

Unit-level environment template (REF5b)

Institution: St George's, University of London
Unit of Assessment: 1 Clinical Medicine
1. Unit context and structure, research and impact strategy

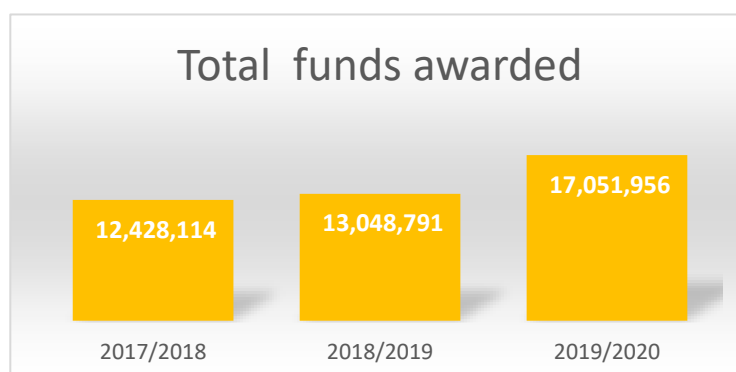
1.1. Unit Context and Structure

Clinical medicine research at St. George's, University of London (SGUL) is performed by the university's two largest Research Institutes, Infection and Immunity (I&I) and Molecular and Clinical Sciences (MCS). These were formed in 2014, reflecting SGUL's strategy to concentrate and prioritise research areas of international strength. Staff and doctoral students totalled ~304 in 07/20, with ~197 honorary staff.

- Attributed to UoA1 are 100 HESA-listed Category A Principal Investigators (PIs): non-clinical and clinical Professors (40), Readers (19) Senior Lecturers (20) and Lecturers (21). 43% of these PIs hold joint or honorary clinical contracts. A further 29 Category C Clinical Research academics reflect our close links and shared campus with **St. George's University Hospitals NHS Foundation Trust (SGUHT)**, and our emphasis on impactful clinical research.
- MCS staff are divided between five Research Centres: Cardiology, Cell Biology, Genetics, Neurosciences and Vascular Biology (Section 3.2).
- In I&I, staff affiliate to relevant primary research areas - Global health, Tuberculosis, Novel vaccine and therapeutic approaches, Paediatric infectious disease, and Innovation in diagnostics and can also be members of an I&I Research Centre (Section 3.2).
- Many Institute members, together with staff from St George's NHS Trust, are also members of one of the four Clinical Academic Groups (CAGs): Cardiovascular Sciences, Infection, Neurosciences and Genetics & Genomics.

1.1.1. Headline Achievements

- **Growth in funding awards** for UoA1 research – approximately 30% in the last 3 years (Figure 1).



- **Leadership in research.** Numerous prestigious research consortium projects led at SGUL include 12 EU, 17 UKRI, 7 NIHR and 29 Charitable awards (e.g. the Gates Foundation, British Heart Foundation and Wellcome Trust).
- **Research outcomes influencing national and international policy.** Many examples include: treatment of cryptococcal meningitis, driving equitable access to diagnostics and drugs and impacting international guidelines on screening, diagnosis and life-saving treatment; work on optimizing global antibiotic prescribing, leading to the first WHO targets for limiting the impact of antimicrobial resistance; cardiological research influencing national and international guidelines/practice on sudden death and on cardiology monitoring in sports.
- **A reputation for societal and academic impact.** Ranked 4th in the UK in REF 2014 for societal impact of our research, our research publication impact has ranked first or first equal in the world for citations in the Times Higher Listings for 3 of the last 5 years.

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- **Increase in critical mass, promoting succession planning and sustainability.** 34 new UoA1 PIs recruited between 2014 and 31/07/2020, including 26 early-career academics. Total PI numbers with primary employment in UoA1 institutes grew from 77 to 94.
- **Improved research mentorship and training.** Our mentorship scheme, revitalized in 2019, contributed to successful personal applications for a UKRI Future Leaders Fellowship and NIHR Research Chair (the latter not taken up) (**Le Doare**), an NIHR Advanced Fellowship (**Hargreaves**), a Medical Research Foundation personal Fellowship (**Groppelli**), an MRC-NIHR Clinical Academic Research Fellowship (**Ricciardi**) and success in Academy of Medical Sciences Springboard applications, including 3/3 in 2019.

1.2. Research and impact strategy and Implementation

UoA1 includes most of SGUL's research and our strategies mirror university strategy. SGUL's 2015 Research Strategy identified three priorities to maximise research impact:

- Translational research – bench to bedside, theory to practice
- The international dimension – global health
- Working in collaboration – with a range of partners, especially SGUHT.

These aims were refined in our 2017 five-year research strategy:

- Increase societal impact by improving diagnosis and treatment and preventing disease;
- Respond to new and emerging healthcare challenges through targeted intervention;
- Develop our understanding of health through effective collaboration, with a focus on excellence and impact through eight key measures (Institutional 5a Statement).

A new Research Operational Plan was published in 2019 following the appointment of **Friedland** as Deputy Principal (Research and Enterprise).

1.2.1 Increase societal impact by improving diagnosis and treatment and preventing disease

Our primary focus has been on strengthening collaboration with our closest research partner SGUHT. Building on broad and longstanding collaborations in many disciplines, we:

- established a Joint Strategy Board of senior directors led by the University Principal and Trust Chief Executive.
- restructured the Joint Research and Enterprise Service (**JRES**) which oversees research administration, clinical governance and enterprise in both institutions.
- developed four CAGs with SGUHT, in joint areas of strength: Cardiology (2015), Infection (2018), Neurosciences and Genetics & Genomics (2019).
- created a Translational Research Advisory Board to facilitate research impact, with members from both institutions, large pharma, and biotech.
- Reciprocally, the Trust published its 5-year Research Strategy (1/2020), prioritising a close partnership with SGUL. This supports joint research appointments, including 43% of UoA1 REF-returned PIs, and new talented clinical recruits such as **Singanayagam** (Hepatology), **Fusi** (Oncology) and **Ricciardi** (Neuroscience).

The effectiveness of these measures and their outcomes are evidenced in many sections of this statement.

The international dimension

Global Health research illustrates our collaboration strategies to increase societal impact. We prioritize: i) understanding of target diseases; ii) new medical interventions and technology; iii) clinical trials with national and international partners; and iv) work with policymakers and other local stakeholders to increase local expert capacity and promote product development and implementation. Since 2014 our international activities have expanded widely. Most of our strategic international partners are in Lower- and Middle-Income Countries on the DAC list of ODA recipients. We maintain and nurture these links through e.g. funding and staffing of long-term clinical and non-clinical research programmes in Africa and South America. Examples include:

1. the EDCTP-funded PREPARE project, introducing maternal immunisation for neonatal sepsis in Uganda (**Le Doare**);
2. the EDCTP-funded DREAMM implementation project which, responding to an analysis reported in a highly-cited UoA1 output in Lancet Infectious Diseases, combines traditional trial methodology with local health system strengthening, social science, education and

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- health economics to reduce mortality linked to HIV-related meningitis in Tanzania, Cameroon, and Malawi (Loyse);
3. the MRC/ Wellcome Trust/ DfID funded RIFASHORT Phase III trial in Botswana, Uganda, Peru, Bolivia, Nepal, Guinea and Mexico, that builds on another highly cited UoA1 output in NEJM, which is testing shorter treatment regime for pulmonary tuberculosis (Jindani and Harrison);
 4. the GARDP-funded neonatal observational cohort study, NeoOBS for 3000 babies: the first global hospital study for AMR involving 19 neonatal intensive care units (NICUs) in 11 LIMC countries, including sites in Asia, Africa, Europe and South America.
 5. the EDCTP funded PEDICAP study of hospitalised children with severe pneumonia recruiting in Zimbabwe, Zambia, Uganda and South Africa, which will inform WHO antibiotic treatment guidelines.

Most activities are conducted through our Centre for Global Health (www.sgul.ac.uk/centre-for-global-health), which has received consistent university support and investment, through recruitment of research leaders and other staff including research trial managers and co-ordinators, and administrative staff in the JRES (detailed in 3.2.1).

1.2.2 Respond to new and emerging healthcare challenges through targeted intervention

St. George's response to COVID-19: This illustrates our vitality and ability to react nimbly to new healthcare challenges, undoubtedly facilitated by both the Infection CAG and the JRES. By 2/2020, university research staff were working with South West London Pathology's diagnostic service to provide reagents, as demand for SARS-CoV-2 diagnosis was accelerating. In early March, laboratories in our CL3 biocontainment facility were offered to the Trust to increase capacity, and an early decision was made to focus all SGUL's research activities on COVID-19, ahead of many universities. With support from St. George's Hospital Charity, dedicated university CL3 laboratories were immediately upgraded for processing COVID-19 research samples. SGUL formed a COVID-19 research group of 27 academics and clinicians to identify an efficient strategic approach. By late May, the group comprised over 50 PIs in all three research institutes, transforming into a research collaboration forum, complemented by the SGUHT COVID-19 Clinical Trials Group with Trust and university members, overseeing COVID trials and highly successful patient recruitment to urgent studies.

By 31st July 2020, SGUL working with SGUHT recruited 2768 patients to 22 COVID studies. We far exceeded our targets and outperformed all other hospitals in the South London Clinical Research Network. The clinical research in COVID-19 led by SGUL academics has led to immediate impact, enhancing our international reputation:

- **Bicanic** is St. George's PI for University of Oxford's important Recovery trial
- **Heath** and **Cosgrove** led the Vaccine Institute/Clinical Research Facility as a major recruitment site for COVID-19 vaccine trials, including Phase I-III studies of the Oxford/AZ vaccine, the Phase I Imperial College vaccine trial, and many further major vaccine trials planned for the second half of 2020.
- **Planche**, with the Trust and South West London Pathology, are implementing Public Health England's SIREN study (SARS-CoV-2 immunity & reinfection evaluation). They evidenced long-lived protection against SARS-COV-2 reinfection following COVID-19 illness.
- St. George's is extensively engaged in other COVID-19 research areas. We are at the forefront of efforts to develop rapid point-of-care diagnostics with two industrial partners, QuantuMDx Group Ltd. and Mologic Ltd. We have developed two COVID-19 antibody in-vitro diagnostics devices with Mologic with CE marking through a Wellcome Trust/DfID funded project, and are extending the developing antigen lateral-flow devices for professional use and home self-testing. With QuantuMDx, we developed a CE-marked laboratory-based RT-PCR assay in May 2020 and are currently developing a point-of-care option with their Q-POCTM platform.

Ageing and associated diseases: Demographic ageing is an important emerging health challenge and an MCS Institute priority theme, with targeted recruitment especially to research on cardiovascular and neurological disease, widely involving joint SGUHT employees and clinical collaboration. Outcomes are summarised in Section 3.2, but prominent examples include: world-leading research on heart disease supported by charitable income, generating high-impact

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publications (six in NEJM), and two of SGUL's Impact cases, on sudden death and preventative screening in athletes. Dementia is studied in the Neurosciences centre, with support from the EC and UKRI. Studies include linguistic, big-data and novel MRI approaches to early diagnosis (**Garrard, Howe, Barrick**). Research by the large Movement Disorders group addresses diseases including (age-associated) Huntington's (**Hensman-Moss**) and Parkinson's disease, including novel surgical therapies through Deep Brain Stimulation (**Ricciardi, Pereira**). In Cell Biology, **Hainsworth**, supported by Alzheimer's charities and BHF, studies vascular dementia and stroke, while **Bennett** received Wellcome Trust and Age UK funding on cell senescence in ageing and skin cancer. **Meijles** (Vascular Biology) studies cardiological side-effects of cancer drugs, gaining several BHF grants since recruitment in 2017.

1.2.3. Develop our understanding of health through effective collaboration

Our extensive network of local, national and international collaborations is described in Section 4. Wide-ranging initiatives encourage internal interdisciplinary collaboration. The Institutes themselves were structured to bring together scientists and clinicians, and our clinical academics are drawn from a very broad range of clinical specialties. Our UoA1 outputs include diverse areas interdisciplinary with clinical topics, including plant biology (**Ma, Drake and Teh**), social sciences (**Hargreaves**), linguistics (**Garrard**) and chemistry (**Hilpert and Fisher**).

The establishment of joint Institute membership for PIs promoted both integration of teaching with research, and cross-cutting research. At 31/7/2020, eight PIs held joint membership between Institutes. The cross-Institute Bioinformatics Unit (2018) provides advanced Bioinformatics support, notably to Genetics/Genomics research in humans, model animals and pathogens. Led by Reader (**Witney**), with new Lecturer **Pittman** and an SGUL-funded postdoctoral fellow (2018-2022), the Unit's impact has been far-reaching, including involvement in over 40 major grant applications, supporting student research projects, and establishing local, national and international collaborations. These include a ~£1M BHF award on genomics of sudden cardiac death; £2.4M from the MRC for a TB therapeutic trial, five 6-figure awards from other charities, and multiple smaller awards. The Unit has industry funding to develop point-of-care diagnostics, bacterial microarrays and pathogen genome sequencing. It develops other researchers' skills and interdisciplinary collaboration by providing monthly Bioinformatics workshops. By July 2020, this group were preparing to contribute to rapid COVID-19 genomic sequencing for the NHS.

1.3. Enabling the achievement of impact - Impact Case Studies

Our seven selected UoA1 impact case studies reflect continuity and sustainability of strategic objectives pursued successfully over the last 20 years. All the cases considered arose from the targeting of university resources into specific focus themes according to 2015 strategies: promoting translational research, global health and collaboration, improving diagnosis and treatment and preventing disease. The selected seven relate to Infectious Disease, Global Health and Cardiology, but other strong cases under development include research in rheumatology, lymphoedema and STI diagnostics. All these programmes have benefitted from our overall strategy of investing for impact by intensifying collaboration with SGUHT, recruitment and support for key staff and critical mass and infrastructure investment (detailed in Section 3.2).

Five Infectious Disease and Global Health impact case studies respond to new and emerging healthcare challenges (2017 strategy).

1. **Novel molecular serotyping technology** – was made available through a not-for-profit company, leading to widespread adoption for multiple pneumococcal vaccine studies.
2. **Transforming the treatment and prevention of HIV-associated cryptococcal meningitis** – Our work impacting Global Health, international policy and guidelines was built on highly productive partnerships and capacity-building efforts with institutions in 8 countries across sub-Saharan Africa.
3. **Optimising malaria treatment with artemisinins** – Multiple collaborative clinical trials, in three African countries, led to a new standard of care in sub-Saharan Africa, finding simple dosing regimens for children, and a widely-used parasite resistance assay.
4. **Driving strategies to prevent neonatal Group B streptococcal (GBS) infection** – Our epidemiology surveillance work with a network of UK collaborators led to current UK guidelines for GBS prevention. We helped develop a strategy for maternal

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vaccination in the UK, which is now extending internationally, involving 28 collaborators in 12 countries in Asia and Africa.

5. **Optimising antibiotic prescribing in children** – Our research into inappropriate prescribing of antibiotics for children drove WHO's strategy, involving a new classification of antibiotics and leading to the first global paediatric antibiotic point prevalence survey involving over 25000 children in 56 countries. The work has extended globally, assessing antibiotic use across 70 countries.

Two Cardiology impact case studies likewise illustrate success in improving diagnosis and treatment and preventing disease (2017 strategy); facilitated by SGUL-funded Cardiology research nurses.

6. **International recommendations for ECG interpretation in young athletes to identify those at risk of exercise-related sudden cardiac death.** SGUL/SGUHT staff collaborated with multiple sports organizations, to greatly reduce false positive ECG outcomes, with international impact on >300,000 young (especially black) athletes.
7. **Sudden Unexplained Death in the Young: Enabling diagnosis and promoting preventative interventions.** Research on criteria combining genetic and pathological data for diagnosis after sudden death has influenced practice across UK, Europe and Asia.

We also have a healthy pipeline of potential future impact cases supported by our current strategy. They include : genetic diagnosis of lymphoedema (3.2.6), improved diagnosis and treatment for osteoarthritis (**Sofat**), development and evaluation of rapid diagnostics of sexually transmitted infection (**Sadiq**), rapid diagnostics for TB (**Bull, Hilpert**), rapid diagnostics for malaria (**Krishna, Staines**), improved TB therapy regimes (**Jindani**), new antibiotics (**Coates**), novel cancer therapeutics (**Dalgleish**), new treatments for orphan disease (**Bax**), new treatment for spinal cord injury (**Papadopoulos, Saadoun**) and new diagnostics for progressive aphasia (**Garrard**). Our Public Engagement in Science programme also supports our research impact. All of our impact case studies as well as our other significant research programmes have been featured in our regular Spotlight on Science public engagement programme, featuring the lead scientists and members of the research team explaining their work, and responding to questions and comments from members of the public.

1.4. Supporting and strengthening research culture

Research culture in UoA1 is supported extensively through institutional structures (REF5a). We particularly benefit from short lines of communication (between researchers and research support teams) and frequent meetings between senior lead staff. For example, a monthly meeting brings together the Deputy Principal (Research and Enterprise) with the Research Institute Directors, the Director of JRES and the Head of Research Funding.

Research Governance, Ethics and Integrity: UoA1 Institutes promote research integrity. As evidence, SGUL meets the Concordat to Support Research Integrity, UKRI Policy and Guidelines on the Governance of Good Research Conduct, UK Policy Framework for Health and Social Care Research and publishes an annual Research Integrity statement. Our UoA1 clinical and translational research receives external ethics committee review, regulatory approvals by the MHRA, HRA and regular audits by national authorities. Processes are supported by JRES's Research Governance team and the St George's Joint Clinical Research Committee (chaired by the Trust, with SGUL as deputy) which oversees clinical trials sponsored by SGUL and SGUHT. Non-NHS research is reviewed internally by our Research Ethics Committee. PIs are supported to produce research manuscripts and grant applications with statistically valid and reproducible experimental design, by designated statistical advisors/collaborators, and independent internal peer review before submission, contributing to top-quality systematic reviews and research reports in high-impact journals.

SGUL has robust policies for investigating alleged breaches of research integrity and handling other transgressions in research institutes, including bullying and harassment and data protection breaches.

Patient and Public Involvement: Patient/public involvement in research co-design is now routine for clinical studies. Many UoA1 groups (e.g. **Sharma, Dalgleish, Le Doare and Sadiq**) have established relevant patient groups who are regularly engaged for advice and comment. During

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2020 our COVID study applications have been informed by the public through links mediated by the Research Governance team in JRES.

Research Publications policy and Open Access: SGUL invested in a Current Research Information System (CRIS), detailing staff outputs among other data, and linked to SORA (SGUL Online Research Archive), supporting Open Access compliance. Monthly OA compliance reports to UoA1 Institute Directors have led to a culture change amongst PIs, with increasing awareness and deposition in St George's Online Research Archive (SORA). In addition, SGUL has supported Green OA publication routes, pursued numerous Read and Publish subscriptions with major publishers, and invested £42K within UoA1 in this REF period, over and above our block funding from UKRI and other charities, to ensure Gold open access for our impactful research.

Research Data Management (RDM): SGUL is working towards compliance with the Concordat on Open Research Data. SGUL's widely representative RDM working group leads on strategy and guidance (REF5a). Communications from them and from Institute management ensure that PIs engage to maximize sharing and potential use of data. Figshare is heavily used by UoA1 PIs in the Centre for Global Health, including for trial data and protocols, and for patient and public engagement activities and genetic datasets. Many UoA1 researchers also use REDCap to collect/manage research trial data, including international data. We also use subject-specific repositories like the NCBI Short Read Archive (SRA) for genome sequence data, the EBI European Nucleotide Archive (ENA) as standard practice upon publication, and Gene Expression Omnibus for functional genomic data.

Annual IG Toolkit training completion rates in the research institutes consistently approach 100%. We invested in a Data Safe Haven for storing personal identifiable and sensitive information, enabling projects using NHS Digital data and facilitating all clinical studies.

Public and Community Engagement: Detailed in section 4.4.3.

1.5. Outlook for the next 5 years

UoA1 strategies align with SGUL's 2017 Five-year Plan and 2019 Research Operational Plan. We will build on our stable research base and structures, further develop existing areas of innovation and strength and expand selected research areas (with flexibility for new and emerging challenges and outstanding potential recruits), to maintain vitality and increase our world-leading impact. SGUL and SGUHT jointly created the **Translational and Clinical Research Institute (TACRI)**, in June 2020, to provide joint research activities for all clinical and health researchers together with research training and development opportunities.

An important development will be our Strategy for Impact, informed by contributions including from the St George's Translational Research Advisory Board. We will develop and extend the CAGs. We will increase research capacity through continued recruitment and investment, primarily into early career researchers but also, where appropriate, into established international research groups. We will strengthen research into interdisciplinary and cross-cutting themes like Bioinformatics, Age-associated diseases, Genetics/genomics and Global health and have appointed a new Director of Cross-Cutting Research Themes.

Our strategies to take forward current work are well developed, particularly supporting the areas of fungal disease, antimicrobial resistance and paediatric infection (I&I); genomics of heart and lymphovascular disease, movement disorders (mechanisms and therapy), brain-computer interfacing and MRI innovation (MCS).

The COVID-19 pandemic raised Global Health issues on the scientific and political agenda. SGUL has a strong track-record and international reputation in this area, and our investment into Global Health research infrastructure, collaborations and people has positioned us to move quickly to address future Global Health research challenges and initiatives.

Our implementation of strategy to date has placed us in an excellent position to achieve these aims. Our strengthened collaborative links with SGUHT have been reciprocated by firm commitment from the Trust, evidenced by increasing investment, facilities and key supporting administrative structures (value ~£493k)

2. People

The reorganization of SGUL into Institutes in 2014, with Research Institute academics able to devote up to 80% of their time to research, has enhanced prioritization of research. It has provided

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an effective structure for interdisciplinary collaboration and strategic management of staff performance and development, overseen by Institute Directors.

SGUL has strongly supported the Vitae Concordat to Support the Career Development of Researchers since its inception in 2008, and pursued its principles, including its 2019 revision. Central to this are strong communications across the university, informing all staff about our high standards for research integrity, and care to ensure policies and practices are inclusive, equitable, open and transparent.

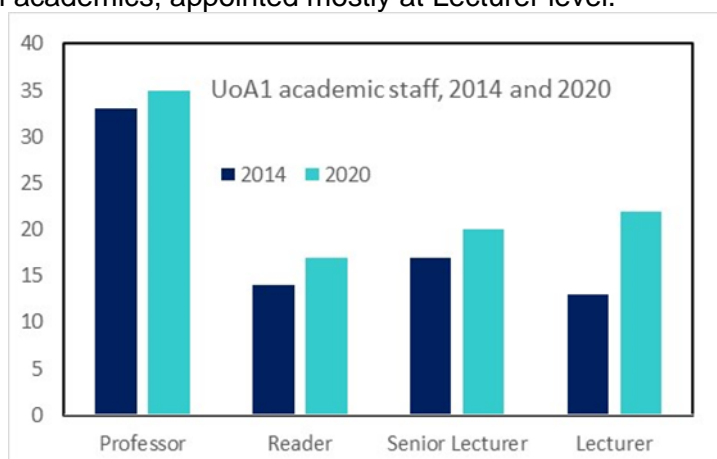
2.1. Staffing and staff development strategy

In UoA1 Institutes this is aligned to our research strategic aims and encompasses two objectives: recruitment and development of early career researchers (ECRs), and renewal (via promotion) and development of more senior staff. Developing and training junior academic and clinical-academic staff to become world leaders in our research areas reflects the University's goal of "fostering research growth, impact and excellence".

Key elements of our staffing and staff development strategy include:

2.1.1. Targeted growth and development in critical mass

HESA-returned academic staff primarily based in UoA1 institutes (representing SGUL research focus areas) have grown from 77 to 94 (Figure 2), with 34 new PIs since 2014, of whom 26 were early career research academics, appointed mostly at Lecturer level.



Recruitment to and investment in our NIHR clinical trainee programme has also increased, with a doubling in academic clinical fellows and Lecturers in 2019 and 2020 (19 recruits) compared to 2014 and 2015 (9 recruits). The overall younger demographic improves vitality, sustainability and succession, through development and promotion. Most new Senior Lecturer to Professor appointments have been through promotion.

Investment into academic posts and people is targeted to expand collaborative Centres/clusters in key focus areas. The resulting scholarly and societal impact, for example in Cardiology, Genetics, Neurosciences, Global Health, Diagnostics and Paediatric Infection (details in section 3.2), demonstrates the effectiveness of this policy, which incorporates succession-planning by recruitment of junior academic staff, as restated in SGUL's 2019 Research Strategy Operational Plan. This commits to a minimum of 3 new Lecturers in each of the next 5 years, including joint appointments with SGUHT.

Integration of clinical staff: Nearly half our UoA1 staff have clinical appointments, bringing important insights into our research. They are fully integrated into the Institutes and enjoy the same privileges and support as other staff. Clinical ECRs are also supported by GAT (section 2.1.2).

2.1.2. Commitment to staff development at all career stages

Personal development: Our thriving Staff Development and Support programme aims to inspire innovation and enable researchers at all career stages to reach their full potential. On arrival there is an induction programme, while long-term peer support comes from Institutes, Centres, CAGS and cohort networking groups for postdoctoral researchers, Lecturers and Senior Lecturers, represented on the university's main committees.

A centrally-organized annual personal development review (PDR) by senior staff provides a regular opportunity to review progress and define goals and development needs. In a 2019 staff survey,

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over two-thirds of respondents agreed that the PDR scheme was useful to identify strengths and achievements and effective in reviewing personal progress.

Staff achievements are recognized in Institute and University communications and newsletters. Annual merit awards recognize staff making an exceptional contribution, UoA1 awarded 15 merit awards (one-off bonus or increments) during the REF period.

Training: Training courses and workshops are available, with many focussed on career development, such as paper- and grant-writing, interview preparation, presentation skills, enterprise, intellectual property, media and public engagement. Staff and line-managers receive training in areas including equality, diversity and inclusion (EDI), tackling discrimination and mental health. We encourage staff to enrol on leadership courses, including in-house and Aurora women's leadership programmes. SGUL funds at least 5 Aurora places/year. For example, **Molloy** was enrolled in 2017, subsequently recruited as a Lecturer in Epidemiology and awarded an AMS Springboard in 2019.

Staff development funds (allocated per capita) to attend training events and courses, research conferences and other academic activities are available, including designated funds for those with caring commitments.

UoA1 Institutes run six external and internal research seminar series and three annual research symposia. Jenner Day and the international InterTB symposium are major annual events, attracting external audiences and top international speakers. Together with SGUL's annual Research Day, these activities provide our young scientists excellent and regular opportunities to develop critical thinking and presentation skills.

Researcher support: To promote impact, UoA1 Institutes allocate funding rounds for competitive small grants, enabling pilot data towards large grant applications, completion of work for publication, and collaborative work with clinical colleagues. 105 awards totalling £635,927 were made from 2016 (outset) to 7/2020. A subcommittee of senior academics makes the awards openly and transparently, based on merit. Analysis indicated no significant M/F difference in success rates. Many awards have enabled completion of high-quality publications submitted in this REF (e.g. Circulation, Nature Communications) and pilot data towards successful grant applications (e.g. BHF, MRC, BBSRC).

We support academics to secure prestigious personal support, through personal and professional mentorship and collegiate support such as internal peer-review of applications and papers). 39 fellowships were awarded during the REF period, with 26 fellowships since 2017. Recent successes include four named fellowships (1.1.1) and Academy of Medical Sciences Springboard 100% success rate for round 6. This resulted in an invitation to present our process, consisting of offering each applicant internal peer support, mock interviews and continued dialogue with an experienced Research network.

Promotion: SGUL's academic promotions process was updated in 2016 with Innovation and Enterprise as a significant new route. Other changes recognised activities like public engagement, teaching scholarship, and excellence in clinical practice informing research or education. DORA principles are now incorporated into our promotions assessment criteria. Workshops support applicants to develop their strongest case. The Promotions Committee membership is transparent, and decisions are objectively informed through extensive external review.

Leave: SGUL's Leave policy covers all circumstances including parental leave, adoption, domestic and personal matters, or essential civil/public duties. It is linked to our policy on flexible working. It also encourages development through sabbaticals, external collaborations and new activities within SGUL. Three UoA1 staff have taken sabbaticals during 2014-2020.

Staffing support and investment in relation to the research and impact strategy: SGUL values its reputation for a friendly, open environment for students and staff. In addition to individual career support, we recruit and group people within centres of critical mass to provide a collegiate and stimulating research environment (section 3.2).

Early career researcher (ECR) academics: ECR academics are recruited in research fields where we can provide robust support: mentorship, potential collaborative input and critical mass. They are integrated with research teams, and into research centres or CAGs as appropriate. They receive a generous startup package, which currently includes a PhD studentship. They are supported to establish their research laboratories and in recruitment and research supervision, besides the training already mentioned. Each ECR is assigned an in-house mentor, with AMS-based mentorship training provided. Besides standard probationary periods and PDRs, new

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Lecturers have meetings after 18 months and 3 years to review progress, ensure appropriate support and advise on career and progression plans, with their Institute Director, academic mentor and the Deputy Principal (Research and Enterprise). **Meijles**, **Southgate** and **Hargreaves** were all promoted to Senior Lecturer within 3 years of appointment.

SGUL encourages ECRs to obtain the postgraduate certificate in Healthcare and Biomedical Education (PgCertHBE) or Advance HE accreditation, to promote research-informed teaching and equip them for future academic employment or promotion.

George's Academic Training (GAT): SGUL prioritises the training of clinical academics. This is primarily through the NIHR Integrated Academic Training (IAT) scheme for Academic Clinical Fellows (ACFs) and Clinical Lecturers (CLs), to which SGUL provides matching funds to increase numbers of recruits. We established the innovative GAT scheme, led by **Sofat**, in 2016 to attract the best young clinical academics to work and develop their careers at St. George's.

GAT provides high-quality training for clinical academics through to tenured posts. Providing structured professional development, research skills and networking events, the programme is a partnership between SGUL, SGUHT and allied hospitals. It strongly encourages collaboration across our organisations. In 2019 the GAT's new Postgraduate Certificate in Research Skills and Methods was quickly oversubscribed. A service-level agreement with Health Education England of £0.54M per year was secured to cover salaries, training on our PGCert or MSc programmes, and conference and course attendance.

All our training posts have been filled, and the partnership has hosted 56 ACFs and CLs, with 24 currently in the scheme. The number of ACFs and CLs in the 2019 intake has increased by 50% compared to 2013.

Among ACFs, 83% have completed or are pursuing externally-funded higher degrees, 61% at SGUL. Of 49 GAT trainees since 2014, 16 associated with UoA1 institutes have won prestigious fellowships or been appointed to senior positions in academia, including three Professors and one Reader. GAT has developed into an important provision to encourage interdisciplinary research and develop future clinical research leaders.

Fixed-term postdoctoral and other research staff: Our strategies are designed to attract and support outstanding postdoctoral researchers. The postdoctoral network group organizes regular meetings and events and has representation on senior university committees. In our 2019 staff survey, responses from this group to "Your institution treats you fairly as a researcher in comparison with other types of staff with respect to...", included positive responses as follows:

- Access to training/development opportunities 88%
- Opportunities to attend conferences and external meetings 88%
- Opportunities to participate in decision-making processes 72%

Competitively awarded bridging support funds provide short-term continuity of funding for research staff. Since 2015, the main University scheme has made awards to 28 UoA1 individuals, with a spend of over £300,000. 50% of the supported applications were successfully bridged to external research grants. Conspicuous successes include **Witney** and **Gould**, who as postdoctoral researchers in bacterial genomics received bridging funding to a Gates Foundation award. **Witney** is now a Reader in Bioinformatics, whilst Gould became senior scientist to BUGS Bioscience, contributing to an Impact Case study.

SGUL also invests in salaries for research staff pivotal for major core areas, e.g. trial managers and co-ordinators in the Vaccine Institute and Cardiology Centre, and research managers and technicians for large research groups like the Paediatric Infectious Disease Research group (PIDRG). Similar investments have promoted sustainability in new areas of expertise, such as the Centre for Global Health. Through such investment:

- the Vaccine Institute had the resource to become a major London centre for COVID-19 vaccine studies;
- the PIDRG has attracted 34 grant awards over the last 3 years, totalling £21M;
- in 2020, Jindani and Harrison completed international recruitment of 672 participants to the MRC-funded RIFASHORT trial (NCT02581527), despite the COVID-19 pandemic.

We aim to support outstanding post-docs, fellows and other research staff to further their career at St George's. Since 2014, 12 such staff have been promoted to an academic post (7M/5F) and are returned as category A staff.

Unit-level environment template (REF5b)**2.1.3. Evidence of staff satisfaction**

Among UoA1 researchers, in a 2019 institutional staff survey:

- 78% agreed that they were well integrated into their Institute's research community.
- 78% agreed that they were encouraged to engage in personal and career development.
- SGUL recognises and values researchers' contributions in research (69%), teaching (66%), publications (78%) and public engagement in science (62%).

2.2. Research students

SGUL encourages all PIs to recruit PhD students (Research Operational Plan). Recruitment protocols are transparent and inclusive, overseen by SGUL's Research Degrees Committee (RDC).

Funding programs: In July 2020 the UoA1 Institutes hosted 59 MPhil/PhD and 23 MD(Res) students. A major source of studentships is the MRC DTP with the London School of Hygiene and Tropical Medicine (LSHTM) (section 2.2.1). We are also part of the Wellcome Trust Clinical PhD programme in Global Health Research, collaborating with LSHTM and four other medical schools. Other funding includes MRC Clinical Research Training Fellowships, and charity (eg. 4 BHF)- and 6 industry-sponsored PhD and MD(Res) studentships and fellowships, often an outcome of dedicated GAT training. SGUL has increased internal investment into PhD studentships, including support for international PhD studentships to UoA1 institutes from LMICs.

2.2.1. Support for PhD and MD(Res) students

We constantly strive to improve the quality of training and supervision offered to our students, with opportunities to prepare for independent research. The annual Graduate School Skills Programme (GSSP) is mapped against the Vitae Researcher Development Framework and includes modules on good research practice, research integrity, ethics, time-management and public engagement as well as core disciplines including statistics, research methods, project planning and management, and critical appraisal. Since 2016, six sessions in the GSSP and a programme of workshops address Postgraduate Student wellbeing, as well as a session on Personal Resilience. Each Research Institute has academic Postgraduate Co-ordinators, who oversee the students' welfare and progress, monitor quality of project and supervision, advise if problems arise, and represent the Institutes at the RDC.

The MRC London Intercollegiate DTP (LID): This MRC Doctoral Training Programme, awarded jointly with the LSHTM in 2016, enabled the establishment of a cohort structure for PhD students, our model for the future. The current programme (final cohort starts in October 2021) has recruited 66 PhD students, with 15 registered at SGUL and 17 jointly supervised from SGUL and LSHTM, in UoA1. These students enjoy the student benefits from both organisations, including taught modules, seminars and public engagement resources. The unique selling points of this DTP map to our research strategies and include: international focus, multidisciplinary collaborative research, and societal impact and engagement. Our students access extended placements in industry (large Pharma and SMEs) and the public sector (e.g. NHS, WHO, PHE) and events to showcase careers. Training days (2 per year) cover research impact and engagement, and strategic skills emphasising communication and influencing policy guidelines.

Two national prizes have been won by these students, one jointly supervised at LSHTM and SGUL, and the other, the MRC (UK) Max Perutz Science Writing Prize, to Natasha Clark at SGUL.

MD(Res) students: at SGUL attend the GSSP and are affiliated with the GAT (Section 2.1.2) which, besides the support already mentioned, holds 3 workshops per year for all Clinical Academic Trainees. Recent workshops have included Career Development, NIHR funding schemes, managing completion of clinical competencies and development of own research themes and funding.

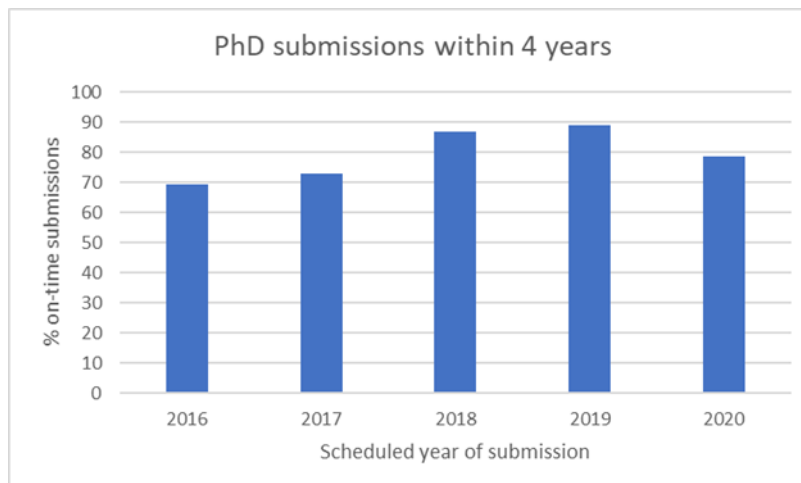
2.2.2. Evidence of progress

Improvement in the student research environment, completion rates and growth in postgraduate research student numbers have been prioritised over the last 6 years.

Structural changes were implemented, including a culture change in communications between university, supervisory team and research students, improved oversight and monitoring of student progress, as well as better integration of research students into the institutes, with representation on institute and senior university committees, and to support career progression. In addition, PhD

Unit-level environment template (REF5b)

students have representatives on the Institute Steering Group/Management Team. The PhD peer group regularly meets with the Head of Graduate School and DPs for Education and Research & Enterprise. Together, these measures have had a positive impact on improving morale and satisfaction levels amongst staff and students, who now feel more valued and better supported. UoA1 institutes averaged 21 new PhD/MD registrations per year throughout this REF period. We made significant improvements in our on-time submission rates (Figure 3), with year on year increases until 2020 where studies for two students (14%) were significantly interrupted by COVID-19.

**2.3. Equality & diversity**

Equality and Diversity are at the core of our values (REF5a Statement). SGUL is an inclusive employer aiming to create an environment and culture based on staff merit, ability and potential. UoA1 institutes align fully with these values and practices.

Our strategy commits us to:

- the expanded Athena SWAN Charter;
- the European Commission's HR Excellence in Research award;
- the University as a Stonewall Diversity Champion and a Disability Confident Employer.

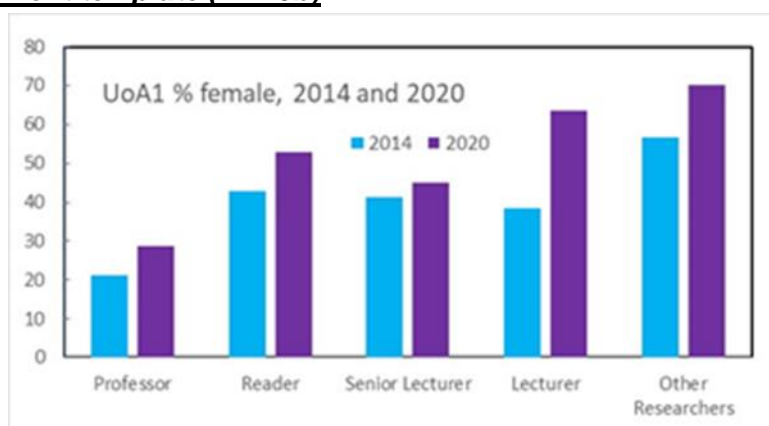
SGUL received the Institutional Athena Swan Silver Award in 2018 (Bronze in 2015), reflecting continuing commitment and progress. SGUL has created supported networks for LGBT+ staff and allies, staff with disabilities, a mental health network and an emerging Race and Ethnicity network. The UoA1 Institute Directors are members of the Athena SWAN Self- Assessment Team (SAT).

Examples of good equality and diversity practice in UoA1 have included:

- support for flexible employment and working arrangements. For example, a newly appointed Lecturer is supported to work remotely in Africa for 3 years for family reasons, and another staff member works flexibly to enable a disabled child;
- anticipatory advice and support for staff on short-term contracts, and strategic support for securing bridging funding from University funds;
- support for part-time and fixed-term staff, study and sabbatical leave, and to support good mental health, for example through investment in mental health first-aid training. Important especially in 2020 when most of our staff were supported to work from home, for example through provision of IT and office equipment. Institutional strategic support funds were also offered to assist staff coping with difficult personal circumstances;
- special provision for disabled staff, including a networking group, flexibility of working arrangements, and other measures including parking support.

The Institutes facilitate return to work after absences associated with parental leave, ill-health or caring. We typically employ one or two Chadburn Lecturers, clinicians in training requiring part-time posts. Designated funding allows academic and research staff with family commitments to attend conferences and academic meetings, covering carer travel, support costs and any unusual circumstances.

Our strategy and approach is bringing about changes in gender balance (Figure 4).

Unit-level environment template (REF5b)

Overall, female staff in UoA1 Institutes have increased from 55% to 62%, in line with the rest of the university (62.5%, 31/3/2020). Our percentage of female staff has increased at every grade, including by 35% for Professors and by 65% for Lecturers. Changes at Lecturer level are expected to feed through to more senior levels over time, with promotions.

An established Pay Gap Working Group tackles gender and ethnicity pay gaps. Our mean gender pay gap for Category A staff in Uo1 has reduced from 31.3% in 2013 to 13.5% in 2020, predominantly due to the increased number of senior women, as well as the identification and removal of a historical pay bonus, and a new starting salary policy introduced in 2018.

SGUL has recently completed an internal Race Equality Review. Data from SGUL's Equality Duty Report in July 2020 showed that 27.5% of UoA1 staff identified as BAME (4% preferred not to say). This is markedly higher than the sector average of 10.3%.

A series of internal "Deep Dive" audits in 2020/2021, as part of our Athena Swan action plan (MCS in July 2020, I&I in Sept 2020), which reviewed data and processes around promotion, recruitment, support and investment and identified key areas for actions including further equalization of gender balance between junior and senior posts, and improved data gathering across the university on ethnicity.

2.3.1. Construction of REF submission: equality and diversity considerations

In line with our CoP and EDI objectives, our approach to the construction of this REF submission has been open and consultative, transparent and fair. There was wide consultation about our REF Code of Practice across the university. All academic staff were able to apply to become joint members of a Research Institute, affecting eligibility for REF2021; 6 staff took this opportunity and restructured their research-teaching workload (2M, 4F).

All eligible staff were engaged in identifying their strongest papers for consideration in a mock REF, and the criteria for selection widely shared on webpages and at seminars and events. A panel of 36 senior PIs volunteered to review papers internally. A near-final Output shortlist was shared with eligible staff who were invited to propose any final amendments to the shortlist panel for re-consideration.

For impact case studies, all academic staff were given the opportunity to put forward a draft impact case. A designated committee, including representatives across the university and external consultants, determined a shortlist according to the REF criteria, advised PIs on providing supporting evidence, and finalised the submission.

3. Income, infrastructure and facilities**3.1 Research funding and strategies for generating income****3.1.1. Strategies**

Strategies for generating research income align with our research strategies and include: investing in critical areas of research strength, establishing Centres and CAGs;

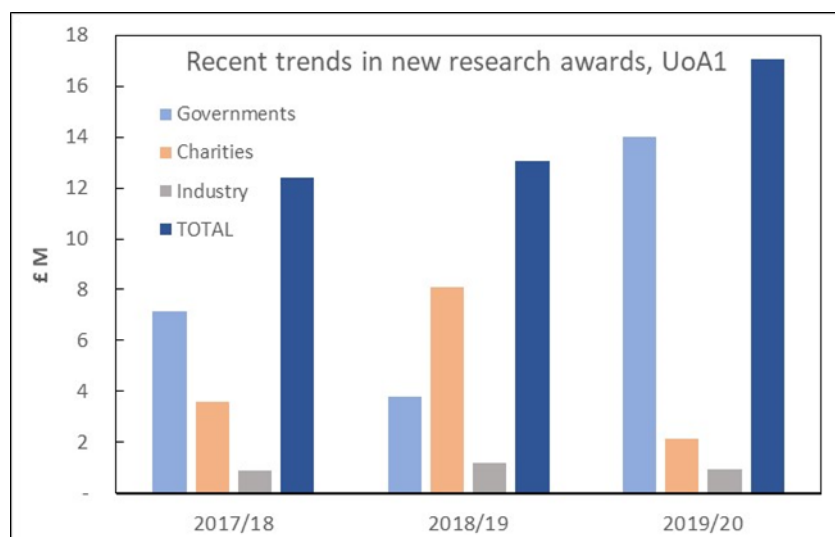
- recruiting talented academics, especially at Lecturer level, maintaining both vitality and sustainability;

Unit-level environment template (REF5b)

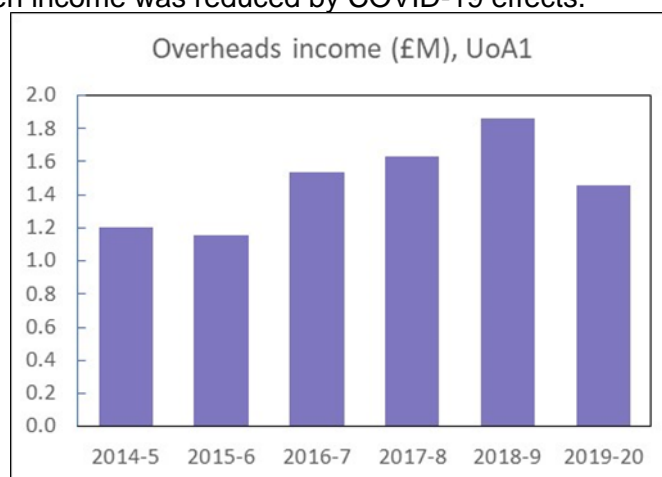
- encouraging internal and external applicants for personal Fellowships, supporting outstanding early-career researchers to work and develop at SGUL;
- generating impact and intellectual property by supporting translational research and development;
- promoting income generation from research donations, consultancy and commercial activities.

3.1.2. Research funding, overview

Total research awards to SGUL UoA1 Institutes have increased in recent years (Figure 5).



New awards are shown. A major charitable sponsor is the BHF, who awarded £5.5M, funding 45 SGUL projects over the REF period. New charitable awards were healthy up to 2018-19 but fell sharply in 2019-20 as sponsors were affected by the COVID-19 pandemic. However, this was balanced by rising income from governments, especially EU and UK. EU grants have represented 31.8% of our total UoA1 new awards in the period shown, evidencing our international activities. The funding trends are also reflected in rising overheads income over recent years (Figure 6), except for 2019-20 when income was reduced by COVID-19 effects.



Among 24 grants of over £400,000 awarded in 2017-8 to 2019-20, the sources were UK Government (Research Councils, NIHR) (12), the EC (6), UK and overseas medical charities (5) and a Swiss non-profit foundation (1). (Further details in Section 3.2).

SGUL was awarded £1.5M Institutional Strategic Support Funding from the Wellcome Trust between 2014-2016 and a further £1M between 2017-2020. These funds, matched by the university, have been used to support the research strategy through a range of measures, including recruitment of ECR Lecturers, supporting University/Trust collaborations, investment in

Unit-level environment template (REF5b)

cross-cutting research initiatives, supporting researcher personal development and public engagement in science.

3.1.3. Research consultancy and enterprise income 2014-2020

The Joint Research and Enterprise Services (JRES) team of 30 staff is jointly funded by SGUL and SGUHT, managing research grants, research governance and enterprise activity within and across both organisations. Investment and complete restructuring since 2014 have strengthened JRES capacity.

JRES facilitates academic interaction with industry, including funding, collaborations, knowledge exchange, career development and a route to market for our innovations. They set up spin-out companies such as TiKa Diagnostics and BuGS Biosciences (section 4.4.1 and Impact Case). Their Innovation Awards scheme competitively awards around £50K/year to academics to pilot innovative ideas towards commercial development. SGUL income from Enterprise and IP includes direct grants, consultancy and patents. Our Higher Education Business and Community Interaction (HEB-CIS)-eligible income has risen from £2.9M in 2015/6 to £6.7M in 2018/19, and our HEIF from £330K in 2017/18 to £663K in 2020/21, reflecting our 2016-2021 knowledge exchange strategy. The additional funding supports our industry interaction and knowledge exchange, promoting medical impact.

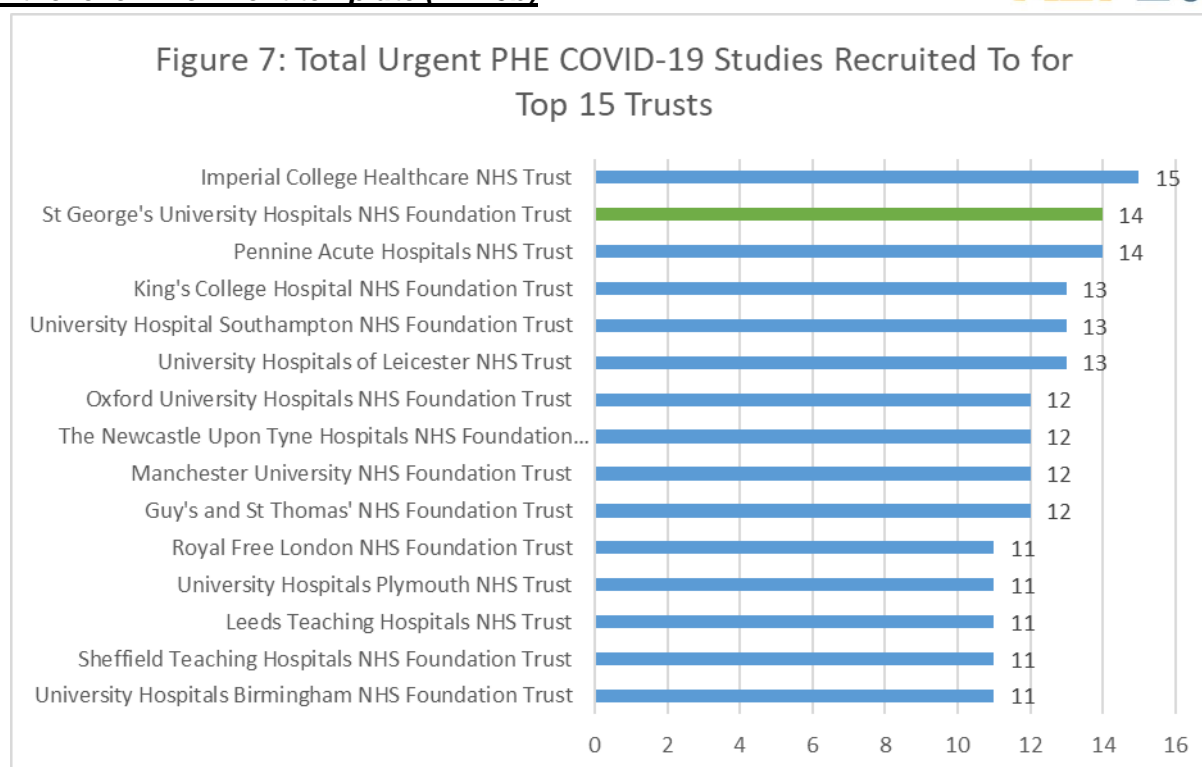
Research supported by industry income was £730K in 2013/14 but has since averaged £1.26M/yr for the three years leading to 2019/2020. As a result, in the recent KEF analysis SGUL was ranked in the top 10% for Research Partnerships and top 20% for working with business.

Under SGUL's new consultancy scheme, 71 consultancy agreements were arranged for UoA1 academics in the two years to July 2020. Our consultancy income increased from £314K in 2015/16 to £1,061K in 2018/19. We protect and licence our innovations. We have 11 active patents, and our intellectual property income increased from £340K in 2015/16 to £807K in 2018/19.

3.1.4. Clinical Research activity and funding

Much of the clinical research taking place in SGUHT is led by or involves SGUL academics, enabled by the aligned research strategies and joint staff of both institutions. It is supported by the joint **Clinical Research Facility (CRF)**, and a Trust-employed research workforce of over 140 staff. The 21 CRF staff comprise nurse managers, research nurses, clinical trials coordinators and assistants, technicians and a receptionist, overseen by the JRES. UoA1 staff collaborate with SGUHT across a full range of clinical specialities, with particular strengths including Cardiology, Infection, Paediatrics, Reproductive Health, Neurology/Neurosurgery, and Accident & Emergency. Through involvement and leadership from clinical academic staff in UoA1 institutes (e.g. **Sharma, Behr, Sofat, Heath, Bicanic**), we have greatly increased patient numbers recruited to clinical research studies in SGUHT, from 5,108 in 2016/17 to 13,102 in 2018/9 (10,538 in 2019/20). The number of clinical research studies increased from 221 to 319 in 2019/20. Relative to other NHS Trusts in the South London Clinical Research Network (CRN), SGUHT's share of 'weighted recruitment' (weighted towards complex/costly research) roughly doubled from 2016/17 to 17.2% in 2018/19. The consequent CRN funding to the Trust increased from £2.0M in 2019/20 to £2.7M in 2020/21.

Clinical research was diverted in 2020 by a rapid decision to focus new studies on COVID-19. As of July 2020, St George's had recruited 1,750 patients to 14 NIHR urgent public health studies, placing St George's second in the country for the number of urgent COVID-19 public health studies (Figure 7). Three of these studies, including the COVID vaccine trials, were led by SGUL clinical academics who are returned as Category A staff in this REF.



3.2. Organisational infrastructure supporting research and impact

From 2014 we established Research Centres and other clusters in critical areas of research strength, backed by SGUL investment into infrastructure and facilities to drive internationally outstanding research with impact. These provide cohesion and a sense of identity, with seminar series, journal clubs and focussed symposia contributing to intellectual rigour.

Other areas of research strength in I&I, including paediatric infectious disease, rheumatology, respiratory inflammation, cancer immunotherapy, virology and vaccine design are encouraged to develop into Research Centres, facilitated by our establishment of the four CAGs (Clinical Academic Groups), joint formal structures designed to bring together academics and clinical academics within SGUL and clinicians in SGUHT. Descriptions and achievements of the main units follow.

3.2.1. Global Health

The Centre for Global Health (2017) includes 19 internationally recognised research teams and has led clinical trials that have substantially influenced national and international policy and practice. Over 30 of our REF outputs, including NEJM (3), Lancet and Lancet group journals (6), and Clinical Infectious Diseases (3), all ranked in the top 1% for citations, and three of our impact case studies led by Harrison, Heath/Le Doare and Krishna illustrate this impact.

Longstanding projects include:

- multi-centre trials for TB chemotherapy in Asia and throughout Africa;
- Cryptococcal meningitis diagnosis and treatment studies throughout Africa;
- Latin America's only rural birth cohort, established since 2006;

A major impact of our Global Health research strategy has been to inform and shape WHO policy and guidelines in these and other areas including paediatric antibiotic prescribing and recently maternal immunisation programmes.

SGUL's investment into this Centre includes core funding for two international trial managers, three research nurses, recruitment of 7 Lecturers, a Senior Lecturer and a Professor, and increased academic time for clinical Professors **Harrison** and **Jindani**. In this REF period, four PIs have been promoted, 1 to Reader and 3 to Professor. Infrastructure funds support the BSL3 suite, and a controlled-environment plant biotechnology facility, for expression of novel biologics for infectious diseases.

Centre PIs have a strong track record of leadership in Horizon 2020 awards, with Global Health grants to Ma (2) €2.2m and Krishna €3.7m, and EDCTP grants to Le Doare (€9.9m), Reljic (€7.9M),

Unit-level environment template (REF5b)

Loyse (€1.8m) and Harrison (€0.4m). The centre has also been successful in securing funding from MRC (£3.2m) Harrison and major charities including the Bill & Melinda Gates Foundation \$5.2m Le Doare (2).

3.2.2. Centre for Diagnostics and Anti-Microbial Resistance

Established in 2015, this Centre includes 14 research groups who focus on developing, evaluating and implementing new diagnostic devices and understanding the origins, spread and impact of antimicrobial resistance.

There is extensive collaboration with industry to understand resistance markers and to develop diagnostic devices (**Krishna, Staines, Butcher, Hilpert, Bull, Sadiq**), notably with UK SMEs QuantuMDx (<https://quantumdx.com/>) and Mologic Ltd. Two of our impact case studies (**Hinds** and **Sharland**) are examples of success.

SGUL's support included core funding of 4 key technical and managerial staff for 3 years, and appointment of 3 Lecturers and 1 Professor (part-time) to the Centre during this REF period. Five Centre PIs were promoted, 4 to Reader and 1 to Professor. Additional academic time for Professors **Sharland** and **Sadiq** was also funded. Research space, including a GLP-compliant laboratory for the Advanced Diagnostics Research and Evaluation Unit (ADREU) was renovated (cost ~£400K).

In the REF period, PIs have won significant research grants including £2.6M (Sharland), from Global Antibiotic R&D partnership, as well as £1.6M NIHR (**Sadiq**) and Innovate UK funding for TiKa (**Hilpert and Bull**), and £406k JPI-AMR/MRC (**Lindsay**). 34 AMR Clinical Trials have been supported by **Sharland** and **Heath**.

3.2.3. The Infection CAG

This network was formalized in 2019, dynamically incorporating university academics and all clinical specialities involving infection, immunity or study of the microbiome. See section 1.2.2 for an example of impact.

3.2.4. Cardiology Research Centre and the Cardiovascular CAG

Cardiology, including sudden cardiac death, is a major speciality, with internationally eminent research groupings. The Cardiology Centre recruited **Sharma** and **Sheppard** at Chair level (2013), expanding to the Cardiology CAG (2015), and recruiting Senior Lecturers **Papadakis** (2016, now Reader) and **Asimaki** (2017). **Behr** was promoted to chair (2018) and leads the further-expanded Cardiovascular CAG (2020), combining strengths in Vascular Biology and Vascular Surgery.

SGUHT is intensively involved, co-employing 13/20 SGUL-funded PIs in this complex (July 2020). SGUL also funded 3 cardiology research nurses/trial co-ordinators during this assessment period, helping attract extensive external funding. This includes £4.7M from CRY to **Sharma** and **Sheppard** and £1.04M to date from McColl's/Lancaster foundation to **Behr** with strong ongoing relationships.

Research outputs include two of SGUL's Impact cases (Sharma and Behr), and many highly cited outputs (e.g. seven NEJM publications, 2015-2020). Cardiology hosts the **CRY** (Cardiac Risk in the Young) **Centre for Inherited Cardiovascular Conditions and Sports Cardiology** led by Sharma (sports) and Behr (inherited conditions). It includes the UK's largest sports cardiology clinic. **Sheppard's** unit incorporates the CRY National Centre for Heart Pathology, a national coroners' referral service for sudden death. **Camm** (Emeritus since 2018) is a Clarivate Highly Cited Researcher 2015-20.

3.2.5. Neurosciences Research Centre and CAG

The Neurosciences Research Centre (headed by **Howe**) has also received substantial investment, with renovated/restructured accommodation (2018, £504,000 cost including adjacent office for JRES), and expanding from 4 to 16 SGUL-funded staff in the period, including highly productive groups on Movement Disorders and Deep Brain Stimulation led by **Edwards** and **Pereira**. They established a high-volume **Deep Brain Stimulation** treatment/research centre, already the UK's 5th largest. They collaborate with **Howe's** established Magnetic Resonance Imaging (MRI) research team. The **Neurosciences CAG** (from 2019) embraces the SGUL Neurosciences Centre and SGUHT's extensive Neurosciences Centre, serving 3.5 million people with 10 specialities. Research strengths include movement disorders, dementia, neurosurgery and brain MRI.

Unit-level environment template (REF5b)

Neurosciences staff received prestigious funding including £1.1M from NIHR to **Nielsen** and £662K from MRC to **Edwards** on movement disorders; EC Horizon funding to **Garrard**, on precision medicine for dementia; TSB and Innovate UK grants to **Howe** and **Barrick** on novel MRI methodology, and an MRC-NIHR CARP Fellowship to **Ricciardi** on Parkinson's disease.

Cock co-led international NIH-funded consortium ESETT, trialling therapies for status epilepticus, (output **NEJM**, 2020). All the above groups had highly cited outputs (top 1% or 5% in field). The MRI group patented QDI (Quasi-diffusion imaging) – accelerated high-resolution MRI imaging.

3.2.6. Genetics Research Centre and Genetics & Genomics CAG

Expansion and support of Genetics were prioritised in 2014. A Genetics Unit was established in renovated labs and offices. Three new Lecturers (one in Bioinformatics) were recruited and we invested in research time for clinical geneticists **Mansour**, **Mortimer** and **Ratnam**. Genetics was then launched as a Research Centre (2018). The Centre has benefitted from SGUL's investment into greatly enhanced data storage capacity and the Data Safe Haven (section 3.3). **The Genetics and Genomics CAG**, led by **Mansour**, was established in 2019, further developing our translational research strategy.

Genetics has received substantial grants including a £2M MRC program and £606K from the Swiss National Science Foundation to the **Lymphoedema** team – **Ostergaard** with **Mortimer**, **Mansour**, **Howe** (Neurosciences), and others – on genetics and diagnostics of primary lymphoedema. Their research impact includes identification of 8 lymphoedema genes and establishment of a genetic/diagnostic classification of lymphoedema, adopted by the European Reference Network VASERN. The team is world-leading, as illustrated by the (international) LERN Career Achievement Award to Ostergaard and Lifetime Award to Mortimer (2018). Lecturer **Southgate** gained an AMR Springboard award.

Genetics REF-submitted outputs include four cited in the top 1%, in Cell-, Nature- and Lancet-family journals. The staff have also contributed to many other multiauthor international consortia with highly cited publications (top 1%), e.g. in Nature, Nature Genetics and Lancet.

3.2.7. Cell Biology Research Centre

Cell Biology is led by **Carter**, recruited from NIMR in 2013 with MRC funding (£0.95M). Investment has included equipment grants and staff bridging, also recruitment of new Lecturer **Chikh** (2020), who already gained an AMS Springboard award.

Major grants include an MRC program of £3.15M to **Bax**, with £3.15M matching funding from Orphan Technologies, on cell therapy for genetic disease. MRC grants were also awarded to **Fisher** on bacterial topoisomerases (£847K), **Kim** and **Cotterill**. BBSRC awards went to **Török/Carter** (£280K and £616K) on rapid probes for molecular imaging.

Cell Biology hosts the **Wellcome Trust Functional Genomics Cell Bank**, directed by **Sviderskaya** and **Bennett**. This resource has allowed the group to collaborate and publish with over 40 other teams in 12 countries (4 continents) since 8/2013, on pigmentary and melanoma gene dysfunction, including highly-cited collaborative papers in Cell, Cancer Cell, Nature Genetics etc.

3.3. Operational and scholarly infrastructure supporting research and impact

UoA1 comprises the majority of research that requires the infrastructure and facilities outlined in REF5a. The compact management structure at SGUL allowing frequent conversations between groups is key to our efficient decision-making and agility in developing new initiatives. Research at SGUL is directed by the Deputy Principal (Research and Enterprise), who chairs the Research Committee, reporting directly to SGUL Executive Board and SGUL Council.

The Research Operations Directorate co-ordinates practical research support at University level. A new Director of Research Operations (2019) has restructured the department of 24 staff to deliver a coordinated, high-quality service to all researchers. They oversee the specialist research facilities BRF and IRF (3.4), among other services. Estates and Facilities manage and high-level forward plan for our estate and facilities, as well as overseeing aspects including Safety, Health, Environment and Wellbeing; and physical security. Since 2014, SGUL's Estates Master Plan (REF5a) has enhanced our physical environment, benefitting researchers and enhancing sustainability. Facilities include CL3 labs, greenhouse, the ADREU unit, and spin-out companies. In a rapid response to the COVID epidemic, CL3 containment laboratories were upgraded and

Unit-level environment template (REF5b)

dedicated to COVID research, and substantial space renovated to accommodate increased demands of South West London Pathology's testing facilities. The Information Services Directorate oversee both IT and library provision, providing IT support and advice. We have achieved NHS Data Security and Protection Toolkit status and Cyber Security Essentials Plus Certification, and greatly upgraded SGUL's high-capacity data storage. Besides the Data Safe Haven, SGUL's High-Performance Computing service now provides several computing clusters for modelling and data analysis, with 272 cores, 4 GPU nodes with >20,000 GPU cores, and 1.5 Tb of RAM.

3.4. Specialist research infrastructure and facilities**3.4.1. Biological Research Facility**

The Biological Research Facility (BRF) provides expert advice, assistance and well-equipped facilities for research using live animals or their tissues. Illustrating the facility's vitality and flexibility: after an €8M H2020 award (EMI-TB) to Reljic, the BRF created a CL3 facility within months for aerosol infection studies with *M. tuberculosis*. The Zebrafish Facility (2013), aided by internal pilot grants, has grown to support six internal and three external research groups, attracting funding from medical charities like Wellcome Trust, Muscular Dystrophy Association, Diabetes UK. It also supports over 75 student research projects pa.

3.4.2. Image Resource Facility (IRF)

The IRF provides cutting-edge, high-end imaging services, training and technical support to researchers in SGUL and SGUHT, for light and electron microscopy. IRF images feature in impactful outputs from across the Institutes.

Since gaining Partnership status with Nikon in 2016, SGUL has invested over £820,000 in the IRF, major items including a controlled-environment 4-channel confocal microscope capable of molecular imaging (FRET and FRAP); a LiveCyte2 for video phase-contrast live-cell imaging and analysis, a digital slide-scanner, analytic cell-sorters and more.

3.4.3. The Vaccine Institute (VI)

The Vaccine Institute, embedded within I&I, focuses on vaccine-preventable infectious diseases and Phase I-III clinical trials of paediatric, adult vaccines and AMR. Led by UoA1 clinical academics in paediatric infectious diseases, the VI is responsible for 50 SGUL/SGUHT-sponsored studies in infection and immunity, and hosted another 69. These are local, national and international studies funded by a range of NIHR, UKRI, EU, charity and industry. Multiple trials have focused on preventing and treating infection, with particular interest in meningococcus, maternal vaccination, antimicrobial dosing and resistance. The VI collaborated with the Clinical Research Facility for all COVID-19 vaccine trials resulting in two Lancet REF outputs.

4. Collaboration and contribution to the research base, economy and society**Arrangements and support for collaborations at the various levels**

The Institutes and CAGs were established expressly to bring together researchers from different specialties and from within SGUL and SGUHT, to encourage collaboration. External and international collaborations and grants are also strongly encouraged; administrative needs such as subcontracts and IP agreements are efficiently supported by the JRES. Indicators of success include substantial grants, impactful publications and social impact; examples follow.

4.1. Main local collaborations**4.1.1. St George's University Hospitals NHS Trust (SGUHT)**

With increasing alignment of research strategies, the university and Trust are working more closely together than ever before. The Joint Strategy Board, co-chaired by the university Principal and the University Hospital Trust Chief Executive, effectively provides top-level strategic oversight of new initiatives, including the CAGs and TACRI. 43% of UoA1 academics returned in this REF are jointly employed by SGUHT, while another ~140 SGUHT employees (consultants, clinical research

Unit-level environment template (REF5b)

fellows, research co-ordinators, nurses etc) contribute to UoA1 research led by the university (Category C staff).

Three of the UoA1 impact case studies arose from extensive collaboration between SGUL and SGUHT, achieving societal impact at international level.

ISSF funding in SGUL-SGUHT collaboration: We have consistently used Wellcome Trust **Institutional Strategic Support Funding (ISSF)**, to support collaborations with SGUHT. To build critical mass in genomics, supporting multiple SGUL/SGUHT projects, a postdoctoral bioinformatics researcher is funded 2017-2022. Academic time for nine SGUHT clinicians (up to 6 months, 0.2FTE) has been funded to facilitate new collaboration with university academics. Initial outputs from the scheme include many publications (including a highly cited systematic review on functional cognitive disorders in Journal of Neurology, Neurosurgery and Psychiatry); and research funding, including with Pfizer and Nordic Biosciences.

4.1.2. LSHTM

From 2016, SGUL and the LSHTM co-established the MRC-funded LID DTP (Section 2.2.1), substantially promoting wider SGUL-LSHTM research collaboration by encouraging jointly supervised projects.

4.2. National collaborations and networks

UoA1 institutes conduct numerous and diverse national collaborations with academic and commercial partners across the UK. Selected significant examples follow.

4.2.1. Sports Cardiology

Sharma led a consortium with 13 other UK centres and the CRY charity on cardiac screening in adolescent soccer players (NEJM, 2018, and contributing to an Impact Case Study).

4.2.2. Neonatal Infection Network

A national network of paediatric and neonatal units, chaired by **Heath**, has conducted surveillance of neonatal and young infant infections since 2004. Most recently, their surveillance of antimicrobial resistance in UK neonatal units informed National Institute for Health and Care Excellence 2020 guidelines for neonatal sepsis management. **Heath** and **Le Doare** are jointly appointed to Public Health England, and their vaccination work has contributed significantly to national policy, for example national guidelines on introducing the Tdap (tetanus, diphtheria, pertussis) vaccine to women from 16 weeks of pregnancy (iMAP). **Heath** and **Le Doare** are members of the UK DoH Group B Streptococcus scientific advisory committee, resulting in two national studies relating to the national screening programme.

4.2.3. 100,000 Genomes Project

SGUL genomics researchers and clinicians have joined HEIs around the country to analyse data from the 100,000 Genomes Project through disease-specific Genomics England Clinical Interpretation Partnerships (GeCIPs), e.g. Cardiovascular, Neurology and Paediatrics GeCIPs (collaborative use of a major UK research facility). E.g. **Ostergaard's** Lymphoedema group provided 136 cases with unknown causation to the 100,000 Genomes project, leading to identification of 7 promising variants and a new candidate gene (unpublished).

4.3. International collaborations and networks

UoA1 institutes are heavily engaged with successful overseas collaborations. Selected examples include:

4.3.1. Africa: Cryptococcal Meningitis

Harrison, Bicanic, Loyse and **Molloy** lead the global effort to reduce the ~180,000 deaths/yr globally from cryptococcal meningitis. The ACTA trial, the largest phase III trial to date, which identified new treatments to halve mortality rates at favourable cost, was conducted with key partners in South Africa; Uganda; Tanzania; Cameroon; and the London and Liverpool Schools of Tropical Medicine.

The findings were endorsed by WHO and implementation started, with investment from Unitaid and the Cryptococcal Meningitis Action Group (chaired by **Loyse**), a network including representatives

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from the WHO, US CDC and Médecins Sans Frontières, advocating for drugs and diagnostics for cryptococcal meningitis. The team contribute significantly to training and capacity-building in Africa, also through the €1.9M EDCTP funded DREAMM implementation project led by **Loyse**.

The highly cited ACTA study was reported in NEJM, included in our REF outputs, and our work on cryptococcal meningitis in Africa forms one of our impact case studies.

4.3.2. Infection-related child mortality and morbidity

Sharland's group have a global strategic partnership focussed on causes of infection-related child mortality and morbidity. Sharland is Vice Chair of the Penta Foundation, the leading global paediatric infection clinical trials network, which recruits in >30 countries. He chairs its AMR group which works with the Global Antibiotic Research and Development Partnership, formed by the WHO and the Drugs for Neglected Diseases initiative to stimulate development of novel antimicrobial treatment in LMICs. Penta and GARDP develop multiple strategic trials in neonatal and paediatric AMR, conducted so far by SGUL in collaboration with the MRC Clinical Trials Unit at UCL.

These trials focus on optimal drug dose duration and formulation to prevent and treat MDR infections contributing to Sharland's impact case study and emerging WHO guidelines on antibiotic use in children. Strategic antibiotic trials focus on severe pneumonia and neonatal sepsis, while trials in antiseptics focus on prevention of severe infections and death.

Sharland is Chair of the WHO Essential Medicine List Antibiotic Working Group and his policy team has also strongly influenced WHO AMR policy development, building the AWARe system and the WHO Global Program of Work formal target that 60% of total antibiotic prescribing for children should be narrow spectrum Access antibiotics.

4.3.3. Latin American studies

Cooper performs field studies in Latin America on aetiology of paediatric allergy and asthma and the immunology, molecular diagnosis, control, and elimination of neglected tropical diseases. Research networks involve the Ministry of Public Health and universities in Ecuador, Colombia, United States, and Brazil. In Ecuador, his work has contributed to the WHO certification of the elimination of onchocerciasis (2014) and the elimination of yaws (in preparation for certification). Cooper's longstanding collaborative study with the Federal University of Bahia (Brazil) into causes and management of asthma in Brazil and Ecuador remains ongoing since 2004. It has led to >70 joint outputs and the training of >50 Masters and PhD students from the region, approximately half since 2014. He established a rural birth cohort of ~2400 newborns, followed to 8 years old, testing the hygiene hypothesis in development of paediatric allergy. The cohort has helped train 12 Ecuadorian students at MSc/PhD level since 2014, and supported 5-10 short-term regional training visits of Ecuadorian scientists per year and 2 per year to the UK. The biobank derived from this cohort and its data archive, all at the Universidad Internacional del Ecuador, Quito, continues to support numerous locally funded research projects (US\$20-40k/yr).

Friedland has a longstanding collaboration on tuberculosis with University of Cayetano in Peru (Garcia, Castello-Branco) and the NGO AB Prisma in conjunction with Johns Hopkins University (Baltimore, USA), generating several NIH grants, 2 current MRC CRTFs and multiple papers in high-impact journals, including three outputs to this REF return.

4.3.4. Other countries/networks:

The **Thompson/Holt** vascular surgery team take part in many national and international multicentre trials. They led a US-UK comparison of aortic aneurysm repair in over 300,000 patients with Harvard Medical School, leading to an important and highly cited publication in NEJM, 2016 (top 1% of citations).

Cock co-led an international NIH-funded consortium ESETT, trialling therapies for status epilepticus. Outputs include NEJM, 2020.

Garrard, who has leading expertise on linguistic changes in dementia, is part of iASiS, a Horizon 2020 network of 10 centres across Europe and the US, on "big data for precision medicine" for Alzheimer's and lung cancer. The network combines diverse data sources – medical records, imaging databases and genomics data – to develop personalized diagnosis and treatment.

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Friedland and **Hargreaves** work with the ESCMID Study Group on Mycobacteria. **Hargreaves** chairs the Study Group on International & Travel Medicine. Both groups include membership from across Europe and have made successful grant applications and important publications.

Lindsay is Chair of the ESCMID Study Group on Staphylococci, and a lead on the JPI-AMR funded MACOTRA consortium investigating markers of MRSA success across Europe.

4.4. Beneficiaries: Communications, public engagement and promotion of impact

SGUL's Public and Civic Engagement Strategy (2019-2023) sets out four priorities, namely Science communication and knowledge exchange; Patient and Public Involvement; Development and scholarship; and Community partnerships and outreach. The UoA1 Institutes are major contributors in all aspects of this strategy.

4.4.1. Promotion of societal impact

SGUL's research strategy prioritises translational impact through clinical utility and throughout this document we have highlighted our diverse approaches, leading to societal impact. In REF 2014 we ranked 4th in UK for impact, and during this REF period we have built on this to enhance societal impact not just through research but also through our place in the local and global community. In 2014, with Innovate UK funding, we set up **TiKa Diagnostics** to commercialise an accelerated test for diagnosis of mycobacterial infections in humans and animals. The University provided investment, space and academic time, covering patent costs for four years: an investment of £53K. The company made its first sales in 2018 and now have customers in the UK, Spain, Portugal, Switzerland, Norway, Denmark and South Africa. In 2020, the shareholders' fund was valued at £112,000.

BUGS Biosciences was established in 2002 by **Hinds** and BlueGnome co-founder Snudden, to offer high-quality molecular serotyping services. It has had over £2.5M turnover since 2014. SGUL (shareholder and board member) provides lab facilities and equipment, as well as access to the wider institutional research framework. The company's pneumococcal molecular serotyping platform has been widely utilised by NGOs and vaccine companies to improve surveillance, development and delivery of pneumococcal vaccines worldwide and is one of our impact case studies. As a not-for-profit enterprise, it achieves societal impact by contributing to the global health efforts of partners such as Gates Foundation, GAVI and PATH, by helping to assess vaccine roll-out and impact to reduce child deaths from infectious diseases.

4.4.2. Communications and informational promotion of impact

The External Relations, Communications and Marketing (ERCM) Team was created since 2014, greatly improving both external and internal communications, with huge benefit to UoA1 researchers. Internal aspects now include weekly staff and student newsletters, email updates, and periodic staff briefings/Q&A with the Principal, COO and Deputy Principal (Research and Enterprise). A completely re-designed SGUL website was launched in 2019. The team promotes our research impact externally through a dedicated Press and Research Communications Manager, and assists researchers to gain media engagement skills.

ERCM have fulfilled a vital role during the COVID-19 pandemic, working with SGUL academics to provide accurate, up-to-date public information on the latest research findings about the disease, its diagnosis and treatment. SGUL researchers contributed to >500 research stories in the media on COVID-19 up to June 2020, including work of **Groppelli**, an ECR virology Lecturer who conducted >250 interviews and discussions on COVID-19 to 11/2020, via international and UK television (BBC etc), online and other media.

4.4.3. Public and Civic Engagement

A Public Engagement Working Group, chaired by the Deputy Principal (Institutional Affairs), develops and coordinates activities across SGUL and is supported by a Public Engagement Officer and an Associate Dean for Civic and Public Engagement. A Public Engagement Network was also established with members from across the university staff and SGUHT. Public Engagement activities are discussed in the annual personal development review, and considered as part of applications for academic promotion.

Local Engagement: SGUL's flagship Public Engagement activity is the Spotlight on Science programme, free evening events engaging the public with our research. Of the 38 events in this

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REF period, 33 have been led by UoA1 PIs and their research teams, with audiences averaging over 100 for the last three years. Feedback has been consistently excellent, with strong enthusiasm for the levels of interactivity and the opportunity to voice opinions on research approaches.

Since 2014, the Inside Science programme with HMP Wandsworth has targeted male prisoners, a neglected and hard-to-reach group. Led from UoA1, informal discussions on a wide range of scientific topics have taken place in a regular prison art class, also leading to the creation of new works of art that were displayed in two public exhibitions (2016 and 2019), attracting over 4000 visitors.

Other elements of our programme, largely run by UoA1 PIs and post-doctoral scientists, range from events at local schools to large public events, including all age groups (e.g. Uo3A). We work to engage with less accessible groups including our local Muslim community. In 2015 we initiated "Ask a Scientist", inviting secondary-school students to submit questions online to scientists at SGUL. In 2020, working with 3 secondary schools to support Y11 and 12 students studying from home, we developed and delivered short online science enrichment courses on Global Health and Vaccines, HIV and Genomics, and Cancer.

Other local examples: Other initiatives to encourage more staff and students into public and civic events include:

- Our Public Engagement Champions Programme: four Champions are selected and mentored each year to develop skills in public and civic engagement, supported by a programme of events including invited talks, training events and lunchtime discussions. In 2018, one of the champions designed a course in Personal Resilience, which has since been utilised across the university for students and staff.
- Patient Involvement events: our researchers are increasingly working with patient charities or project-specific patient groups to engage and co-design research proposals. For example, the "Meeting of Minds", co-organised and chaired by Kaski, was the UK's first international patient/physician encounter on angina pectoris (2019). It gathered over 120 lay people and physicians and 300 other attendees, and is planned to repeat annually.

SGUL's Widening Participation Team has several initiatives involving staff and students to support local schools. The scheme linking to UoA1 researchers is The Brilliant Club, an award-winning charity helping pupils from under-represented backgrounds reach highly-selective universities, by mobilising our PhD students and postdoctoral researchers to share academic expertise with state schools.

Global Public Engagement: SGUL's Global Public Engagement programme was initiated in 2018 to build on our collaborative, international research and supports our research teams to co-create public engagement events with overseas collaborators for local audiences.

The PREPARE and PROGRESS studies of Group B streptococcal infections in Uganda are a case study. The projects' aim is to develop a maternal vaccination platform in Uganda for equitable access of pregnant women to next-generation and novel vaccines. We collaborate widely with local academic organisations, also through a community advisory board, youth teams and women's groups. Engagement with women influencers, through our Village Health team network, improved uptake of vaccines in pregnancy and infancy across Kampala.

We provide training in explaining vaccines to the village health teams who attend local communities and monitor health. We work with key stakeholders including the Ministry of Health, to develop nationally-adopted videos and posters publicising signs of neonatal sepsis. Two locally-filmed videos funded by SGUL are being shown in Kampala hospital waiting rooms to raise awareness of neonatal sepsis.

4.5. Contributions to the research base; Indicators of recognition and wider influence

Selected highlights during the assessment period are mentioned below.

4.5.1. Academy membership

UoA1 staff during the assessment period have included 10 Fellows of the Academy of Medical Sciences (**Bennett, Camm, Chambers, Clark, Dalgleish, Friedland, Gordon-Smith, Krishna, MacGregor, Markus**). **Griffin** (FMedSci, CBE), Emeritus Professor, was Vice President International of the AMS until 2018 and is President of the Federation of European Academies of Medicine. **Bennett** is an AMS Sectional Committee member.

Unit-level environment template (REF5b)4.5.2. Awards and fellowships**International:**

Asimaki: Exaleiptron Award for Women in Science (Greece). **Bicanic:** Life Fellowship, European Confederation of Medical Mycology. **Cock:** European Academy of Neurology Service Award (Lifelong membership). **Jindani:** Princess Chichibu Memorial TB Global Award. **Krishna:** Hind Rattan Award; highest honour for non-Resident Indians. **Sharma:** European Society for Cardiology, Conraads Prize for Outstanding Academic Achievement.

National:

Sharland, CBE. Sharma: Asian Professional of the Year (UK, Medical Category). Member of the (Royal) Order of St John.

4.5.3. Eminent advisory positions (selected)

WHO advisory positions: Most significant from many examples are:

- **Le Doare:** Chair, WHO/Drugs for Neglected Diseases Initiative, Maternal, Newborn & Child Health working group.
- **Sharland:** Chair, Antibiotic Working Group for Essential Medicines List.
- **Heath:** Member: Advisory committee on Vaccines against group B streptococcal disease, and GBS Surveillance Technical Working Group.
- **Harrison:** Member, Expert Group on fungal pathogens, and Guidelines Development Group on cryptococcal disease in the HIV-infected.
- **Le Doare, Sharland, Cooper, Hargreaves, Krishna, Loyse, Sadiq** also are/have been WHO consultants, expert advisors, or members of committees, working or advisory groups.

Other international advisory positions:

- **Behr:** Invited expert to the European Medicines Agency.
- **Bennett:** International Expert Panel for French Government Research Agencies ANR and INSERM.
- **Coates:** Scientific Advisory Committee, Global Antibiotic Research & Development Partnership (GARDP).
- **Cock:** European Neurology representative, European Medicines Agency.
- **Friedland:** European Medicines Agency Working Group on Updating TB Medication Guidelines and Specialist Advisory Group on 5FU & related substances.
- **Loyse:** Strategic advisor to the Clinton Health Access Initiative.
- **Ma:** Scientific Advisor to the Innovative Technology Solutions Group, Gates Foundation. External Expert Review Committee for High-end infrastructure funding, Department of Science and Technology, South Africa.
- **Reljic:** Co-chair, Aerosol and Mucosal Immunity group of the Collaboration for TB Vaccine Discovery, Gates Foundation.
- **Sharland:** Lead clinical advisor, Neonatal and pediatric programme of GARDP.

National scientific advisory roles/leadership:

- **Edwards:** Invited expert to Ministry of Justice Medical Disability Review Panel.
- **Friedland:** Commissioner, Commission on Human Medicines. Chair, MHRA Infection Expert Advisory Group. Chair, CHM COVID-19 Expert Working Group.
- **Le Doare:** Paediatric Infection and Immunity sub-specialty chair, Royal College of Paediatrics and Child Health.
- **Sadiq:** National lead, development of National guidelines for management of gonorrhoea in adults.
- **Sharland:** Chair, DoH National Expert Advisory Committee of Antimicrobial Prescribing, Resistance and Healthcare Associated Infection.
- **Sharma:** Chair, Expert cardiac committee for the Football Association. Medical Director for: Virgin London Marathon. Cardiology advisor for: Team GB rowing; the Lawn Tennis Association and British Premier Rugby.

Other roles:

- **Many UoA1 PIs** regularly act as experts for national and international scientific review bodies.
- **Goodbourn, Harrison, Lindsay** are on UKRI panels or advisory committees, **Bennett** is on REF2021 UoA5 panel.

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- **Bennett, Camm, Coates, Cock, Friedland, Hainsworth, Jindani, Krishna, Loyse, Morgante, Ostergaard and Robinson** are founders, trustees or scientific advisors to UK and international charities.
- Numerous members of international commercial scientific advisory boards, including **Bax, Harrison, Holt, Krishna, Ma and Planche**.
- Seven UoA1 PIs act as company directors for SGUL spin-outs.

4.5.4. Contributions to learned societies (International leadership roles only included)

Our academics have been elected to leadership roles in many disciplines, showing international recognition.

- **Bennett**: President, International Cell Senescence Association. Past President, International Federation of Pigment Cell Societies.
- **Camm**: President, European Heart Rhythm Association. President, International Arrhythmia Alliance.
- **Cock**: Chair, Education Committee, European Academy of Neurology.
- **Hainsworth**: Chair, Vascular Cognitive Disorders Area of the Alzheimer's Association.
- **Heath**: Chair, European Society of Paediatric Infectious Diseases Committee for Research
- **Kaski**: Chair, Executive Board, International Society of Cardiovascular Pharmacotherapy.
- **Ma**: Founding President, International Society for Molecular Farming.
- **Papadakis**: President-elect, European Association of Preventive Cardiology.
- **Sheppard**: President, European Association of Cardiovascular Pathology.

4.5.5. Editorship and contributions to publishing

Many examples. Highlights include: **Baines**: Chair of publications for the Physiological Society. **Krishna**: The Lancet Expert Advisory board. **Lindsay**: Chair of Publications Committee, Microbiology Society; Reviews editor, Microbiology. **Albert**: Editorial Board, Cells. **Bax**: Topic Editor, International Journal of Molecular Sciences. **Behr**: Editorial Board, Heart Rhythm. Advisory Board, Nature Reviews Cardiology. **Camm**: Editor-in-Chief, Clinical Cardiology. Editor-in-Chief, Europace. International Editor, European Heart Journal. **Kaski**: Deputy Editor, European Heart Journal.