

Institution: University of Sussex
Unit of Assessment: UoA1 – Clinical Medicine
<p>1. Unit context and structure, research and impact strategy</p> <p>1.1 Overview</p> <p>Brighton and Sussex Medical School (BSMS), is a joint entity founded in 2003, co-hosted by the University of Brighton (UoB) and the University of Sussex (UoS). By necessity, the early years of the Medical School were focussed on delivering an innovative curriculum but through targeted recruitment and investment, we have established a research infrastructure and built critical mass in a spectrum of basic, translational and clinical research. For REF 2021, this is exemplified by a focussed UoA1 REF submission of 19.2 FTE and a larger contribution of 63.9 FTE to a joint UoA3 submission with UoB. BSMS did not make a UoA1 submission in REF 2014 but the current split return reflects the diversity of research fostered within the School and demonstrates our commitment to research excellence in both host Universities. Together with our partner NHS trusts, BSMS engages with the NIHR clinical academic training programmes to build excellence, impact and capacity, in particular in the fields of Global Health, and Neuroscience. These areas of specific research strength have been nurtured over the last ten years; both of these broad thematic areas were targeted for development because of the potential for synergies with existing strengths within our parent Universities and partner NHS Trusts and to emergent national research priorities.</p> <p>1.2 Unit context and structure</p> <p>Research at BSMS is now organised in five departments: Global Health & Infection, Neuroscience, Clinical and Experimental Medicine, Primary Care and Public Health and Medical Education. The Department of Medical Education is focussed predominantly on delivering our highly rated BSMS undergraduate medicine curriculum (overall satisfaction rate 96%, NSS 2020). It also provides postgraduate level training in applied health research methodologies through a successful portfolio of Master's level programmes, many of which include a module in research methodology undertaken by over 100 students in the past year (2019/20). Each department is led by a subject chair who is responsible for academic leadership and who represents their department on the School's senior management team. Staff from 4 of the 5 departments have contributed to this UoA1 submission with staff from all five departments contributing to the joint UoA3 submission with UoB.</p> <p>1.3 Current research and impact strategy</p> <p>Following the arrival of the new Dean in 2015, a full review of the strategy and structure of BSMS was undertaken and led to reconfiguration of two new Departments: Global Health & Infection, and Neuroscience – bringing together a number of successful research groups - and the merger of another two to form the Department of Clinical and Experimental Medicine. The aim of the latter was to bridge the translation gap between basic laboratory science and clinical research, and this has begun to bear fruit, particularly in the area of haemato-oncology. Investment in research has continued to focus on building critical mass in these domains and this has been successful in leveraging opportunities and international reputation in partnership with our host universities. The overarching research strategy for the School is to instigate basic, translational and clinical research of the highest quality and wherever possible seek to accelerate the implementation of basic and translational research findings into clinical practice so that positive impact for patients can be realised. Embedded within the School's culture is the</p>

assertion that an institution that teaches students and doctors to practise evidenced-based medicine should actively contribute to the creation of that evidence base. Naturally, the implementation of this strategy is nuanced within each department, but its success is perhaps best illustrated by the quality and range of impact case studies submitted in REF 2021: two in UoA1 and five in UoA3.

The strategy for each of the four research-focused departments, together with selected achievements during the current REF cycle, are outlined below:

Global Health & Infection (GHI)

Global Health and Infection have been core research themes within the BSMS strategy since the Medical School opened in 2003, reflecting the international research reputation of the Founding Dean and early recruits. These disciplines have grown alongside BSMS and a new Department of Global Health and Infection (GHI) was formed in 2015. The Department runs a vibrant research programme with academic links around the world via the Wellcome Trust Brighton and Sussex Centre for Global Health Research (£251K), the NIHR Unit for Neglected Tropical Diseases (£5.7M), and the NIHR Social Sciences for Severe Stigmatising Skin Diseases (the 5-S Foundation (£3.4M).

The Department also works closely with both parent universities to develop novel opportunities for research, aimed at improving global health and health equality. Examples of this cross-university collaboration are with the Centre for Global Health Policy and with the prestigious Institute of Development Studies (IDS), on the University of Sussex campus. Sussex, with IDS, was recently ranked the top University in Europe for Development Studies by the QS University World Rankings, second only to Harvard globally. Opportunities to collaborate with colleagues at these institutions are facilitated through a Global Health Network that meets regularly and organises a seminar series and an annual conference. The Department's reach and influence extends beyond academic research by building partnerships with community organisations, universities and non-governmental organisations based locally and internationally (e.g., GHI researchers initiated the *Footwork* consortium; a public/private partnership set up to prevent and treat pododermatitis). In addition, GHI has established Health Link, a sustainable education and research partnership between BSMS and University Teaching Hospital in Lusaka, with an overall goal of improving healthcare in Zambia through educational and clinical support. This initiative is being extended to promoting good antimicrobial stewardship via the Department of Health and Social Care's Fleming Fund. GHI strategic partnerships are now being forged with health organisations in Central America, such as the Pan-American Health Organisation.

Researchers within GHI work on a range of global health issues, including neglected tropical and non-communicable diseases, infectious diseases (tuberculosis, malaria, HIV), hospital-acquired infections, antibiotic resistance, health risk behaviours and their determinants, occupational health policy and practice, ethics and community interventions. Thematically, the Department focuses on two key areas with specific applications in the UK and in developing countries: firstly, how our immune systems fight infectious diseases such as the bacterial causes of sepsis, hospital-acquired infections, sexually transmitted diseases, viral hepatitis and tuberculosis. Dissecting the interactions between host and pathogen is complemented by expertise in non-communicable diseases, such as diabetes and pododermatitis, with centres in the UK and sub-Saharan Africa (Davey and Newport). Their research also addresses the psycho-social aspects of disease and has resulted in a number of important mental health and social stigma initiatives.

By combining these research themes with studies aimed at explaining the spread of disease, GHI hopes to gain a greater understanding of the biological mechanisms that underlie infection and inflammation. This knowledge, alongside expertise in measuring health outcomes, disease epidemiology and behavioural interventions, is helping to tackle health inequalities and improve human health worldwide. The reach and significance of GHI research is exemplified in the ICS *Podoconiosis Global Mapping*. This provides a striking example of challenge-led interdisciplinary research, delivered with international partners and the full engagement of the local stakeholders (i.e., equitable partnership building) to ensure that the research outcomes respond to real needs, and lead to direct health, economic and social impact in a timely manner. It is also a good example of our contribution to the UKRI GCRF (Global Health) and NIHR Global Health initiatives.

Neuroscience

The Department was established in 2016 to capitalize on the international strengths of our neuroscience research. The Department was created to bring together the Biological Psychiatry group, the Centre for Dementia Studies, BSMS Neurology, basic and cognitive neuroscientists (e.g., Sackler Centre for Consciousness Science) and the Clinical Imaging Sciences Centre (CISC) including the Medical Physics group. This strategic decision recognised the research and educational strengths in clinical neuroscience at BSMS within the context of strong basic neuroscience across the university of Sussex campus. The strategic vision of the department is to build upon existing research strengths, develop excellent research that is translationally relevant and foster the next generation of academic leaders in clinical neuroscience research educational and evidence-based clinical practice. To achieve these aims, there has been significant investment in both people and infrastructure, centring on clinical academics and translational scientists pursuing innovative studies of mind-brain-body interactions and the development of novel healthcare interventions (e.g., Aligning Dimensions of Interoceptive Experience). The Department is increasingly moving more towards interventional, proof-of-concept, studies and clinical trials: here, novel treatments arising from mechanisms uncovered in our mind-brain-body funded studies include trials in autism, anxiety, chronic pain and hypermobility patients. Success in developing staff includes achievements of early career researchers (e.g. [Garfinkel Nature Index Rising Star 2018](#) selected by the journal Nature as only UK scientist of 11 'Rising Stars', across all STEM disciplines internationally) and more senior researchers, e.g. Critchley a [Web of Science 'Highly Cited Researcher'](#) (top 1% internationally 2019/2020).

Clinical and Experimental Medicine

The Department of Clinical and Experimental Medicine (CEM) encompasses groups studying fundamental biology, disease mechanisms and translational medicine, the Sussex Health Outcomes Research and Education in Cancer group (SHORE-C), and clinical and biomedical ethics team. Laboratory research is focused around three main areas: haemato-oncology, inflammation and immunity, and RNA biology. Clinical research is based at Brighton and Sussex NHS Hospitals Trust (BSUHT) with two main foci being paediatrics and neonatology, and elderly care, stroke and hypertension. Paediatrics and neonatology have two major areas of interest: personalised medicine focussing on asthma and strategies to improve neonatal circulatory adaptation after birth. The latter research has contributed to changes in clinical guidelines across the world. Research into hypertension and medication harm in the elderly has also led to important changes in clinical practice. Our clinical research has also embraced new therapies in auto-immune disease (e.g., Sjögren's syndrome) and neuroinflammation in chronic pain, the latter in collaboration with the Department of Neuroscience.

The haemato-oncology research team, led by Pepper, is a true bench to bedside research group encompassing basic cancer biology, translational research including the discovery and validation of prognostic and predictive biomarkers and clinical trials of novel agents. Most recently, the recruitment of an outstanding systems biologist (Mitchell) who has already secured a UKRI Future Leaders Fellowship and John Goldman Leukaemia Fellowship. These awards are enabling the team to begin to harness the power of mathematical modelling to address clinically relevant questions e.g., understanding the development of drug resistance and the identification of personalised therapeutic strategies.

Following decades of improvements in cancer mortality, there is increasing recognition of the need to understand the impact of treatments on quality of life and use this knowledge to empower patients. Sussex Health Outcomes Research and Education in Cancer (SHORE-C) is a world-renowned group focused on psychosocial outcomes in cancer, including patient centred outcomes in palliative care for children, which has produced ground-breaking quality of life in cancer measurement research. This extends the work of other international groups and is now part of the FACIT measurement system, one of the most extensively used Patient Reported Outcome Measurement Systems worldwide, used both in research and in clinical practice to discuss the implications of treatment choices with cancer patients. SHORE-C led by Professor Dame Fallowfield, focuses on measuring quality of life in clinical trials, designs patient reported outcome measures and evaluating interventions to help patients deal with treatment side-effects. This work is also highlighted in an impact case study returned in UoA3.

Biomedical ethics research within the Department focuses on a number of key areas that complement and enhance the research activity within the School, enrich the undergraduate curriculum and provide the basis for a range of outward-looking activities. This team of researchers are influential in their chosen fields and BSMS has become a hub for ethics-related activities locally and nationally. Their work covers interdisciplinary studies on the role and experience of healthcare professionals and medical scientists operating within ethically contested areas of medicine and biomedical science. These areas include stem cell research, foetal medicine, embryo experimentation, ante-natal screening and testing, transplantation and donation. The medical ethics and humanities team are also key contributors to the School's widening participation activities and community engagement.

Primary Care and Public Health

The PCPH Department brings together a wide range of disciplines to address clinical and healthcare challenges, including general practice, public health, epidemiology, statistics, and psychology, and has grown from a head count of 5 (2013/14) to 17 (2019/2020). Headed by Professor Harm Van Marwijk the Department both leads a range of community focussed clinical and health research and provides methodological expertise to support research across BSMS. A strong portfolio of primary care and health services research focusses on stigmatised problems (e.g., sexual health, mental health) and marginalised groups (sexual minorities, care home residents, coastal deprivation) - all of which are highly relevant to the local community.

The Department has built innovative collaborative links in digital health and community engagement, (EU funded SPICE and PRODEMOS projects) and in the exploitation of electronic health records which hosts Wellcome Trust funded research with University of Sussex Astrophysics colleagues, and social scientists on ethical aspects of health records use. The statisticians of the Brighton and Sussex Clinical Trials Unit are based in the Department which also provides input across a wide range of methodological skills in both quantitative and qualitative approaches, in particular for real-world evaluations or implementation research in

pragmatic community-based randomised control trials, interventional behaviour change, analysis of large data sets, survey design (including discrete choice experiments), and health outcome measurement. Van Marwijk and Cassell as Primary Care and Public Health Theme Leads respectively for the newly established regional NIHR Applied Research Collaboration Kent Surrey Sussex, work closely with the Multimorbidity and Dementia Theme Lead, Tabet (Centre for Dementia Studies). They focus on improved outcomes and sustainability of care for complex conditions including dementia, in marginalised groups and for carers.

1.4 Summary of research performance and impact

In REF 2014 BSMS made contributions to five units of assessment across our host universities, with a major contribution to research impact that drew on a substantial Wellcome Trust-funded programme of work in ethics and medical humanities. For REF 2021 we have consolidated our REF return into a smaller number of UoAs to demonstrate the distinctive research profile of our Medical School and establish a presence in UoA1 (Clinical Medicine). As a joint venture medical school, our research strategy aims to dovetail with the core aspirations embedded in the strategies of both parent universities, namely, prioritise the growth of research funding and the quality of research outputs. To achieve these aims, the UoS has established interdisciplinary, University-level centres, which support the pump priming of research through a process of internal bidding. Whilst the UoB has invested in the formation of Centres of Research and Enterprise Excellence (COREs), to build critical mass and create opportunities for high-quality external bids. These structures encourage our researchers to transcend subject and discipline boundaries in order to tackle the most pressing global issues.

The breadth of BSMS research is, in part, a consequence of the wide-ranging medical curriculum; the successful delivery of our highly regarded undergraduate degree programme requires that we employ staff across a wide range of disciplines. Whilst supporting all staff to undertake research, our clear intention has been to focus significant investment in areas of emerging excellence, preferably where there is synergy with our host institutions. The aim is to actively build collaborations and leverage internal funding opportunities, available within both universities, in order to pump-prime successful bids to external funders, with a particular focus on NIHR and UKRI. Although starting from a fairly modest base (£1.5M in 2013-14), we have seen an 67% increase in grant capture over the current REF period (£2.5M in 2019-20). Furthermore, BSMS researchers continue to extract excellent value from the investments, generating high-quality internationally connected research outputs with demonstrable impact.

The quality of our research outputs, and the research impact that they achieve, are evidenced by strong research metrics (SciVal): 72% of the research outputs submitted in this UoA are in the top 10% most cited worldwide and 97.9% are published in the top 10% journals (CiteScore). Importantly, the average field-weighted citation impact for the combined output profile is 6.5, giving a strong indication that the research submitted is highly regarded and relevant within its field. This is underpinned by the fact that 55% of the outputs submitted in UoA1 were the result of international collaborations with a further 39% co-authored with national collaborators.

Furthermore, the reach and significance of our research is exemplified by the two impact cases submitted to this UoA. The first, describes ground-breaking work on Podoconiosis Global Mapping (Davey), which demonstrates an authentic example of challenge-led interdisciplinary research, delivered with international partners and the full engagement of local stakeholders (i.e., equitable partnership building). This partnership working ensures that the research outcomes respond to real needs, and thus lead to direct healthcare, economic and social impact

in timely manner. This is perhaps best exemplified by the successful mobilisation of governmental, third sector and industrial partners to provide appropriate footwear for local communities as a practical preventative measure in the absence of effective treatments for podoconiosis. The underpinning research for the second ICS (Llewelyn), delivered in partnership with Public Health England, challenges the dogma surrounding antibiotic use and the emergence of antibiotic resistance in secondary healthcare settings. The evidence from this NIHR-funded RCT (ARK-Hospital; £2.6M) led to the development of key interventions promoting good antimicrobial stewardship in hospital. As part of the trial, 40 participating NHS Trusts in England achieved a three-fold increase in prescribers' decisions to stop unnecessary antibiotic treatments.

1.5 Open Access

BSMS actively supports and implements the principle of making our research freely available. To enable this, we have introduced several policies, resources, and initiatives to embed this principle within our processes including the establishment of a School Open Access (OA) fund; currently £10K/annum. Researchers are strongly encouraged to include the costs of OA in research funding applications; this is highlighted during the grant costing process. As a signatory to DORA, UoS is committed to ensuring that research is assessed on its merits rather than on publication venue. The University advocates OA for publications and since August 2011 requires researchers to record publication metadata and deposit all peer-reviewed research outputs (where permitted by the copyright owner) into Sussex Research Online (SRO), our institutional repository. The School requires and supports all researchers to submit research outputs to SRO on acceptance and monitors compliance with this requirement.

1.6 Future BSMS strategy and how it will be taken forward

The UK and international funding landscape for health-related research has changed significantly since we began our last five-year plan, with the establishment of UKRI, the internationalisation of NIHR, and the emergence in the Smith report of a post-Brexit direction of travel. We note funders' increasing focus on integration of health and social care, the emergence of geographical inequalities in NIHR priorities, and a growing interest in place-based research. Supported by the recently established infrastructures for clinical research, these offer significant opportunities for BSMS in the coming years. BSMS researchers have also risen to the challenge of the COVID-19 pandemic. A UoS taskforce chaired by the BSMS Dean (Reed) was set-up to assist the local and national efforts to tackle the pandemic. Thanks to Research England granting flexibility for the use of the HEIF money, the University was able to fund projects that made an immediate difference (e.g., face shield development) and more long-term impact e.g., the creation of a 'living cohort' of COVID-19-positive people across the region, to explore longitudinal aspects of the clinical, social and psychological impacts of the virus (Kern) and its impact on care home and domiciliary care (Cassell).

Our research strategy (2021-2026) for the next REF period will reflect these national and international drivers, whilst continuing to build on our established strengths. The key aims are listed below:

- *Respond to regional, national and international healthcare challenges through targeted impactful research in our areas of strength*
- *Invest in emergent areas of research strength where we feel that we can make a distinctive and important contribution*
- *Renew and expand our commitment to our GHI portfolio and the contribution of Neuroscience to a growing national prioritisation of mental health, dementia and ageing*

- *Increase collaboration and co-location of the elements of clinical research infrastructure with the aim of enhancing and increasing the efficiency of clinical trial development and funding*
- *Support our researchers, at all levels, to deliver research that is relevant to our stakeholders, accelerate its recognition and foster adoption of our findings to catalyse further new research impact*

2. People

2.1 Staffing strategy

Our overall staffing strategy is to continue to strengthen and build critical mass in the key research areas described above. To develop our research strengths, the School has made a significant number of new appointments during this REF cycle, showing a net increase in T&R staff head count from 54 in 2013/14 to 73 in 2019/20. This rise in substantive T&R posts is mirrored by an increase in R-only staff (mainly post-doctoral researchers) from 37 in 2013/14 to 66 in 2019/20. This indicates that our new appointments are already starting to establish themselves and bring in new research funding to support the employment of R-only staff. Wherever possible, we make appointments that enhance the potential for inter-disciplinary working within our parent universities, local NHS Trusts and with industrial partners. It is the School's policy to actively encourage medically qualified, category C staff, to take up honorary titles and contracts for the most research active (10 Professors, 8 Readers, 69 Senior Lecturers and 21 Lecturers since REF2014). This is helping to build and reinforce the research links with our NHS partners through the creation of an 'NHS faculty'. We have also made three cross-school academic appointments (Sellers, De Visser, Middleton), which demonstrates our on-going commitment to identifying research synergies within our parent Universities.

2.2 Support for Early Career Researchers

BSMS has a thriving community of Early Career Researchers (ECRs) who are the powerhouse of our research outputs. BSMS ECRs hold an array of different contracts: 7 have "research only" contracts and comprise a mix of research assistants, facilities managers, postdoctoral research fellows and clinical/non-clinical research fellows on independent research fellowships. In addition, we have 14 ECRs on T&R contracts; 5 Lecturers and 9 Senior Lecturers; 7/14 (50%) ECR appointments at Lecturer/Senior Lecturer were female. A total of 21 ECRs are being returned by BSMS in REF2021; 2 as part of this UoA1 submission. BSMS ECRs are supported by the BSMS non-clinical Early Career Research Lead (Sacre) and the clinical Research Lead (Colassanti) who have overview of their skills training and career opportunities. The ECR Leads work closely with the "Inclusivity" team in line with the achievement of our Athena SWAN Silver award. ECRs also have a dedicated space on our intranet which specifies career, mentoring and training opportunities available. These include [research development courses](#) offered by both the Universities of Sussex and Brighton. ECRs are encouraged to lead applications for pilot funding grants from local and national sources to begin to establish their credentials as future research leaders e.g., the Rising Stars Initiative and the Research Development Fund to enable pilot data collection (from the Universities of Brighton and Sussex respectively). A generous School conference fund for ECRs also provides them with opportunities to build their networks and foster collaboration with external investigators. There is an active mentoring scheme whereby ECRs with potential for future successful research careers are mentored to apply for Fellowships (e.g., Mitchell; UKRI Future Leaders Fellowship) with funding underwritten to support excellent staff and to provide a degree of job security. Complementing this, the School has created a Director of Clinical Academic Training post (Chevassut) who is responsible for

overseeing externally funded research training programmes for clinicians including NIHR Academic Clinical Fellows (ACF) and Lecturer (ACL) schemes. Only specialties that are included in the School's strategic research plan are selected for formula NIHR ACF and ACL posts. Similarly, competitive bids are made only for disciplines that are adequately supported within the BSMS research plan. From 2014 onwards, the School has been allocated 17 formula ACFs posts and 6 formula ACL posts. The School has also been awarded 10 ACF posts through the NIHR competition, plus two locally funded ACF, all of which have been filled. Since 2013 there has been 100% completion of the MRes degree course, and 8 ACFs have gone on to higher degrees including MRC, Wellcome and Fulbright Fellowships.

2.3 Research students

BSMS has a thriving community of 69 postgraduate research (PGR) students registered for the joint BSMS degree of which 12 are clinical research fellows. Over the current REF period, BSMS staff successfully supervised 64 research degrees to completion (55 PhD and 9 MD). In addition, BSMS staff also co-supervise PGRs within both of our host Universities. BSMS PGR recruitment is overseen by the Director of Doctoral Studies (DDS), who leads a compulsory programme of supervisor accreditation and re-accreditation, compliant with the regulations of the UoB's Doctoral College. The students are registered through the UoB and are awarded a joint degree between UoB and UoS. A Joint Research Degrees Approval Board oversees the regulations, progress and awards for all PGRs and also oversees the approval of supervisors. Supervisors are required to refresh their supervisor training every three years.

Each student undergoes tailored training, which fits the needs of their individual project. In addition, they must undergo an Annual Progress Review process comprising:

- (i) a 2000-3000 word summary of progress (determined in relation to the candidate's Research Plan and demonstrating their understanding of research methods appropriate to the field).
- (ii) a statement articulating the anticipated original contribution to knowledge likely to be made.
- (iii) a statement demonstrating that they can critically investigate and evaluate their topic.
- (iv) a detailed work plan for the completion of the thesis.

Students are also required to provide the Annual Progression Review Panel with access to work completed to date. This could include draft chapters, examples of practice, data generation and analysis, or papers that have been prepared, submitted or accepted for conferences, journals, etc. This process involves an interview from a panel with two academics at BSMS, or the parent Universities, who are knowledgeable in the relevant field of research. This structure has consistently delivered high completion rates over the current REF period (see table below).

Academic year	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20
4-year completion rate	93%	90%	88%	89%	91%	89%

PGR students have access to a wide range of training courses provided by the Doctoral School (UoS) and Doctoral College (UoB) as well as BSMS courses and modules of master's level courses provided by the Department of Medical Education. All students present a seminar in their first year to an appropriate departmental group and attend an annual postgraduate conference. PGR students can apply for support to present at conferences. BSMS is part of a Wellcome Trust Clinical Doctoral Training Programme in a consortium with the London School of Hygiene and Tropical Medicine, and staff jointly supervise students funded through the UoS Leverhulme Doctoral Training programme "From Sensation and Perception to Awareness", Sackler Centre for the Study of Consciousness and the AHRC CHASE doctoral training

programme. Two NIHR doctoral trainees (Edelman, Youssef) have successfully completed since 2013. BSMS also hosts clinical PGR students funded by its partner trusts.

2.4 Evidence of promoting equality and diversity

EDI policy and initiatives at BSMS are led by the Inclusivity Team (lead, Shahvisi) and its subgroups, and are overseen by the Steering Group, chaired by the Dean, and comprising the Medical School Secretary, the Diversity Co-Leads and the Project Officer for Diversity and Inclusivity.

The BSMS Ethos Statement underpins everything we do: *“At BSMS we strongly believe that our curriculum must be value-based, both inside and outside the classroom; and that all people involved with our school should feel welcome and respected, and should be helped to feel confident about themselves and valued for the positive contributions they can make. The School has a commitment to equality and diversity including protected characteristics such as gender, race, disability, religion, age and sexuality.”*

Athena SWAN

BSMS obtained Athena SWAN Bronze in 2013 and during this REF cycle, we were able to secure an Athena SWAN Silver departmental award (November 2017). Although proud of this achievement, we are now working towards achieving Gold award status by 2023 as a way of increasing further our commitment to equality and equity, diversity and inclusion. There are now significantly more women in senior roles e.g., Deputy Dean (Cassell), Director of Research (Newbury), Head of Department GHI (Newport) and significant increases in promotion success for women. Since REF2014, 28 BSMS staff achieved promotion, of which 17 (61%) were women. Furthermore, 8/17 were promoted to the level of professor and 7/17 started work at BSMS during this current REF cycle. It is worthy of note that our submission for REF2021 (UoA1 and UoA3), demonstrates gender balance in the number of outputs selected.

Whilst recognising the importance of addressing gender inequalities, the School's Inclusivity Team is equally committed to challenging racism, sexism, homophobia, transphobia, ableism and oppression in all its forms. We strive to create an inclusive and supportive environment for all of our staff and students with all staff having equality and diversity training. Academics, students and professional service staff are expected to promote equality, diversity and inclusion across the range of our work. In practical terms this involves targeted support with training, mentoring and support at School level. There is a mentoring scheme for all new staff with specific programmes and networks for black and ethnic minority (BAME) staff. The University has made a public commitment to supporting equality and diversity through the Equality, Diversity and Inclusion policy. The School has supported this through the work of the Inclusivity Team, which promotes inclusion in priority areas including BAME recruitment, retention and progression at all levels of research, LGBTQ+ students and staff, the Gender pay gap and mental health. Most recently, in response to the *Black Lives Matter* campaign, the School established an active anti-racism forum for staff and students with four specific workstreams.

3. Income, infrastructure and facilities

3.1 Research income

The research income for this Unit has risen from £1.5M in 2013/2014 to £2.5M in 2019/20 – a rise of 67% over the REF cycle. Whilst income from charities has remained stable, the largest increase in grant income has come from NIHR, Wellcome Trust and UKRI. The top 3 funders for this Unit based on current Open Awards value are the National Institutes for Health Research

(Top Award: NIHR Global Health Research Unit on Neglected Tropical Diseases, Davey Newport, £5.7M), the Wellcome Trust (Top Award: A new class of genes containing small Open Reading Frames, Couso, £1.6M) and the European Union (Top Award: Cardiac control of fear in brain, Critchley, £1.4M).

3.2 Research related income

This section provides an overview of the management of indirect funding in support, not received as research income, but which contributes to our research outputs and impact.

Clinical Imaging Sciences Centre

The Medical School's Clinical Imaging Sciences Centre (CISC) is an interdisciplinary research, imaging and teaching facility that draws together a dynamic range of researchers and their interests. An area of particular strength at CISC is imaging neuroscience; academic staff in CISC work in close cooperation with colleagues in Sussex Neuroscience and the Sackler Centre for Consciousness Science to unravel the complex neural networks underpinning conscious experience in health and disease.

Alongside cutting-edge research, CISC delivers clinical imaging services in the fields of Positron Emission Tomography/Computed Tomography (PET-CT) and Magnetic Resonance Imaging (MRI) to patients from the Brighton and Sussex University Hospitals NHS Trust and other sectors. Historically the delivery of clinical imaging has underpinned the financial health of the Centre. It is financially self-sufficient with any surpluses being transferred to a hypothecated reserve so that scanners and associated equipment can be replaced when they come to the end of their life. In 2017 CISC Purchased a 3T MRI scanner and as part of the installation project, the Centre was reconfigured to accommodate the new scanner, provide testing facilities, seminar rooms and supporting infrastructure. The total cost of the project was £3.64m including £568K grant from the Wellcome Trust. The Centre plans to extend the range of PET and MRI clinical services it offers to support translational research in the areas of neurodegenerative diseases, dementia and prostate cancer.

3.3 Infrastructure for research

At School level, research is supported by a Director of Research (Newbury) and a Research Manager (Theberge). In addition, there is a vibrant Research Committee populated by Research Leads from each of the School's research departments. This committee meets quarterly to discuss and prioritise equipment needs, highlight research funding opportunities and share best practice, including issues relating to working with human tissue. The School has its own Human Tissue Authority research licence; the Designated Individual (Pepper) is supported by a Laboratory Services Manager (Harriman) and a Governance Group composed of HTA leads from each department and representatives from Brighton and Sussex NHS Trust. Beyond the School, the University of Sussex provides substantial additional support to increase the quality of grant applications, to ensure that opportunities for impact of ongoing research are maximised and to prepare for external forms of assessment. We also benefit from a range of centralised support. The University's Research Dashboard provides up-to-date research management information and Sussex Research Online (SRO), supported by the University Library, provides the institutional repository for outputs. The full roll out of the Symplectic Elements platform (2021) will enable researchers to capture, collate and showcase research activities and enhance open access compliance. Significantly enhanced central support for research impact, provided through the Research Quality and Impact team with a dedicated Research Impact Officer,

includes an online Research Impact Toolkit, training impact pathway guidance for individual bids and an annual Impact Day.

3.4 Clinical research infrastructure and facilities

Our growth in research income has been underpinned by sustained investment in research infrastructure, in partnership with Sussex Partnership Foundation Trust and Brighton and Sussex University Hospitals NHS Trust. A Clinical Trials Unit (CTU) was established in 2014 and achieved provisional accreditation (2018), providing professional statistical support, data management, costing and oversight of large-scale clinical research for the first time. This has led to improved grant capture and effective delivery of clinical research, in the UK and internationally. A new Director of the CTU has been appointed with the aim of achieving full accreditation in 2021. In 2019, a Joint Clinical Research Office (JCRO) was established with initial QR-derived funding from BSMS, providing support for the development, delivery and cost optimisation of clinical research spanning university and NHS. The JCRO has rapidly established a key role in clinical research development and coordination with early evidence of enhanced income (£5.5M). The JCRO will continue to develop and establish a sustainable funding model that covers costs and increases the success and efficiency in the development of university / NHS research projects by 2022/23. The population of Kent, Surrey and Sussex that we serve (approx. 3.5M people) has one of the lowest levels of access for participation in clinical research studies of any region in England, due to a long-standing lack of local research-intensive centres of excellence and despite the proximity to major centres in the capital. We plan to address the fragmentation of the infrastructure and development components for the promotion of access to clinical trials for the public and patients with multiple separate elements present in BSMS, its partner universities and across NHS and other HEI's. These include:

- The Clinical Trials Unit
- The Joint Clinical Research Office
- The NIHR Research Design Service
- The Clinical Research Network
- The NIHR Applied Research Collaboration

While each of these has differing functions and funding sources, they share the aim of increasing participation in clinical research studies for patients and public in our region. As demonstrated by the JCRO, enhanced coordination between these agencies has the potential to grow activity, income and efficiency. A key target of our new research strategy (2021-2026) is to increase collaboration and co-location of the elements of research infrastructure with the aim of enhancing and increasing the efficiency of clinical trial development and funding in the next five years. This will be delivered through the development of a Health Research Partners model to significantly increase patient and public participation in clinical research – particularly recruitment to clinical studies.

Our partner Brighton and Sussex Hospitals NHS Trust (BSUHT) hosts a Clinical Investigation and Research Unit, available for translational work by BSMS academics and supported by the Brighton and Sussex Clinical Trials Unit (BSCTU). The BSUHT Director of Research is a member of BSMS faculty (Llewelyn) and is currently working with colleagues on a new research strategy for the Trust. The recently appointed Director of the BSCTU (Perry) is a joint BSMS/BSUHT funded post and BSMS staff have leadership roles in BSCTU (Davies, Bremner). The region NIHR Clinical Research Network and NIHR Research Design Services are in close proximity to the BSCTU team. BSUHT is currently implementing a £485 million programme to

replace all the buildings on the front of the Royal Sussex County Hospital site, the '3Ts Redevelopment', which will, from 2022, provide new opportunities to develop our Trauma and Tertiary care portfolio in collaboration with NHS partners.

3.5 Laboratory research facilities

The state-of-the-art Medical Research Building (MRB) on the Falmer campus houses our current wet laboratory facilities and includes lab-based researchers working in the Wellcome Trust/NIHR Brighton and Sussex Centre for Global Health Research. The MRB provides an outstanding resource for around 70 medical research scientists, working on cancer, RNA biology, cell signaling, developmental biology, neuro-inflammation, human genetics, immunology and infectious diseases. The laboratories include facilities for molecular biology, primary tissue culture, *Drosophila* genetics, advanced microscopy, flow cytometry, phlebotomy, biobanking (-80°C and liquid nitrogen) and microbiology (Containment Level 2 and 3 labs for AMR-pathogens and TB respectively). Investment by BSMS in larger items of equipment provides access to first class instrumentation and additional opportunities for networking and cross-school collaboration. For example, BSMS recently partnered with the School of Life Sciences (UoS) to co-purchase a BD FACS Melody high speed cell sorter. This instrument is housed in the School of Life Sciences with free access to BSMS researchers; currently 17 different groups across both Schools are using this joint facility. Core equipment available to researchers in the MRB includes a 21-colour Cytoflex flow cytometer, an ABI QuantStudio7 qRT-PCR machine with microfluidic capacity, Agilent bioanalyser, Zeiss fluorescence microscopy, Precellys Cryolys Evolution cell disruptor and a Biocomp polysome profiling system. In addition, BSMS researchers have access to core facilities across the Universities of Sussex and Brighton. These include a confocal microscopy suite, electron microscopy, high performance computing cluster at University of Sussex and mass spectrometry and genomics/transcriptomics centres at the University of Brighton. A research methodology team provides statistical advice for clinical studies and genome-wide data analyses.

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

4.1 Research integrity and reproducibility

BSMS is committed to the highest standards of research integrity and in partnership with UoS has been actively engaged in national developments in this area. Much of this engagement has been with the UK Research Integrity Office (UKRIO). During this REF period, UoS reviewed and reconfigured its research governance and ethical review committees and processes. A new Research Governance and Quality Assurance Committee oversees regulatory and compliance matters in research and the BSMS Research Governance and Ethics Committee provides ethical review for all higher risk studies across UoS. All researchers working with human tissue are required to undertake Human Tissue Act training, which includes seeking informed consent, tissue storage and disposal. In addition, all researchers receive regularly updated training in GDPR, and postgraduate research students' induction covers publication ethics including data storage, criteria for authorship, data fabrication and plagiarism.

Researchers working in the NHS undertake Good Clinical Practice training, and complete NHS information governance training, through NHS and NIHR partners. A dedicated research governance officer supports NHS Sponsorship applications together with the Joint Clinical Research. They oversee monitoring and audit of studies as necessary where there is no external requirement (e.g., MHRA). The research governance officer also provides pre-review of applications to the Health Research Authority for ethical approval of NHS based research. Our

codes of practice for the storage of human tissue are fully compliant with the Human Tissue Authority requirements.

4.2 Academic partners

Researchers within BSMS collaborate closely with colleagues at our host universities and our NHS partners as well as national and international partners, both on specific projects and by leading or participating in collaborative groupings that catalyse interdisciplinary opportunities (e.g., Centre for Dementia Studies, Wellcome Trust Centre for Global Health, SHORE-C, Centre for Cultures of Reproduction, Technologies and Health (CORTH)). It is the School's policy to actively encourage medically qualified, category C staff, to take up honorary contracts (10 Professors, 8 Readers, 69 Senior Lecturers and 21 Lecturers since REF2014). This is helping to reinforce the research links and facilitated the generation of research with impact in collaboration with our NHS partners through the creation of an 'NHS faculty'. Collaborative projects in the REF period have included:

DETERMIND: DETERMinants of quality of life, care and costs IN people with Dementia and their carers after diagnosis; PI, Banerjee (BSMS), ESRC/NIHR, £1.7M in collaboration with UoS, Psychology (Rusted) and other external HEIs (LSE, York), and the Alzheimer's Society.

Sharing a genome: caste antagonism and coadaptation in social insects – CASTECON; Co-I Newbury (BSMS), H2020 ERC Advanced Grant, £1.7M in collaboration with UoS, Life Sciences, (PI, Field)

Dedicated MR equipment for optimised imaging of the Structure and Function of the Human Brain; PI, Cercignani (BSMS), Wellcome Trust Equipment Grant, >£500k in collaboration with the UoS, Life Science (Co-I, Atack) and Psychology (Co-I, Bird)

The Sackler Centre for Consciousness Science 2019-2021 Leading-edge consciousness science and its application to psychological and neurological health; Co-I, Critchley, SACKLER-DR MORTIMER AND THERESA SACKLER FOUNDATION, >£1.4M in collaboration with UoS, Informatics (PI, Seth)

Developing an Integrated and Interdisciplinary Practice-Based Training Model aimed at Improving Mental Health Outcomes for Children, Parents and Families; Co-I, Cassell, RUDD FAMILY FOUNDATION, >£1.5M in collaboration with the UoS, Psychology (PI, Harold).

NIHR Global Health Research Unit on Neglected Tropical Diseases; PI, Newport (BSMS), NIHR, >£5M

MIROCALS: Efficacy and safety of low-dose IL-2 (Id- IL-2) as a Treg enhancer for anti-neuroinflammatory therapy in newly diagnosed Amyotrophic Lateral Sclerosis (ALS) patients; PI, Bensimon (Nimes, France), Leigh (BSMS), H2020, >£1.1M.

NIHR ARC Kent, Surrey and Sussex; PI, Peckham (Kent), Cassell, Tabet, Van Marwijk (BSMS), NIHR, >£1.3M

BSMS also promotes collaborative work between its two parent Universities as illustrated by BSMS staff membership of some of the UoB, Centres of Research Excellence (COREs) established in 2017:

Centre for Regenerative Medicine and Devices: Cercignani, Dowell, Ghezzi, Levic and Mullen

Centre for Stress and Age-related Disease Devices: Ferns, Ghezzi, and Sacre

Centre for Transforming Sexuality and Gender: Llewelyn and Pantelic

4.3 Collaboration with industry, government and other research users

BSMS works proactively with research stakeholders and users, with a strong culture of patient and public engagement in research from inception to dissemination. We address questions relevant to our user community, for example:

- The Health Education England funded “Time for Dementia” inter-professional learning and research programme is ensuring medical and nursing students are ready to meet the challenge of dementia (Banerjee/Wright)
- Research on podoconiosis is meeting health challenges prioritised by the Ministry of Health in Ethiopia and Rwanda (Davey)
- Work on access to services for people who use drugs and homeless individuals with hepatitis C is a priority for Brighton and Hove City Council (Verma).
- Training resources for multidisciplinary teams working in breast cancer (Fallowfield)
- Member of the Department of Health's Organ Donation Taskforce, Specialist Adviser to the House of Lords and is a current member of the UK Donation Ethics Committee (Farsides).
- Panel member on the Government's Infected Blood Inquiry, Advanced Breast Cancer (ABC) international consensus panel, American Society for Clinical Oncology (ASCO) guidelines panel for Endocrine Sensitive Metastatic Breast Cancer (Fallowfield).

In addition, we continue to work with industrial partners wherever synergies can be identified. Examples of companies that we are currently collaborating with include BMS/Celgene, Astra Zeneca, Nucana PLC, Janssen, Roche, Glaxosmithkline, Aventis Pharma, Gilead Sciences, Boehringer Ingelheim, Genetech, Merck, Abbvie, Nanostring Technologies, Danone Research, Novartis.

4.4 Contribution to the discipline and research base through activities including peer review, scientific advice to UKRI, research charities and major academic institutions.

Our UoA1-returned staff hold a range of editorial positions in international journals e.g. Co-Editor of Head & Face Medicine, Editorial advisory board member: American Journal of Perinatology, Acta Paediatrica and Journal of Pediatric Research (Rabe); Clinical Cytometry (Kern); Editorial board member: Frontiers in Consciousness Science & International Journal of Psychophysiology (Critchley); Deputy Editor for Magnetic Resonance in Medicine (Cercignani); Specialty Chief Editor, Frontiers in Immunology, Associate Editor, Frontiers in Digital Health (Ghezzi); Associate Editor for BMC Pilot & Feasibility Studies (Bremner); editor for Clinical Medicine, the Journal of the Royal College of Physicians (Chevassut); Editorial board member: International Journal of Hematologic Oncology, Leukemia Research and Treatment, Frontiers in Oncology (Pepper), Editor in Chief BMJ Sexually Transmitted Infection (Cassell).

Many of our researchers contribute to the research base by providing expertise and peer review to national and international funding bodies: NIHR Global Effort on Covid-19 (GECO) Health Research panel (2020) and NIHR Global Health Research Units Funding Committee (Davey); CRUK Clinical Trials Awards Committee member (Reed); Expert Reviewer/advisor for European Commission FP7/H2020 grant submissions and monitoring of projects, NICHD (USA), NIHR-i4i, EMA, FDA (Rabe); Review College member, (Fonds Wetenschappelijk Onderzoek Vlaanderen expert panel membership) Belgium, Scientific Workgroup on Interoception in the Service of Allostasis and Energy Balance. Basic Biobehavioral and Psychological Services at the National Cancer Institute (NCI) NIH USA, Bial Award in Biomedicine Award Committee member, Chair, Paul D MacLean Award Committee, American Psychosomatic Society, Bial Foundation Scientific Advisory Panel, Chair of Academic Faculty of Royal College of Psychiatrists (Critchley); Executive Board member of World Association of Sarcoidosis and Other Granulomatous

Diseases (Patterson); Executive Committee member of the UK CLL forum (Pepper); Member of the Wellcome Trust multi-user equipment grant panel, member of the NIHR clinical scientist award panel (Cercignani); Member, Starter Grants Panel, Academy of Medical Sciences (2016-2018), Scientific Co-Chair, Multiple Sclerosis Society Research Strategy Committee, Chair, PSP (Progressive Supranuclear Palsy) Association Scientific Advisory Committee (Leigh); Member of the Research Governance committee of the University of Milano and of the Doctoral College of the University of Urbino (Ghezzi); Member of National Cancer Research Institute Lymphoma Science Group (Mitchell); Member of the South East & Central Advisory Panel for the NIHR Research for Patient Benefit Programme (Bremner); Member of the Blood Cancer UK Scientific Committee, North West Cancer Research Scientific Committee, external scientific adviser and Scientific Committee member, Cancer Research Wales, Scientific advisor, Leukaemia Research Appeal for Wales, International expert for the National Science Centre, Poland (Pepper); member NIHR/MRC Methodology Research Panel Advisory Group, NIHR Integrated Academic Programme, MRC Adolescent Health, served on Wellcome Doctoral Programmes and Postdoctoral Fellowship, Health Review Board, Ireland doctoral programme, UKRI Global Health (Cassell).

4.5 Awards and recognitions

Fallowfield: Dame Commander of the British Empire - for services to psycho-oncology (2016), Lifetime Fellowship of the British Psychosocial Oncology Society (2018), European School of Oncology (ESO) Umberto Veronesi Memorial Award “in recognition of a leading role in advancing science and care of breast cancer patients” (2019) and Honorary Fellowship of the Association of Cancer Physicians UK – “for outstanding contributions to patients centred cancer research and cancer care” (2019).

Davey: President of the Royal Society of Tropical Medicine & Hygiene (2020) and was awarded an OBE for services to Neglected Tropical Diseases (2020).

Critchley: Honorary Visiting Professor University of Hiroshima, Japan (2020), Elected Chair of Academic Faculty of Royal College of Psychiatrists (2020), Web of Science Highly Cited Researcher (2019), Paul D MacLean Award from American Psychosomatic Society (2017), Elected Vice Chair of Academic Faculty of Royal College of Psychiatrists (2016), 16th Valsalva Lecturer and Honorary Member of Italian Autonomic Association (2016), Elected Fellow of Royal Society of Biology (2015).