Institution:
Edinburgh Napier University

Unit of Assessment:
Unit of Assessment 3 – Allied Health Professions, Dentistry, Nursing and Pharmacy

1. Unit context and structure, research and impact strategy

1. Overview

1.1 Organisation/structure of unit: The submission of Edinburgh Napier University to Unit of Assessment 3 encompasses research from the School of Health and Social Care (SHSC) and the School of Applied Sciences (SAS). SHSC (largest provider of nursing education in Scotland) research contributes to the work of nurses, allied health professions and the health sector. UoA3 research within the School of Applied Sciences spans biological understanding of health and disease processes, translation into medical intervention, and examination of the environment as a determinant of health. This submission is comprised of 46.4 FTE category A staff.

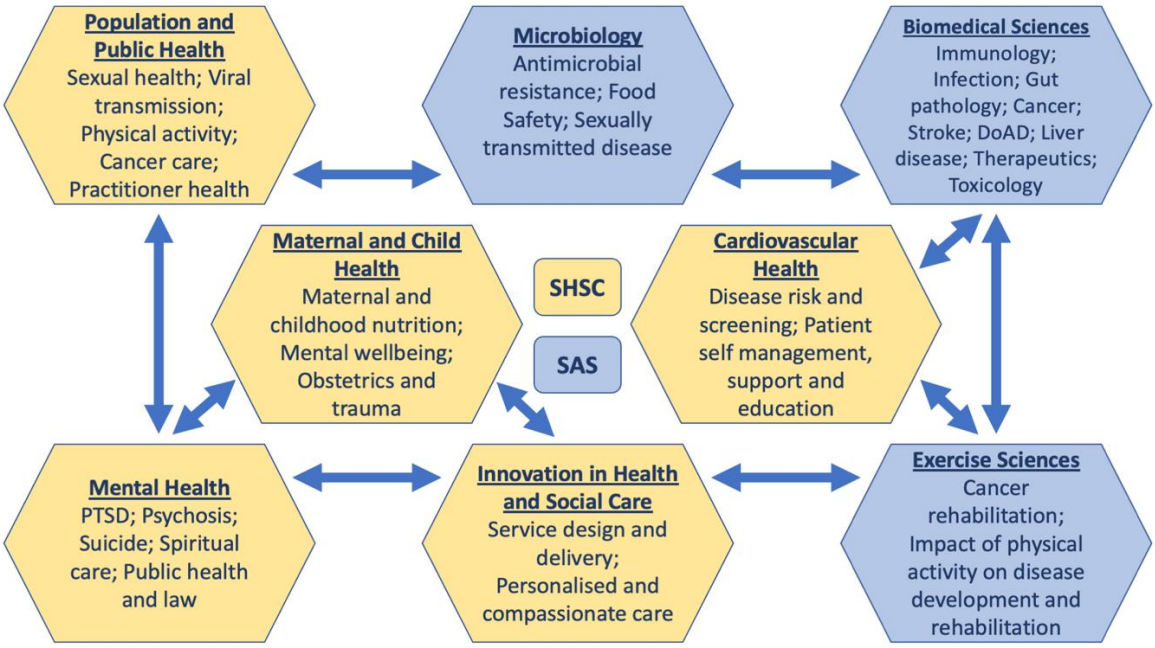

Figure 1.1. UoA 3 Thematic research groups and current, cross-disciplinary interactions (indicated by arrows) (PTSD=post traumatic stress disorder; DoAD=developmental origins of adult disease)

Research groups foster links between disciplines, (**Figure 1.1**), driving intellectual benefit /added value outcomes from cross-disciplinary working. We have increased research capacity, more than **doubling numbers of staff submitted from REF 2014 in 2021**, adding **ten new professorial appointments**. We improved balance between experience and early career researcher development (Figure 1.2). **Research student completions rose by 41%** (section 2.2), and we recorded a **sustained, overall 79% increase in research income** generated in the current as compared to previous REF reporting period (section 3.2).

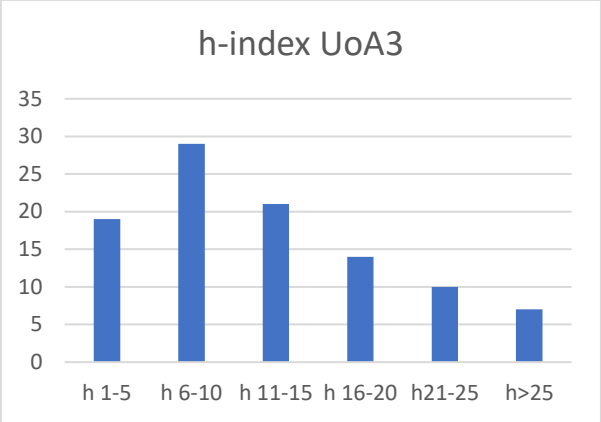

Figure 1.2. UoA 3 experience measured by percentage of researchers within h-index category

1.2 Research direction: We investigate health and disease from conception, throughout childhood, adolescence and adulthood, driving improvements and innovation in health and healthcare, delivering contributions to the knowledge economy and societal wellbeing.

1.3. Research groups contributing to UoA3

1.3.1 *Mental Health*: *Research in this group is focused around PTSD and complex PTSD, psychosis, suicide prevention, the interface between law enforcement and public health, and the utility of chaplaincy and spiritual care in healthcare scenarios.*

This grouping was strengthened by the appointment of Professor **Snowden** and two Associate Professors (**Hutton** & **Dougall**). The group has published several systematic reviews (including Cochrane) and meta-analyses since 2014, and conducted multiple analyses of national linked datasets, delivered several RCTs, and novel outcome measures. **Karatzias**' trauma research led to a new diagnosis (Complex PTSD; CPTSD) introduced to the 11th edition of WHO International Classification of Diseases (ICS1) He is involved in studies in Europe, USA, Asia and Africa on the assessment, epidemiology and psychological treatment of CPTSD, across community, military and refugee populations.

Utilising big data approaches, **Dougall**'s work (**CSO** funded) involves linked national dataset analysis, examining outcomes (for individuals, services, and care pathways), with focus on suicide. She demonstrated, for the first time, greater suicide risk post-discharge from general than psychiatric hospitals, highlighted by national bodies noting benefits of linked data. A **CSO funded** project summarising health records of individuals who later died by suicide, examining impacts of recorded childhood adverse experiences in terms of subsequent mental health and suicidal behaviours is ongoing. **Dougall** works in collaboration with **Maternal and Child Health** on a PTSD project led by **Hollins-Martin** (below), and her expertise is utilised across other UoA3 themes, notably Biomedical Sciences and Cardiovascular Health (**CSO**, **NIHR**, **Stroke Association** funded).

Hutton published the first RCT of a psychological intervention to improve treatment decision-making capacity in psychosis, and the first study of the effects of collaborative psychological assessment and formulation of impaired capacity in people with psychosis. He is PI on a **CSO**-

funded Umbrella trial, where the effect of these and other interventions on capacity are examined in multiple parallel single-blind RCTs. To improve effectiveness, acceptability and cost effectiveness of psychological interventions for people with severe and complex mental health problems, **Hutton** and **Karatzias** formed key collaborations with local NHS clinicians – the Edinburgh Research and Innovation Centre for Complex and Acute Mental Health Problems (https://www.ericca.co.uk/).

Stavert (UoA18) directs our Centre for Mental Health and Capacity Law, giving testimony to parliamentary committees, thereby influencing policy. Current work examines mental health tribunals (**Nuffield Foundation** funded). **Heyman** collaborates with international public health experts, the Scottish Government, Assistant Chief Constables and other academics, underpinning the creation of the Scottish Centre for Law Enforcement and Public Health. **Ring** collaborates to synthesise the existing evidence base with systematic reviews and meta-ethnographies across several areas (suicidal experience among children; emergency room treatment of those who self-harm; and substance use among homeless people). Person centred care is a key priority area for the NHS, Department of Health, and the WHO.

Murray and **Chouliara** (now University of Abertay) developed a suicide risk assessment tool aligned to person-centred principles for use in emergency admissions wards. **Snowden** (funded by **NES, CSO, SAMH, Macmillan**) led a five-year evaluation of 'Improving the Cancer Journey', designed to support holistic needs and mental well-being following cancer diagnosis. This work underpinned Scottish Government and Macmillan £18million investment into a national rollout of the project. **Snowden** also designed the first patient reported outcome measure (The Scottish PROM) for healthcare chaplains, now in use worldwide.

1.3.2 ***Population & Public Health:*** *This group encompasses research into population health, sexual health, blood borne viruses, physical activity, cancer and healthcare workers health.*

The appointment of **Kyle** (Reader), **Atherton** (Reader), **Frost** (Lecturer) and **Williams** (Professor) increased focus upon local and international public health challenges.

Recent projects included work on the impact of Hepatitis C on intravenous drug users and development of GP-led approaches to patient care (**Whitely, CSO** funded), and **Coull**'s work focussing upon tissue viability and ulceration, relating to injected drug abuse, with impact enabled by her retention of a part-time clinical position (NHS Lothian), and commitment to e-learning development for the nursing profession (**NES** funded).

Best practice in supporting families affected by paternal substance misuse (**Whittaker, NIHR** funded) deals with wider ramifications of current societal issues. Similarly, **Williams** (**NIHR PHR**) recently completed a randomised control trial (RCT), examining impact of a brief alcohol intervention delivered by text message, followed by successful completion of an **NIHR** pilot trial to reduce alcohol consumption among people with high BMI.

Regarding workplace health, 'Nurse's Lives', led by **Kyle**, demonstrated high levels of obesity among the national nursing workforce; and subsequent work has examined strategies to address this. Future health is examined by studies to reduce sun exposure and sunburn among adolescents (**Kyle, CSO** funded). **Frost**'s musculoskeletal care and rehabilitation for long term conditions, and promotion of physical activity in older people, (including implementation) exemplifies aims to provide benefit to all age groups (**EU** funded, **JIGSAW-E** funded).

As potential of 'big data' analyses came to the fore, **Atherton** was appointed deputy director of the **ESRC** funded Scottish Centre for Administrative Data Research, a £10 million initiative (~700K to ENU) to facilitate and enable use of Scottish census and administrative data for social science research to inform policy. He has led data linkage projects which improved understanding of social circumstances of people at the end of life, drivers behind changes in place of death, welfare of military veterans, and of care home residents during the current pandemic.

1.3.3 ***Maternal & Child Health***: *Partnering with Scottish Government, NHS Education Scotland, and NHS Lothian, focus is upon self-harm and suicidal behaviour in children, improving child and maternal nutrition, addressing trauma around childbirth and stillbirth, improving management of long-term conditions in children, and advancing practice through new models of care and education.*

This theme was significantly strengthened by the appointment of **Hollins-Martin** (Professor), **Ring** (Associate Professor), **McInnes** (Lecturer), and **Malcolm** (Lecturer).

Hollins-Martin led development and roll out of a robust and clinically useful Birth Satisfaction Scale, validated internationally (Iran, Greece, USA, Turkey, Australia, Spain, UK, Israel, Slovakia). Her research extends to examining PTSD associated with perinatal loss (**CSO**), preventing preterm loss and stillbirth (**NIHR**) and maternity care inequality in Scotland. Funding from **MNH Lothian** for a joint clinical academic post (**McInnes**) led to the examination of breastfeeding services.

As part of our strategy to ensure direct patient benefit from our work, we developed novel intervention studies to increase physical activity among young people with asthma (**Williams & Murray, CSO**), and improve adherence to chest physiotherapy among children with cystic fibrosis (**Williams, CSO** & **CF Trust**). Group members developed methodological practices regarding systematic reviews of qualitative research (**Ring, NHIR**), (final report rated 'outstanding' by NIHR). These guidelines were simultaneously published in four journals and feature as the reporting template in the EQUATOR network international guidance on study reporting. **Rings'** research focusses on generation and evaluation of evidence in practice, relating to the self-management of long-term conditions e.g. asthma (impacting upon current UK (SIGN/BTS) and international (GINA) asthma guidelines) and mental health (most shared paper in Journal of Child and Adolescent Mental Health). It has a strong meta ethnography focus, working collaboratively with universities of Stirling, Edinburgh and Cardiff on the **NIHR** funded eMERGE project, developing evidence-based reporting guidelines for meta-ethnography.

1.3.4 ***Innovations in Health & Social Care Practice*****:** *This group focusses on developing innovative and technological solutions and attitudes to complex health problems, including service delivery/redesign*.

Strengthened by the recruitment of **McKay** as lead (Associate Professor, occupational therapy) and **Williams,** this group led two of the largest evaluations (£1m) of interventions to change ward culture since the Francis Inquiry Report (2013). These include two separate stepped wedge trials covering 30 wards and over 1,500 patients (**Scottish Government**). The evaluation of the 'Productive Ward' is the most robust evaluation of this ward culture interventions to date. **Williams** developed novel outcome measures assessing both caring and personalised health care (**Scottish Government**).

Ramsey was awarded a national fellowship (**Scottish Government**) for her work developing web-based interventions to support patients post-discharge from ICU, resulting in 2 national prizes for impact, and is currently **CSO** funded to develop a patient centred assessment tool for hospital discharge planning among ICU survivors.

1.3.5 *Cardiovascular Health*: *This newly created grouping (since 2014) aims to drive improvements in cardiovascular health through a variety of innovative approaches, including telemonitoring.*

The theme benefited from significant investment with the appointment of **Neubeck** (Professor), **Farquharson, Ramsey**, and **Kydonaki** (Lecturers).

Neubeck is an international expert on atrial fibrillation (AF) and leads work on introducing screening to Scotland to reduce incidence of stroke. Since appointment in 2016, **Neubeck** has been awarded funding as PI/Co-I from BHR, Horizon2020, National Heart Foundation of Australia, CSO, City of Edinburgh Council, Scottish National Heritage, European Society of Cardiology, Laerdal Foundation and Burdett Trust for Nursing.

The group has demonstrated strength in digital innovations, e.g. **Farquharson** uses digital animation to reduce delay in patient presentation to hospital services after acute coronary syndrome (**CSO**). **Neubeck**'s work led to the development of mobile apps to support self-management of cardiovascular disease. **Hanley** completed an RCT (SCALE-UP BP) demonstrating utility of digital home blood pressure monitoring in improving self-management (**CSO**) (ICS2). **Kydonaki** completed a cluster RCT (**CSO** funded) demonstrating that responsiveness monitoring and online education has potential to improve sedation–analgesia quality and patient safety in mechanically ventilated ICU patients, delivering a development of an education package via LearnPro that will be launched in all ICUs in the UK. **Kydonaki** is also an investigator on trials examining Alpha-2 agonists to improve sedation (**NIHR**), and an exploratory study of staff perceptions of minimising sedation in the UK funded by **Barts** charity, **NHS Trust**.

Rowat focuses on patients' lives post-stroke, examining nasogastric feeding. She has co-authored a Cochrane review examining dehydration in elderly patients, and collaborates with our mental health research group examining suicide risk in emergency healthcare settings. **Dawkes** work encompasses cardiac rehabilitation, secondary prevention and risk factor modification for cardiovascular disease, involving a wide range of collaborators /stakeholders e.g., her work examining reduced male uptake in referral schemes to support in partnership with **Neubeck**, University of Sydney; Flinders University; Fife Sports and Leisure Trust; NHS Fife, NHS Highland (**Burdett Trust** funded).

1.3.6 *Biomedical Sciences*: *This group, based within SAS, encompasses health-relevant fields such as immunology & infectious diseases, clinical immunology, cancer, inflammation, toxicology, neuroscience, reproductive biology and exercise sciences.*

Recent appointments include **Erhardt** (Lecturer), **Russo** (Lecturer) and **Vass** (Lecturer).

Barlow focusses upon the urgent requirement for new antimicrobial therapeutics, for example, leading work (**CSO**) characterising antiviral activity of host defence peptides against rhinovirus and influenza, (most common causes of pneumonia), which gained international media attention and was profiled on BBC television and in Scientific American, ensuring dissemination beyond academia. This extends internationally to Dengue fever (**MRC**) in collaboration with Indonesian

scientists. **Hutchison** and **Malone** are funded by the €8 million **BIORIMA H2020** project to establish a risk management framework for nano-biomaterials used in medical products and devices, and **Hutchison** is a member of the **Food Standards Agency** Committee on Toxicity, and the **DEFRA** Hazardous Substances Advisory Committee.

Rae leads a (**MRC**) project which, in collaboration with the Universities of Aberdeen and Edinburgh, examines impacts of prenatal insults associated with common clinical conditions on lifelong metabolic health. He collaborated with UoE as part of an industrial partnership with **GSK** to develop novel *in vivo* modelling of neuroendocrine dysfunction. **Staines** (ECR, recently moved to University of Brighton) was awarded **MRC-NIRG** funding on a collaborative osteoarthritis project, reflective of our investment in ECR development.

Stevens research is focussed upon roles of autophagy in Crohn's disease, elucidating mechanisms of action of drugs used to treat inflammatory bowel disease (IBD)**,** and in collaboration with **Barlow** (**MRC, BBSRC** and **CSO** funded), examines roles of host defence peptides in IBD. He received PhD studentship funding from Crohn's in Childhood Research Association (**CICRA**) for a collaborative translational project with the Royal Hospital for Sick Children in Edinburgh, and engages with patient families on mechanisms of action of IBD therapeutics, with a long-standing collaboration with University of Oxford. **Stevens** and **Barlow** supervise a research fellow funded by the **Daphne Jackson Research Trust** and **Medical Research Scotland**, indicative of our inclusivity of support for individuals returning to research post career break.

Wright leads a multi-centre collaboration (University of Glasgow, Scottish National Blood Transfusion Service and University College London) (**CSO**), taking advances in the field of adoptive T-cell therapy for cancer and applying in diseases including rheumatoid arthritis and multiple sclerosis, now in the initial stages of clinical translation. **Campbell** (awarded an MBE in 2016 for services to cancer survivorship) led the evaluation of national programmes such as Transforming Care after Cancer Treatment, and is co-chair of the American College of Sports Medicine Special Interest Group on Cancer (**Macmillan**).

Fraser (recently moved to Royal Dick School of Veterinary Studies) collaborated with the Roslin Institute on the role of exosomes derived from breast cancers, and in collaboration with **Hutchison** investigated nanoparticles as clinical imaging agents in placental insufficiency and fetal neural development. She works collaboratively with **Poole** (in joint receipt of PhD funding from the **Melville Trust**) on stroke damage and reperfusion, in collaboration with the University of Leon, Spain.

1.3.7 *Microbiology*: *Closely aligned with the biomedical sciences grouping, Microbiology research within the institution has both a clinical (UoA3) and environmental focus (UoA7)*.

This group was strengthened by strategic recruitments of clinical/NHS staff (**Dancer**) (Professor, Clinical Consultant Microbiologist) and basic scientific staff (**Wheelhouse**). These individuals conduct research that links directly to human / animal health and food security (in terms of zoonotic disease). **Wheelhouse**'s recent focus is neglected causes of non-malarial fevers in sub-Saharan Africa including Q-fever and Brucellosis, strengthened through novel partnerships with the Kumasi Centre for Collaborative Research, in Ghana, working on zoonotic reproductive pathogens of livestock and seroprevalence in pregnant women (**Microbiology Society** funded). He retains collaborative relationships spanning clinical and livestock issues surrounding chlamydia infections, working with the NHS and Moredun Institute. **Dancer**, funded by **MRC,**

EPSRC, CSO, has an extensive international collaborative portfolio, focussing upon hospital infection control. In a responsive manner, she is now working with hospital-based staff on effective PPE sterilisation and throat prophylaxis for staff exposed to Covid-19.

Barlow in collaboration with **Singleton** (UoA7) leads an **Innovate UK** funded project, assessing the use of post-harvest washing of fruits and vegetables with antimicrobial electrolyzed water to prevent microbial contamination with pathogens. **Barlow** and **Stevens** have published on the potential of antimicrobial peptides as novel therapies in combatting viral infections. Cross-thematic research is further characterised by **Singleton** and **Rae's** collaboration (**Society for Reproduction and Fertility funded,** plus **internal pump-priming**) to determine the role of the microbiome in PCOS, and in a cross School-project, **Wheelhouse (SAS)**, with **Dougall** (**SHSC**) and **Brown** (UoA20; recently moved to University of Edinburgh) are part of a **CSO**-funded study determining acceptability of extragenital Chlamydia testing in young women.

1.4 Review of Assessment period research objectives

1.4.1 2014 – 2021 Objectives: Be '***academically excellent***' and '***create, exploit and transfer knowledge***'. We committed in 2014 to '***invest in and value research'***; to enable us to '***conduct research with impact beyond academia'***. These objectives have been achieved: establishment of research groups, early translation of research beyond academia, blending new staff appointments with development of existing staff, collectively driving sustainable increases in external income generation, representing a 79% increase in research income (Figure 1.3) and increasing numbers of staff submitted to UoA3 (REF2014 n=22 vs REF2021 n=49).

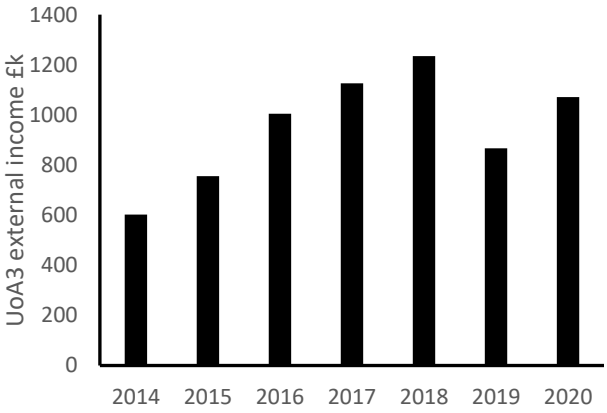

Figure 1.3. External research income over current reporting period

The four following REF aligned objectives have been achieved:

1. *Enhance our research impact and reach by developing and expanding our researcher base*. Since 2014 we filled unmet expertise needs in our schools, facilitating health research priorities and improving balance between basic and clinical sciences (see section 2 below).

2. *Ensure our research remains cutting edge, impactful and novel* Through externally funded collaborative effort, we gained access to methodologies and technologies not available in-house, e.g. 'omics' facilities in the University of Aberdeen, custom therapeutic peptide generation with

the United States Centers for Disease Control and Prevention (CDC), access to research materials through international collaborations and development of our skills base (e.g. bioinformatics capability). We forged a formal partnership with the local NHS research body (ACCORD) and developed ongoing relationships with clinical trial units (CTUs) in Scotland.

3. *Support our researchers* Specific to UoA3, our researchers piloted use and implementation of institutional research management systems (REF5a). We updated our Researcher Development Programme in both Schools (mapped upon www.vitae.ac.uk). We support a wide array of training opportunities, organised by our dedicated researcher development office. We developed a research mentoring system for ECR careers, with 'in house' funding applications (financed by school budget), where senior staff mentor ECR's in bid preparation, management and delivery of pilot projects to underpin external bids/collaboration development.

4. *Value research activity* Protected time for research (minimum 0.2FTE), is available to all academics self-identified as on our Research management and promotion pathway, and new appointments receive this automatically to establish their research. Key Performance Indicators are linked to research aims (e.g. funding applied /achieved, outputs). Contract research staff are included in mentoring/management systems, with a specific promotions pathway based upon research excellence.

This delivered: **1**. A fast-growing research community with experienced leadership, and a supported ECR base. **2**. An expanded multi-professional researcher base (nurses, midwives, social workers, physiotherapists, occupational therapists) and multi-disciplinary (clinical psychologists, health psychologists, sociologists, statisticians, data and laboratory scientists). **3**. Increased track record of funding from substantive funding bodies (e.g. NIHR, CSO, MRC, BBRSC, EU H2020) with ~40% application success rate. **4.** Increased research influence upon policy (e.g. UK Government Advisory Committee Membership, NHS), and practice (e.g. Complex PTSD and Atrial Fibrillation) **5**. Publication of high-quality papers, and increased staff numbers submitted to REF. **6**. Increased numbers of research degrees awarded.

1.5 2021 – 2026 – Our strategy for the next REF reporting period

We recently approved (November 2020) a new institutional research structure (see REF5A) to enhance interdisciplinary working, external partnerships, and to provide a supportive research environment. We will transition from research groups to centres of interdisciplinary thematic research, with UoA3 activity housed in the theme '**Health**'. Transition will occur in alignment with UoA3 activity, defining desired impact in terms of societal benefit. We will invest in six PhD studentships for Biomedicine, Mental Health and Cardiovascular Health, and two further studentships to accompany a new Professorship and Lectureship in a novel strategic direction ('health technologies'). This demonstrates our commitment to research sustainability, growth, and promotion of interdisciplinary effort, strengthened through fostering of active clinical:basic researcher relationships.

Within this restructuring, new research centres will be created, designed to facilitate collaborative effort beyond UoA3, through identification of unmet needs to be addressed by non-UoA3 active disciplines (e.g. computing, engineering). This restructure represents a maturation of research activity for UoA3 and the wider institution. Our ambitious plan builds on critical mass, and recognises our rapidly changing role as an institution, ensuring alignment with government priorities, matched to consideration of our broader impact and contribution as a civic university.

1.6 Approach to supporting interdisciplinary research

Current: Our open and inclusive research environment, and formation of themed groups provided identity and understanding of remits between disciplines, e.g. clinical:basic science *foci*. We facilitate cross-institution working via annual interdisciplinary research conference, and smaller, focussed themed meetings. We ensure researchers from different disciplines are informed of current developments via our quarterly Research Newsletter, detailing funding success, publications, and research updates.

Successful interdisciplinary outcomes include: **Wheelhouse** (AP microbiologist) and **Dougall** (AP Statistics, Data Science and Mental Health Research, UoA3), collaboration on a **CSO** funded study determining acceptability of extragenital Chlamydia testing in young women. **Singleton** (microbiologist (UoA7) and **Rae** (reproductive endocrinologist UoA3) developed a collaborative project with an ECR (**Society for Reproduction and Fertility, and internal ECR** funded) examining interplay between obesity, PCOS, androgen concentrations and the gut microbiome and mycobiome. **Barlow, Stevens** and **Hutchison** and engineering researchers work together on developing novel nanocellulose delivery of peptide-based therapeutics. Our *Population and Public health* group worked with computer scientists, developing research using electronic vital signs and activity tracking equipment, facilitating understanding of nurses' work and links to their health and wellbeing.

Future: We will reinforce these efforts through our research environment restructure and move from a 'individual led' approach to one with greater support for such initiatives through new, fully supported, research centres.

1.7 Progress towards an open research environment

In addition to OA policy (full REF compliance), data, material and information sharing enhances overall research outputs and quality of findings. All data sets from proteomic and transcriptomic work is deposited in online repositories (PRIDE and ArrayExpress respectively). Biological samples and research materials are available upon request. Knowledge exchange occurs internationally, with institutions in countries receiving ODA funding such as Indonesia, Kenya and Thailand, used to underpin inter-institutional funding applications. 94% of staff submitted possess an ORCID identification.

1.8 A culture of research Integrity

Mandatory GDPR training events (annual) for all researchers ensure understanding and compliance with legislation. All research projects, during application development, undergo ethical review by a team of academics from a range of disciplines (School Research Integrity Committees; average of 55 applications per year in SHSC; 300+ in SAS), in addition to professional body review (e.g. NHS ethical approvals, Home Office). Approval is followed by compliance monitoring, in terms of data management, subject recruitment, project conduct. All projects present a formal data management plan prior to approval/submission.

Methodologically, discipline specific 'best practice' requirements are early adopted e.g. 'MIQE guidelines' for qPCR. Work by **Hutchison** and **Malone** delivered *in vitro* triage assessment of engineered nanomaterials to reduce animal toxicology testing, contributing to regulatory development. **Skelton** works on the use of facial recognition, perception and memory, applied to reliability of eyewitness evidence, police e-fit composites and miscarriages of justice in collaboration with social scientists. An important component of sustained research integrity are

our PhD students, who report a 78% satisfaction rating as regards development/understanding of research integrity during their studies (PRES2019).

1.9 Approach to enabling impact

We define impact potential through identification of 'critical unmet needs' of society and individuals.

1.9.1 Development of cross disciplinary impact: UoA3 researchers established a multidisciplinary group (computing, engineering, creative industries, health care and life sciences). ***Exemplar activity: Improving quality of care in care homes and care at home:*** We created a multidisciplinary group including gerontologists, care specialists, computer scientists, designers and engineers, encompassing skills in improving care, the use of IT in service delivery, the use of the arts in care homes to improve quality of life, and building design.

1.9.2 Direct translation of research projects beyond academia: We engage staff on non-research academic career pathways in a strategic manner. Through early stage peer review we ensure that the choice of research foci maximises the chance of translation (e.g. a clear and recognised problem, explicit demand for the research, available industry/policy partners, and meaningful public involvement). We strengthen this further by combining staff from all four of our academic pathways to contribute to impact: research (skills, and research projects/findings), professional practice (engagement with practice and policy makers to achieve changes to policy, guidelines and practice), enterprise (innovations or business links), and learning/teaching (interventions and strategies within our curricula, dissemination through our graduates). For example**, Kyle** identified prevalence of obesity within nursing communities.

Direct communication with stakeholder groups (nurses, manages, student nurses) and UK media coverage meant further development of activity monitoring was undertaken. Our research on effectiveness of compassionate care (**Smith, Adamson**), and trials releasing 'time to care' (**Williams**), alongside new outcome measures delivered by this work, created new interventions (e.g. changing student's attitudes to older people) (**Sharp**), engaging with NHS to facilitate implementation. **Coull**, via a clinical position (NHS Lothian), translated work on injecting drugs and implications for tissue viability into practice. **Karatzias'** work underpinned the development of a new psychiatric diagnosis (CPTSD; now included in ICD-11), publication of clinical and training guidelines by the UK Psychological Trauma Society and British Psychological Society, and the widespread use of standardised assessment tools (e.g., International Trauma Questionnaire and International Trauma Interview – both now used in over 30 countries (ICS1).

Hutton oversaw the first RCT of a psychological intervention to support impaired treatment decision-making capacity in psychosis. This directly influenced NICE guidelines (https://www.nice.org.uk/guidance/ng108) which through their national and international reach have direct benefits for policy and practice development, ultimately impacting positively upon those individuals subject to capacity-based mental healthcare legislation. **Ramsay's** work (www.criticalcarerecovery.com) on patient and family support after ICU discharge, was recognised as one of the top 5 social enterprises in a Scotland-wide entrepreneurial competition (Converge Challenge; https://www.convergechallenge.com/about/). **Chouliara**'s work (British Journal of Nursing Dermatology Award, 2016) raised international recognition of impacts of dermatological conditions upon patients. **Murray**'s person-centred care research directly impacted policy and practice (recognised by NICE Evidence Search: patient routine outcome measures) with >10,000 health professionals using www.caremeasure.org, entering data from >300,000 patients nationally and internationally.

Dawkes' and **Neubeck**'s work with the British Heart Foundation and NHS Lothian produced the Evaluation of Cardiac Rehabilitation Assessment Workbook (CRAW) – now used by all cardiac rehabilitation services in Scotland. **Dawkes** is engaged in partnership with Chest, Heart and Stroke Scotland, developing e-learning with Scottish Ambulance and Fire and Rescue Services. **Neubeck**'s early detection / management of atrial fibrillation work had significant impact on the field of cardiovascular health on a global level, encompassing validation of single-lead ECG devices, to implementation in practice, influencing management of AF, informing international guideline development. **Neubeck** holds a consultancy agreement with WeHealth by Servier and presented at meetings for Daiichi Sankyo, Pfizer BMS, and Boehringher Ingelheim, and sits upon an advisory panel for Novo Nordisk. **Hollins-Martin** work to reduce health inequalities in maternity care provision is in partnership with NHS Lothian Nursing, Midwifery and Allied Health Professions Research Unit (NMAHP) to ensure stakeholder involvement. **Ring**'s work guided practice on asthma education and current UK (SIGN/BTS) and international (GINA) asthma guidelines.

Relationships with industry were forged to utilise academic expertise, supported by **Innovate UK**, **Medical Research Scotland** and **Interface**. This has been supported by incentivising translation and industry related activities through explicit inclusion of achievements in the revised promotion criteria, and by providing time and funding to engage in supportive activities. Exemplars of activity include **Rowat**, (collaboration with Ingenza Ltd) developed novel technology to evaluate placement of nasogastric tubes. **Hutchison's** work on *in vitro* triage to reduce animal use in toxicological screening, and his inclusion upon DEFRA panels informs new and existing policy making. **Barlow**, in addition to working with SMEs, is media spokesperson for the British Society for Immunology and contributed to an RSB working group on the UK Government Clean Air Act consultation.

Campbell's work on improving cancer care rehabilitation through specific, personalised exercise regimens (ICS3) received wide media attention, raising profile and importance of physical exercise to improve recovery, driving direct patient improvements in cancer rehabilitation. **Dancer** is an expert advisor to international bodies, e.g. Australian REACH (examining effective approaches to hospital cleaning), Scottish working group on diabetic foot management, Scottish Government ECONI project (healthcare economics of hospital acquired infections). **Rae** collaborated with University of Edinburgh and GSK to develop novel disease models to test new therapeutics, and with the Royal Zoological Society, developing methodology to detect reproductive cycle stage and pregnancy in endangered species.

2. People

2.1 Staffing strategy and staff development

2.1.1 Research Leadership: Each UoA3 school has a designated Research Director (0.4 FTE) (**Karatzias, SHSC; Barlow, SAS**). Research support is available from Research Directors, and Research, Innovation and Enterprise (RIE), collectively advise upon funding streams, costings and proposal preparation, and access to internal funding support. ECR's, and those with RA positions, are encouraged to apply for such funding, receiving mentoring in terms of writing research proposals. Mentoring is from senior staff with relevant expertise (PI on successful grants); examples of success include **Staines** (**MRC NIRG** award); **Wright** (**CSO** award).

2.1.2 Managing the researcher base: New academic appointees are awarded protected time to establish a research programme in their first year (0.2FTE). Staff research time allocation is managed via agreed objectives/KPI's (e.g. funding applications and outputs), ensuring fit to workload (minimum 0.2FTE). We pursue person development through formalised progress reviews to inform strategic planning, running parallel to promotions framework, ensuring consistency between individual development plans and unit level objectives. New staff appointments are informed by strategic requirement in research capacity e.g. appointments of **Erhardt** (computational drug design), **Russo** (Blood Brain Barrier crossing drug design) were made to increase strength of neurological disease / imaging development alongside **Poole, Stevens** and **Fraser**. Ten new professorial positions were appointed: 5 new and five internally promoted, via identified requirement, and new associate professors are similarly blended between new and promoted staff.

Early Career Researchers: All ECRs are provided with mentoring to develop sustainable research plans. We created: early concept-stage peer review, protected time through research modules, grant writing surgeries, writing retreats, and substantive methods training workshops. Principals Research Fellowship scheme led to recruitment of UoA3 ECR (**Staines**), mentored by **Rae** and **Barlow** through to award of RUK funding, and further (**MRS**) award through collaboration with **Stevens**, exemplifying commitment to ECR development / collaborative working. Training and CPD budgets are available to all UoA3 research-active staff. We encourage staff on fixed term research contracts to develop academic skills and accreditation e.g. HEA membership (to date, all externally funded RA's are HEA accredited within 2 years) and our promotions framework is embedded into formal RA progress management. Category A staff who do not have an advanced degree can study part-time for MSc by Research, PhD, or PhD by published work); workload time and waiving of tuition fees is provided.

2.2 Postgraduate Research Students (PGR):
Adjustments to research degree provision have improved quality of supervision, and experience of PGR students, evidenced by sustained increases annual PhD completions (Figure 2.1) (41% increase compared to previous reporting period). In addition to data reported here, we have seen 16 MRes completions, and have 76 RPG students currently enrolled in UoA3, indicative of our research and training intensity. Where reference is made to the Postgraduate Research Experience Survey (PRES), figures are mean output score of our two UoA3 submitted schools (2019 survey).

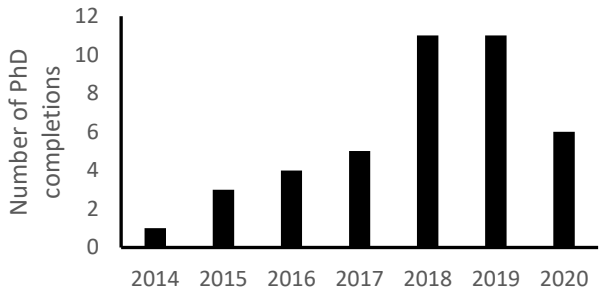

Figure 2.1. *Growth in PhD completions over reporting period*

2.2.1 ***Postgraduate research structure*** Embedded in each school submitted here is a senior academic staff member designated Research Degrees Lead (RDL), with oversight of research degree conduct, and related activities e.g. university paid work for research degree students,

operating in concordance with Research Directors. UoA3 RDL's are supported by school-based committees (sRDC, comprised of academic staff and Research Director), who assess all progress reports, triaging major decisions (e.g. examination team composition) prior to scrutiny by the institutional research degrees committee (URDC). Research degree student representatives contribute to sRDC, ensuring the PGR community voice, and use of PGR student budget. Importantly, students can influence research degree practice at university policy making level. We now have, as members of uRDC (chaired by **Rae** during this reporting period), student representatives, who bring reports from the student body to the committee, and reciprocally disseminate information to research degree students.

2.2.2 ***Supervision arrangements***: We operate a compulsory course to train supervisors and ensure compliance with our Research Degrees Framework, aligned to Chapter B11, QAA. In UoA3 schools submitted here, a supervisor–student agreement exists to ensure expectations are correctly managed. This is demonstrably effective: PRES outcome of 95% and 88% student satisfaction regarding understanding personal and supervisory responsibilities respectively, and 97% PRES satisfaction rate for supervisor skills. Independent panel chairs (staff members outside of supervisory teams) support students throughout their studies (PRES satisfaction 94%); this system being featured by invited presentation (**Rae**) via QAA meeting during reporting period.

2.2.3 ***Recruitment:*** PGR student recruitment is via online platforms (e.g. FindAPhD.com), with a bi-annual intake to expedite our induction process, and create cohort-identity to foster collaborative researcher culture (flexibility to recruitment times is on a case by case basis). All PhD candidates are interviewed by panels consisting of proposed director of studies, sDRL and relevant academic staff, (interview panels have undergone equality, diversity, inclusivity and unconscious bias training).

2.2.4. ***Research student skills development***: We recognise academic skill set utility during early career, and equip students to self-identify professional development needs (PRES outcome of 92% satisfaction regarding students' ability to self-manage professional development). In addition to alignment with Vitae career development guidance, we developed (in UoA3, now across institution) formal provision of HE teaching training for research students, with option of studying towards Associate Fellowship of the HEA. Students who perform university work are recompensed at the appropriate pay grade. UoA3 students are provided budget to organise a conference to showcase their research and manage the PGR student society (training events, writing workshops, hosting visiting speakers, weekly PGR seminars).

PGR students have access to the Research Postgraduate Fund for research related expenses, all are provided a desk / PC in shared offices (PRES satisfaction regarding working space is 85%), and (school funded) opportunity to attend an international conference during their studies. **Hutton** developed a unique training programme - Clinical Academic Research Leader (CARL) including workshops covering methods, ethics, writing, and statistics, utilising in-house expertise. This drew on a "knowledge, experience and competency framework" designed by **Williams** to highlight key characteristics of a highly competent and employable health services researcher.

2.25 Research Student Equality and Diversity: See section 2.6 below for our practices which apply to staff, but also, where applicable, our research students. We considered the impact of prolonged illness, and maternity/paternity of PGR student's ability to complete their studies in terms of financial viability where a university stipend would normally co-suspend with suspension of study. We have therefore applied full maternity/paternity and sickness payments as described

by RUK PhD studentships to in-house studentships. We ensure equal opportunity, for example in terms of conference attendance, where if a care-giver was required to attend with a student this will be financially supported within our schools.

2.6 Equality and Diversity

The 'human shape' of our REF2021 submission:

Category A profile: Our current submission of 49 academic staff (those deemed as having significant research responsibility) represents 38% of total Category A staff.

Age profile: Of staff submitted, 4% were age 25-35 (29% of this age range of total Cat A staff); 41% aged 35-45 (61% of this age range of total Cat A staff); 37% were age 45-55 (40% of this age range of total Cat A staff); and 18% of the submission were 55-65 years of age (21% of this age range of total Cat A staff).

ECR profile: ECR formed 16% of submission (57% of all category A staff at this stage of career were deemed to have significant responsibility for research).

Staff grade profile: In terms of the staff grades of our submission, 53% were Grade 6 (as compared to 68% of Cat A total staff); 18% were Grade 7 (as compared to 13% of total Cat A staff), and 20% of submission were Grades 8-10 (as compared to 8% of total Cat A staff). The remainder (8%) of the submission were categorised 'off-scale'.

Disability profile: 16% of our submission identified as disabled, as compared to 11% of total Cat A staff.

Gender profile: 67% of those submitted identified as female, 33% were male. This compares with a gender profile of 72%/28% female / male regarding total Cat A staff.

Ethnic profile: 98% of those staff submitted self-identified as white (as compared to 93% of cat A staff overall), the remainder were unknown (2% of submission as compared to 5% of Cat A staff overall), or 'other' (of which 2% of Cat A staff are classified as – none were submitted).

Maternity leave profile: 6% of the submitted staff has a maternity period over the reporting period, as compared to 7% of Cat A staff overall.

Contractual status profile: All submitted staff in UoA3 held permanent contracts. Of the 2% of Cat A staff on fixed term contracts, none were submitted to UoA3.

Both Schools are working towards Athena Swan Bronze award status. A Category A staff member is designated Academic lead for Equality, Diversity and Inclusion (EDI), a standing item upon all management meetings, integral to decision making regarding policy change. EDI lead is a member of EDIS (Equality & Diversity in Science & Health (https://edisgroup.org) ensuring best practice. Staff undertake compulsory training in leadership, equality and diversity, ensuring line management support is underpinned by such good practice. All interview panels are where possible, balanced in terms of gender ratio. We are, in UoA3, active members of our institutions Carers Network, of which **Hutchison** is sponsor.

Internal surveys shape practice, for example: employee engagement survey, culture survey, and during this reporting period UoA3 schools undertook two gender equality surveys to support

ongoing Athena Swan related development. We ensure equal opportunity in terms of conference attendance, where if a care-giver is required to attend with a member of staff this is financially supported. Where there has been staff absence due to illness, or maternity leave, we operate a flexible phased return to work including protected time for research. In other aspects we follow institutional policies, e.g. support for staff with protected characteristics, and supporting wellbeing. We ensure requests for arrangements for flexible or remote working to support staff with these requirements, including caring responsibilities, are assessed under our institutional policy.

3. Income, infrastructure and facilities

3.1 Summary

UoA3 schools operate with dedicated research managers, covering pre-award (supporting grant writing and costing) and post award (contracting and monitoring). The previous REF reporting period saw us move to newly built laboratories at our Sighthill Campus; this was further developed, including major capital spend; such investment now being realised by continued research income growth.

3.2 Income: Figure 1.3 demonstrates sustained growth in research income (79% increase compared to REF2014). Figure 3.1 data is indicative of maturing research income profile through increased larger awards (from, e.g. MRC, CSO, NIHR). We have maintained securing of smaller grants in our drive to support our ECR's to secure important first awards.

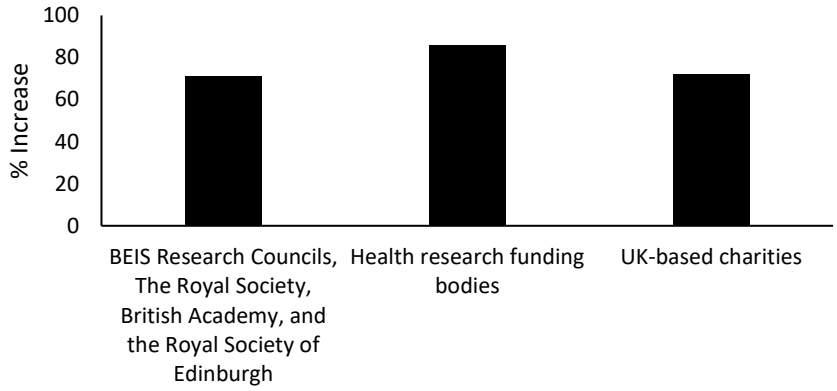

Figure 3.1 Percentage increases in income from major funding bodies during REF2021 as compared to REF2014

3.3 Income generation strategy

Drivers*:*

1. *Recognition of desired impact of research (1.4/1.5 above)*

2*. Identification of excellence in methodology and partners (2.1.1 above)*

3*. Filling unmet staffing requirements (2 above)*

4*. Ensuring financial, time and infrastructure requirements are met (2.1 above)*

***5**. Ensuring stakeholder involvement from inception to outcome delivery (2.1.2/1.9 above).*

We make initial investments to develop research areas on an internally (school budget) funded, competitive basis. This underpins pump-priming activity and forms part of our ECR mentoring scheme. We further foster research through indirect costs generated by FEC bearing awards being paid directly to UoA3 schools, which is reinvested in research e.g. PhD stipends, travel and support monies for conferences, network development. This reinvestment permits agility in responding to research priorities from staff and funding bodies.

For example, the potential of data mining/'big data' analysis became apparent and relevant to our research goals; where we can utilise existing large scale data sets we have done so (**Atherton and Dougall**), and where the data does not yet exist, we have teamed with government departments (The Ministry of Defence, the National Records of Scotland), stakeholders (NHS Education Scotland, Nursing and Midwifery Council) and other institutions to generate it securing necessary external funding to deliver, but also internally funding smaller projects to deliver data required for future larger external applications (e.g. **Rae**'s collaboration with the University of Aberdeen). We **do not** operate on a cost recovery basis in terms of equipment use (maintenance/replacement is from school funds), in order to facilitate activity of individuals with no current funding, supporting their research towards the goal of securing external support.

3.4 Research Infrastructure

Investments made during reporting period were targeted to underpin research sustainability e.g., our confocal imaging suite (£183K) was central to five published outputs in 2019 alone, and formed the basis of awards e.g. to **Stevens** and **Barlow**. **Wright** received CSO funding, supported by investment (~£100K) in flow-cytometry equipment. We invested in qPCR equipment (~£25K), doubling analysis capacity. Strategic relationships with NHS organisations, such as the Scottish National Blood Transfusion Service, facilitate sample access that supports clinically translational laboratory research. We employ two UoA3 full time, permanent research technicians, who support ECRs, contribute to industry-led research activity (**Innovate UK**), train PGR students in equipment use, maintain equipment and manage infrastructure upgrades aligned to research requirements. Technicians also run a seminar programme, where all researchers and postgraduate students deliver their research, reinforcing our 'by and for researchers' approach to research culture development.

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

4.1 Effectiveness of support for research collaborations

Internal research collaboration is encouraged through intra- and inter-school seminar series, with research groupings broad enough to encompass diverse research with similar overarching goals, and inter-group discussions, facilitated by school-based research meetings and annual conference. We support external network development via financial contribution to ignite relationship building e.g. support for travel to external institutions (e.g. **Poole** and **Fraser's** collaboration with University of Leon, **Barlow** to Indonesia and USA), or, on a competitive basis, small research awards, ECR investment awards. Staff in UoA 3 have been supported through competitive allocation of SFC GCRF institutional pump priming awards.

To retain focus of funded development opportunities, researchers submit reports upon

completion of spend. Such initial priming investment resulted in **Rae**'s ongoing collaborative work with the Universities of Edinburgh and Aberdeen, supporting **MRC** research grant award, and 12 published outputs to date, >10 conference papers, internal ECR award and external ECR applications. Similarly, **Barlow**'s collaboration with CDC (USA) generated externally (MRC) funded work with international partners. Analysis of a random sampling of our output portfolio shows 83% of outputs are collaborative (at least one non-ENU author), 46% have at least one international (non-UK based) author, and 71% are interdisciplinary. Research collaboration beyond academia drove policy development (e.g. **Hutchison**'s work), and new disease identification (e.g. **Karatzias**' work). Examples are detailed herein and in impact case studies.

4.2 Impact Realisation and Interaction with research users and beneficiaries: contribution to economy and society

See Section 1.9. We encourage staff to retain / establish clinical contacts, through joint clinical academic appointments (e.g. **Dancer**, **McInnes**: NHS Lanarkshire, Lothian) and provide funding to support clinical academic fellowships (e.g. **Ramsay**: Scottish Government re-engagement fellowship). **Karatzias** contributes to Rivers Centre for Trauma care. **Hollins-Martin** is seconded (0.8FTE) to NHS Education Scotland. **Coull** retains 0.2FTE position with NHS Lothian working with injecting drug users. **Williams** chaired the national clinical academic careers initiative at NMAHP RU, initiated the national awards ceremony for NMAHP, and developed and administered a novel and successful national fellowship scheme (**Government** funded) designed to re-engage experienced nurse researchers back into research substantive posts.

Hutton is an invited member of a group advising the Scottish Government's Review of Mental Health Law in Scotland on the assessment and support of capacity and decision-making. **Barlow** chairs the **CSO** clinical academic funding panel, and works with SME partners on antiviral approaches to Covid-19 (**Innovate UK** funded). We provide an academic home for the Scottish Critical Intensive Care Research groups (SCCIRL), which includes NHS staff and is coordinated by **Kydonaki**. The Clinical Academic (Research) Careers Scheme (CARC) for Nurses, Midwives and Allied Health Professionals in NHS Lothian was established by the NHS and three Universities (Edinburgh Napier, University of Edinburgh and Queen Margaret University), providing NHS practitioners opportunities to undertake a PhD or develop postdoctoral skills.

Rae worked with commercial stakeholders including GlaxoSmithKline (collaboration with University of Edinburgh), and the Royal Zoological Society (generating two published articles to date), and was an invited expert reviewer of a DEFRA report (USA collaboration). **Wheelhouse** delivered **SFC** sponsored development of a new hand sanitiser system, nominated for 'innovation of the year' at the Scottish Knowledge Exchange Awards (2019). **Campbell** engages extensively with the third sector e.g. Macmillan and Scottish Government regarding cancer rehabilitation policy. She is director of CanRehab (www.canrehab.co.uk), an international provider of training on exercise-based cancer rehabilitation for health professionals and fitness specialists, and works with UK regulatory professional bodies for fitness instructors – CIMPSPA and REPS; ACPOPC – physiotherapists working in oncology, and Royal College of Anaesthetists.

Dougall sits on the National Confidential Inquiry into Suicide and Safety in Mental Health, and was invited to present to the UK Parliament (House of Commons All Party Parliamentary Group, *'Can patient data revolutionise healthcare*?'). **Hollins-Martin** developed the Birth-Satisfaction-Scale-Revised (lead international clinical measure of satisfaction regarding care provided during

childbirth, recommended by the International Consortium for Health Outcome Measures (ICHOM): www.ichom.org/medical-conditions/pregnancy-and-childbirth/). **Hollins-Martin** work has been adopted in > 30 countries across Europe, North and South America, Asia and Middle East, and cited with positive impact in 18 clinical reports.

Rowat works extensively with third sector organisations, including Chest Heart and Stroke Scotland and the Stroke Association to involve stroke survivors and carers in research planning and dissemination. **Dancer** collaborates with industry examining applications of electrolysed water in healthcare settings. **Wright** receives funding to develop immune assays to speed up drug discovery and development in collaboration with industry (Elasmogen). **Hutchison** is a UK Government Scientific Advisor and member of Defra's Hazardous Substances Advisory Committee (HSAC); Committee on Toxicity of Chemicals in Food, Consumer Products and the Environment (COT) providing advice to the Food Standards Agency and Department of Health, contributing to Joint Research Centres of the European Commission.

4.3 Contributions to sustainability of research base

During this reporting period**:**

Campbell worked with a Macmillan task force to integrate graduates with exercise physiology into the NHS workforce.

Dawkes delivered CPD spanning her discipline base in Singapore, Australia, Hong Kong and UK; contributed to Cardiac rehabilitation in Covid-19 isolation (multi-UK university initiative), and is editorial board member and reviewer for several UK discipline-based journals. She is an Honorary Research Consultant, Cardiac Rehabilitation, NHS Lothian.

Neubeck is editorial board member of the European Journal of Cardiovascular Nursing, and consultant editor of the British Journal of Cardiovascular Nursing. She contributed by invitation to the national Atrial Fibrillation inquiry, is an invited member of BHF Scotland strategic planning group for policy, contributes to the WHF roadmap on AF and is a member of the medical advisory group for the Atrial Fibrillation Association (a patient organisation).

Barlow serves as Chair of the British Society for Immunology (BSI) Inflammation Affinity Group (2018-), is a member of Executive Committee, Scottish Universities Life Science Alliance (SULSA, www.sulsa.ac.uk/), was an invited Member of the RSB Working Group preparing responses to Government Consultation on the Clean Air Strategy for the UK, and also served as Secretary of the BSI Inflammation Affinity Group. He has reviewed for 33 journals in the reporting period. He chairs the **CSO** Clinical Academic Fellowship funding panel and reviews for the CSO, MRC, EPSRC, BBSRC, the Royal Society, and serves on panels for The Carnegie Trust for the Universities of Scotland, UKIERI, the Austrian FWF as well as La Caixa internationally.

Rae reviews ECR research applications for SULSA, has presented and chaired numerous conference sessions during the reporting period, and served as a council member on the Society for Reproduction and Fertility (SRF, https://srf-reproduction.org/) for four years; **Wheelhouse** now serves in the same capacity, indicative of our intention to sustain our external contributions.

Kyle contributes heavily in terms of national and international funding body peer review, ranging from CRUK to Cancer Society New Zealand.

Malone organised a series of Scottish Toxicology Interest group meetings and has championed both teaching of STEM, and development of those entering STEM careers with a series of 8 national keynote (invited) addresses.

Frost's international reach is evident from her invited inclusion upon FWO Expert Panel Research Foundation Flanders, Belgium.

Vass has delivered keynote addresses on developing science-based careers for ECRs in STEM throughout local HE institutions.

Wright chairs an advisory group to the Heads of University Bioscience and the Royal Society of Biology, and organised 'New to HE Bioscience Teaching' (hosted at University of Reading 2018) to help development of an RSB/HUBS funded workshop (UCL 2020) on research programme development, both towards enhancing ECR academic development.

Williams chaired the £1.5m national clinical academic careers initiative at NMAHP RU, initiated the national awards ceremony for NMAHP, and developed and administered a novel, highly successful national fellowship scheme (Government funded) designed to re-engage experienced nurse researchers back into sustainable and substantive research posts. This was achieved for all fellows. He has chaired the last 2 review panels for the Health Research Board for Ireland's national PhD scheme; and been a member of 5 researcher development funding panels for the Research Council of Norway and the Health Research Board for Ireland.

4.4 Engagement with public

Rae opened sessions at an international conference (Fertility 2016) delivered to local schools, hosted by the UK Fertility Societies joint annual conference, and delivered a session to the MGA Academy of Performing Arts on the realities of being a research scientist.

Barlow acted as Invited Judge, Youth and Philanthropy Initiative (YPI) Scotland Finals and was invited keynote speaker at Craigmount High School Student Awards, Edinburgh. He made >30 research expertise-based contributions to public engagement and dissemination of scientific findings over this reporting period, (e.g. Metro, Telegraph, The Daily Mail, Newsweek, Scientific American, The Scientist, IFLScience, Atlanta Journal and Constitution, The Scotsman, BBC News, The New York Post, Sky News, LBC radio). He delivered The Royal Scottish Society of Arts (RSSA) Invited Public Lecture based on his research.

Rowat contributed an article to the online Atlas of Science, addressing the top ten priorities relating to stroke nursing (https://atlasofscience.org/top-ten-research-priorities-relating-to-stroke-nursing/).

Dougall's suicide research featured in the national press (The Independent), which underpinned numerous online and radio based follow up reports (http://medicalxpress.co-suicide-hospitals.html).

Wheelhouse published an article in the woman's lifestyle magazine 'Bustle' concerned with how HPV infection alters the vaginal microbiome.

Rings eMERGe meta-ethnography reporting guidance is one of three on YouTube produced by the emerge team.

Fraser, in her role as a STEM ambassador, has worked with the Midlothian Science festival, Edinburgh Science festival, delivering science workshops to local schools.

Coull delivered an internally funded public engagement project to disseminate resources developed from her work on injecting drug abuse and tissue damage.

Kyle utilised the Edinburgh Fringe, International Book and Science Festivals 'Cabaret of Dangerous Ideas' platform to directly engage with public audiences as regards his research programme focussing upon the individual and societal costs of obesity. His work was the subject of 12 national newspaper articles and 5 national television and radio interviews.

Malone has delivered sessions focused upon careers in science, women in STEM, at local public engagement events, and work on host immunity with children was selected by the Midlothian Science festival for inclusion in their suite of activities.

Vass has used the 'Soapbox Science' platform to deliver 'on street' addresses explaining her work on tumorigenesis to a lay audience.

Wright's articles regarding the life of research scientists have been published in 'The Conversation' and IFLScience, and he contributes a regular column in The Biologist (the magazine of the Royal Society of Biology) about issues facing ECRs.

Skelton, through public engagement activities (Cabaret of Dangerous Ideas, Edinburgh Fringe Festival) has established a new partnership with the Miscarriage of Justice Organisation (Glasgow), leading to collaborative Leverhulme funding, exemplary of how public engagement can be used to enhance our research activity in addition to dissemination beyond academia.

Hutchison joined (by invite) a Defra/ScienceWise/Industry Steering Group, to develop a public dialogue for nanotechnologies.

4.5 Recognition by research base

Neubeck : Fellow of the European Society of Cardiology and National Health and Medical Research Council of Australia (Early Career Fellowship); selected to participate WHF Salim Yusuf emerging leader programme in 2018. Awarded the Prevention and Clinical Cardiology Prize, Cardiac Society of Australia and New Zealand, National Best General Practice Research Article in Australian Family Physician (AFP) Award, and honorary appointments (Honorary Research Consultant, NHS Lothian; Adjunct Professor, Flinders University; Honorary Professor, University of Sydney; Honorary Senior Research Fellow, The George Institute for Global Health). Medical Advisory Board Member, Hearts4Heart; President elect, Treasurer and programme committee member of European Society of Cardiology (ESC) Association of Cardiovascular Nursing and Allied Professional, past President, Australian Cardiovascular Health and Rehabilitation Association, Postdoctoral Representative Research and Research Training Committee, Sydney Nursing School, University of Sydney, Senior Medical Advisor (Cardiac

Rehabilitation), Cardiomyopathy Australia, Vice President, Australian Cardiovascular Health and Rehabilitation Association, Board member of the Cardiovascular Nursing Council of the Cardiac Society of Australia and New Zealand, all over this reporting period.

Dawkes : Nominated Role Model for the Leadership Foundation for Higher Education, Honorary Research Consultant, Cardiac Rehabilitation, NHS Lothian; member of: International Council for Cardiovascular Prevention and Rehabilitation Cardiac Rehabilitation data dictionary panel; Council of Deans of Health UK Global Advisory Group, International Council for Cardiovascular Prevention and Rehabilitation, National Audit for Cardiac Rehabilitation Steering Group, Scottish Government National Strategic Group for Cardiac Rehabilitation, Astra Zeneca Medical Advisory Group, Quality of Care Committee, European Society of Cardiology, Co-chairperson Future Nurse Group, Lothian Clinical Academic Research Careers Management Group, Secretary) of Cardiac Rehabilitation Interest Group Scotland, NHS Quality Improvement Scotland Advisory Board, Deputy Convener of the Education Committee of the Association for Cardiovascular Nurses and Allied Professions, European Society of Cardiology; President of the British Association for Cardiovascular Prevention and Rehabilitation. She was awarded presentation prizes by Singapore Prevention and Cardiac Rehabilitation and Australian Cardiovascular Health and Rehabilitation Association and is Scottish lead for the Global cardiac rehabilitation survey.

Kydonaki received the 2017 NHS Lothian, Nursing & Midwifery & Allied Health Professionals Unit (NMAHP) impact award for “Supporting survivorship after critical illness: service development as a result of interdisciplinary collaboration” and the 2015 Scottish Intensive Care Society Nursing & AHPs Award. She was keynote speaker at the European Federation of Critical Care Nurses 2015 meeting.

Wheelhouse was awarded affiliate researcher status at the University of Glasgow. Council member of the Society for Reproduction and Fertility; reviewer for the MRC and BBSRC funding streams, delivered numerous international invited presentations on subjects including bovine reproductive failure and extragenital Chlamydia testing in young women; Co-organised a workshop on ‘Livestock infection and reproductive disease in women 2019’ in Kumasi, Ghana. He serves on editorial boards of three international journals and is International External advisor for the Instituto Nacional de Tecnologia Agropecuaria (INTA) in Argentina, and Expert of Science and Technology Evaluation- National Centre of Science and Technology Evaluation, Kazakhstan.

Rae was invited to speak at international meetings (Fertility 2017; World Congress of Reproductive Biology 2020, Beijing (rescheduled 2021); ICPMS 2020); chaired discipline specific meeting sessions in the Universities of Edinburgh and Cambridge for learned scientific societies. He was awarded honorary fellowship of the University of Edinburgh Deanery of Medical and Veterinary Sciences and is a journal editorial board member (Molecular and Cellular Endocrinology, Elsevier).

Campbell chairs the cancer interest group of the American College of Sports Medicine, and was awarded an MBE for leadership and contributions to cancer rehabilitation services. She is Macmillan Cancer Care’s Physical Activity Key Advisor, developed the MoveMore programmes in Scotland, and contributes to policy, patient information and healthcare guidance, both in the UK and internationally. She delivered invited presentations at conferences including Breast Cancer Conference UK; Irish Cancer Society; and ASCO.

Hutton has spoken at multiple international research meetings, notably the 36th International Congress of Law and Mental Health, Rome and the **Wellcome Trust** funded Mental Health & Justice Neuroscience Symposium at King's College London and is an Expert Advisor to the National Institute for Health & Care Excellence (NICE) Centre for Guidelines.
Hollins-Martin was the midwifery editor of the journal 'Nurse Education in practice', and gave invited keynote address at the joint research network at the National Maternity Hospital (NMH) and University College Dublin (UCD).

Rowat chaired the 2019 Stroke Nurse Training Programme, European Stroke Organisation Conference in Milan.

Dougall was Programme Committee Chair for Collaborative Leadership in Mental Health Distress International Workshops, International Law Enforcement & Public Health Conference (2019), and was awarded both Chartered Scientist and Chartered Statistician status by the Royal Statistical Society during this reporting period. She has delivered numerous international keynote addresses, notably at the International Law Enforcement & Public Health Conference, Toronto, 2018. **Dougall** sits on numerous expert national and international review panels, concerned with suicide prevention, policing and public health, and third sector advisory groups (e.g. providing statistical data interpretation advice to Samaritans Scotland.

Ring was an invited expert advisor on evidence synthesis in studies investigating experiences of young people who self-harm (Wales), understanding effective interventions in substance abuse amongst homeless people (Scotland) and a synthesis of treatment adherence in paediatrics (England). She delivered a workshop on behalf of the Canadian Institute of Qualitative Methodology (2019) and a public lecture at the University of Malta (2018) on meta-ethnography.
Stevens sits upon the editorial board of 'Advances in Biology', and was appointed as an expert reviewer for the Royal College of Surgeons (RCSI), Ireland, and for 'Fondation Innovations en Infectiologie' (Finovi), France.

Ramsay served upon the James Lind Alliance/Intensive Care Society Research Priority Setting Group and in 2019, was twice recognised by awards for her web-based support tool (criticalcarerecovery.com) for post-discharge ICU patients (Digital public sector award and Scottish Digital Impact Award).

Barlow served as an editorial board member of the Journal of Medical Microbiology (2017-2020) and was Organising Committee Member and Co-Chair of a joint MRC Centre for Inflammation Research and British Society for Immunology Conference (2019), and was appointed as British Society for Immunology Media Spokesperson (2014-present), and was awarded a British Science Association Media Fellowship in 2018. He has acted as an external subject assessor for PhD programmes at the University of Edinburgh, L'Oreal Women in Science initiative and for the FWF Austrian Science Foundation.

Snowden is visiting professor at KU Leuven in (2018-) and developed a number of studies as PI from that role, which are now translated into both Flemish and Dutch, and used in care homes to measure impact of chaplains. He is lead researcher for the European Research Institute for Chaplains in Healthcare (ERICH), lead for education and research in the Joint Research Council of the Association of Professional Chaplains, and was contracted by UK Board of Healthcare Chaplains to update competences and standards for professional practice. **Snowden** holds two editorial board memberships, Journal of Prescribing Practice and Markallen Books, and has

delivered 7 keynote conference addresses during the reporting period.

Coulls work was recognised in 2016 when she was awarded 'Best free paper' at the Tissue Viability Society Conference for work on leg ulceration in young people who inject drugs, and was subsequently twice invited to judge for Nursing Times Awards 'Innovation in Chronic Wound Management' category. She is an editorial Board member of the British Journal of Nursing, and has delivered keynote address at national meetings concerned with tissue viability.

Kyle is an Expert Academic Advisor on nursing workforce, advising Chief Nursing Officer Directorate, Scottish Government, NHS Education for Scotland (NES), Health Education England and Public Health Wales, and is Assistant Editor, Nurse Education Today. He has delivered 4 keynote invited presentations at national conferences during this reporting period.

Frost's research was recognised by the Physiotherapy Evidence Database (PEDro) award for being the author of one of the 15 most influential RCTs in physiotherapy practice, and she has delivered 4 invited keynote presentations at national and international meetings on her work.

Dancer, in the current reporting period, has been awarded ISAC Fellowship and ESCMID Fellowship for professional excellence and outstanding service rendered to the profession, and accepted an invitation to join the NICE antimicrobial prescribing committee, and has delivered >10 invited international keynote lectures.

Hutchison is a UK Government Scientific Advisor with membership of Defra's Hazardous Substances Advisory Committee (HSAC) and contributed to 'Chemicals advisers weigh in on DEFRA's 25-year plan' (The Ends Report) and was invited to develop an HSAC opinion paper responding to a policy paper submitted by European Joint Research Centre, RIVM in Holland and The European Chemicals Agency. He led discussions focusing on nano safety and 'safety by design' at the NoWNano Nanoscience conference 2014, in addition to representing Defra at this meeting on regulation and policy, and is a founding member of the UK nano group, bringing together policy makers, regulators and academics working in nanomaterial safety.

Williams has recognised expertise in researcher development, and was invited to lead Scotland's national initiative for development of NMAHP research, and act as panel chair for review of Ireland's national PhD programme (SPHERE). He has also been appointed to new investigator funding panels, and research leadership award schemes in Norway and Ireland.

Karatzias is an internationally recognised expert in psychological trauma, and led the development of training guidelines for undergraduate and postgraduate psychologists as part of the activities of the BPS Crisis, Disaster and Trauma (CDT). He convened the British Psychological Society Scotland Working Party for Adult Survivors for Childhood Sexual Abuse (BPSSS) and is a member of the BPS CDT Section Committee and the UK Psychological Trauma Society.

Collectively, this document illustrates a vibrant, supported, growing research environment and culture, which we will build upon into the next reporting period to ensure our overarching aim of improving health and wellbeing in society continues to be achieved.