportunities for interdisciplinary research across Schools. For example, in response to COVID-19 the University set up *Conversations* across Schools to address questions emerging from the pandemic. **Entwistle** led a conversation on grieving and dying, resulting in a collaborative project with **Locock** but also Archaeology (*Crozier*, returned in UoA-15), Anthropology and Development Studies (*Arnason*, returned in UoA-22) and Philosophy (*Thornton*, UoA-30), together with an external funeral director, to investigate funeral practices in the time of COVID-19.
- Our research groups’ focused seminar series (e.g. HERU’s monthly Stated Preference Seminar Series, research meetings and econometric workshops; HSRU’s monthly research meetings, Lunch ‘n Learn sessions and methodology workshops; Medical Statistics contributions to the Foresterhill Statistics Group seminars and the Royal Statistical Society Medical Section and Highlands Local Group seminars) all provide opportunities for sharing knowledge and experience in a friendly environment.

Achieving Research Impact

We enable our researchers to achieve research impact by:

- Providing financial support to travel to engage in discussion and develop collaborations with healthcare users, healthcare professionals and policy makers working in national and international settings.
- Informal engagement with policy makers and healthcare professionals to understand their concerns and priorities and to inform our research plans.
- Encouraging researchers to undertake strategic positions on policy committees and grant funding bodies (see Section 4).
- Supporting the career development of clinical researchers, ensuring the clinical relevance of our research. We participate in the *Academic Foundation Programme in North of Scotland*, the *Early Career Academic Programme (ECAP) Scheme*, *NHS Research Scotland (NRS) Fellowship Schemes* and the *Scottish Clinical Research Excellence Development Scheme (SCREDS)*. We support clinical academics to be Chief Investigators on large trials. An exemplar is Jan Jansen, a trauma surgeon and intensivist who joined HSRU as an NRS Fellow and completed a high-profile study of the reconfiguration of trauma services in Scotland as part of his PhD. He was mentored to become a chief investigator of a major NIHR trial (REBOA) and is now Director of Research of the Division of Surgery at the University of Alabama with a multi-million-dollar research portfolio.

RESEARCH STUDENTS

Our research students are central to the creativity and vitality of our research community and play a central role in the methodological advancement and innovation of our research. Through our PhD programme we build capacity for the health services research community. Over this REF period 48 PhDs were awarded.

Our PhD students are fully integrated into our vibrant research community. Students are embedded within each of our research groups, sharing offices with ECRs within their relevant groups. Each student has a minimum of two supervisors and an advisor (for independent advice and pastoral support). We provide financial support to cover bespoke training, research costs and conference attendance. Students are encouraged to participate in our seminar series, attend Unit retreats and are supported if they wish to undertake a small amount of paid tutorial teaching during the latter part of their first and second study years. All PhD students undertake a skills audit to identify training needs and attend generic courses in their initial three-months (research ethics and governance, research integrity, avoidance of plagiarism, equality and diversity, information security awareness and research data management). We offer subsequent courses on a wide variety of topics including data handling and statistics, scientific writing, presentational skills, entrepreneurship and knowledge exchange. We have six-monthly reviews of progress, providing an opportunity for students and supervisors to provide feedback and discuss ideas and issues. The nine-month review comprises a written report, oral presentation and viva. In the second year a manuscript is written and a poster is presented. In the first and third years a presentation at the School's Postgraduate Research Symposium (organised and led by PhD students) is required.

STAFF AND STUDENT SUPPORT DURING COVID-19

The mechanisms we have to support staff whilst working from home during COVID-19 have proved invaluable. Our regular seminar series have continued (via MS Teams). Senior staff have been tasked with maintaining regular contact with their ECR and mid-career researchers, line managers have weekly contact with their staff, and for PhD supervisors with their students. We transitioned from three-monthly IAHS Open meetings to fortnightly, ensuring staff are informed

of rapidly changing developments and allowing feedback and discussion. Staff wellbeing has been a priority, with clear messaging around support for flexible working, work/life balance, workload expectations and ensuring workstation needs are met.

EQUALITY AND DIVERSITY

The University is committed to staff and student equality and diversity. We have policies and initiatives that support: ethnic minority groups; women; Lesbian Gay Bisexual Transgender and Questioning (or Queer, LGBTQ); people with a disability; part-time workers and returners to work (see **REF5a**). Our commitment to opportunity, equality, diversity and inclusion is further supported within our UoA-2 groups. The IAHS gained its Bronze Athena SWAN award in 2017 and is working to advance to Silver. Regular IAHS external seminars and line manager workshops are organised on equality and diversity issues; recent topics covered imposter syndrome and unconscious bias. Our “live” Athena SWAN action plan informs our “people strategy” and determines the direction and format of any intervention. For example, following the latest biannual staff survey, we ran a focus group on perceived negativity of part-time working and established a short-term working group on barriers/ facilitators for female clinical academics.

The professional development of female academics, and those identifying as female, is supported by the IAHS annual funding of places on the *Aurora Higher Education Leadership Development Course*. Twelve researchers have benefitted during this REF period. UoA-2 staff have also benefitted from the School’s “*Family Award for Scientific Conferences*” scheme which provides childcare and other caring responsibility support for staff wishing to attend conferences. Our Wellcome Trust Institutional Strategic Support Fund (ISSF) grant (GBP2.1m. 2014-2021) dedicates resources to support the career development of staff returning to academia from parental leave. **Gillies** was awarded a Women Returner award following a period of maternity leave. Women have a strong leadership and mentoring role in our UoA-2 submission, for example, our Medical Statistics Team and HERU are led by women (**Lee** and **Ryan**) and our Vice Principal/Pro-Vice Chancellor (Research) is female (**Campbell**). This return includes eight female professors (from a total 12 professors) and 20 females (from the 32 individuals returned).

The University has signed up to the Race Equality Charter (see **REF5a**). We pride ourselves on the multi-national and ethnically diverse staff and students across our research groups.

In preparing this submission, the unit complied fully with the requirements of the institutional **Code of Practice** and with the commitments we have made as a signatory of the San Francisco Declaration on Research Assessment (DORA). Outputs were reviewed by at least two internal and/or external reviewers and selected strictly based on quality. Choices between papers of equal grade were informed by the detailed reviewers’ comments and by further independent ratings. Where appropriate, specialist external review was sought. Where choices between outputs of equal quality had to be made, we took care to appropriately represent protected characteristics.

3. Income, infrastructure and facilities

INCOME

Over the REF period we secured GBP44.6 million in grant income to support our research agenda. Since 2014 our grant income has diversified, illustrated by current support from UKRI, NIHR, research charities (e.g., Cancer Research UK, Wellcome Trust, Health Foundation), government (e.g., DHSC, CSO, Innovate UK), the European Commission and industry (e.g., AstraZeneca UK). Awards include our competitively awarded HTA programme grant (secured to 2027) and two CSO programme grants secured to 2024.

INFRASTRUCTURE AND FACILITIES

Location and Buildings: We are located on the Foresterhill Health Campus (FHC), one of the largest clinical complexes in Europe, developed to provide high quality health services, research and teaching. FHC, jointly owned by NHS Grampian and the University of Aberdeen, is home to NHS Grampian clinical facilities. Our researchers are located in the linked University Medical School and purpose-built Health Sciences Building (HSB, completed 2006, GBP8.6m). The HSB also houses our Clinical Research Facility, providing a high-quality environment for participants to take part in research. We are co-located with our clinical colleagues in the IAHS, returned to UoA-1. Adjacent to these buildings are the Institute of Medical Science (IMS) and Rowett Building. The IMS brings together laboratory and clinical research. The Rowett Building is a state-of-the-art facility (opened 2017, GBP40m), housing international expertise in nutritional research. FHC is home to the Suttie Centre for Teaching and Learning in Healthcare (opened 2010, GBP22.5m). The Centre is an award-winning building, which received a prestigious “Building Research Establishment Environmental Assessment Method” award for its environmental considerations. It offers our researchers excellent teaching facilities, fully equipped simulation suites, well-equipped meeting rooms and social areas.

The co-proximity of our health service researchers to our clinicians and scientists provides unique opportunities for interdisciplinary research from bench to bedside.

Research Infrastructure: The excellence of our research is enriched by the distinctive features of our research infrastructure:

- **Centre for Healthcare Randomised Trials (CHaRT):** co-ordinates national and international trials and provides state-of-the-art facilities for designing and running trials. CHaRT is an active participant within the UKCRC Clinical Trials Unit Network, with membership and contributions to the Directors, Trial Management, Programming, Information Systems Quality Assurance, Statistics, and Patient and Public Involvement and Engagement working groups.
- **Aberdeen Centre for Healthcare Data Science (ACDHS):** is a partnership involving the University of Aberdeen, NHS Grampian and NHS Research and Development North Node. The Centre provides a safe environment to facilitate access to NHS linked data for health research. ACDHS runs the Scottish Government/ISO27001 accredited Grampian Data Safe Haven (DaSH), providing a platform for the use of NHS electronic data. DaSH is one of only four in Scotland and part of the Scottish Federated Safe Haven Network, and since 2015, a *Charter for Safe Havens in Scotland* signatory. ACDHS is also one of only five UK centres chosen to form part of the new Health Foundation funded Networked Data Lab - a network of advanced analytical teams established to provide leadership and expertise in the delivery of health and social care analytics for policy makers.
- **Eye-tracking technology and Scottish Economics Experimental Laboratory:** during this REF period, we invested in a screen-based eye-tracker. The Department of Economics is home to a state-of-the-art experimental economics laboratory. These facilities enable us to conduct novel research that enhances understanding of how individuals make decisions, informing our preference elicitation, workforce and behavioural economics research.

Research Support Services: our research is enabled by the excellence of our support services (more detail in *REF5a*).

- **Research and Innovation** services offer support for research, knowledge exchange, impact, commercialization, entrepreneurship and public engagement to researchers.
- Our **Grants Academy** supports researchers in all stages of the research grant cycle, from conception of ideas, development of high-quality funding applications to research delivery and realising the impact of our research. The *Supporting Grant Applications* (SGA) process provides a framework for early-stage feedback and mentorship by a small

panel of experienced academic staff. Late-stage full proposals are reviewed by senior colleagues with established funding records of accomplishment.

- The University has an overarching **research governance** structure ensuring our research meets the highest ethical standards. We support and comply with the *Universities UK Concordat to Support Research Integrity*. The University's Research Policy Committee, chaired by the Vice Principal for Research (**Campbell**), has overarching responsibility for ensuring rigour and consistency in our research ethics and governance arrangements and reports to the University Court, Senate, and Senior Management Team. The University is one of ten foundational UK institutions to join the UK Reproducibility Network working in partnership to improve research rigour, robustness and quality. The University has clear mechanisms in place, including a well-defined and publicised whistle-blower policy, to deal with alleged shortfall in research governance practice and research misconduct. The School employs a Research Governance Manager and Officers to guide the ethical conduct of studies, formulate applications for regulatory approval and oversee ongoing research involving NHS patients through liaison with NHS Quality Assurance. We have augmented this with our own Quality Assurance manager. This ensures adherence to the NHS Research Governance Framework and EU Clinical Trials Directive, thus meeting the wide range of legal, ethical, regulatory and governance requirements.
- We have structures in place to ensure data management within the University is compliant with **General Data Protection Regulation (GDPR)** and the **Data Protection Act 2018**. The University provides a range of guidance and training on data protection and data management. There is a central Information Governance Team and Information Champions within all Schools and Directorates. Research activity is supported by the Information Governance team. A Data Protection Toolkit offers detailed guidance to ensure compliance with legislation, and there is a requirement to undertake a data protection impact assessment (DPIA) where there is high-risk processing of personal data. Training on data protection and management is offered by the Aberdeen Grants Academy. Researchers involved in the collection and analysis of patient data must hold a valid Good Clinical Practice certificate and those accessing population health linked patient data require a safe researcher training certificate.
- We are supported by the **University Medical Library** and the **Sir Duncan Rice Library** (opened in 2012 and an iconic landmark of northeast Scotland) giving our researchers access to over one million volumes in our library collections. We are committed to **open access** of our research outputs. Our Libraries run the Aberdeen University Research Archive (*AURA*) open access repository. Where permitted by the publisher, all published papers are released via AURA. The portal includes an overview of social media, press and public policy attention for more recent outputs. Our **open access compliance** rate for journal articles has grown from 43% in 2014 to 75% in 2020 and for all outputs from 34% in 2014 to 68% in 2020.
- Our high-performance computing service provides vast computational power to analyse large data sets. Our computer support service provides world class, researcher driven IT services and access to specialist software. We provide remote access to desktop computers and the safe haven. This has enabled research to continue during homeworking following the COVID-19 pandemic.
- We have worked with our award-winning **Public Engagement with Research Unit (PERU)** to deliver a range of events during this REF period (See Section 4).

4. Collaboration and contribution to the research base, economy and society

COLLABORATIONS

Collaborations enable us to extend the range of skills and expertise we can bring to our research. We have extensive **international** and **interdisciplinary** collaborations, ensuring we work with world leading researchers and conduct interdisciplinary research of the highest standard. Examples from the REF period include:

- Our large portfolio of clinical trials involves national and international collaborators. For example, we led the Effectiveness in Angle-closure Glaucoma of Lens Extraction trial (EAGLE), a large, international, multicentre, randomised controlled trial that compared the effectiveness of lens extraction versus laser for management of angle-closure glaucoma (**Ramsay, Scotland**). Participants were enrolled from 30 hospital eye services in five countries (Australia, mainland China, Hong Kong, Malaysia, Singapore and UK).
- The Selective Decontamination of the Digestive Tract in Intensive Care Unit Patients trial (SuDDICU, **Campbell, MacLennan**) is a multi-national collaboration across Canada, Australia, New Zealand and UK to undertake trials with a harmonized protocol to study the effects of selective decontamination of the digestive tract.
- **Ryan's** collaboration with world experts on preference elicitation to write a Contemporary Guidance for Stated Preference studies. This paper was the most cited paper in the Journal of the Association of Environmental and Resource Economists over the past year (at September 2020).
- **McNamee's** co-investigator status on the ConCIV Research Consortium (funded by the Iceland Research Fund), bringing together economists, lawyers, geneticists, philosophers and ethicists from UK, USA and Iceland to address issues around valuing benefits in monetary terms.
- **Campbell** and **Gillies's** CIHR funded project developing a framework for the ethical design and conduct of pragmatic trials to improve the quality and value of healthcare systems and practices includes clinicians, statisticians, ethicists, philosophers and trialists.
- **Treweek** set up Trial Forge, an initiative to improve efficiency in the design and conduct of trials. There are now nine Trial Forge Centres in five countries (UK, Switzerland, Australia, Canada, Ireland).
- **Avenell** leads (UK, Australia) and collaborates on (New Zealand) evidence syntheses on weight management for adults with obesity, and nutritional interventions, particularly vitamin D.
- **Elliott** led the European Commission FP7 MUNROS project, looking at the impact on practice and costs of new roles for health professionals. Eight countries participated (Czech Republic, Poland, Netherlands, Scotland, England, Germany, Turkey and Norway).
- **Ramsay's** leadership of a Joint Programming Initiative on Antimicrobial Resistance funded international collaboration, comprising of world experts in antibiotic stewardship from UK, Canada, Norway and Germany, in partnership with experts in implementation science and behaviour change intervention.
- **Campbell's** research on optimal configuration of trauma systems, conducted in collaboration with the Division of Surgery at the University of Alabama, an international centre of excellence in major trauma surgery.
- **McLernon's** membership of STRATOS (STRengthening Analytical Thinking for Observational Studies), collaborating with an international multidisciplinary group (statisticians, methodologists, epidemiologists and clinicians) from around the globe (Netherlands, Belgium, UK, USA, South Africa and Australia) to evaluate diagnostic tests and prediction models.

Our collaborations feature extended visits by international scholars. We have hosted 45 international visitors during the REF period from a variety of countries across six continents. We support international strategic partnerships to promote cutting-edge research. Examples include our partnerships with the University of British Columbia (Professor Stirling Bryan had a 10% WTE post at HERU during the REF period) and our programme of exchange with Ottawa Hospital Research Institute. We lead and contribute to international programmes, for example, Cochrane (**Brazzelli, Ramsay**) and the International Extra Corporeal Membrane Oxygenation Trials Network (**Campbell**). In 2019 **Treweek** was named in the world's most highly cited researchers list (as was Professor Jill Francis for her work undertaken while at Aberdeen).

CONTRIBUTION TO RESEARCH BASE

Membership of Grant Awarding Panels: Examples include - NIHR Clinical Trials Fellowships Panel (**Campbell** *Chair*); NIHR Health Services and Delivery (**Campbell** *Deputy Chair*, **Gillies, Locock**); Scottish Government CSO Health Improvement, Protection and Services Committee (**Treweek** *Chair*, **Watson, Lee**); MRC Strategic Skills Fellowships Panel (**van der Pol** *Deputy Chair*, **Ryan**); NIHR Clinical Doctoral Fellowship Programme (**Lee**); NIHR Policy Research Programme (**Lee, Gillies, Elliott**); NIHR Health Technology Assessment (**Ramsay, Gillies**); NIHR Systematic Review Fellowship Panel (**Brazzelli**); NIHR Clinical Trials Unit Standing Advisory Committee (**Campbell**); NIHR Urgent Public Health Studies for COVID-19 methods assessor (**Campbell**); Ireland Health Research Board Secondary Data Analysis Review Board (**Lee**); Ireland Health Research Board Interdisciplinary Capacity Enhancement Awards (**MacLennan**); Asthma UK grant committee (**Lee**); MRC Methodology Research Panel (**Ryan**); Carnegie Trust Research Incentive Grants (**van der Pol, Ryan**); Medical Research Foundation – Emerging Leaders Prize (**van der Pol**); ESRC Dementia Platform (**McNamee**); European Commission Horizon 2020 (**McNamee**); European Cooperation in Science and Technology (COST) panel (**Treweek**); and Wellbeing of Women (**McLernon**).

Editorial Boards: Examples include - International Journal of Pharmacy Practice (**Lee**); Human Reproduction (**McLernon**); Implementation Science (**Ramsay**); Cochrane Collaboration Effective Practice and Organisational Care Group (**Ramsay**); Journal of Clinical Urology (**MacLennan**); Statistics and Clinical Trials (**MacLennan**); Trials (**Campbell, Treweek** *Editor-in-Chief*); Cochrane Stroke Group (**Brazzelli**); Cochrane Diagnostic Test Accuracy (**Brazzelli**); Cochrane Nutritional Interventions Group (**Avenell**); Comparative Effectiveness Research (**McNamee**); BMC Medical Research Methodology (**McNamee**); BMC Public Health (**McNamee**); Health Care Analysis (**Entwistle**); International Journal of Feminist Approaches to Bioethics (**Entwistle**); Asian Bioethics Reviews (**Entwistle**); Health Economics (**Ludbrook, van der Pol**); and Cochrane Collaboration Incontinence Review Group (**Treweek, Kilonzo**).

Keynote/Plenary Presentations: Examples include - Association of Clinical Biochemists and Association of Clinical Biochemists of Ireland (**Avenell**); European Society of Human Reproduction and Embryology (**McLernon**); Swiss Clinical Trial Organisation Conference (**Gillies**); Nordic Nursing Conference (**Locock**); Nordic Health Research and Innovation Networks Conference (**Locock**); Swiss Society of Health Economics (**Ryan**); Canadian Centre for Applied Research in Cancer Control (**Ryan**); International Clinical Trials Methodology Conference (**Campbell**); International Critical Care Review Conference (**Campbell**); German Health Economics Association Conference (**van der Pol**); Australasian Association of Bioethics and Health Law (**Entwistle**); International Conference on Clinical Ethics Consultation (**Entwistle**); WHO Global Code of Practice on the International Recruitment of Health Personnel (**Elliott**); Evidence-based Medicine Network Conference (**Treweek**); Belgian Healthcare Knowledge Centre Trials Symposium (**Treweek**).

Fellowships/Awards: Examples include - Fellowship of the Academy of Social Sciences (**Locock**); Distinguished Visiting Professor, University of Auckland (**Avenell**); Visiting Research

Scholar Fellowship, University of Melbourne (**van der Pol**); Erasmus Fellow (**Nath**); MRC Strategic Skills Methodology Research Fellowship (**Gillies**); The Healthcare Improvement Studies Institute Fellowship (**Duncan**); Elizabeth Russell Career Development Fellowship (**Kopasker**); Cochrane-REWARD Prize (for reducing research waste, **Treweek**); and International Visiting Research Scholar Award, University of British Columbia (**Watson**).

Membership: Examples include - 40+ trial steering and data monitoring committees, including some as *Chairs* (**Ramsay, Campbell, MacLennan, Treweek, Lee**); Trial Conduct Working Group for the MRC Trials Methodology Research Partnership (**Gillies**, co-lead); steering committee for Trials Engagement in Children and Adolescents (**Locock**); MRC Hubs for Trials Methodology Research International Advisory Board (**Campbell**); International Extra Corporeal Membrane Oxygenation Trials Network Steering Group (**Campbell**); International Society of Clinical Trials "Trial of the Year" Award Committee (**Campbell**); REF2021 panelist (from criteria stage) for UoA-2 (**Campbell**); Methodology Group for the Scottish Improvement Science Centre (**Ramsay, Chair**); Cochrane Collaboration Statistical Methods Group (**Ramsay**); inaugural member of the Royal Society of Edinburgh Young Academy of Scotland (**Ramsay**); steering committee for the UKCRC Clinical Trials Statistics Operations Group (**MacLennan**); British Association of Urological Surgeons Academic Section Executive Committee (**MacLennan**); REF2014 panelist for UoA-2 (**Elliott**); Low Pay Commission (**Elliott**); European and International Health Economic Association Boards (**Elliott**); and Scientific Advisory Board, Hospinnomics, Paris School of Economics (**Elliott**).

Organising/Chairing Conferences: Examples include - International Health Workforce Conference (Milan and Basel, **Skåtun**); World Health Organization Expert Workshop for Toolkit Development 'Labour Market Analysis for Health: wages and incentives' (**Skåtun**); International Clinical Trials Methodology Conference (**Campbell, Gillies, Treweek**); European Health Economics Association conferences (**van der Pol**); and World Congress of International Network on Feminist Approaches to Bioethics (**Entwistle**).

CONTRIBUTION TO ECONOMY AND SOCIETY

Engagement with policy makers: to ensure our research is relevant and addresses clinical and societal need we connect and communicate with policy makers, through targeted mechanisms, including, advisory roles, dissemination events, engaging with professional bodies, regular newsletters and policy briefs, websites and social media. This dialogue also ensures **research findings are implemented leading to an onward impact on society and the economy**. We provide expertise and support to the NHS. Examples include: our strategic alliance with Healthcare Improvement Scotland, providing and sharing knowledge, delivering courses (e.g., diagnostic test assessment, DCEs) and organising a joint annual policy conference (**Ramsay, Ryan**); our NIHR contract to produce TARs, through which we engage with NICE to inform guidance on the provision of new and existing treatments (**Scotland, Hernández, Ramsay, Brazzelli, Aucott, Boyers, Scott**); membership of the Scottish Medicines Consortium and Scottish Health Technologies Group, providing expertise on the introduction of new procedures in NHS Scotland (**Scotland, McNamee, Ramsay**); advising Government on, for example, the role of mesh in prolapse (**Glazener**), reconfiguration of trauma services (**Campbell**) and the introduction of minimum unit pricing for alcohol (**Ludbrook**); membership of various groups, for example, Monitoring and Evaluating Scotland's Alcohol Strategy (**Ludbrook**), Scottish Cancer Patient Experience Survey (**Ryan**), Scottish Government Technical Advisory Group for Resource Allocation (**Skåtun, Elliott**), Chronic Pain Service Improvement (**McNamee**), Restricting Promotions of Discretionary Foods (**McNamee**) and Scottish Government Mental Health COVID-19 Research Advisory Group (**Kopasker**); advising Public Health England regarding establishing a National Congenital Anomaly and Rare Disease

Registry (**Vieira**) and informing guideline development for Delivering Better Oral Health (**Duncan**).

Patient and Public Involvement (PPI) and Engagement: We are committed to making our research both relevant and accessible. PPI is a key part of our strategy. We actively involve public, patients and patients' representative organisations (e.g., Health and Social Care Alliance; Genetics Alliance; Chronic Pain Support Group, INVOLVE) as research co-applicants. Working with our Public Engagement in Research Unit, we have an extensive portfolio of public engagement activities, for example: family activities at local science festivals; public "café style" talks; PechaKucha; Bright Club; and school outreach. Events have been run as part of national festivals (e.g., British Science Festival, Explorathon, Edinburgh Fringe). Our researchers brought the first ever Soapbox Science event to Aberdeen and took part in Cellblock Science. We are multiple winners of the Principal's Award for Excellence in Public Engagement. Our public engagement activities won an award from the Marie Curie Alumni Association, and we have been invited to deliver our activities at the European Parliament. Public engagement is central to our ISSF activities, funding our researchers to attend the National Coordinating Centre for Public Engagement "Engage Researchers Academy".

Research Networks: **Ryan** and **van der Pol** set up and lead a network for health economists in Scotland. The Scottish Health Economics (**SHE**) group brings together health economists from Scotland's universities, NHS and government with policy makers to discuss issues of current policy concern. **Ramsay** set up and leads **TRiADS** (Translation Research in a Dental Setting). This multidisciplinary group formed to develop a national programme of knowledge transfer research. It is embedded within the Scottish Dental Clinical Effectiveness Programme and has public, academic, policy and professional members.