

<b>Institution: University of Sunderland</b>
<b>Unit of Assessment: 3 – Allied Health Professions, Dentistry, Nursing and Pharmacy</b>
<p><b>1. Unit context and structure, research and impact strategy</b></p> <p>UoA3 is situated within the Faculty of Health Sciences and Wellbeing, which launched in 2016 and brings together academic staff and research capability in the Schools of Pharmacy and Pharmaceutical Sciences, Nursing and Health Sciences, and Psychology. In 2019 the School of Medicine was established and is now a key component of the Faculty. Development of a sustainable research environment in contemporary health sciences is evidenced in this REF period through continued strategic investment in infrastructure, facilities and staff, and research impact is demonstrated through a focus on high quality <b>applied research, partnership working and commercial activity</b>. The submission has expanded to return 30 staff (including 17 new appointments) compared to 25 staff in REF2014. Significant investment in buildings and facilities at the University's city campus (£18.2M since 2014), has brought together researchers in basic and applied science, allied health professions, nursing, pharmacy and psychology with access to excellent laboratory and allied healthcare research facilities. A key driver of our research strategy is to foster research that aims to 'make a real difference', with applied research and practice delivering contributions to the knowledge base that informs our knowledge exchange and impact agendas. We collaborate with local, national and international partners in industry, academia, and health services, ensuring that our outputs and products are both locally relevant and have international reach, and that they address the translational challenges of getting science into products and evidence into practice.</p> <p>To maximise the quality and impact of our research, and in alignment with the University Research and Innovation Strategy, our research objectives aim to:</p> <ul style="list-style-type: none"> <li>- Enhance health and wellbeing through development of treatments and interventions, and improved quality, equity and delivery of healthcare services</li> <li>- Work collaboratively with scientific, public sector, healthcare, charitable and industry networks and organisations to address regional, national and international health priorities</li> <li>- Conduct national and international multidisciplinary research that maximises opportunities to produce high-quality research outputs</li> <li>- Integrate the research specialisms and professional expertise of academic staff into the taught curriculum</li> <li>- Continue to develop a research culture and infrastructure that is supportive and sustainable</li> </ul> <p>Our strong collaborative and multidisciplinary research profile spans a range of disciplines including biomedical and pharmaceutical sciences, public health, primary care, pharmacy practice, health policy, health and social care and psychological health. Building on the areas of research strength identified in REF2014 (Mental Health and Health Behaviours, and Pharmaceutical and Biological Sciences), we have sought to expand key specialisms and to establish new core areas of research, for example, drug discovery and pharmaceutical sciences, health inequalities, health services research, and psychology. Our research aims to address issues of local, national and international importance, and our well-established areas of research excellence are recognised by funding bodies, with successful awards in excess of £6.5M over the assessment period. Demonstrable impact is evidenced from our research conducted in</p>

partnership with key stakeholders, including industry, health practitioners, health organisations and service users. Our work with industry addressing drug stability issues during the formulation process has led to increased industrial manufacturing efficiency (see impact case study, **Dodou**). In response to a regional health priority, our work on the interprofessional management of oral health has led to a change in policy and pharmacy practice (see impact case study, **Sturrock**). In a further example of work which started by focussing on a regional health issue, our work on the lived experience of bariatric patients after surgery has changed clinical practice and increased patient wellbeing worldwide (see impact case study, **Graham**).

Our strategy of investment in academic staff is foundational: building research capacity; providing research funding; supporting networking (e.g. Conference attendance); reducing teaching and associated activity; and mentoring Early Career Researchers (ECRs). Our success in developing future research leaders is evidenced by our impact case studies which are all led by staff who completed their PhD at the University. Our staffing strategy was commended in REF2014 and we have continued to attract high quality researchers during the REF census period, evidenced by recent appointments (e.g. **Ahmed** and **Petrie**) which has helped secure our critical mass of established researchers. We anticipate that staff recruited to deliver new provision, but who are not currently eligible for REF, will develop their research activity over the forthcoming REF period. The breadth and depth of our research (evidenced by >1000 research outputs over the REF census period) demonstrates the sustainability of the University's health research portfolio.

We are able to attract high quality PhD students from outside the University and support them with external funding, evidenced through collaboration with industry and participation in regional partnerships that increase engagement of health professionals with research and/or provide access to funding; for example, the HEE-funded GP Integrated Training Posts (GP School, North East and North Cumbria) and Fuse (a UKCRC Centre of Excellence for Translational Research in Public Health). We are developing strategic relationships with regional NHS Trusts which are essential to our future research strategy; a priority area for future growth is evidenced by establishment of the Helen McArdle Nursing and Care Research Institute (2019) to increase research capacity and capability among Nurses, Midwives and Allied Health Professionals (NMAHPs). Capacity building and alignment of research with national priorities is further demonstrated by our partnership in the Applied Research Collaboration North East and North Cumbria (ARC NENC), launched in 2019. As a partner the University benefits from a joint-funded ARC Research Fellow (2020-24), based in the Helen McArdle Nursing and Care Research Institute and two full-time funded PhD students in the School of Psychology and the School of Medicine (2021-24). The three posts are aligned to the Multi-Morbidity, Ageing and Frailty Theme, although the remit of the ARC Research Fellow encourages collaborative working across the other six ARC themes, to increase opportunities for the University to be involved in other areas of ARC research.

Our innovative research developing new medicines for the treatment of rare inherited metabolic diseases (**Anderson, Newell**) is an example of how our work complements the strategic priorities of the North East Health, Life Sciences and Medicines Manufacturing Strategy. We will continue to support laboratory-based research and strengthen our focus on product development through collaboration with the life sciences and pharmaceutical industry, while our newly established Medical School will promote further integration with clinical research and drive future development of a clinical academic research portfolio.

Our activities and achievements in relation to the objectives and in accordance with the research themes, are summarised below.

### **Drug discovery and pharmaceutical sciences**

Research in this area aims to translate fundamental science to impactful patient benefit and provides a platform to develop and encourage internal and external collaboration in molecular and cellular biology, analytical and medicinal chemistry, and pharmaceuticals, for the diagnosis and therapy of human diseases. By positioning our research towards the translation of basic scientific findings into novel biomarkers or pharmaceutical interventions, we have attracted funding from charities (Cystinosis Foundation UK, Northern Counties Kidney Research Fund, Cambridge Cancer Research Fund), the MRC, Innovate UK and industry partners (bioMérieux, UCB Pharma). Working in collaboration with both national and international universities as well as industry, research undertaken within this core area is focussed into two sub-themes:

#### 1) Molecular medicine and drug discovery

Research focusses on understanding pathological processes underlying disease and the biological rationale for biomarker and target selection, across a spectrum of metabolic disease, cancer, autoimmune disease and infection (**Ahmed, Anderson, Armstrong, Barrow, Bingle, Darby, Hill, O'Boyle, Petrie**). Further work on translating basic research findings includes target validation studies and the design and characterisation of small molecule inhibitors or prodrugs (**Anderson, Myers, Nathubhai, Newell**), as well as the development of approaches to deliver stratified and personalised medicines (**Armstrong, Newell, Petrie**). We have been successful in closing the gap in 'bench to bedside' communication. The bringing together of molecular and cellular biologists with medical chemistry expertise has facilitated the translation of basic laboratory findings into pre-clinical development. For example, an MRC-funded project (2017-) has supported the pre-clinical development of a new treatment for patients with the incurable genetic disease cystinosis (**Anderson, Newell**). Our experience in facilitation of knowledge exchange across disciplines has led to a long-term multidisciplinary, industry (bioMérieux)-clinical (Freeman Hospital, Newcastle upon Tyne) collaboration building on a REF2014 impact case study, focused on the development of diagnostic tools to detect pathogenic bacteria (**Anderson, Gray**). Furthermore, our strategy to develop the commercial potential of our research has resulted in a Northern Accelerator Connecting Capability Fund (NA-CCF) award to develop new treatments for metabolic disorders (**Myers**).

#### 2) Pharmaceutical formulation and drug delivery strategies

Research under this theme is directed towards development of technologies and approaches designed to improve pharmaceutical manufacturing processes, such as cost or ease of production (**Dodou, Elkordy**). Working with an industry partner (UCB Pharma), we have developed a novel industrial protocol to optimise drug stability during the pre-formulation stage, which will have global impact (see **Dodou's** impact case study). Further work is focussed on overcoming the challenges faced with the formulation of both small and large drug molecules into suitable, patient compliant dosage forms for patient benefit (**Elkordy**), as well as improved insulin stability and delivery (**Faheem**). We are also able to offer unique expertise to industry, evidenced by a Knowledge Transfer Partnership (2018-21) with Fontus Health Limited which aims to develop new emollient formulations for dry skin conditions (**Dodou**).

### **Health inequalities and health services research**

The University is committed to supporting the regional health improvement agenda (Strategic Plan 2016-21). Research in this area falls into two themes: health inequalities (a key issue in the North East), and health services research. Research expertise from nursing, general practice,

pharmacy, applications of psychology and public health is brought together to inform an evidence base for decision-making in policy and practice. This group has excellent links with the NHS, clinical research networks, Clinical Commissioning Groups (CCGs), patient groups and service users. Capability in research methodology (clinical trials, qualitative/quantitative research, and systematic review) as well as multidisciplinary expertise from professional practice has led to successful funding bids from a range of bodies including the Academic Health Science Network (AHSN), MRC, NIHR, and Public Health England. Professional Practitioners are included as applicants on funding bids, for example an AHSN-funded project to explore the impact of the Pharmacist Independent Prescriber in community learning disabilities services involved Nurses and Pharmacists from the Cumbria, Northumberland, Tyne and Wear NHS Foundation Trust as co-applicants (**Graham**), facilitating adoption of research outcomes into practice. Furthermore, service users are at the centre of our research, not only as research participants but also during the research process, ensuring our research is designed and carried out with the perspective of service users at every stage. An example of patient involvement in the research design phase, including ethics and development of participant information, is provided in research on oral healthcare which has led to a demonstrable impact through the improved management of oral health within general healthcare settings in the North of England (see impact case study, **Sturrock**).

Fuse is a founding member of the NIHR School for Public Health Research, with renewal of its membership in 2017 of strategic importance to public health research in the North East; **Crosland** and **Ling** are former and current Associate Directors respectively. We have conducted research into social and economic factors affecting people's health which aims to translate to changes in policy and health outcomes at a national and international level. Our extensive expertise in this area has led to the proposal of new ways to analyse complex public health data (**Ling**), and we have a critical mass of capability focused on informing public health policy on alcohol use, with research on alcohol consumption patterns, licencing policies, and evaluation of interventions to reduce alcohol-related harm (**Crosland, Mooney**). We also work with regional, European and international universities, professional networks and healthcare organisations to improve the understanding of health behaviours relating to childhood obesity and the impact of austerity measures as drivers of health inequalities (**Ling, Wilkes**).

Our health services research focuses on the views and experiences of patients and professionals, and how these impact the use of health interventions, as well as the effectiveness of new health interventions or technologies. For example, we have worked with patients to identify strategies to avoid unplanned hospital admission and evaluated health technology and digital solutions to inform clinical practice and healthcare provision (**Wilkes, Ling**). We have a strong relationship with the NIHR Clinical Research Network North East and North Cumbria and in alignment with the regional Nursing, Midwifery and Allied Health Professions (NMAHPs) Strategy (2017-20), we established the Helen McArdle Nursing and Care Research Institute in 2019. The research institute promotes a vibrant, inclusive and sustained research environment that is key to developing NMAHPs' ability to carry out research. In response to a specific regional priority and in collaboration with the Sunderland Royal Hospital, we have pioneered research investigating the social challenges of patients following bariatric surgery. Working collaboratively with patients to reach a consensus on research questions of importance and significance has embedded patients as partners in the research process, from design to dissemination, and has led to changes in pre- and post-operative care and improved patient health and wellbeing (see impact case study, **Graham**).

**Psychology**

Research in this area includes cognitive neuroscience, forensic psychology, environmental and health psychology and online behaviour. Research is often multidisciplinary; for example, integration of the study of health behaviours and environmental psychology has led to successful funding bids to Public Health England (**Wilkie**). Specialisms include working with the criminal justice system where research focusses on the ways in which the Police Force and other security organisations conduct interviews (**Farrugia**). The underpinning research has now been applied to the current COVID-19 pandemic landscape and is influencing protocols which would allow interviewing to take place online, in collaboration with Northumbria Police.

Work in the area of neuropsychology and cognitive behaviour has focused on the effects of hormones on behaviour, such as the evaluation of the neuroprotective properties of oestrogen on schizophrenic spectrum related symptoms (**Hodgetts**). Further research is focussed on decision making and social communication in psychopathologies (**Knight, Pearson**), and strategies to improve cognitive impairment (**Ennaceur**). Researchers have worked extensively on identifying how emotional states impact upon our cognitive styles; for example, investigation of the role humour and our humour style has upon our day-to-day living has led to a greater understanding of gelotophobia (**Platt**). Further research has focused on the way in which cognitive styles interact with postpartum mental and physical health; this research has informed guidelines for healthcare professionals (Sands, Stillbirth and neonatal death charity; Pregnancy Loss and the Death of a Baby, 4<sup>th</sup> Edition) (**Wilkie, Crawley**).

The University policy on research integrity follows the concordat to support research integrity in the UK and is set out in the Code of Practice for Research. All staff and students engaged in research are expected to comply with the ethical, legal and professional obligations and standards as required by statutory and regulatory authorities, and by employers, funders and other stakeholders. Staff are able to identify training and development opportunities through annual appraisal and the Individual Research Plan process, such as training on use of University research systems (Ethics, pFACT, VV Impact Tracker), creating and planning for impact, securing external funding, publication and dissemination of research, and project management, as well as allocation of a research mentor. Staff are also supported to undertake relevant external courses (e.g. research methods) and several staff have Good Clinical Practice certification. Adherence to the Code of Practice ensures research is conducted to appropriate ethical standards, with a single auditable online review and management process with embedded records storage and data security. Applications for Research Ethics are considered by the University Research Ethics Group (members include expert reviewers with a range of expertise in applied health research and working with vulnerable groups) who will either approve, request more information, or escalate to review by an NHS Research Ethics Committee. As well as informing the research design process, this procedure also aids compliance with relevant legislation, such as the Data Protection Act or Human Tissue Act.

Researchers specify a data management plan at the early stages of the research process. Where appropriate, research data relating to personal information are subject to the University Data Protection policy which complies with GDPR; all staff are required to take mandatory Cyber Security and Data Protection training. Good research practice is supported by internal peer review and dissemination of research outputs is in-line with the University's commitment to open access. All staff are required to submit their research outputs to the Sunderland Repository (SURE), including peer-reviewed research articles within 3 months of acceptance. Staff can also apply for Research Office funds to publish work in appropriate open-access journals (such as BMJ Open). Open access to data is facilitated through depositing data in public repositories (for



example, the Center for Open Science (**Williams**)). Research outputs are published in accordance with journal editorial policy, with data conforming to appropriate guidelines and reporting standards for improved transparency and reproducibility. Examples of reporting guidelines used include the Reporting Recommendations for Tumor Marker Prognostic Studies (REMARK), the Preferred Reporting Items for Systematic reviews and Meta-Analyses (PRISMA) and the Consolidated Criteria for Reporting Qualitative Research (COREQ). The RATULS clinical trial is registered with the ISRCTN registry and research reported in line with CONSORT guidelines, including publication of the study protocol (**Wilkes**).

Within the Faculty there are numerous opportunities for staff to present their research outputs as well as research ideas, under which circumstances support can be given to enable non-research productive staff (as measured in publications) to become active. An example of this is the Psychology Tree day where all colleagues within the discipline, including international and TNE staff, present their research enabling potential collaborations and support to be identified. There are also regular reading groups organised where recent publications of staff are discussed. This approach has been extended to grant writing groups in which researchers who have submitted successful external research bids lead a discussion of their bid and mentor more junior colleagues through the process.

## 2. People

### Staffing strategy and staff development

The Faculty is supported by the University's People Strategy 2016, as well as the recently retained HR Excellence in Research Award (first awarded in 2013) evidencing commitment of the University (as a member of *Vitae*) to the Concordat to Support the Career Development of Researchers. During this REF period, several strategic initiatives identified following internal and external analysis have been implemented in four areas: recruitment and selection, recognition and value, support and career development, and equality and diversity.

In accordance with the recruitment process for academic staff, the Faculty follows the University Recruitment and Selection Policy. All staff involved in recruitment and selection undergo training to ensure compliance with the policy and fairness. Periodic refresher training is mandatory. The policy requires candidates to remain anonymous in the shortlisting process. Selection panels are usually drawn from a School Management Team, but male and female representation is always required in line with University policy. The Chair role is rotated so the Chair is not always male. To support the strategic aims, a new recruitment policy supports Academic Deans to make strategic appointments where new staff demonstrate an internationally recognised research profile at entry which is complementary to our research themes. During the REF census period, the Faculty have appointed 17 research-active staff as Lecturers, Senior Lecturers, or Principal Lecturers. The present submission includes 6 early career researchers, 11 mid-career researchers, 4 Principal Lecturers and 9 Associate Professors/Professors, demonstrating a strong profile of experienced researchers alongside researchers at various stages of development.

In line with the Research and Innovation Strategy 2016-2021, all academic staff can engage with research activity as part of their agreed workload. A range of training programmes are available within the University or regionally such as 'How to be an Effective Researcher' hosted by Sunderland and 'Leading and Managing Research Excellence' run jointly with Teesside University (2011-17). Staff are able to request additional institutional support (time and/or

resources) for research and impact activities via the annual Individual Research Plan (IRP) process; applications are considered on a competitive basis by a joint Research Office and Faculty review panel to ensure resource is allocated equitably and strategically, informing annual investment of University research funds. Between 2017-2020 the IRP process has supported on average 32 staff each year with a success rate of 54% and 59% for female and male staff respectively. The IRP process also provides a framework for staff to identify development needs, undertake a research degree or request mentoring support (in addition to the annual appraisal process and mentoring scheme for new academic staff); 7 members of staff in the Faculty are registered PhD students (with further support provided by the Staff Undertaking Qualifications policy). The institutional IRP process is not the only mechanism through which research is supported. Colleagues who do not have measurable outcomes also have a Faculty-led initiative to present their case to their line managers for support to develop their own research profile. Staff are also supported to seek external research degree funding, for example, a member of staff was awarded an NIHR Doctoral Research Fellowship (2016), supervised by **Wilkes**.

In line with the staff development strategy, staff are encouraged and supported to become supervisors of Postgraduate Research (PGR) students early in their academic careers. Faculty management are instrumental in the creation of supervisory teams of at least two internal supervisors consisting of staff new to research and early career researchers alongside experienced supervisors to provide mentorship and personal development. Staff are required to take mandatory training in PGR student supervision, and to update their knowledge annually.

The researcher development offer supports career progression within research, with clearly defined roles at Associate Professorial and Professorial level. As part of the revised procedure for merit promotion, 5 staff in the submitting unit were appointed to Associate Professorial (**Carter, Dodou, Graham, Wilkie**) or Professorial (**Elkordy**) roles in 2018. The role profiles included in the merit promotion process are disseminated prior to, and discussed during, the annual appraisal meeting and targets and performance measures are agreed in line with these profiles. In this way the Faculty is clearly identifying and supporting staff in their career progression in a measured, supportive and inclusive manner.

As part of the Northern Accelerator (partnership between Durham, Newcastle, Northumbria and Sunderland universities), staff have access to training courses 'ACTION for Impact' and 'Future Founder' (4 staff from the submitting unit have attended) to develop impact from their research and build entrepreneurial capability respectively. Working with a dedicated Business Development Manager (Enterprise and Innovation, funded centrally by the University), staff can apply for pre-incorporation funding to realise the commercial potential of their work.

The Visiting Professor and Fellow scheme is employed strategically within the submitting unit. This scheme allows staff to work collaboratively with researchers; there are currently 25 Visiting Professors and 5 visiting research fellows mainly drawn from the NHS, clinical practice and the wider care sector. These staff are invaluable to the development of research culture and capacity through provision of clinical expertise on projects as well as training and supervision of PhD students. For example, the appointment of Michael Norton (Community Cardiologist and North East Ambulance Service Deputy Medical Director) has advanced the development of pre-hospital research with the North East Ambulance Service (**Wilkes**). Furthermore, **Graham** has led the appointment of a number of clinical researchers who have been instrumental in the development of the Nursing and Care Research Institute, and who are members of the External Advisory Board, co-authors on over 30 research outputs, and co-applicants/co-investigators on successful funding bids (from both the NHS and commercial funders) for studies subsequently adopted onto the NIHR portfolio (PROACT, VITAMINS, Exploring the role of the specialist

bariatric pharmacist in pre-surgical assessment). Examples include Kamal Mahawar (Consultant General and Bariatric Surgeon, Sunderland Royal Hospital), Ann Fox (Executive Director of Nursing, Quality and Safety, Sunderland Clinical Commissioning Group), Jeanette Scott-Thomas (Executive Director of Nursing, Quality and Safety, South Tyneside Clinical Commissioning Group) and Melanie Johnson (Director of Nursing, Midwifery, and Allied Health Professionals, South Tyneside and Sunderland NHS Foundation Trust). This expertise is central to the creation of a sustainable research culture within the Nursing, Midwifery and Allied Health Professions (NMAHPs) by encouraging staff to become research active and provide experienced mentors to support the successful delivery of studies and peer-reviewed publications.

### Research students

The University aims to ensure that our Postgraduate Research (PGR) students enjoy an excellent student experience. Reporting to the Postgraduate Research Student Sub-committee, PGR is managed at Faculty level by Research Student Managers (RSM; **Bingle, Ahmed, Wilkie, Petrie**) and the Faculty Postgraduate Research Degrees Sub-committee (FPRDSC; Chair, **Elkordy**). Student representation on the FPRDSC ensures students' views and concerns are raised formally, and feedback is also collated via PGR surveys and by the RSMs. The Graduate Research Support (GRS) office provides administrative support for PGR students, their supervisors and procedural requirements.

The current submission provides evidence of a successful postgraduate research environment, with 96 students currently registered on research degrees (compared to 77 at the time of submission to REF2014) and 52 doctoral awards made during the REF census period. Students are engaged on a wide range of projects from basic scientific research to applied health and social care. PhD positions are advertised via the University website or FindAPhd.com, and prospective students apply via the University Postgraduate Research website. Applications are invited for funded PhD studentships as well as the opportunity to self-fund. The admissions process ensures students are appropriately prepared for their studies and that the Faculty has sufficient resources and infrastructure to support the proposed projects. Externally funded PhD studentships have been obtained from the NIHR ARC NENC, Fuse/MRC and the Northern Counties Kidney Research Fund, as well as through industry sponsorship (bioMérieux, UCB Pharma). Graduates are successful in progression to post-doctoral research positions or senior roles in industry or healthcare organisations (e.g. University of Sydney, Kings College London, University of Cambridge, MDNA Life Sciences). The unit also has expertise of supervision of individuals working within industry and healthcare professions, with students undertaking research degrees part time and in relation to their professional practice (e.g. Hart Biologicals, NHS Blood and Transplant, General Practice). We also participate in collaborative activities that increase engagement of health professionals with research. Establishment of the School of Medicine will further integrate clinical researchers; 6 general practitioners are currently undertaking post-graduate study as part of the HEE-North East Integrated Training Programme (ITP) for academic GPs. This is now an established pipeline and the School will have between 4-6 academic training GPs at any one time. The School will be appointing a significant number of joint clinical academic posts including at professorial level with our neighbouring trust, South Tyneside and Sunderland NHS Foundation Trust over the forthcoming REF period as the School becomes fully established with its first cohort graduating in 2024.

The PGR offer includes a comprehensive support package, including a four day induction programme, research skills workshops and courses (such as the 'Central Research Student Development Programme'), and a dedicated space on CANVAS (the University's Virtual Learning Environment) where students are able to access online training and the Vitae



resources. In addition to this general research training, the Faculty offers discipline-specific training in techniques and equipment, as well as the opportunity to gain teaching experience and achieve HEA Associate Fellow status. To promote a research community culture, the Faculty has invested in postgraduate infrastructure, including dedicated laboratories, fully equipped office space, free printing facilities, and access to kitchen areas and social spaces. Regular research seminars allow PGR students to present their work alongside academics and external speakers from international research groups or industry (e.g. Newcastle University, Glasgow University, Memorial University Newfoundland, Pfizer). Further opportunities to present research findings and network are provided at annual PGR research and Faculty conferences, as well as external national and international conferences. Faculty funding is available to support conference attendance, with applications reviewed and assessed by the FPRDSC. We also have a strong relationship with pharmaceutical industry, and the Faculty (**Gray, Myers, Lough**) host the Newcastle upon Tyne and North East Coast division of the Royal Society of Chemistry seminar series and events (e.g. North East Industrial Symposium), providing a valuable opportunity for students to network with leading scientists from a range of careers, encompassing basic science through to identification of intellectual property, product development, and marketing (e.g. Astra Zeneca).

Students are supported and monitored through their studies according to University policies, and students meet formally with their supervisors at least once a month where discussions are recorded, and actions agreed by both supervisor and student. The annual monitoring process, where students submit evidence of their research progress, permits formal progression decisions by an independent panel. This process also considers the student's personal development plan and attainment of appropriate skills and knowledge, demonstrating our comprehensive 360/holistic approach to support and management of PGR.

### **Equality and diversity**

As set out in the Code of Practice for REF2021, the unit operates according to a set of principles and policies of inclusiveness. Staff identified research outputs were graded via an annual audit process and reviewed by a Quality Review Panel, with selection of outputs based solely on quality. Members of the Quality Review Panel received Equality and Diversity and Unconscious Bias training. The University provides mandatory Equality and Diversity training for academic staff and provides staff awareness sessions on the REF2021 Code of Practice, ensuring principles of inclusiveness were embedded during development.

The University is committed to supporting progression of women's careers. 11 women (37%) are included in this submission, accounting for 34% of the submitted research outputs; additionally, women occupy 6 out of 13 leadership roles (Principal Lecturer/Team Leader, Associate Professor, Professor) in this submission. The University currently holds a Bronze Athena Swan award and the School of Psychology submitted the first application to Athena Swan (Silver Award, 2020) since the institutional award for bronze was reconfirmed. A key strategic aim for our new Medical School is to apply for an individual award for the School, to demonstrate its commitment to those values and to succeed with NIHR bids. There is also a policy in place which supports the return of staff from maternity/paternity leave. While on such leave colleagues are encouraged, but not required, to use insert days to keep in contact with co-researchers which facilitates their continued familiarity with advances in their field of research. Upon a return to work, every effort is made to ensure that the colleague will be given fewer teaching responsibilities at the outset so that they can re-integrate themselves with their research community. The School of Psychology is piloting this as a formal strategy to promote reengagement with research post-maternity, with adjusted workloads with greater time allocated to research for the first year after returning. The Faculty also adopts a flexible working approach

so that members of staff who have caring responsibilities are not disadvantaged. This can be arranged either formally through the HR Flexible Working procedure when long term adjustment to work patterns are needed, or locally with line managers when more flexibility is required.

### 3. Income, infrastructure and facilities

The value of grants awarded from over 150 research and knowledge exchange awards within the 2014-20 period exceeds £6.5M. To attract funding, our research maps to the funding priorities and programmes of Public Health England and the National Institute for Health Research. Additionally, there is a focus on industrial collaboration as well as translational research in areas of unmet clinical need (such as rare diseases) funded by charities and the Medical Research Council. We have a long-standing collaboration with bioMérieux (**Anderson, Gray**, funding totaling £239K) and an Innovate UK KTP award with Fontus Health was ranked 5<sup>th</sup> in the UK in 2018 (**Dodou**, £171K). Establishment of the Northern Accelerator through an award from the Connecting Capability Fund to Durham, Newcastle, Northumbria and Sunderland Universities, has supported exploration of the commercial potential of our research (**Myers**). MRC funding was awarded to **Anderson** and **Newell** (£1.5M) and Anderson was principle investigator on two awards from the Cystinosis Foundation (£128K). Our continued collaboration with North East Universities is evidenced by our partnership in Fuse, which has led to MRC funding awarded to **Crosland** (£319K from three awards). Furthermore, as members of the NIHR Applied Research Collaboration North East and North Cumbria, we have obtained funding to support capacity building in health prevention and health inequality research. The reach and breadth of our funders further reflects our core strengths of applied research and partnership working, with funding from the Academic Health Science Network (**Crosland**, £100K), the Northern Cancer Alliance (**Graham**, £111K) and a collaborative award from Yorkshire Cancer Research (Cancer Patients Needs Assessment in Primary Care, **Wilkes**, £161K).

The physical infrastructure for health science research at the University and has undergone further redesign and renovation since REF2014. Significant recent investment to create a Health Campus has enhanced the University estate and enriched the experience of both staff and students. It demonstrates the University's continued commitment to health-related research activity. Academic, social, teaching and research spaces have been equipped to the very highest sector standards and include all modern facilities necessary to deliver contemporary pharmaceutical, biomedical and health sciences teaching, research and external engagement. As part of the £18.2M investment since 2014, the University completed a phased development programme (in 2016 and 2018) at the City Campus to create new infrastructure to support and enhance teaching, learning and research in STEM aligned with the structure of regional, national and international healthcare systems and agendas. As a result of this investment, dedicated research laboratories have been fully refurbished and fitted with state-of-the-art equipment, expanding facilities for molecular and cellular biology, mass spectrometry and pharmaceutical sciences research. We have also created a number of clinical simulation facilities based on the patient journey from home to pharmacy, GP practice to hospital and back again. These include the 'Living Lab', a unique environment incorporating advanced hi-fidelity simulation equipment with mock wards, as well as a mental health ward, therapy suite, behavioural observation room and neuropsychological assessment suite. These new facilities promote partnership working and external engagement with healthcare and life sciences partners. The dedicated research facilities in the School of Psychology facilitate the integration of staff research into the taught curriculum as students also access these facilities for their own learning journey. Areas of

research include online behaviour, the use of eye tracking equipment in areas such as deception and attention and the measurement of brain activity during cognitive tasks, the use of virtual environments (simulation suites) to investigate observational and behavioural responses, and observational suites (two way mirrors) where group behaviour can be observed and recorded. A further £4.8M investment will see provision of a dedicated Anatomy Centre, due for completion in 2021, with future plans focused on refurbishment of additional laboratory facilities for molecular and cellular biosciences and laboratory medicine research activities. In addition, University Library Services support research and researchers through the provision of high-quality library environment and facilities, appropriate print and electronic information resources and support from professional staff. The Library subscribes to over 25,000 print and electronic journal titles, where usage is monitored and the portfolio of titles is continuously reviewed.

A £2.5M donation by Helen McArdle in 2019 led to the University's Shackleton House building being re-named as Helen McArdle House. Creation of The Helen McArdle Nursing and Care Research Institute in 2019, led by **Graham**, is facilitating collaboration with academic and clinical colleagues across higher education and the NHS and has become a regional/national hub for impactful research into patient care. Research themes reflect staff expertise and support regional, national and international collaborations: Health Services Research, Nursing, Out of Hospital Care, Bariatric Surgical Care, Military and Veteran Health and Wellbeing. These themes are underpinned by the ethos of improving care through ensuring avoidance of unintended or unexpected harm to patients/people during the provision of health care, by promoting the adoption and integration of evidence-based practices, interventions and policies into routine health care. Participation in the NIHR ARC NENC is supporting the costs of a Research Fellow and PhD student within the Institute, further aligning research with the ARC Multi-Morbidity, Ageing and Frailty Theme to create impact at regional, national and international level.

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

##### Drug discovery and pharmaceutical sciences

Research in this area is focused towards translating scientific discovery into new medicines or product development and addresses issues encountered by pharmaceutical industry for patient benefit. Staff aligned to this research theme work with several universities within the UK, including Newcastle, Durham, Northumbria, Bath, Bradford, Ulster, Glasgow and Cardiff, as well as internationally with Complutense University (Madrid), Tor Vergata University of Rome, University of California San Diego (UCSD), New York University (NYU), Tanta University (Egypt) and the Universities of Queensland, Sydney, and Melbourne (Australia).

Our research expertise in drug discovery is particularly relevant to industry. Pioneering research on development of a new treatment for the life-threatening genetic disease cystinosis using prodrug delivery technology (CF10) demonstrates our potential to translate basic research findings into clinical utility (**Anderson**). Collaboration between the University of Sunderland, High Force Research, NewChem Technologies, Fine Organics/Lianhetech, Northumbria Pharma, Covance, HGF Ltd and University Hospitals Birmingham is aimed at progressing to a CF10 Phase I trial and Pharmacology and Logistics Study (PALS) in cystinosis patients. Building on our critical mass of expertise focussing on new medicine discovery, the prodrug technology established for cystinosis is being expanded for investigation in other therapeutic areas in collaboration with Newchem Technologies and Covance (**Myers, Newell**). We are increasingly focused on commercialisation of research; staff are named inventors on patents (P207153WO (**Hill**), GB1607593.9 (**Faheem**), WO/2019/058074 (**Anderson, Gray**), GB2015/052707 (**Myers**), and spin-out Sundara Pharmaceuticals has been established to commercialise CF10,

WO/2020/165601 (**Anderson**). Our formulation science expertise has led to industrial collaboration with UCB Pharma (see impact case study, **Dodou**) and an Innovate KTP award with Fontus Health (**Dodou**).

Our research expertise in pharmaceuticals and formulation science has a wider contribution to society. For example, we are a partner in the EPSRC-funded Electro Hydro Dynamics Atomisation (EHDA) Network, which brings together specialists from academia and industry to advance the manufacturing of biopharmaceutical drug delivery (**Elkordy**). We are responsive to industry demands to develop the technical and research skills of the workforce: working with regional, national and international employers we recognised a skills shortage and addressed this through collaborative development and introduction of BSc and MSc programmes in Cosmetic Science which will produce job-ready graduates for a thriving industry. Led by **Dodou**, a member of the Society of Cosmetic Scientists Council (2019-), we also hosted the 3rd Skin Metabolism meeting (2017) co-organised by LEO Pharma, L'Oréal, and Charles River.

Our recently appointed staff bring additional expertise and significant contribution to the research environment in line with our research strategy in key strategic areas. For example, collaborative research with the University of Bath, NYU, and UCSD alongside AstraZeneca aims to develop novel reagents to synthesise pancreatic beta cells to replace the use of donor tissue for islet transplantation therapy (**Nathubhai**). Enhancing our expertise in biomarkers and target identification, collaborative research with Newcastle University and the Melbourne Collaborative Cohort Study is examining genetic changes in chronic lymphocytic leukaemia and potential utilisation for diagnostic testing (**Barrow**), collaborative research with James Cook University Hospital and Northumbria University aims to identify metabolomic signatures in glioblastoma tumours to aid therapeutic design (**Ahmed**), and **Petrie** is an associate partner of the DECIDE Marie Curie ITN Consortium focused on development of differentiation therapy for cancer.

Current projects not yet published continue to embed the core objectives of our research strategy. For example, in response to a national priority identified by the UK Translational Research Network in Dermatology (TREND), development of biomarkers for personalised therapy in melanoma is extended to non-melanoma skin cancer in collaboration with Newcastle University and AMLo Biosciences (**Armstrong**). Research in collaboration with the Children's Hospital of Eastern Ontario aims to identify compounds to treat neuromuscular disorders and cancer (**Gray**), and long-standing collaboration with the Freeman Hospital (Newcastle) is aimed at increasing the availability of organs for donation, a key NHS priority (**Carter**). Sundara Pharmaceuticals is established for commercial exploitation of CF10 in cystinosis as well as CF10 and associated pro-drug technology for other therapeutic categories.

Staff in this group regularly review for over 50 high quality international journals as well as funding bodies (e.g. MRC, BBSRC, British Skin Foundation, Royal Society Leverhulme Trust Senior Research Fellowship, EPSRC, Saudi Arabian Ministry of Higher Education). High-level contribution to the peer review process is evidenced by editorial board memberships and guest editor roles for journals such as Cells (2019-, **Armstrong**), OncoTargets and Therapy (2017-, **Ahmed**), Frontiers in Genetics (Special Edition Editor 2019-21, **Barrow**), Cancer Reports (Associate Editor, 2017-, **Petrie**), Journal of Applied Microbiology (2017-, **Bingle**), Molecules (2020-, **Gray**), Pharmaceutics (2020-, **Dodou**), and Frontiers in Pharmacology (Special Edition Editor 2015, **Elkordy**). National and regional research leadership is also evidenced by staff with elected roles with relevant learned societies or committee membership. For example, staff take part in mentoring, funding decisions or event organisation through their roles with the British Society of Immunology (2014-, **O'Boyle**), the Royal Society of Chemistry (Member Networks



Committee 2018-, **Gray**) and the UK Research and Innovation Future Leaders Fellowships (UKRIFLF) programme Peer Review College (2018-, **Dodou**). Staff have also served on organising committees for conferences {e.g. the Future Leaders in Dermatology satellite symposium at the European Society of Dermatological Research annual conference (2015) (**Hill**)}, have chaired conference sessions {e.g. at the Energy, Materials and Nanotechnology meeting on Hydrogel Materials (2017, Netherlands) (**Elkordy**)}, or delivered keynote speeches {e.g. at the International Pharma Research and Drug Delivery Summit (Belgium, 2019), 2nd International Conference on Nanotechnology based Formulations: Nano Pharmaceuticals (India, 2015) (**Faheem**), and 4<sup>th</sup> World Congress and Expo on Pharmaceutics and Drug Delivery Systems (Italy, 2019) (**Elkordy**)}.

Other indicators of wider influence and contribution to the research base include: staff acting as external examiners for doctoral students across a range of institutions (including University College London, University Del Piemonte Orientale (Italy), Newcastle, Ulster, Bradford, Strathclyde, Sussex, Central Lancashire, Kingston, and Reading universities); **Hill** was awarded the British Society for Investigative Dermatology Young Investigator Award in 2015; invited contribution of a research methods article (Journal of Investigative Dermatology) to bridge the gap between clinical and academic dermatology (**Hill, Armstrong**); **Dodou** was a winner of the 10<sup>th</sup> Anniversary Award given to the best research article published in Pharmaceutics between 2009-18.

### Health inequalities and health services research

Research in this theme has a strong foundation in multidisciplinary collaboration between the health professions and the NHS, clinical research networks, Clinical Commissioning Groups (CCGs), patient groups and service users. Members of this group have extensive reach via clinical networks enabling relevant, applied and impactful research. Networks include; **Ling**: Mental Health Integrated Care System for North East England: Evidence and Evaluation Subgroup (2018-); **Graham**: (i) Specialty Group Lead for Health Service Research, NIHR North East and North Cumbria Clinical Research Network (2015 -), (ii) National Deputy Lead for Public Health (2018 -), (iii) Strategic NMAHP Research Lead, Sunderland Clinical Commissioning Group (2017-), (iv) Vice Chair, Research and Evidence Group, South Tyneside CCG and Sunderland CCG (2018-), and (v) Honorary Speciality Lead, Health Services Research, South Tyneside and Sunderland NHS Foundation Trust (2015-); **Wilkes**: Primary Care Speciality Group Lead, NIHR North East and North Cumbria Clinical Research Network (2014-18). We are partners in two NIHR-funded networks; Fuse (Centre for Translational Research in Public Health) and the Applied Research Collaboration North East and North Cumbria, which aim to deliver world-class research to improve health and tackle inequalities. We also created the Health and Care Workforce Interdisciplinary Research Network (2017) which works with health and care providers and the Faculty of Arts and Creative Industries to explore the intersectionality between arts and science via the exploration of the role of arts in wellbeing (for example, how the arts can be used to give voice to stigmatised health conditions, decrease social isolation and build community cohesion). The Time for Tea project, funded by the Armed Forces Covenant Local Grant Scheme, was carried out in collaboration with Veterans in Crisis Sunderland and Sunderland Clinical Commissioning Group (**Graham**) and focused on veterans who are a known marginalised population (2018-20). Further funding has been granted to carry on this work with the National Glass Centre, with a funded full-time PhD student carrying out further research into veteran health.

Our research is regionally important and has national and international reach. In an example of our approach to partnership working in applied health research, collaboration with Durham



County Council Public Health Team, County Durham and Darlington Local Pharmaceutical Committee, County Durham and Darlington Foundation Trust and the National University of Singapore has led to improved interprofessional management of oral health using a pharmacy-based intervention (see impact case study, **Sturrock**). Our research into the patient experiences of the stigma of obesity and bariatric surgery has led to a greater understanding of the social aspects of surgery on patients' lives nationally and internationally (see impact case study, **Graham**). **Graham** is the National Research Lead for the British Obesity and Metabolic Surgery Society (2018-), and the impact of the research findings led to **Graham** being awarded Faculty status on the Advanced Bariatric Nutrition Course for Healthcare professionals (Mumbai, 2020), recognition as an Honorary Lifetime Member, Mexican College of Surgery for Obesity and Metabolic Illnesses (2019) and an Honorary Visiting Professorship, University of Anahuac, Mexico (2019-). We are also co-investigators on NIHR-funded multi-centre clinical research projects; Robot Assisted Training for the Upper Limb after Stroke (RATULS), Innovative photoplethysmography technology for rapid non-invasive assessment of peripheral arterial disease in primary care (NOTEPAD), and the National Trial of Tonsillectomy IN Adults (NATTINA) (**Wilkes**). Where our research informs practice, this is embedded into curricular across our range of healthcare programmes; work in the area of pharmacy practice led to the award of a National Teaching Fellowship (**Sturrock**, 2019), and establishment of the Medical School has facilitated interdisciplinary research in medical education, in collaboration with the University of Central Lancashire.

Our expertise in public health research is particularly valued. Members of this group sit on committees for PHE (Health Education England (North East) Public Health Subgroup (2016-17, **Ling**), the UK Public Health Practitioner Registration Scheme (Regional Coordinator 2016-17, **Ling**)) and Government (Westminster Alcohol Strategy consultation group (**Mooney**)). Our work on alcohol licencing policies and health outcomes has led to demonstrable impact both within the region and nationally. In collaboration with the University of Bristol, we were commissioned to lead evaluation of a public health tool in alcohol licensing. Working with 8 local authorities this research led to new PHE guidance to promote effective public health engagement with the Licensing Act (Guidance: Findings from the pilot of the analytical support package for alcohol licensing, 2017) (**Mooney**). Related research was highlighted in two NIHR Signal Alerts and was the focus of an Editorial in the British Medical Journal (2019, **Mooney**), and **Mooney** was awarded the President's Medal by the Faculty of Public Health in 2020 for his work on alcohol harm reduction interventions and policies.

Members act as editors or are editorial board members for a range of journals including Frontiers in Public Health (**Ling**, Associate Editor), Frontiers in Psychiatry (Review Editor, **Ling**), Integrated Pharmacy Research and Practice (Editor-in-Chief, **Ling**), BMC Public Health (Associate Editor, **Mooney**), Obesity Surgery (**Graham**), Obesity Science and Practice (**Graham**), BMC Medical Research Methodology (Associate Editor, **Graham**), Clinical Radiology (Associate Editor, **Graham**), Journal of Family Planning & Reproductive Health Care (Associate Editor, **Wilkes**), review for over 30 high-quality journals within clinical and applied health research and for funding bodies including the NIHR Health Services & Delivery Research Programme, School for Public Health Research, ESRC, The Leverhulme Trust, Diabetes UK, and NIHR Health Services Research Portfolio studies. Our influence on regional and national funding decisions is evidenced through grant committee membership, for example the NIHR Research for Patient Benefit Committee, North East and Yorkshire (2012-17) (Chair, **Wilkes**), and the National School for Primary Care Research funding Committee (Deputy Chair 2014, panel member 2020, **Wilkes**). Members have also delivered keynote speeches at a range of events, including the 7th International Pharmaceutical Conference (Jordan, 2019) (**Ling**), APPG Conference on Obesity Stigma (Houses of Parliament, 2020), the 24th

International Federation for the Surgery of Obesity and Metabolic Disorders (Madrid, 2019) and at the XXI Congreso Científico del Colegio Mexicano para la obesidad y enfermedades metabólicas (Mexico, 2019) and IFSO EC Scientific Congress (Prague, 2020) (**Graham**).

### Psychology

Multidisciplinary collaboration aims to enhance the quality of life across society. This group works with national and international Universities, including Newcastle, Durham, Edinburgh, Wolverhampton, Imperial College, Abertay, Dundee, University of Zurich, Martin-Luther University Halle-Wittenberg, Duke University and Vanderbilt University. We work with colleagues across disciplines both within the University (such as the Vulnerability and Criminal Justice Research Network) and externally, for example the Vulnerable Accused Work in Progress network (Cardiff University, **Pearson**) and the Psychological Science Accelerator, a collaborative network which supports inclusive, transparent, rigorous and open access research (**Williams**).

Our work is of wider benefit to the research community and society. Collaborative multidisciplinary research with Durham University aims to understand the impact of loneliness in stroke survivors (in response to the Loneliness Strategy, 2018) and stroke charities and stroke survivors are participants in our research on visual impairment (**Dunne**). Our current and future work in collaboration with Abertay University on literacy acquisition will likely impact educational policy (**Williams**) and it is anticipated that stakeholder collaboration on forensic interviewing will produce a Forensic Interview Tool which can be licenced to police forces in England, Wales and international security agencies (**Farrugia**). Work in collaboration with Newcastle University and the National Cerebral and Cardiovascular Centre (Osaka) applies cognitive tests in pre-clinical animal research on neurological disease (**Ennaceur**). Our work on environmental psychology aims to address the impact of built and natural environments on human health, wellbeing, and social interaction. Partnership working with colleagues in urban design, architecture, landscape architecture and public health has led to impactful interdisciplinary research evidenced by invited presentations at national meetings (Healthy Streets Summit in Glasgow, 2019) and a commissioned review of the health impact of pollution funded by regional local authorities (**Wilkie**).

Social media is used extensively, one example is the BLOG site established by the School of Psychology. Staff are encouraged to provide a short, easily accessible outline of research outputs which are intended to be written from the perspective of a non-expert. This form of dissemination has led to several invitations for staff to give talks and attend discussions outside of the normal academic delivery channels. An example is the invitation to lead a discussion focusing on addiction in the Psychology in the Pub events in the North East. Staff regularly raise awareness of our work to external audiences by taking part in podcasts, radio interviews and via news media; for example, 'What's the point of laughter?' (BBC radio, 2018) and 'Why laughter is key during coronavirus lockdown' (ChronicleLive, 2020) (**Platt**), as well as contributions featured in Health & Fitness, Marie Claire, and Grazia magazines (**Wilkie**).

Members review for over 30 journals within psychology, and act as editorial board members and guest editors, such as for AIMS Neuroscience (2017-, **Ennaceur**), Sustainability (Special Issue Editor, 2019, **Wilkie**), Frontiers in Developmental Psychology (Special Issue Editor 2020, **Pearson**), Current Psychology (Associate Editor 2016-, **Platt**), International Journal of Applied Positive Psychology (Special Edition Editor, 2020-, **Platt**), Frontiers in Psychology (Topic Editor 2016-18, **Platt**) and HUMOR: International Journal of Humor Studies (Consulting Editor 2016-, **Platt**). Members have also delivered keynote speeches such as at the British Society Environmental Psychology Society (2018, **Wilkie**) and the 4th International Gelological

Congress (Saint Petersburg 2017, **Platt**), or delivered guest lectures e.g. Humour Summer School (Purdue University, **Platt**). Staff review for funding bodies such as Leverhulme Trust, MRC, NIHR, the Nordic Programme for Interdisciplinary Research, ESRC, DFG German research council, and **Dunne** is a member of the Scientific Advisory Panel of the Animal Free Research UK charity.

We have also engaged extensively with both private and public sector organisations in the form of consultative and research collaborations. We are developing research relating to building resilience and safety within the workforce, consultative action research with several organisations (e.g. Vantec and Leiber) and have produced protocols for the respective workforces in relation to Health and Safety training and psychological wellbeing within a shift pattern context. This approach has currently been extended to work in partnership with Northumbria Police, investigating factors influencing psychological resilience within their workforce. Our developing work in occupational psychology and wellbeing is contributing to the development of new policy initiatives within the field of clinical embryology and professional practice.