

<b>Institution: King's College London</b>
<b>Unit of Assessment: 3</b>
<b>1. Unit context and structure, research and impact strategy</b>

## 1.1 Overview

Our allied and applied health research transforms health, quality of life and care across dentistry, nursing, midwifery, palliative and end of life care, pharmacy, nutrition, women and children's health, diabetes and obesity, and related laboratory-based and applied clinical, health and social sciences. Teams address complex, multi- and interdisciplinary health and social challenges.

This submission comprises **224.4 fte Principal Investigators** (PIs; 248 headcount) from King's College London's Health Faculties. It includes all PIs from two Faculties – Dental, Oral & Craniofacial Sciences and Nursing, Midwifery & Palliative Care – plus all PIs in Pharmaceutical Sciences and Life Course Sciences (Faculty of Life Sciences and Medicine), and 5 PIs from the King's Workforce Research Unit (figure 1.1).

We **lead global, international, national and local programmes**. Avoiding silos, we collaborate widely across King's, working with staff from UOAs 1, 2, 4, 5 and 24 in multiple faculties, and with partners, patients and the public, embracing 'mind and body' research.

This REF period has seen a **marked rise in UOA3 activity**, research quality, impact, staff development and diversity. Grant income climbed by 65% from £91M (REF2014) to £150M (REF2021), with £60.2M (40%) from UKRI or the National Institute for Health Research (NIHR). Illustrating the extent of our collaboration, total grant income involving UOA3 teams was >£345M (section 3) over the same period. We have 380 PGR students currently registered, from 50 countries across six continents (section 2).

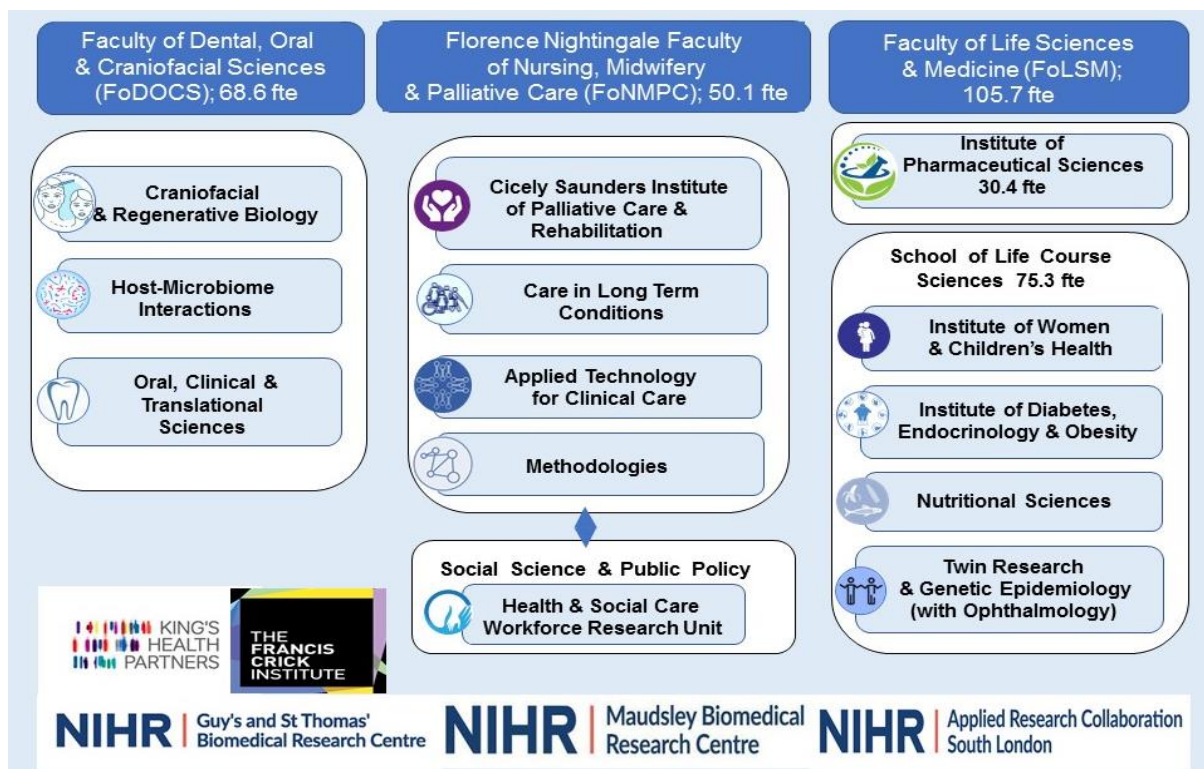


Figure 1.1 The breadth of research teams in UOA3 across King's Faculties, Schools, Institutes and Departments, plus key infrastructure (REF5a).

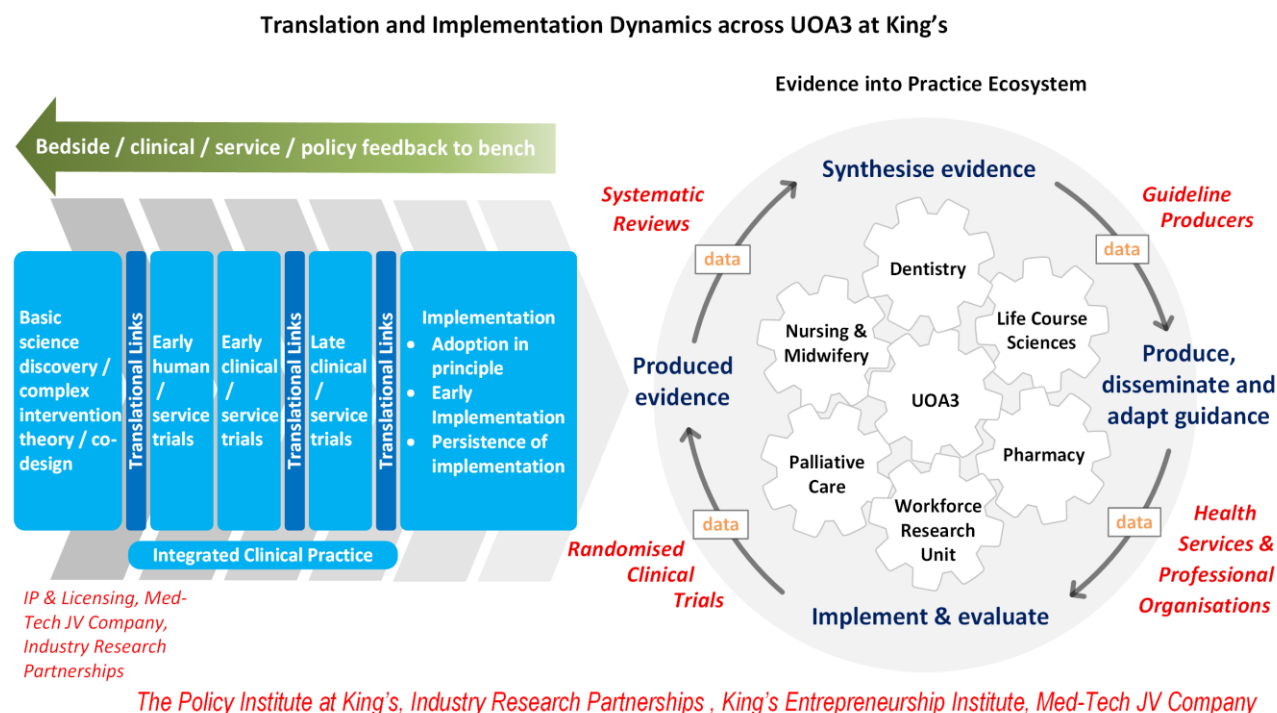
## 1.2 Strategic Aims for Research and Impact in UOA3

**UOA3 PIs are united by our vision to make the world a better place through applied health and translational research, its impacts, our education and by service to society.**

We deliver scientifically informed solutions to health and care problems through research of the highest rigour, significance and originality with five key principles:

- Enquiry-driven research of high-quality and high-impact that builds knowledge to transform health, treatments and care and leads policy, practice and industry.
- An inclusive environment where every individual is valued and able to succeed, encouraging diversity, open mindedness, respect and tolerance.
- Research that enables multi- and interdisciplinary collaborations, where staff and graduate students work together in themes unrestricted by discipline or department, leading to more holistic treatments and care.
- Clinical/academic interaction, supported by our Academic Health Sciences Centre, King's Health Partners (KHP), where outstanding research, education and clinical practice are unified for the benefit of patients, those important to them, care teams, and society.
- Research that integrates impact to create new solutions for the diverse health and care challenges locally and globally, including the COVID-19 pandemic.

Our **Integrated Translational Research Delivery pathway** seeks to overcome traditional implementation “blocks”, creating the links for rapid translation, and for research to be informed by “reverse translation” from practice (figure 1.2).



**Figure 1.2 Contribution of the different elements in UOA3 to translational research. Translation involves cycles and feedback facilitating progression to clinical, policy and societal impact.**

### 1.3 COVID-19 contributions

UOA3 teams led world-leading responses to the COVID-19 pandemic, highlighting our commitment to immediate health care needs, support for vulnerable and disadvantaged populations, societal impact, and the breadth of our disciplines and science.

We were at the centre of the COVID-19 response, which affected >3,000 patients across our hospitals during the initial outbreak. Our PIs rapidly contributed to **sector-leading outcomes** for our populations; COVID-19 inpatient mortality rates for our two acute National Health Service (NHS) Trusts were lowest and third lowest nationally.

Spector and Steves (with King's Healthcare Engineering) launched the **COVID Symptom Tracker App** that transformed the understanding of COVID-19 presentation and symptoms and made an acclaimed national contribution [Impact Case Study (ICS)05].

**Pregnancy:** Chappell worked with the RECOVERY trial team to enable participation of pregnant women in COVID treatment trials. Sandall leads the UK arm of COCOON, a global study to understand challenges and concerns of parents who are pregnant or have recently given birth during the pandemic. von Dadelszen adapted the PRECISE cohort to assess COVID-19 impacts on pregnant women in Africa, supplying PPE for staff and ensuring clean water supplies (figure 1.3).

Carter discovered the immunological basis of the **multisystem inflammatory syndrome in children (MIS-C)** associated with SARS-CoV-2 infection

The 'King's Together' (REF5a) scheme funded: 1) a study to assess the impact of COVID-19 on antenatal management, using routine electronic health records (Poston, Magee, Sandall), and 2) another investigating influences of SARS-CoV-2 on the developing brain (Poston, Edwards).

The Centres for Oral, Clinical and Translational Sciences and Host-Microbiome Interactions led research to **enhance facemask effectiveness** and more personalised PPE funded by the EPSRC (Addison, Coward), to quantify aerosols associated with dentistry (Addison, Wade, Gallagher), to understand COVID-19 risk perception (Asimakopoulou, Scambler), and to develop a salivary secretory IgA assay to confirm a mucosal response to COVID-19 (Carpenter).

Page was seconded to NIHR/ACCORD to work on appraising and **recommending which drugs go into COVID-19 trials**, an initiative flagged in the New England Journal of Medicine.

Rose, with Aetonix®, developed **Life Lines**, a home care technology platform rolled out to hospitals across the UK, enabling family members to see and speak with their loved ones and with clinical teams, supported by 'King's Together' (REF5a) and Guy's and St Thomas's charity.

Higginson, Harding, R, Sleeman, Bajwah and Maddocks led the **local, national and international palliative and end of life care response** across high and low-and-middle-income countries, producing new evidence on symptom and care experiences and clinical guidance. They launched evidence for symptom management for people needing to shield with symptoms such as breathlessness [ICS-02]. **Their UKRI-supported CovPall study** provides the first robust understanding of care and symptom management for people dying from COVID-19.

Bajwah led the development of evidence-based fact sheets for patients and families affected by COVID-19, **co-designed with the European Lung Foundation** (a patient led group). Recognising the disproportionate impact on minority ethnic groups this was translated into 27 languages with local and global dissemination [ICS-09].



**Rehabilitation during and after COVID-19** has been pioneered in research and guidance by Turner-Stokes and Maddocks. Manthorpe researched the experiences of children's social care and how to keep children safe during the COVID-19 pandemic.

**NIHR funded:** Fitzpatrick to lead COVID-19 research into **social distancing in care homes; primary palliative care** using the Clinical Practice Research Datalink (Gao), and **palliative care in care homes** (Sleeman). COVID-19 impacts on Palliative Care delivery are being investigated using the King's Electronic Record Research Interface and co-designed community project of **an Integrated Palliative Care Partnership** (Higginson, Donetto, with NHS Improvement London).

**UKRI funded** work led by Sturt with Harding, R and an international team is developing and evaluating the **upscaling of adapted and digitised remote consulting** during the pandemic in Tanzania, Nigeria, Uganda, Kenya and Rwanda.

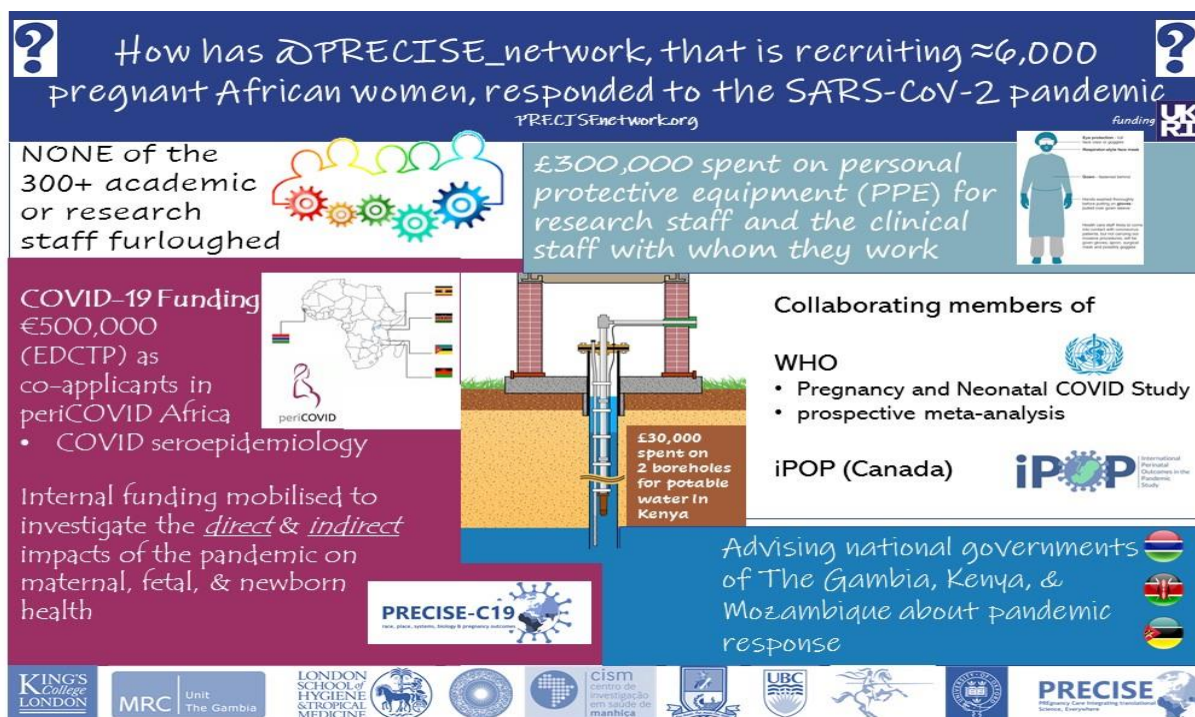


Figure 1.3 Infographic illustrating response to COVID-19 by the PRECISE Network, led by King's, uniting research scientists and health advocates in the UK, Africa and World Health Organization (WHO) with core UKRI funding

## 1.4 Evidence of progress against our REF2014 strategy: overall

Together, we have delivered our REF2014 plans. These were explained individually in three 2014 submissions totalling 187.6 fte. Since REF2014 we have invested to create groups with critical mass, built infrastructure to support their functioning, and have developed and included early career researchers and PhD students.

We have intensified multi- and interdisciplinary research, both within and beyond UOA3 (section 3). We created strategic approaches to wide multi-sector partnership, actively engaged with patients' and stakeholders' needs, innovated research methods and accentuated both significance and reach. Equality, diversity and inclusion is embedded in all activities (section 2).

**King's publications for the period 2014 to 2020 for relevant allied health fields are top or highly placed in the UK for key quality markers**, including number of outputs in the top 10% of Citation Percentiles (SciVal) and total numbers of citations (figure 1.4). These illustrate the scale, connectivity and influence of research in UOA3 fields at King's.

## Unit-level environment template (REF5b)

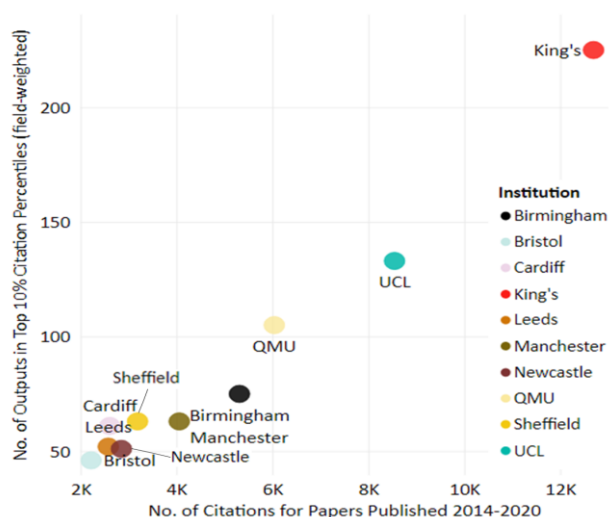
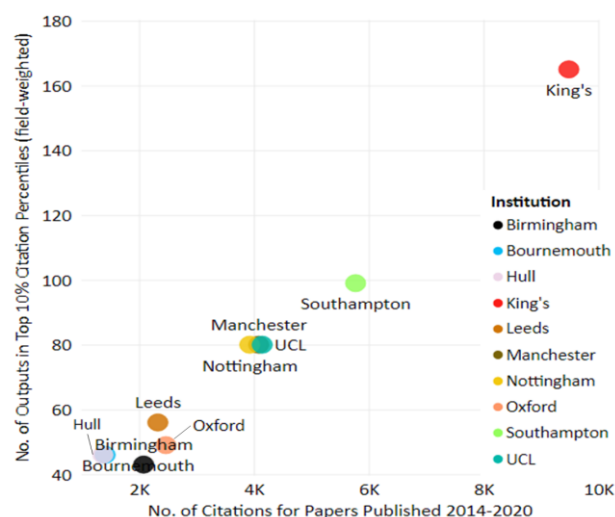
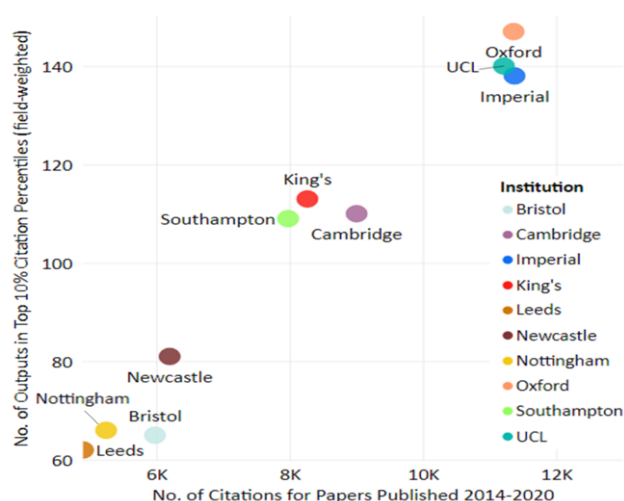
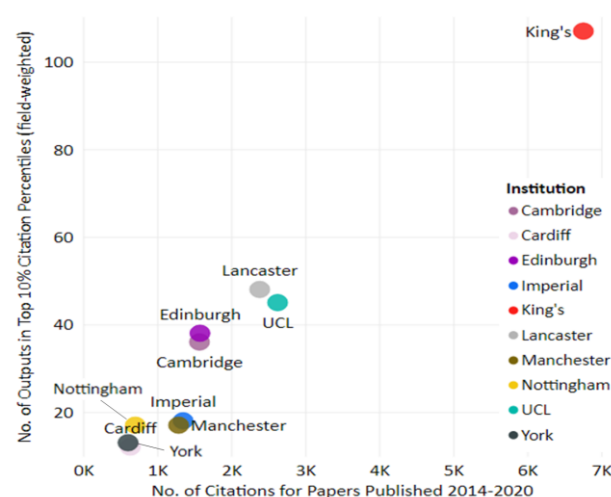
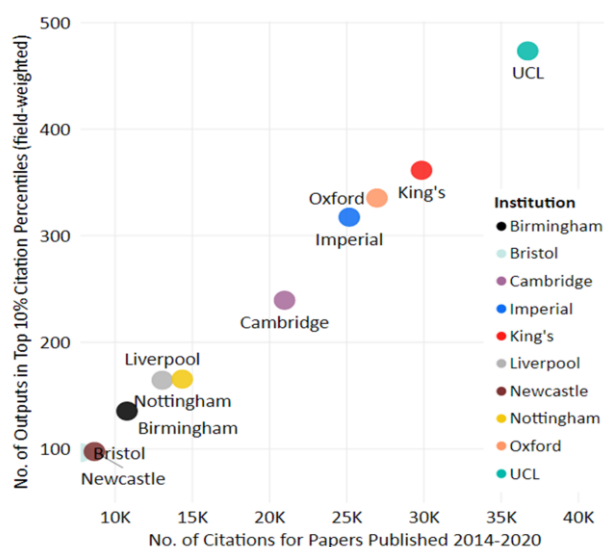
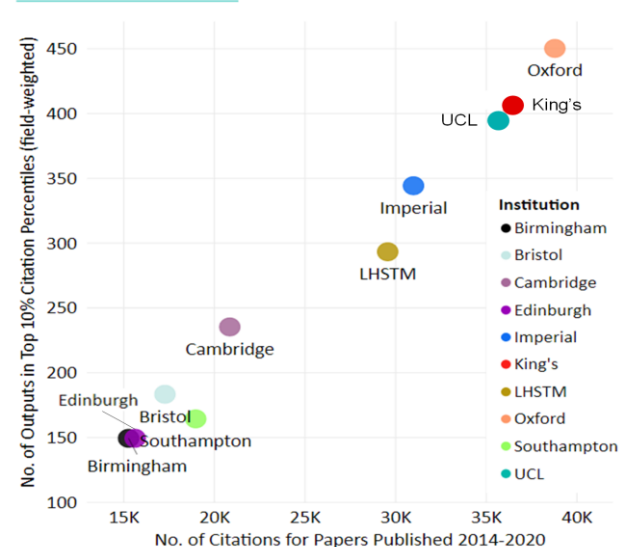
DentistryNursing & MidwiferyNutritionPalliative CarePharmacy & PharmacologyWomen's Health

Figure 1.4. Research benchmarking: Number of Outputs in top 10% of Citation Percentiles (field-weighted) versus total number of citations for outputs published 2014-2020. Source SciVal: Data includes articles, reviews, conference papers. For each field, the 10 universities with the highest number of outputs in the UK in the period were selected for comparison. Outputs were identified using search of keywords (e.g. pharm\*) for the field.

The QS World University Rankings 2018-21 places **King's Nursing** and **Dentistry** consistently first in the UK, 1st-3rd in Europe; with Pharmacy & Pharmacology and Life Sciences & Medicine in the top 5-6 in the UK.

Reflecting our outstanding clinical research leadership, a UOA3 PI has been appointed **Chief Scientific Adviser**, Department of Health & Social Care and NIHR (Chappell, from August 2021). Another PI is seconded as **NHS England and Improvement's Head of Midwifery Research** (Sandall, from 2021). These appointments will bolster our future clinical-academic strategies and impact.

**Teams from King's UOA3 now lead five Institutes or clinical academic groups within King's Health Partners (KHP):** i) Dentistry; ii) Cicely Saunders Institute (Palliative Care, KHP adopted 2017); iii) Institute of Diabetes, Endocrinology & Obesity (launched 2019); iv) Pharmaceutical Sciences and v) Institute of Women and Children's Health (launched 2019). Nursing, Midwifery, Allied Health and other teams are integrated into these and other groups.

KHP is **one of eight UK Academic Health Science Centres** accredited by DHSC/NHS England. It unites King's with our three world leading NHS Trusts (REF5a). KHP aims to accelerate the translation of leading-edge research, new technologies and treatments into advances in patient care throughout the sector and has c.5M patient contacts/year and >600 clinical trials in delivery.

Our **commitment to equality, diversity and inclusion is manifest in our research**, which addresses ways to reduce poor access and disadvantage in health and social care. For example, dental health research includes people who are elderly or have dementia (Gallagher, Manthorpe), those with socio-economic disadvantages (Bernabé), and from minority ethnic groups (Sabbah).

In Palliative Care, this includes research to uncover and reduce inequities and exclusion for people by age or disease (Higginson, Harding,R, Evans), socioeconomic group (Higginson, Maddocks), ethnicity and culture (Koffman, Bajwah), for LGBTQ people (Harding,R, Bristow, ICS-09) and older people with memory problems who are homeless (Manthorpe).

Nutrition research uncovered the socioeconomic determinants of mental and physical health (Harding,S) and of food insecurity and hunger (Loopstra). In low-and-middle income countries research aims to improve access to antenatal care amongst disadvantaged women (Shennan, Von Dadelszen, Magee).

## 1.5 Major research groups: achievements in this REF period

From the >11,500 peer-review papers published by UOA3 staff in the REF period, we selected 507 outputs to illustrate research quality. Of these, 52% are in the top 5% field-weighted citation percentiles. Early Career Researchers were named authors on an average of 2.3 submitted papers each.

### **Faculty of Dentistry, Oral & Craniofacial Sciences (FoDOCS) (75 staff, 68.6 FTE)**

Following REF2014 feedback and strategic review in 2018 the Faculty was renamed and became the Faculty of Dentistry, Oral & Craniofacial Sciences, acknowledging our research breadth. Three research focussed centres were created, plus the Centre for Dental Education.

Building on our 2014 aims, we strengthened activity in host-microbiome interactions, recruited in the areas of big data and biomaterials and created extensive new links within King's, KHP and the Crick Institute. We have built on international links and established an alliance with three other major dental schools (dentALLiance).

## Unit-level environment template (REF5b)

The major research achievements in our three centres span an understanding of basic cell and molecular biology to clinical implementation:

### **1. Centre for Craniofacial and Regenerative Biology (CCRB), lead Sharpe**

**Aims:** to understand the underlying causes of birth defects associated with the cranial region and use the principles of stem cell and developmental biology to promote regeneration and repair in the adult.

#### **Current work and achievements:**

The centre brings together a diverse range of interests from understanding the evolution of structures to recreating them through bioengineering. We are the **main hub for Craniofacial research in the UK**.

Major achievements include: the discovery of signalling pathways controlling resident adult dental stem cells, repurposed potential therapeutics for tooth regeneration (Sharpe); tailoring of biomaterials to support organoids (Gentleman); use of nanoneedles for drug delivery and precision diagnosis (Chiappini); identification of sensory cell fate decision (Streit, Mann); and revealing the underlying mechanisms behind craniofacial ciliopathies (Liu,K).

### **2. Centre for Host-Microbiome Interactions (CHMI), lead Proctor**

**Aims:** to understand the interplay between the oral microbiome and oral mucosa and the consequences of this interaction on development of oral and systemic disease, such as periodontitis, candidiasis, oral cancer and Alzheimer's disease.

#### **Current work and achievements:**

The centre brings together academics from microbiology, immunology, data science and epidemiology. Major achievements include: identification and characterisation of the first fungal toxin Candidalysin (Naglik); complete analysis of antibiotic resistance gene carriage in oral & faecal samples (Moyes, Proctor); new mechanisms whereby *Porphyromonas gingivalis* subverts host immunity (Curtis); tissue and subcellular-based maps of the human proteome (Mardinoglu); and demonstration of the association between periodontitis and cognitive decline (Ide).

### **3. Centre for Oral, Clinical and Translational Sciences (COCTS), lead Bartlett**

**Aims:** to translate discovery science into clinical practice, make a difference to patients, and bring benefits to society.

#### **Current work and achievements:**

The centre runs trials through the **Oral Clinical Research Unit** (lead Moazzez) and works extensively with industry (Unilever, Colgate-Palmolive, Procter & Gamble, GSK).

Researchers work directly with dental patients and clinicians to explore new treatment options and raise awareness. The centre hosts two international research implementation charities in the areas of dental caries [ICS-03] and erosive tooth wear [ICS-06].

Major achievements include: understanding the control of crystal nucleation (Elsharkawry); development of interventions to encourage timely healthcare (Scott); management of dental anxiety (Newton) and residual infection analysis (Mannocci).

## **Florence Nightingale Faculty of Nursing, Midwifery and Palliative Care (FoNMPC) (55 staff, 50.1 FTE)**

**Aims:** to develop, understand, implement and evaluate interventions, therapies and care across our fields to build knowledge, lead policy and practice and improve outcomes for patients and those important to them.



**Current Work & Achievements:**

A new Faculty of Nursing, Midwifery and Palliative Care (FoNMPC) formed in 2017, building on REF2014 plans. Its research strategy (2018) created research divisions to focus critical mass in areas of strength and increased support for, and representation from, early career researchers and PhD students.

We created (2020) the **Nightingale-Saunders Complex Clinical Trials and Epidemiology Unit**, as part of the King's UKCRC-Accredited Clinical Trials Unit, Prevost appointed to lead. Other strategic recruitments include: Rose (Critical Care), Simpson (Mental Health), Normand (Economics, Palliative Care).

**1. Cicely Saunders Institute for Palliative Care and Rehabilitation**, lead Higginson, researches ways to improve care and its cost-effectiveness for the growing numbers of people with progressive diseases and in multimorbidity.

Our trials and meta-analyses of **breathlessness interventions** (Higginson, Maddocks) improved care and quality of life for the 75 million people world-wide who suffer breathlessness in advanced illnesses [ICS-02].

We trialled the cost-effectiveness of integrated palliative care in neurological conditions (Gao, Evans, Yi, Higginson); evaluated care for people with dementia (Sleeman), for centenarians (Evans), and home care (Koffman); generated the first multinational data on the economics of palliative care (Normand), including for informal carers (Yi, ECR); and evaluated efficiency and new treatments in rehabilitation (Turner-Stokes, Maddocks) and informed care commissioning [ICS-11].

Our **global programme** was first to evaluate palliative care nurses in Africa (Harding,R). Our **person-centred outcome measures** extended into **patients in care homes** with dementia (Ellis-Smith, ECR) and other diseases widening access to effective palliative care [ICS-09].

**2. Care in Long Term Conditions**, lead Norton, unites teams in mental health, diabetes, bowel conditions and care for older people.

Our trials on intractable **faecal incontinence** overturned the evidence from others' non-randomised series (Norton). We discovered that for **older people with diabetes**, the level of variability of glycaemic control is an important factor in predicting mortality (Forbes,A).

Our multicentre study of 'intentional rounding' to improve **care quality and safety in hospitals** highlighted gaps in its mechanisms and implementation (Harris). In mental health, our cluster trial of the '**Safewards model**' to reduce conflict or containment incidents, found that simple interventions to improve staff/patient relationships are effective (Simpson).

Studying **workforce** across Europe demonstrated how nurse staffing cuts can adversely affect patient outcomes, including mortality (Rafferty). This underpinned legislative changes in Scotland, Wales, Australia and the European Union, improved patient outcomes and saved healthcare costs.

**3. Applied Technologies for Care**, lead Rose: has pioneered new devices, e.g. therapeutic gloves, to improve wound healing and functioning for patients (Grocott, ICS-07) and trialled early extubation to non-invasive ventilation against protocolized invasive weaning (Rose).

**4. Methodologies teams**, lead Robert, refined **Experience-based Co-design**. Additional to impacts in multiple countries [ICS-04], recent research has refined and evaluated co-design among new groups, including mothers and carers of HIV positive children in South Africa, in Stroke and Breast Cancer.



**Institute of Pharmaceutical Sciences (IPS) (35 staff, 30.4 FTE)**

**Aims:** to use science to transform healthcare, from molecules to medicines. We focus on three main areas; Drug Discovery, Medicines Development and Medicines Use.

**Current Work & Achievements:**

Articulated in REF2014, these areas were formalised into groups in 2017 and are connected by cross-cutting themes in respiratory medicine, antimicrobial research, and cancer, the last of these strengthened, since 2017, by IPS and the Comprehensive Cancer Centre together forming the School of Cancer & Pharmaceutical Sciences.

We established a strategic partnership with Public Health England (PHE) to tackle key challenges associated with antimicrobial resistance, have multiple clinical, industry and other external partnerships (section 4) and have made new appointments: Amison, Cillibrizzi and Castagnolo (Drug Discovery); Copeland, Vllasaliu, Raimi-Abraham and Alhnan (Medicines Use).

Strong links with the pharmaceutical industry internationally and local teaching hospitals, through King's Health Partners, enabled us to create the **Centre for Pharmaceutical Medicine Research** and the **Centre for Adherence Research & Education**.

Recent impact from our research includes that of Hider and co-workers who showed that Deferiprone – which treats over 50,000  $\beta$ -thalassaemia major patients per annum – also reduces free radical based neurotoxicity, leading to Phase 2 trials for the treatment of neurodegenerative diseases. They adapted the same class of molecules to bind  $^{68}\text{Ga}$ , creating a radiotracer for prostate cancer PET imaging. Based on a \$500m US market estimate, with Phase 3 trials underway, GE Healthcare and Theragnostics have entered commercial partnership for worldwide rollout.

Page's team demonstrated that a mucus thinning drug, Erdosteine, should be used to reduce chronic obstructive pulmonary disease (COPD) symptom flare-up and, consequently, lung deterioration. Erdosteine was added to the Global Initiative for COPD (GOLD) pocket guide and Recipharm AB reported a 27% rise in its global sales. They also developed the first-in-class drug, Ensifentrine, benefitting COPD, asthma and cystic fibrosis patients. Verona Pharma raised approx. \$280m to take Ensifentrine through Phase 2, and now Phase 3, trials.

Patel and colleagues have improved the safety of anticoagulant prescribing for blood clots. The Royal College of Obstetricians and Gynaecologists dosing guidelines (used by >16,000 members) now recommend pregnant women have only to endure painful injections of low molecular weight heparin once instead of twice a day. Direct oral anti-coagulants (DOACs), such as rivaroxaban, are now acknowledged by King's College Hospital as safe to use in obese patients but pose an adverse effect risk to menstruating women.

Taylor's Maudsley Prescribing Guidelines (13<sup>th</sup> edition 2018; 14<sup>th</sup> edition 2021) are essential, global texts for prescribing in mental illness, translated into 12 languages.

**School of Life Course Sciences (SoLCS) (83 staff, 75.3 FTE)****1. Women and Children's Health**, lead Poston

**Aims:** to understand, and improve management of, disorders of reproductive health and childhood to ensure the best start in life and health across the life course.

**Current Work and Achievements:**

Fertility research demonstrated that functional remodelling in human embryos in vitro can occur independently of maternal tissue cues (Ilic) and, relevant to oocyte function, Jonas discovered a functional role for dimerization of luteinizing hormone receptor, a G-protein coupled receptor.

Researchers made a major contribution to prediction, detection and treatment of pregnancy complications [ICS-10] and established a unique sub-Saharan Africa mother-child cohort (PRECISE, UKRI £7.9M, Wellcome Trust £4M, von Dadelszen). UPBEAT (Poston) provided new insights into obesity in pregnancy (25 publications).

Work with the Evelina Children's Hospital changed policy on childhood food allergies (Lack, ICS-08). Novel electronic health data linkages (Poston, Wolfe) are now enabling 'real world' life course research.

## **2. Diabetes Research**, lead Persaud

**Aims:** to understand the causes, mechanisms and complications of diabetes and to find new ways to manage the disease and improve life-long health.

### **Current work and achievements:**

Key scientific discoveries included demonstration that annexin A1 improves islet transplantation outcome (Jones), placental kisspeptin is linked to gestational diabetes (Bowe), ADCY5 couples glucose to insulin secretion in humans (Pullen) and human islets have unique GPCR ligand expressome signatures (Persaud).

Clinical researchers made advances in continuous glucose monitoring in type 1 diabetes in pregnancy (Amiel) and showed that proinsulin peptide immunotherapy in new-onset type 1 diabetes reduces the need for insulin by 50% (Liu, Y.F). Stadler found that metformin reduced metabolic complications and inflammation in patients on systemic glucocorticoids and Mingrone and Rubino demonstrated a prolonged metabolic benefit of bariatric surgery.

## **3. Nutritional Sciences**, lead Whelan

**Aims:** to explore the relationship between diet, health and disease to find new ways to improve health and to prevent and treat nutrition-related disease throughout the life course.

### **Current work and Achievements:**

The CRESSIDA dietary intervention reduced cardiovascular risk in low risk adults, (Hall, Berry, Goff). (Poly)phenolic compounds, food bioactives found e.g. in blueberries improved vascular function in healthy subjects (Rodriguez-Mateos).

The low FODMAP diet (Fermentable Oligo-saccharides, Di-saccharides, Mono-saccharides and Polyols), was included in NICE guidelines for treatment of irritable bowel syndrome (Whelan). With Twins Research and Genetic Epidemiology, researchers investigated individualised lipaemic responses to food, related to the microbiome (Berry, Spector).

## **4. Twins Research and Genetic Epidemiology**, lead Spector

**Aims:** to identify the genes and environmental factors that influence common complex diseases of ageing and associated traits.

### **Current work and achievements:**

The TwinsUK cohort has pioneered 'omics in population settings leading to advances in understanding the mechanisms by which genetic risk results in disease, using genomics, gene expression (Small), epigenetics (Bell), the microbiome (Steves, Spector) immunomics (Spector) and metabolomics (Menni), as well as a major contribution to the national COVID-19 response, with the Symptom Tracker App (section 1.3)[ICS-05].

The section on ophthalmology showed the importance of environmental factors such as education and outdoor activity in myopia and identified ~ 450 genetic loci associated with the disorder Glaucoma (Hammond, Hysi), altering mechanistics and opening new treatment avenues.

## 1.6 Strategy for impact, our achievements, future strategy and approaches

The King's Strategic Vision 2029 'to make the world a better place' (REF5a) is core to our impact strategies.

Our underpinning **Evidence into Practice Ecosystem** (figure 1.2), provides a successful framework to facilitate efficient transfer of knowledge from high quality original research and systematic reviews.

We have been active in engagement and exchange; our research underpins many national and international guidelines. We produce, disseminate and locally adapt tools and guidance; we implement them to transform clinical practice and policy. Our approaches help overcome the hurdles in moving from guidelines to influencing patient care and health.

An example is the King's led development and evaluation of a prematurity clinic at our partner Guy's and St Thomas' Hospital NHS Foundation Trust, with implementation nationally. We have developed and pioneered palliative care assessment tools, breathlessness therapies, novel wound dressings and improvements in oral health that are used locally and worldwide.

Our selected 11 ICS (table 1.1) give examples of extensive reach and significance across our diverse non-academic groups, collaborators and beneficiaries.

Table 1.1 Impact Case Studies

01	Antibiotic stewardship
02	Care and quality of life for people affected by severe breathlessness
03	Prevention and treatment of tooth decay
04	Experience-based Co-design to improve patient and staff experiences
05	COVID-19 Symptom Study App
06	Erosive Tooth Wear
07	Medical devices and technologies
08	Childhood food allergy
09	Palliative care for underserved groups
10	Personalised care and outcomes in high-risk pregnancy
11	Rehabilitation services

### **Approaches used to achieve impact**

The reach and significance of our research is enhanced by our collaborations (section 4) and relationships with key research users. We combine multiple approaches to achieve impact according to context (figure 1.5):

These approaches are reinforced by **initiatives and underpinning structures** such as our **NIHR Academic Health Sciences Centre, King's Health Partners** (KHP, section 1.4) and our **NIHR Applied Research Collaborative (ARC)** (REF5a).

Impact in UOA3 is especially supported by close working with:

- **King's Policy Institute** is closely involved with UK Government. UOA3 members have benefited, for example, in the development of a strategy to reduce the temperature of the immediate environment to increase fat metabolism in children and reduce obesity (Williamson), and collaborations in palliative care, with a new strategic award from Marie Curie Care (2021-

23) to provide research into the State of the Nation on Palliative Care, (CI Sleeman, with the King's Policy Institute).

- **King's Centre for Improvement Science.** e.g. Sandall (Women's Health) has worked with Centre lead Sevdalis to improve patient and family involvement in escalation of care in acute settings and she contributes to its masterclasses.
- Our **NIHR Mental Health Policy Research Unit**, managed by academics at UCL and King's (Simpson) and established in 2017, is leading developments to help the Department of Health and others involved in making nationwide plans for mental health services to make decisions based on good evidence.
- **King's Global Health Institute**, launched in 2018, is the focal point for King's large academic community of Global Health researchers and students. Led by Prince (UOA4), UOA3 Professors Gallagher (FoDOCS) and Norton (FoNMPC), serve on the strategy group; many UOA3 global leaders such as Bernabé, Challacombe, Harding,R, Harding,S, Shennan, Magee, Moore, Pitts and von Dadelszen are actively involved.

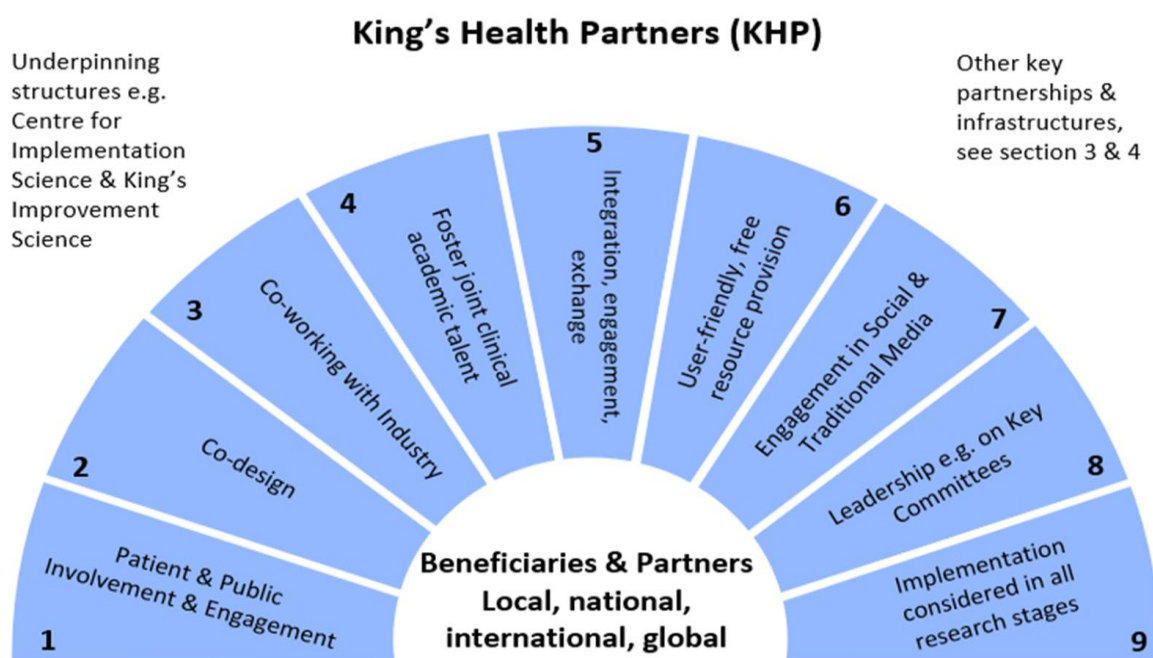


Figure 1.5. Combined approaches to increase the reach and significance of our research's impact across King's UOA3

**1. Active Patient and Public Involvement and Engagement (PPIE):** is instilled across our research projects and programmes. We involve patients and public as co-applicants, co-designers of research, co-creators of interventions and disseminators. The Cicely Saunders Institute has a unique online forum and active 'dragon's den' activities. All studies involve targeted patient/public and stakeholder engagement.

Our UOA contributes to the community: many give talks in schools to pupils of all ages, offer work experience and tours of labs, and act as mentors to outreach students. These include exhibitions at London's Science Gallery; e.g. Tucker was a curator of the 'Mouthy' exhibition in 2016; Nutritional Sciences hosted '3 days of Fat'; Cicely Saunders Institute hosted 'The Sound of Anxiety'.

Our researchers hosted stands at major science festivals and venues, including the Royal Society, Royal Institution, Natural History Museum, Cheltenham Science Festival and New Scientist Live (London EXCEL centre). They participated in Open House, London, and the Academy of Medical Sciences' 'Departure Lounge'. The Smile Society is active in schools and public outreach.



**2) Co-design:** we spearheaded the reconfiguration of healthcare services employing experience-based co-design (developed by Robert). The PROMOTE food programme created a patient and professional co-designed online intervention to improve food-related quality of life in inflammatory bowel disease, led by UOA3 teams across life course (Whelan, Lomer), pharmacy (Morgan) and nursing (Roberts, Czuber-Dochan); funded by Crohn's and Colitis UK.

**3) Co-working with industry:** we created pharmaceutical spin out companies and iCASE studentships. Our collaboration with the fashion industry led to wound care patented products [ICS-07]. Collaboration between King's researchers and the nutrition company ZOE, led to a machine learning algorithm of personalised dietary advice following evaluation of individual microbiome.

Collaboration with a small UK start-up Calcivis led to a new device for assessing the real-time activity of tooth decay lesions in a primary care setting, with CE-Mark and provisional FDA Approvals now in place.

We are collaborating with a US Pharmaceutical Company, Emergent BioSolutions, to develop new generation broad spectrum antibiotics. We have developed pregnancy accredited blood pressure monitors with Micro Life, now used globally, a pre-eclampsia prediction tool (with Quidel [previously ALERE] and Perkin Elmer), and a fetal fibronectin test for risk assessment in premature birth (with Hologic), the latter two adopted by NHS, UK.

**4) Fostering joint clinical/academic/industry talent:** our teams are embedded in clinical settings (section 3) to further collaboration. We won support for new combined clinical/ academic posts from HEFCE, NIHR, industry partners and charities for capacity building. These initiatives, the clinical academic groups and KHP have fostered joint working and increased impact in practice. Our Centre for Adherence Research and Education, in pharmaceutical sciences, was founded as a result of collaboration and investment with KHP.

**5) Integration and engagement:** we partner with clinicians, policy makers, industry, voluntary sector and other non-academic beneficiaries, who are integral to implementation of our research evidence, locally via KHP and nationally (section 4).

We developed the world's first healthcare/academic partnership in pharmaceutical sciences. We instigated and support the End of Life Care Coalition of charities, instrumental in bringing academic and 3rd sectors together.

Our Institutes at King's provide integration and proximity in multiple ways, with shared clinical and academic space, joint posts and objectives and frequent opportunities for knowledge exchange. Palliative care researchers host Clinical Academic Knowledge Exchange events (figure 1.6) and Women and Children's Health created a Knowledge Exchange Hub (figure 1.7).



Figure 1.6. Clinical and academic teams attending Knowledge Exchange events

## Unit-level environment template (REF5b)

**6) User-friendly, free resource provision** appropriate for the audience, culture and language, aids access (reach) and validity (impact). Our research has identified such access accelerates uptake by clinicians, the public, patients and families from many different contexts [ICS-02,05,09].

**7) Engagement with social and traditional media:** to increase awareness and reach our research is frequently featured in major news outlets, including TV, radio and social media. All our teams communicate via newsletters, Facebook and Twitter accounts. We host a YouTube channel in palliative care (CSIKCL) with presentations, discussions and short videos. In 2017, working with the Salzburg Global Seminar, we launched a year-long Twitter campaign on Rethinking Care Toward the End of Life, #allmylifeQs, which had >10 million impressions.

In Women's Health, our information about prematurity research was accessed by >1M women in 2019-2020 on the Tommy's charity web site. The charity's 'Always Ask' campaign, to alert pregnant women to the signs of pregnancy complications, instigated by King's, was viewed 6 million times. The Tommy's pregnancy diabetes information to which we contributed is accessed by ~78,000 women a year.

**8) Leadership:** all our senior investigators and many early career researchers are board members of, and/or chair, international advisory groups, taskforces, national bodies and professional associations (section 4).

**9) Implementation considered at every stage of research:** working with the King's Centres for Implementation Science and Improvement Science and other infrastructure.

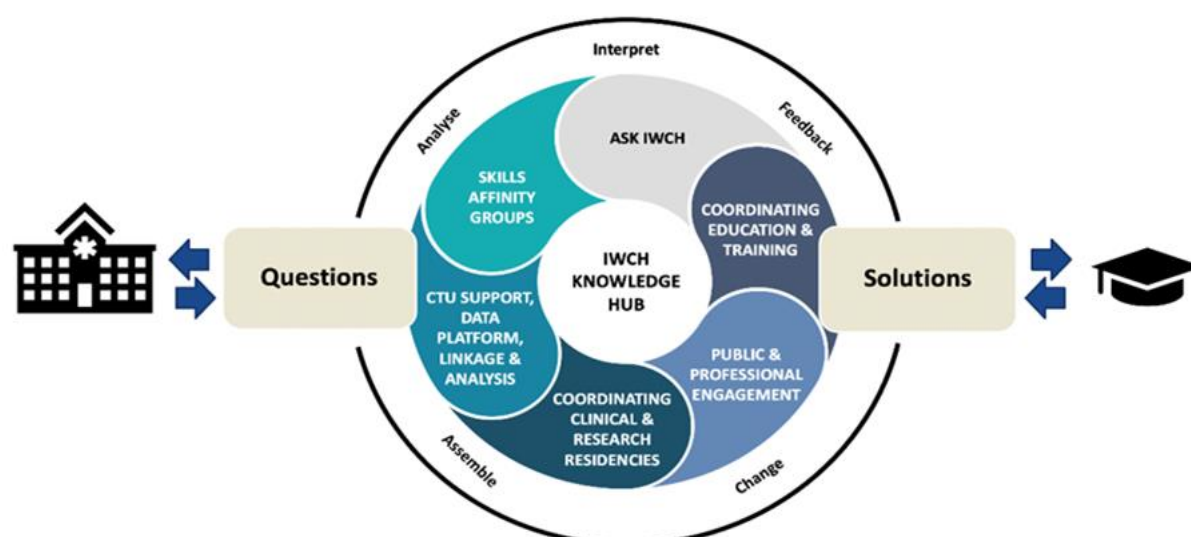


Figure 1.7 Diagram illustrating central role of the Knowledge Hub in the Institute of Women and Children's Health and mechanisms to link research questions with solutions.

## Future improvements to approaches to impact in next 6 years

Building on the above we will further improve our approaches to achieving impact:

- Embed 'impact thinking' in all we do: from project conception, throughout the project and beyond. The Impact Leads of our Research groups (Faculties, Institutes and Schools) will intensify training, resources and external expertise, guidelines and frameworks. They will ensure wide engagement and offer training for early career to established researchers. King's wider structures further aid impact (REF5a).
- Engage and partner actively and often, with the public, patients, industry partners, clinicians, government bodies, policymakers, and others to co-create research and maximise impact.

## Unit-level environment template (REF5b)

- Increase our attention on implementation and improvement at all study stages, growing our infrastructure for commercialisation, capitalising on King's infrastructure (REF5a) and on our leadership roles, e.g. in Women's health in the new Tommy's National Centre for Maternity Improvement (sections 3 and 4).
- Capture and communicate our impact. Recognising impact in its different forms, we will record, appraise and review to improve the reach and significance of our impact, as in ICS 02 where an interim review of impact led to targeted engagement to address gaps.

## 1.7 Scientific strategy for the next 6 years

We will harness technologies, build on our learning from the COVID-19 pandemic, enthuse and foster talented staff and students from across our disciplines, to address future challenges in health and social care, conducting research to improve and innovate in:

- **discovery**, to reveal underlying mechanisms and understand interactions, such as between molecular and cellular, or between intervention content, causal pathways and outcomes
- **prevention**, promoting health throughout the life course and preventing illness, allergies, iatrogenic diseases for example in maternal health, childhood and for older people
- **prediction**, making best use of genetic and phenotype stratifications and routine electronic and big data linkage to research disease and symptom origins, and to personalise or stratify treatments, therapies and care
- **delivering** care closer to patients (supporting patients, mothers, others important to them, such as families, where they want to be cared for, harnessing telehealth, remote monitoring, technology supported self-management and other digital tools)
- **inclusion**, involving patients, and the public, as equal partners
- **tackling inequities**, and reaching populations that have hitherto been missed, such as those from minority ethnic or other disadvantaged groups
- **cost-effective** treatments, therapies and services (innovating, and trialling interventions and their implementation, that give value to health and social care)
- **holistic, personalised** care (considering mind and body together, tackling multimorbidity, putting the person before their diseases, developing and testing self-management interventions) for example in chronic disease, and in palliative, maternity and child care
- **interdisciplinary and integrated** research, collaborating with national, international and global partners (e.g. China, Asia and Africa).

**In the Faculty of Dentistry, Oral & Craniofacial Sciences** we will strengthen our research through recruitment of high calibre staff (see below). Our research environment will be boosted by links with the Guy's Cancer centre, through **a new joint CRUK programme grant** (Neves/Curtis with UOA1 Ng: £2.5M), and with the King's Global Health Institute, spearheaded by the Faculty's work in supporting health systems in Africa. New connections will enable us to share our research through initiatives such as the newly established dentALLiance.

In Craniofacial and Regenerative Biology increasing emphasis will be placed on the **expansion of bioengineering approaches**, integrated with the existing developmental/cell biology discovery research, to drive the translation of cellular therapeutics. In Host-Microbiome Interactions we aim to **extend expertise in fungal pathogens** and move to a greater understanding of the host side of

## Unit-level environment template (REF5b)

host-microbiome interactions, aided by recent appointments in immunology (Neves, Flak) and structural biology (Garnett).

We seek to enhance use of our fantastic resource of patient data to **understand relationships between the mouth and health of the body** through systems biology approaches (Mardinoglu, Shoaie). We will continue patient-centred research in Oral, Clinical and Translational Sciences and develop advanced healthcare technologies with investments in advanced imaging and research into AI, robotics, sensors and nanotechnology.

**In the Florence Nightingale Faculty of Nursing, Midwifery and Palliative Care**, the Nightingale-Saunders Complex Trials Unit will boost evaluative research and accelerate co-designed interventions moving from feasibility stage to effectiveness, cluster and hybrid trials, with a focus on co-production, tele-health, outcome assessment, symptoms and self-management. New health economic posts and collaborations will test cost-effectiveness. We will harness routine and big data, data linkages and AI expertise, partnering with the Innovate UK AI Centre (section 3), to understand inequalities and evaluate care in real time. Global programmes will extend south-north learning.

Partnering with Cicely Saunders International and the Kirby Laing Foundation, we raised **£2.75M to endow the flagship Laing-Galazka Professorship in Palliative Care** (appointing Sleeman, 2021), focussed on palliative care for older people and in multimorbidity.

We will:

- provide **definitive evidence on treatments for breathlessness and for frailty** in advanced disease, with digital self-management, combined rehabilitation and palliative interventions
- **trial new strategies and tailored treatments** including: online self-management for inflammatory bowel disease symptoms, new medical devices, alleviating the effects of noise in hospitals, and supporting family carers
- considerably increase our PhD students, through our new Nightingale-Saunders **Doctoral Studies programme** to launch in 2021
- grow our **capacity-building** post-doctoral posts, and **recruit eight new lectureships or senior lectureships**, one jointly with Women and Children's Health to foster midwifery research.

**The Institute of Pharmaceutical Sciences** is expanding, while integrating the Department of Analytical, Environmental & Forensic Science, with which there are natural fits in analytical and toxicology research. Four appointments will enhance the three cross-cutting research themes (antimicrobials, respiratory medicines and cancer) and existing strengths in neurological disorders and forensics. The two IPS Centres, for Pharmaceutical Medicine Research and for Adherence Research & Education, are recruiting ex-industry and clinicians to accelerate regulatory approval and clinical adoption of medicines transitioning through the development process and enable clinicians to optimise consultations, identifying and tackling medication non-adherence.

For:

- **Antimicrobials:** we will discover, develop and deliver **new antimicrobials** against multidrug resistant Gram-negative bacteria and the emerging fungal pathogen *Candida auris*, leveraging our strategic partnership with Public Health England/UK Health Security Agency (Section 4).
- **Respiratory medicines:** we will better understand **defence versus tissue damage in the immune response**; address safety concerns around anti-inflammatory drugs to broaden their therapeutic use; develop **regenerative pharmacology platforms** to restore tissues damaged in long-COVID or idiopathic pulmonary fibrosis, and optimise the formulation of medicines delivered by inhalation.



## Unit-level environment template (REF5b)

- **Cancer:** linking with the Comprehensive Cancer Centre, we will focus on bioactive material discovery for immuno-engineering and early disease detection (supported by a new major award from CRUK) to develop new therapeutic modalities for cancer and improve prognoses.

**In School of Life Course Sciences (SoLCS)** research will interrogate the life course of health and disease as a conduit to improved population health.

**Women and Children's** research will utilise existing Electronic Health Record (EHR) data linkages (eLIXIR, CYPHP) as a **dynamic Learning Health System** to enable research into improved outcomes, including through partnership with the Innovate UK AI Centre (section 3). Discovery science into causes of maternal and child disorders will be intensified, and evidence-based interventions tested e.g. Hypertensive disease in pregnancy – Baby Panda, NIHR; CRADLE, MRC; POPPY, Wellcome Trust: Child health continuity of care- CYPHP, GSTT charity.

**Diabetes Research** will continue research into islet cell function (Diabetes UK, KCL/Dresden Trans Campus), with increasing interaction with the Institute of Diabetes, Endocrinology & Obesity, underpinned by appointment of the RD Lawrence Chair in Diabetes, sustained by agreed commercial support for a new clinical trials infrastructure.

**Nutritional Sciences** will strengthen their **cell-to-society model theme** with programmatic research on food additives and personalised responses to foods and, using existing cohorts, inform effective interventions to prevent and manage non-communicable diseases.

**Twins Research** will solidify their leading UK cohort (Wellcome Trust Longitudinal Population Studies award), EHR linkage being key to this ambition, together with geospatial data and effects of the COVID pandemic (ZOE app). Inter-individual responses to environmental changes will be addressed using 'omic phenotyping, and, with Nutritional Sciences, they will expand on nutritional challenges.

## 2. People

### 2.1 Overview

Recruiting, mentoring, supporting and developing all staff and students so that they can flourish is central to our UOA3 strategy. We seek to recruit and retain the best, at all stages of their career trajectory. This is buttressed by our dedication to promoting a thriving, mutually beneficial research environment that grows and retains talent and champions equality and diversity.

We employ 248 (224.4 fte) category A staff; of these 43 (41.1 fte, 18%) are Early Career Researchers, 67 (60.1 fte, 27%) are clinical academics. We also employ 82 predoctoral research assistants and 199 post-doctoral researchers. To support our clinical academic integration, we have >100 Category C staff employed in partner organisations, including KHP Trusts, local hospices and community services.

We are addressing the 'leaky pipeline' for staff who may be disadvantaged (section 2.5). Our 18/19 HESA data shows progress made since 2014: an increase in the proportion of women at professorial level, a small increase in men in professional services, and an increase in the proportion of people from black or minority ethnic groups at Reader/Senior Lecturer/Lecturer levels (figures 2.1, 2.2).

Women hold key leadership positions in research, for example the Vice Deans for Research and Impact, Heads of School, Heads of Department and Institute leads.

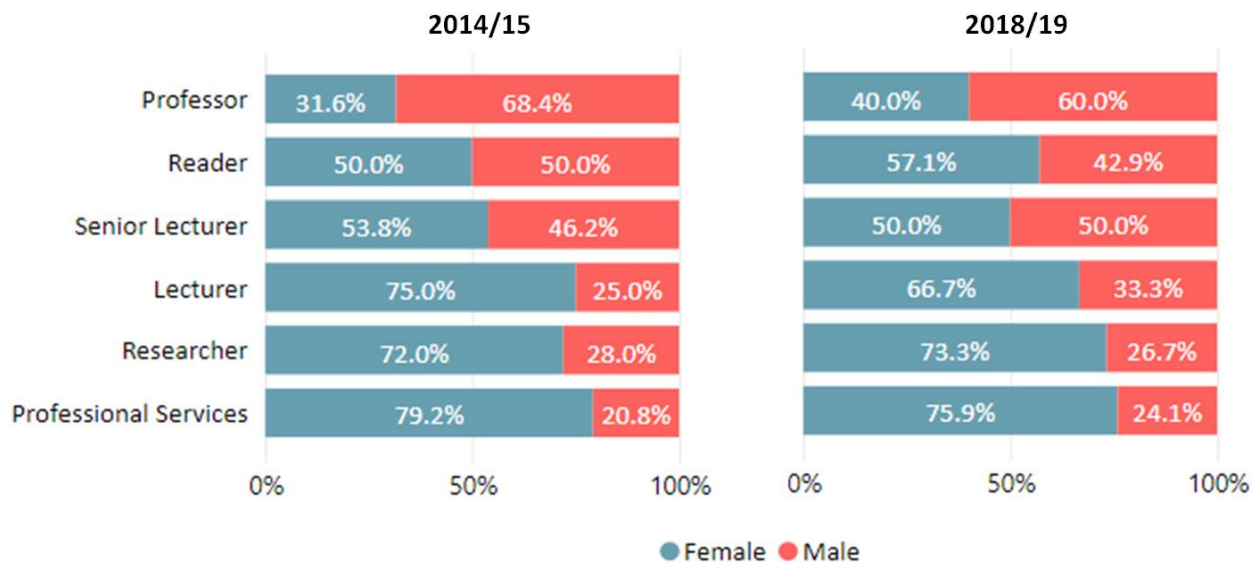


Figure 2.1 Academic and professional services staff gender profile changes over the REF2021 assessment period. Source: HESA.



Figure 2.2 Academic and professional services staff ethnicity profile changes over the REF2021 assessment period. Source: HESA

## 2.2 Staffing Strategy and Staff Development

### Recruitment

We recognise the diverse skills and expertise needed in different fields, while maintaining a focus on excellence. We follow King's common recruitment policies across UOA3 teams (REF5a).

All replacement and new academic posts are subject to business plans and standardised job descriptions, and appointment panels are configured to ensure diversity in gender, ethnicity and age. Unconscious-bias training is mandatory for all interview panel members, with 360 degree feedback. The most recent staff survey data found that most staff (85-93% across Faculties in UOA3) report that King's acts fairly with regard to background (e.g. culture, ethnic group, gender, socio-economic) in staff recruitment.

**Induction, mentoring and buddy system**

New academic staff are assigned an academic mentor, in addition to their academic line manager, to advise them on their development and priorities. We are rolling out best practice across the UOA, e.g. the Cicely Saunders Institute's buddying system, where new staff have a 'buddy' who helps them find resources.

**Appraisal and Probation**

Staff undergo a formal annual **Performance Development Review (PDR)** with their line manager where achievements in the previous year are reviewed and goals, career advancement opportunities and appropriate support and training needs are agreed for the coming year.

The criteria for an **Academic Performance Framework** have been harmonised by King's-wide initiatives to enable a high-performing culture (lead Norman). This takes account of transparent workload data which provide credit for education responsibilities, administrative duties and research productivity and, where appropriate, clinical activity.

Probation of academics (at 3 years) and researchers and professional service staff (at 6 months) across UOA3 follows King's-wide standard protocols to ensure fairness and support for all new members of staff to attain their potential.

**Promotion and Career Progression**

Initiatives aimed at promoting career progression include: mentoring; promotions workshops; generic skills training courses; advisory committees; opportunities to deputise on decision-making committees and, in accordance with our commitment to equality, diversity and inclusion, funds to support return from career breaks and childcare costs when attending conferences and training and leadership development programmes.

Staff are helped through the process of promotion by internal Faculty/School Promotions Advisory Panels. These provide coaching, workshops and 1:1 support with feedback on plans and CVs. Support from our internal panels has yielded successful promotion rates of; 94% (FoDOCS implemented from 2015), 91% (FoNMPC from 2017), 100% (IPS from 2018), 90% (SoLCS from 2017).

**Research culture and research integrity**

King's established a research culture task and finish group to address three areas highlighted by the Careers in Research On-line Survey; career progression, reward and recognition and bullying and harassment (see below). These initiatives are led by UOA3 researchers (Newton: Dean of Research Governance, Ethics and Integrity, Tucker: Chair Research Culture task and finish group), with advisors embedded across UOA3 Faculties (REF5a).

**2.3 Development, support and training for our staff to ensure their personal and professional growth****Early Career Researchers**

Key to our goal is fostering and growing the academic pipeline.

Our strategy is focussed on delivering a positive research culture that offers the best opportunities and training, at all stages, actively seeking to diversify and address areas of under-representation. We actively encourage participation in King's fellowships and, in alignment with new King's strategy, we develop more efficient mentorship process for probationary lecturers and ECRs.

King's has recently launched the *Emerging Research Leaders* Programme to provide specific support to those establishing their independent research programmes, building on the success of our *Leading Researchers* programme (see below).

### **Research-only staff (research assistants, and post-doctoral researchers)**

We support research staff to achieve their ambitions, be they to move from research assistant to undertake PhDs, to win post-doctoral positions, Fellowships, academic posts or to develop specialist skills. King's is committed to leading the implementation of the ***Concordat to Support the Career Development of Researchers***, and recently received the European Commission's HR Excellence in Research award for its commitment to this Concordat.

All staff and PhD students are encouraged to develop an individualised generic skills training programme and to make use of the extensive array of King's development programmes and external opportunities (REF5a).

We recognise the challenges faced by research-only staff, particularly in transition from post-doctoral positions to lectureships or other positions. We seek to mitigate these, and ensure that we retain staff on an upward trajectory through a combination of:

- salary funding to underwrite or bridge high-achieving staff to support fellowship applications, e.g. to UKRI, NIHR and King's
- flexibility of movement between grants
- joint contacts across Departments and Faculties where appropriate, e.g. between SoLCS and the School of Immunology and Microbial Sciences (Santos, Turcanu); between SoLCS, FoNMPC and the IoPPN (Howard, Higginson, Harding, R, Roberts, Norton)
- adherence to King's regulations defining the minimum length of fixed term contracts (REF5a).

**King's Centre for Research Staff Development** provides career enhancement opportunities for all groups of research staff (REF5a).

Successful examples in UOA3 include:

- **King's Prize Fellowships** (2 year salary and running costs) to enable outstanding internal/external postdoctoral researchers transition to independence. Since 2014, seven have been awarded across UOA3; three progressed to lectureships (Flak, Mann, Bergholt), one to an MRC Clinician Scientist (Yu-Wai-Man).
- **One-year Clinical Training Fellowships** from GSTT/KCL Biomedical Research Centre (BRC) to prepare for external Fellowships. Recipients have included NIHR Doctoral Training Fellowships (Hezelgrave, Carter) and an MRC Clinical Research Training Fellowship (Conte-Ramsden).
- Partnering in **European Intersectorial & Multi-disciplinary Palliative Care Research Training** (Euro-Impact), a four-year coordinating action project funded by the European Union, which trained 12 junior and 4 senior researchers in palliative care.
- The **BuildCare Cicely Saunders International fellowship programme**, with pre-doctoral and post-doctoral fellowships and transition funding; seven staff transitioned to lecturer posts (Sleeman, Evans, Ellis-Smith, Henson, at King's, three to academic posts in Germany, Australia, University of Bristol) and one to industry.
- Other externally funded individual training development awards: Marie-Curie fellow (Le Blanc), UKRI Rutherford Fund fellow (Neves), EPSRC fellow (Shoaie), Action on Hearing Loss Pauline Ashley fellow (Mann).



## Unit-level environment template (REF5b)

- **Mentoring and financial support schemes**, including the NIHR Leadership and Senior Leadership programmes (5 female senior staff members, all promoted, 1 of ethnic minority origin promoted to Professor), the Academy of Medical Sciences Future Leaders in Innovation, Enterprise and Research (FLIER) and Springboard programmes (local Springboard 'Champion', Poston), the Stellar Higher Education programme and the Advance HE's AURORA Programme (Leadership programme for women in academia).

All our Faculties have **networks of research staff support** to connect research staff and provide peer-mentoring, provide information about training and progression opportunities and to enable representation on Faculty/School/Institute decision-making committees.

## Clinical academic and clinical research careers

Clinical academics, researchers and PhD students are sustained by our clinical academic structure, co-location with clinical services (section 3), and our KHP Institutes.

We have successfully taken staff from NIHR Academic Clinical Fellow or Lecturer through career development to win awards and senior academic posts. Chappell, an obstetrician, undertook her PhD at King's, became a Clinical Lecturer, Senior Lecturer, then secured a prestigious 5-year NIHR Professorship, and was appointed in 2021 to Chief Scientific Adviser, DHSC. Sleeman, an NIHR Academic Clinical Lecturer in Palliative Medicine, secured an NIHR Clinician Scientist, enrolled in the FLIER programme and recently won (in open competition) a prestigious King's Professorship, starting 2021.

Our research staff comprise a large number of Allied Health Professionals and we actively support their academic career progression. We have fostered many individuals from different disciplines (nurses, midwives, social workers, occupational therapists and social scientists) from MSc, PhD student and post-doc to senior academic posts: Harding, R (social work), Murtagh (medicine), Koffman (health care research), gained PhDs in the Cicely Saunders Institute, won academic posts, progressing to Professors or Readers. Evans (palliative care community nursing), moved from post-doctoral researcher, attained an NIHR clinical lectureship, then senior lectureship, and recently submitted for an NIHR Professorship. Maddocks (physiotherapy) joined as an NIHR postdoctoral researcher, secured an establishment lecturer post, a further NIHR postdoctoral training fellowship and was promoted to Reader in 2020.

We have been awarded the most NIHR Fellowships for midwives of any institution in the country. Briley, senior midwife, following her PhD and postdoctoral research was appointed in 2020 to the Chair of Women's Health and Midwifery Research at Flinders University, Adelaide. Carter, following an NIHR PhD Fellowship, was awarded an NIHR Development and Skills Enhancement Award and is now a postdoctoral midwife researcher for the Tommy's Maternity Improvement Centre. Walker, following her PhD, was awarded an NIHR advanced fellowship.

## Senior academic staff

UOA3 PIs benefit from pump-priming schemes run by King's, including the KHP R&D Challenge Fund (c.£1m/year), King's Together (£1m/year), the Genesis Fund (c.£500k/year), and BRC/CRUK Centre pump-priming schemes (REF5a).

At the highest level, the **King's Leading Researchers Programme** supports rising stars, at or close to professorial level, to establish themselves as research leaders. In UOA3 this has been undertaken by Rose, Gao, Small, Williamson, Williams, Sturt, Koffman, Al-Jamal, Chiappini, Andoniadou, Naglik, Tavassoli.

**Professional services and technical staff development and sustainability**

Highly skilled administrative and technical staff benefit from skills workshops, e.g. on writing/communication, financial management, computer and web design skills, impact capture and are encouraged take part in local and external activities, e.g. engagement in the King's-wide competition for green lab sustainability (Gold star award to Women and Children's Health in this REF period, a technical staff member from that group now leads the London Bioresource Group). Research technical staff are included in the Concordat.

The success is evidenced by promotions and developments in professional services careers within our teams (e.g. Tonkin to CSI Business manager, Nessa from Lab Technician to Clinical Operations Manager, Hollows to senior international partnership manager, Richards to School Technical Manager, Carvalho to School Manager) and in a transition to a research career (e.g. Davies to PhD in palliative care, Verdi to PhD in neurology, Tunnard and Mi to research assistants).

**2.4 Selection, support, training and supervision of postgraduate research (PGR) students**

Currently, we have 380 PGR students, from 50 countries and six continents, supervised by UOA3 researchers. As part of the application and selection process, all students have to submit a research proposal, often developed in collaboration with potential supervisors.

**Support and training**

The **King's Centre for Doctoral Studies** co-ordinates and provides a robust training infrastructure for all students at King's (REF5a).

All students benefit from **The Generic Skills courses** including: information retrieval; research governance; ethics, data protection; IP, health and safety; planning and managing research; statistics; qualitative and quantitative skills; presentation skills; preparing for oral examinations and thesis writing. Students are encouraged to undergo training outside their immediate research area to enhance transferable skills, e.g. communications training and public engagement. UOA3 students have won the King's *3-minute thesis competition* (Blanford, FoDOCS, Salamipour, Prpa, SoLCS), and won through to the national finals (May, FoDOCS, Salamipour, Prpa SoLCS).

Career sessions are organised, including workshops with external speakers/funding bodies, to highlight diverse career paths in academia, industry, clinics, medical writing, patent law etc. Each Faculty/School/Institute has a yearly PGR research day when students present and are awarded oral and poster presentation prizes. We encourage PhD students to gain experience by joining learned Societies e.g. Women's Health PhD students ran a Biochemical Society symposium.

Overseas students are provided with language courses where needed. Laptops and/or fixed computers are provided to all PhD UOA3 students. Where not otherwise provided, our Faculties provide travel grants for PhD students to present at conferences.

**Supervision and monitoring progress**

Across UOA3, student progress is overseen by a **first and second supervisor** (or **joint first** for some programmes) and an independent **post-graduate coordinator** to help resolve any issues arising during the PhD. Supervisor training is mandatory, with refresher courses every 5 years. Excellent supervision is celebrated through the *Supervisory Excellence Scheme* where students can nominate their supervisors for prizes (winners from UOA3 teams include; Liu, Gallagher, Maddocks, Miletich, Newton, Proctor and Tucker).

## Unit-level environment template (REF5b)

All Faculties have bespoke **Thesis Progression Committees** offering support, expertise, advice and guidance for the student and their supervisors. These committees are chaired by a nominated senior academic and include two experts external to the supervisory team. Students' progress is reviewed after their first 3 months and then every 6 months until completion. Students submit a report to upgrade from MPhil to PhD.

**The rates of PhD submission** within four years full time or seven years (part-time) during the REF period are: 95% (FoDOCS), 100% (FoNMPC) and 93% FoLSM (data not available for SoLCS and IPS separately due to organisational changes).

## 2.5 Supporting and Promoting Equality, Diversity and Inclusion (ED&I)

We secured **Athena SWAN Silver Awards covering all UOA3 constituent departments**: FoDOCS 2015, renewed 2018; FoNMPC 2014 for Nursing and Midwifery, renewed 2019; Cicely Saunders Institute 2016; FoLSM 2018 (including Women's Health Silver - awarded first in 2014; IPS; Diabetes & Nutritional Sciences).

We have led the development of **national Athena SWAN networks: for Nursing & Midwifery** (launched 2019) and for **Palliative Care** (launched 2020). These networks offer opportunities to share beacon practices, collectively address sector issues and provide support and mentorship to other institutions to instil Athena SWAN principles.

We support external initiatives for women who have taken career breaks returning back into science, for example the Chadburn Lectureship awarded to Ovadia (Women and Children's Health) and Williams, K (Ophthalmology).

Improvement in equality and diversity; mentoring, and providing support and career development, is central to all our activities, as outlined in our REF2014 and in response to national initiatives and concerns, including Black Lives Matter. King's aim is to become **an exemplar of Equality, Diversity & Inclusion in the Higher Education (HE) sector** and, more widely (REF5a). This is embedded in the five components of Kings Strategic Vision 2029, figure 2.3.



Figure 2.3 Central tenants of Equality, Diversity and Inclusion (ED&I) in the Strategic Vision at King's in UOA3

Since REF2014 King's central organisation of ED&I has been aligned closely with Faculties, with the King's ED&I team delivering priorities to local committees, to embed ED&I across the governance, operations, decision making and culture of Faculties within UOA3 (REF5a).

King's has embedded the **StellarHE programme since 2019** to enhance and extend the leadership skills of Academic and Professional staff of diverse cultural origins. So far 3 UOA3 staff members have enrolled.

King's demonstrated its commitment to inclusion of the lesbian, gay, bisexual and transsexual campus community by becoming a **Stonewall's Diversity Champions** member in 2016, sought their consultation on the **Trans Matters Guidance** documents and hosted their annual Starting Out Guide launch in 2017. This provides workplace resources, a toolkit and a network, used actively by teams across our UOA3 submission.

UOA3 Faculties have focused on means to identify gender, ethnic and other inequalities and on implementing proven interventions to reduce inequalities, implementing King's wide initiatives such as ED&I representation on decision-making committees, aligning Faculty and departmental meeting times within core hours (10.00-16.00), regular staff consultations (e.g. surveys and focus groups) and **King's Diversity Matters** training as standard in staff induction. UOA3 teams have taken the lead on workshops such as: **Inclusive Education, Trans Matters, Culture and Equality, Active bystander training, Digital Accessibility, and Inclusive Practice**, and the **DentAll network** for students and staff.

The **King's Parental Leave** scheme and **Parents' and Carers' Fund** provide assistance for return to research following maternity or carer's leave. Staff surveys show that the percentage of respondents in King's agreeing that they received the support they needed to resume their roles after maternity leave rose from 43% in 2014 to 100% in 2017.

**Awareness of our commitment to ED&I is high.** The most recent King's Staff Survey showed that 88% (FoDOCS), 98% (FoNMPC), 94%(SoLCS) and 97% (IPS) staff were aware of King's commitment to ED&I. Since 2014, the proportion of staff who are aware of, and attend, ED&I training has increased annually. In the most recent survey, most staff (77% FoDOCS; 91% FoNMPC; 82% SoLCS and 91% IPS) felt they had received sufficient training to help them deliver an inclusive environment. and that most staff felt supported and valued by their colleagues (93% FoDOCS; 91% FoNMPC; 89% SoLCS and 90% IPS).

Central to our approach to mainstreaming an inclusive environment has been implementing ED&I at key transition points for all employees, such as reviewing induction content and processes and ensuring that career progression and promotion are more constructively discussed in Performance Development Reviews, as well as improving access to flexible working.

The FoLSM Staff Study in 2019 demonstrates the success of this approach: an increased proportion of staff taking up informal flexible working (73%); 83% of new starters agreeing their induction was welcoming; 77% agreeing that development was discussed effectively in appraisals.

Within FoNMPC, yearly ED&I survey results, with provisional action plans, are presented to staff at workshops to facilitate co-production of action plans and promote a culture of stakeholder buy-in. In the Faculty's 2019 ED&I survey, 90% of respondents said they had not witnessed or been the victim of discrimination on the grounds of race or sexual orientation in the Faculty. 98% said they had neither witnessed nor been a victim of discrimination. Most respondents agreed that they were treated equally by colleagues irrespective of their gender (77% agreed), ethnicity (80%) or sexuality (85%).



## 2.6 Actions to prevent bullying and harassment

A working group of representatives from across our Health Faculties reinforces the commitment to **zero tolerance** for bullying and harassment and develops strategies to tackle the underlying causes across the Health Faculties. The group aims to:

- better enable consistency of action, approach and outcomes across the Health Faculties.
- share best practice and facilitate joint working across the Health Faculties, King's, the Higher Education and health sectors.
- understand the nuanced challenges faced in Health Faculties and the barriers and obstacles to tackling bullying, harassment & victimisation.
- accelerate interventions across the Health Faculties.

Group members include senior academic and professional services staff, King's Director of ED&I and the Director of King's Organisational Development.

## 2.7 Support for staff and students during the COVID-19 pandemic and lockdown

King's put staff and student welfare at the heart of its COVID-19 response. In March 2020, King's stipulated that ED&I be considered in all decisions and implementation responding to COVID-19. It rapidly developed tailored **Equality Analysis materials**, including quick reference guides and an abridged Equality Analysis template.

Whilst our research teams mobilised rapidly to contribute to the COVID-19 knowledge base, we recognised the significant disruption in other research areas due to government lockdowns, travel restrictions, workplace social distancing, halting of clinical research, disruption of animal work, redeployment to clinical duties, and caring responsibilities. We supported our non-independent postdocs and research assistants through fully paid furlough leave, and research students through stipend extensions and interruptions.

UOA3 teams made use of the **King's Coronavirus Disease Equality Considerations Report** which brings together research on the differential impacts of the pandemic on key demographic groups. These materials were available to UOA3 staff on our ED&I Coronavirus webpages.

There is a particular focus on staff wellbeing, including additional concessionary leave days for staff in April, August and December 2020, the creation of an online meeting framework, and the opportunity for parents and carers to utilise special paid leave.

Many clinical academics from UOA3 were deployed to the front line of clinical services, and this was recognised by King's, which relieved them of teaching or other duties.

At local level, Faculties in UOA3 have developed an inclusive approach to supporting all staff and students throughout the COVID-19 period. Initiatives include:

- weekly or fortnightly virtual meetings between Group leads and PI staff, plus staff/department meetings, research round-ups, seminars, conferences and workshops
- PI led researcher development/methodological/ journal club meetings
- Coffee mornings, quiz events, online advent calendar, virtual yoga, rise and stretch to encourage staff to move away from the computer for 15 minutes
- Online graduation events and celebrations
- King's Mental health support hub which was established as a central resource for all staff (REF5a).

### 3. Income, infrastructure and facilities

#### 3.1 Research income and awards

Our external peer reviewed research income across UOA3 at King's for the period 2013/14 to 2019/2020 was £150M. Almost half of this was from UK Research & Innovation (UKRI) (£29.3M) or the National Institute for Health Research (NIHR) (£30.9M) (figure 3.1). Annual income increased over the period from £20.5M in 2013/14 to £22.8M in 2018/19 (£21.6M in 2019/20, some income delayed due to COVID-19).

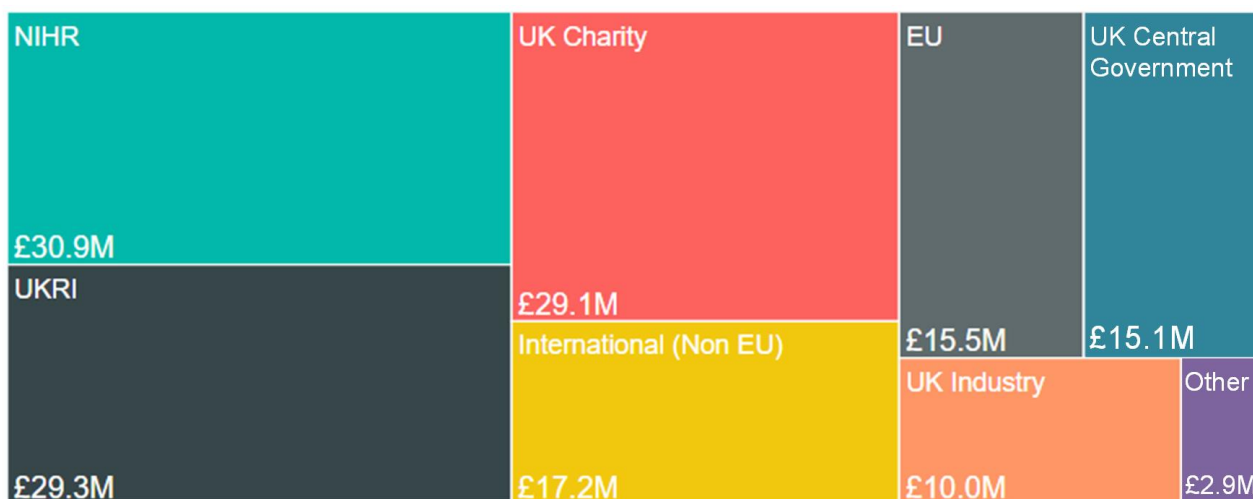


Figure 3.1 Research income for UOA3 teams by funding source for the period 13/14 to 19/20; showing NIHR separately from other UK Government income

The value of new awards involving UOA3 teams increased during this REF period (figure 3.2), especially after 2017, after implementing our strategies of building critical mass and significant partnerships. The total awards over this REF period (2013-2020) involving UOA3 staff (as co-applicants or chief investigators) were £345.4M, illustrating our collaborative networks and vitality.

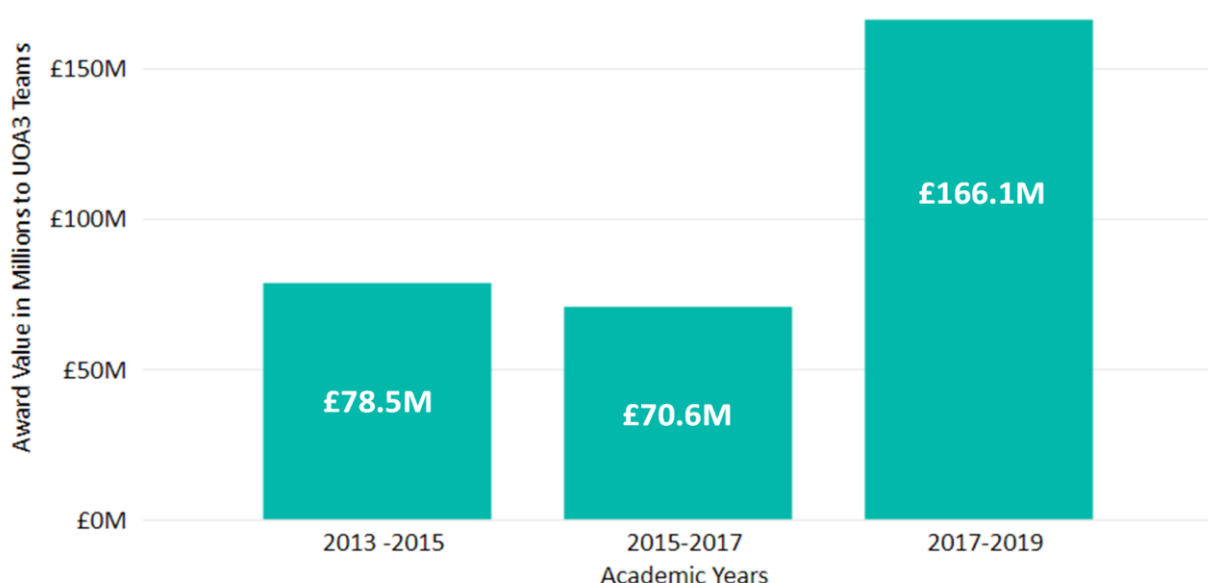


Figure 3.2. Awards involving King's UOA3 teams. Total project/programme values are presented in 2 academic year periods; i.e. 2013/14 and 2014/15; 2015/16 and 2016/17; 2017/18 and 2018/19.

**Major infrastructure awards**

Sustainability across the breadth of our research is illustrated by the programme support to King's and to our partner Trusts, which involves leadership from across our UOA. Some support is direct to the NHS and is additional to the income and award figures above.

These include experimental medicine infrastructure, in particular, the combined investment of more than **£130M** to our King's Health Partners NHS Trusts for two **NIHR Biomedical Research Centres (BRC)** (2017-2022) at Guy's and St Thomas'/King's (£64.4M) and the South London and Maudsley (£66M). Both Centres have Research Platforms for Big data, advanced therapeutics and training, supporting UOA3 teams.

**Oral Health (FoDOCS)** and **Women and Children's Health** themes were included for the first time in this new Guy's and St Thomas'/King's BRC; **Pharmacology** was already a theme. **TwinsUK** (Spector) is a core Research Platform in the GSTT/KCL BRC and feeds into multiple BRC themes including Genomic Medicine, Immunology and Cardiovascular. **Palliative Care** and **Mental Health Nursing** benefit from infrastructure and partnerships with the **translational informatics** and **mental-physical health** programme in the Maudsley BRC.

UOA3 members contributed to King's infrastructure awards for core laboratory facilities including the **King's NMR Facility for structural biology, metabolic profiling and drug discovery** providing core NMR spectroscopy facilities (Wellcome Trust and BHF, £2M; Poston, Williamson), **and the London Metallomics Facility** with a Wellcome Trust Multiuser equipment grant £390K (Maret, Hogstrand, Sharp & Hider), a newly created facility to provide state of the art metallomic analysis, and correlative bio-imaging. Wellcome Trust and UKRI Multiuser equipment grants involving UOA3 provide access to key equipment: £263K (microCT scanner), £198K (laser capture microdissection microscope), £550K (multiphoton microscope).

A Wellcome Cohort Award 'Twins UK', an epidemiological and genomic resource was awarded to Spector's team to support the Twins UK Bioresource (£2.8M). Spector also contributed to the successful bid from Health Data Research UK for the London Substantive Site for HDR UK (£1.2M, 2018-2023, total award to London £7M).

Our applied health research benefits from our leadership in the South London **NIHR Applied Research Collaborative (ARC)** (2019-2024), £9M. This builds from the successful South London **NIHR Collaboration for Applied Health Research and Care**, £10.5M, 2014-2019. Led overall by Thornicroft (UOA4), UOA3 teams lead four of the eight ARC research themes: **Palliative and End of Life Care** (Higginson, Gao, Maddocks); **Maternity and Perinatal Mental Health** (Sandall); two new themes, **Children and Young People** (Wolfe) and **Social Care** (Manthorpe).

We lead an **NIHR Health and Social Care Workforce Research Unit**, Manthorpe and Rafferty (£4.9M, 2019-2023) and an NIHR School for Social Care Research (joint with London School of Economics and Political Science).

Relevant Kings infrastructure awards include the Innovate UK London AI Centre for Value-based Healthcare (£10M + £16M), Wellcome/EPSRC Medical Engineering Centre (£12M), London 7T MRI Clinical Research Facility (£4M) and London Institute for Healthcare Engineering (£16M + £32M from industry) – which benefit UOA3 researchers and themes (e.g. AI Centre linking to data science in LifeCourse theme, Healthcare Engineering linking to biomaterials research in dentistry).

**Strategic and programmatic awards**

In this period UOA3 teams were involved in **>60 awards of >£1M** across our research groups, plus key strategic investments in our research fields. Of these, 46.7% were led by women and 8.3% by investigators of ethnic minority origins.

## Unit-level environment template (REF5b)

Since REF2014 these include **major strategic grants (> £3M) from UKRI** e.g.: Empowering Better End of life Dementia Care, EMBED-Care Programme, £3.7M, 2019-2023 (co-CI Evans, with Harding,R, Sleeman and UCL); stratification studies in hypertension (using ancestry and biological Informative Markers) £3.4M 2015-2021 (uniting UOA3 teams from pharmacy, life sciences and nursing); T Cell Therapy for Inflammatory Bowel Disease, £3.3M 2018-23, plus multiple grants up to £3M.

**Significant NIHR programmatic (>£2M) research** led by UOA3 teams includes: Living well with inflammatory bowel disease: the IBD-BOOST programme, £2.3M 2017-2022 (Norton); The StereoTactic radiotherapy for wet Age-Related macular degeneration (STAR) randomised, clinical trial £2.2M 2014-2022 (Jackson) and on Pregnancy Antihypertensive Drugs, £2M, 2020-2024 (Chappell).

**Investigator awards from Wellcome Trust and other major charities (>£2M)** include: Study of Fungal peptide toxins in pathogenicity and immunity, £2.1M 2018-20204 (Naglik).

**Strategic international applied health collaborative research** is supported, for example, with awards from the European Community. Those >£3M include: MICROBiome-based biomarkers to PREDICT decompensation of liver cirrhosis and treatment response, £12.3M, 2019-2025 (involving Moyes); Solving the unsolved Rare Diseases, £12.3M, 2018-2023 (involving Rafferty); Training European Experts in Multiscale Studies of Neural Crest Development and Disorders, £3.5M 2019-2023 (involving Liu,K); Dyadic Psychoeducational Interventions in Advanced Cancer £3.5M 2019-2023 (involving Harding,R, Bristowe); International randomized controlled trial Improving Mental Health and Wellbeing in the Health Care Workplace (Magnet4Europe) £3.4M 2020-2023 (involving Rafferty); and Better Treatments For Breathlessness In Palliative And End Of Life Care £3.1M 2019-2023 (CI Higginson, with Maddocks, Bajwah and King's Physiology).

Since REF2014, UOA3 units have been involved in an increasing portfolio of **Applied Global Health Research** including: **the NIHR Global Health Unit** 'Health System Strengthening in Sub-Saharan Africa' £7M, 2017-2021 (CI Prince UOA4), with UOA3 teams leading **Maternal Care** (Shennan, Poston, Sandall, Moore), **Palliative Care** (Harding,R, Gao, Higginson) and **Dental** (Gallagher).

The **UKRI Global Challenge Research Fund** is financing UOA3 teams; large awards include: **Research for Health in Conflict**, a network developing capability, partnerships and research in the Middle and Near East (R4HC-MENA), £6M; 2017-2022 (with Harding,R) and **The PRECISE Network: PREgnancy Care Integrating Translational Science, Everywhere**, £7.9M; 2017-2021 (CI von Dadelszen with Poston, Magee, Tribe, Sandall, Shennan), with an additional £4.1M from a Wellcome Collaborative Award in Science (2021-2025) for the PRECISE-DYAD project following mothers and their children.

## 3.2 King's wide infrastructure relevant to UOA3 teams

### Research development, delivery, quality, governance

UOA3 teams benefit from active support from, and collaborations with the King's wide infrastructure (REF5a). In addition to those in section 3.1, other infrastructure relevant to UOA3 include:

- **NIHR Research Design Service (RDS)** London, led from King's in partnership with major London universities, with consecutive five-year contracts (£6.35M, 2018-23).
- **King's NIHR UKCRC Clinical Trials Unit.** Specialist 'spokes' within the KCTU focussing on UOA3 trial needs were launched during this REF period (see section 1) focussing on nursing, midwifery, palliative care, dentistry and women and children's health.



## Unit-level environment template (REF5b)

- **NIHR Clinical Research Network and NIHR Clinical Research Facilities (CRFs).** Our partner Trusts are consistently in the **top five recruiting NHS Trusts in England**, with recruitment in 2018-19 of 19,712 patients at King's College Hospital (KCH), and 19,522 at Guy's and St Thomas' (GSTT), (2019-20 data not available due to COVID-19). UOA3 staff benefit from NIHR CRN support and staff including research nurses, nurses, midwives and trial managers. We lead specialties in dental, palliative care, diabetes, nutrition, and women and children (section 4). We make constant use of the adult CRF and a newly built Paediatric CRF at the St. Thomas' site.
- **King's medical imaging facilities**, including 1.5T/3T/7T MR, PET/MR (+ cyclotron), XMR, PET/CT and embedded chemistry, for clinical and pre-clinical studies.
- **King's Health Partners Clinical Trials Office** supports commercial and non-commercial medicinal trials and provides **Good Clinical Practice Training** to our UOA3 research staff.
- King's **Research Management & Innovation Directorate** provides dedicated support for every aspect of research development, budgeting, contracting and activity.
- **The Centre for Research Staff Development** helps research staff at all levels to achieve their potential, before, during and after their time at King's, including in **Research Governance, Research Ethics, Research Integrity** and **IP & Licensing**. Library, data searching, repository, research integrity tools enable research teams to ensure the highest quality discovery and research practice.
- **Francis Crick Institute.** UOA3 has been involved in close collaborations with the Crick, including secondments (Serio), Sabbaticals (Streit) and joint PhD students.

We also take advantage of the resources across King's for collaboration and to stimulate high-quality research (REF5a). These include **financial support for; interdisciplinary collaborations** e.g. (King's Together, KHP R&D Challenge Fund); **early career researchers** (King's Prize Fellowships); **impact generation** (Impact Acceleration Accounts); **commercialisation** (KHP Accelerator and The Genesis Fund) and **global engagement** (Partnership fund). This has increased UOA3 collaborations across King's, e.g. UOA3 teams have 148 collaborative funding awards with UOA1 PIs in this REF period.

## Laboratory Sciences

King's offers a wealth of core research facilities widely used by UOA3 staff (REF5a). Aside from the GSTT/KCL BRC core facilities, which provide support such as flow cytometry and genomic core support, pre-clinical studies are supported by Biological Services which provides a transgenic mouse service, used extensively by staff in diabetes, women and children's health and dentistry. We also use the Mass Spectrometry and Proteomics Facility, the Nikon Imaging facility, Centre for Ultrastructural Imaging and the Wellcome/BHF NMR and the London Metallomic Facilities. Our research benefits from bioresources provided by many thousands of subjects, including the Tommy's charity Reproductive Health biobank and the Twins UK bioresource.

## Clinical informatics and Digital health

UOA3 teams make extensive use of major linked data sets, nationally, locally, and internationally to promote efficient population based, clinically applied and health and social care research.

King's core facilities offer access to the hybrid cloud platform, ROSALIND which enables cross disciplinary, data intensive research applications and analytics.

## Unit-level environment template (REF5b)

In collaboration between the King's **London Medical Imaging & AI Centre for Value-Based Healthcare** and **Nvidia**, we will have access to the UK's most powerful supercomputer, Cambridge-1, alongside in-house AI capabilities (Nvidia DGX-2) and expert support.

The **Centre for Translational Informatics** (£10M in refurbished space within the Maudsley NIHR BRC) launched in June 2016, brings together King's data science with NHS informatics. The Centre hosts clinical informatics tools (e.g. the **Clinical Record Interactive Search (CRIS)** that contains the anonymised electronic records of South London and Maudsley NHS Trust patients).

**CRIS** has underpinned the **early-Life data cross-Linkage in Research study**, which is linking data from a deprived population of London (>600,000 people) served by three UK NHS hospitals (two Acute, and one Mental Health Care) about pregnant women, infants and children (CI Poston, UKRI funded). Established in 2018, with over 14,000 individual births per year, and the ability to link routinely collected maternal and neonatal clinical data with biological samples, this is set to become one of the largest mother–infant–child datasets in Europe. In addition to secondary care data, it links to **Lambeth DataNet**, an anonymised patient-level source of primary care data, containing 1.2M patient records in an inner South London multi-ethnic population with detailed ethnicity coding. Future linkages include national datasets e.g. Hospital Episode Statistics and the Human Fertility and Embryology Authority database.

**CRIS** provided opportunities for UOA3 team research, for example understanding place of death from unnatural causes in people with serious mental health disorders (Gao, Higginson) and emergency department attendance in the last year and months of life for people with dementia (Sleeman, Higginson).

Building from the processes of CRIS, the **King's Electronic Record Research Interface (KERRI)** was launched in January 2020. The stakeholder committee is chaired by Higginson. Early projects are delivering COVID-19 related research, for example on ethnicity and COVID-19 outcomes and care access, including for those from minority ethnic groups.

Teams across UOA3 conduct collaborative research using the primary care **Clinical Practice Research Datalink (CPRD)** (licence shared by researchers in UOAs 2,3 and 4) the real-world research service supporting retrospective and prospective public health and clinical studies, with linked Office of National Statistics and Hospital Episodes Data.

Additional topic specific clinical and population databases include **the Office of National Statistics Data anonymised Mortality records**, held under licence in the Cicely Saunders Institute (Higginson, Gao), with records from 1984 to present, and national palliative care outcomes data. These have led to transformative research into factors associated with where patients die and into the complexity and outcomes from palliative care.

Turner-Stokes leads the **UK Rehabilitation Outcomes Collaborative (UKROC)** national clinical database, which has enabled research into the costs and efficiency of rehabilitation in different care settings, in addition to enabling national audits and recent COVID-19 surveys.

These initiatives will be enhanced by **the Innovate UK London AI Centre for Value-Based Healthcare** (led by King's), which incorporates 4 universities, 6 industry partners, 11 small and medium sized enterprises and 11 NHS Trusts across the South-East. The Centre aims to bring the power of AI to transform healthcare pathways, providing both patient and economic benefit, and has recently received c.£40m investment from Innovate UK, Office for Life Sciences and industry.

## Commercialisation

Building on the Commercialisation Institute's success, King's recently launched the **Med-Tech Joint Venture Company** between King's and our partner NHS Trusts, Guy's and St Thomas'

### Unit-level environment template (REF5b)

(GSTT) and King's College Hospital (KCH), with a King's investment in this joint venture of >£1.2M a year (REF5a).

Successful commercial ventures in UOA3 include research led by Whelan which resulted in the FODMAP App for people with Irritable Bowel Syndrome, enabling rapid recognition of suitable foods from > 100,000 products in leading UK supermarkets.

ZOE Global Ltd combines artificial intelligence and digital technologies that have made major contributions to the UK COVID pandemic response [ICS-05] and to understanding relationships between gut microbes, health and diet.

The **Institute of Pharmaceutical Sciences (IPS)** has spawned several “spin-out” companies: including **Proximagen** (sold recently with ~£12M returned to King's), **Verona Pharma** and **MedPharm**.

Our strategic decision to recruit and expand in the area of drug discovery with an emphasis on cancer research and anti-infectives, has yielded significant results. A new company based on the work of Thurston and Rahman, **Femtogenix Ltd**, was launched with major funding while retaining an important shareholding for King's. The aim is to develop a new generation of very potent molecules – known as “payloads” - that can be attached to targeting systems and then used as a form of highly specific chemotherapy to kill tumour cells with greatly reduced side effects.

More recently a **new antibiotic company, Necobiotix** has been formed to commercialise the new efflux resistance antibiotics developed by Rahman in **collaboration with Public Health England**. King's has licensed the antibiotic asset to **Biotaspheric** while retaining a significant shareholding in **Necobiotix**.

IPS has one of the **largest Intellectual Property and Patent portfolios within King's** making 18 priority applications during this REF period, of which 12 proceeded to Patent Cooperation Treaty.

### 3.3 Deployed infrastructure within Faculties, Institutes and Schools

In addition to the rich infrastructure across King's, UOA3 teams benefit from deployed infrastructures that ensure the growth of our distinct disciplines, as well as interdisciplinary advances and rapid translation into clinical impact.

Bespoke facilities for the main Faculties, Schools and Institutes within this submission are provided across the four clinical and academic campuses of South London, adjacent to or within clinical services of St Thomas', Guy's and King's College Hospital NHS Foundation Trusts, their associated community services and relevant clinical populations (REF5a).

Devolved administration to these sites provides support to academics for research grant development and management. Research technicians, laboratory and database management staff are also strategically sited.

#### **Faculty of Dentistry, Oral & Craniofacial Sciences (FoDOCS)**

FoDOCS is the largest Dental school in Europe, annually teaching 750 undergraduates and 450 postgraduates from 50 countries. Our clinical services support over 300,000 patients and we produce 15% of UK's new dental workforce.

Research in the faculty is supported by three dedicated research managers, while a team of ten research technicians work across the faculty to support essential research and run facilities (imaging, biological services, HTA support).

### Unit-level environment template (REF5b)

The faculty has recently renovated space at Guy's Hospital to establish **a new bioinformatics centre** and **an integrated hub** with Unilever. Impact was embedded throughout the faculty by positioning the **Dental Innovation and Translation hub** to work with each Centre, proactively reviewing research to identify and support emerging impact.

Within the faculty we have state of the art lab facilities, including Zeiss and Leica confocal microscopes and micro-computerised tomography for imaging, funded by multi-user equipment grants (Wellcome Trust and UKRI: led by Tucker, Green, Knight). Dissecting microscopes, Zeiss apotome microscope, and facilities for microfabrication, 3D printing and tissue culture are housed in the faculty at Guy's. Researchers have close access to the Guy's Biological Services Unit and Nikon imaging centre.

In addition, our **Centre for Oral, Clinical and Translational Sciences** at Guy's includes the **Academic Centre of Reconstructive Science** and the **Oral Clinical Research Unit** to enable trials.

### Florence Nightingale Faculty of Nursing, Midwifery and Palliative Care (FoNMPC)

This is one of the largest Faculties of nursing and midwifery in the world. It now uniquely includes palliative care, providing a focus for person-centred, applied health, social care and clinical research.

To boost research, especially for early career researchers, in 2018 we launched a **Research Challenge Fund**, complementing the King's-wide Research Challenge Fund and providing pump-priming funding. This led to a 160% increase in overhead earning income in 2019-20.

Our **Cicely Saunders Institute for Palliative Care, Policy and Rehabilitation (CSI)** is the world's first and only purpose-built Institute for palliative care, was co-designed with patients and families and has awards for its sustainability (figure 3.3).

An atrium bridges research and clinical teams to increase interactions, with facilities for knowledge exchange, PhD students, clinical research rooms, NHS and university computer networks, and the Institute's linked large data-sets.

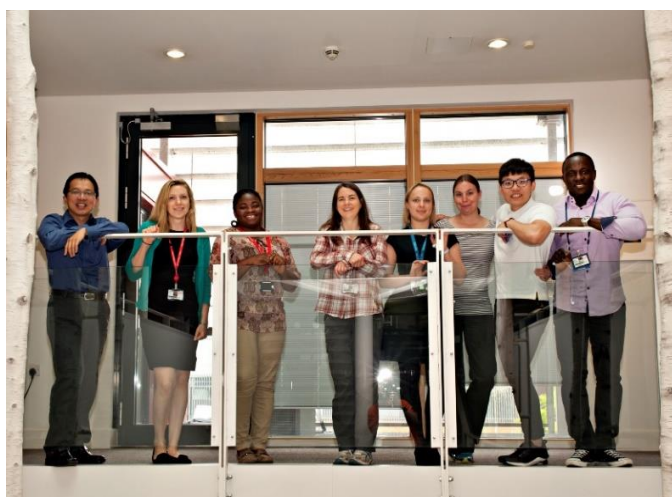


Figure 3.3 Cicely Saunders Institute: external view and PhD students on atrium bridge



In 2019, supported by the **Garfield Weston Foundation** and **Cicely Saunders International** we enhanced the Institute's technological support, with facilities for **interactive tele-health and tele-education**.

Supported by the Clinical Research Network South London, the NIHR CLAHRC South London, and the Wellcome Trust, in 2016 we launched the first ever **virtual public and patient involvement and engagement forum in palliative care**, co-designed with patients and families and co-evaluated in 2018 (Evans, Koffman).

All research divisions provide additional infrastructure with researcher development programmes, modelled on CSI activities, including workshops, methodological seminars, journal clubs and invited lectures.

### **Institute of Pharmaceutical Science (IPS)**

**IPS** was created in 2010, building on a century-long history of pharmaceutical science education and research at King's, and is based primarily on the Waterloo Campus, with links across KHP.

### **School of Life Course Sciences (SoLCS)**

**SoLCS** unites staff based across King's Denmark Hill, Guy's, St Thomas' and Waterloo Campuses.

**Women and Children's Health** facilities, located at the St Thomas', King's and Guy's Hospital Campuses foster co-working with clinical teams in obstetrics, gynaecology and neonatology. Resources included tissue culture, physiology, histology and molecular biology laboratories. A large human sample biobank (St. Thomas' site), supported by a new Lab management platform (FreezerPro), incorporates the UKRI funded Tommy's charity pregnancy biobank, the eLIXIR study bioresource and an extensive prematurity bioresource (INSIGHT).

**Diabetes Research** is located at the Guy's Campus (sharing laboratory space with Women & Children's Health) and Denmark Hill Campuses (with human islet transplantation and metabolic surgery research).

**Nutritional Sciences**, on the Waterloo Campus, has four laboratory suites, equipped with a tissue culture, histology, HPLC mass spectrometry, microscopy and molecular biology. A **Metabolic Research Unit**, for nutritional studies, comprises a dietetics kitchen, dining rooms, phlebotomy suite, lab areas and consultation rooms. Facilities for body composition (BodPod, Bioelectrical Impedance), gut fermentation (breath test), appetite and cardiometabolic suites (e.g. Sphygmocor and Flow Mediated Dilation) and sample processing (blood, stool, urine) are available.

**Twin Research (DTR) and Genetic Epidemiology** (including the section of **Ophthalmology**) houses **TwinsUK**, the UK's largest adult twin registry, and the most clinically detailed in the world which **has biobank status**. This **major genomic epidemiology resource** collected over 20 years contains over 500,000 biological samples relating to over 15,000 identical and non-identical twins for the purposes of longitudinal deep phenotyping and large-scale multi-omics.

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

### 4.1 Research collaborations, networks and partnerships

#### Collaborations: International, Global Health and National

>60% of our submitted 507 research outputs included international (as well as other UK) co-authors, from >50 countries, mainly across Europe, North America, Australia, Asia and Africa (figure 4.1). A further 29% of our outputs include national collaborations beyond King's (10% are across King's teams).

Our global collaborations, impact and reach are widened by our UOA leading **two accredited World Health Organisation (WHO) Collaborating Centres**: for **Oral Cancer/Precancer** and for **Palliative Care, Policy and Rehabilitation**. These centres contributed to our impacts, e.g ICS-02, -03, -06, -09, -11. We plan a WHO Collaborating Centre for Children's Health Systems and Policy.

We are partnering with the **WHO Centre for Health Development based in Kobe (Japan)** to develop evidence-based services for older people at the end of life and are leading the WHO evaluation of sustainable palliative care. Sandall and Edmond are WHO Committee members in Women and Children's Health. These global initiatives extend the reach and significance of our impact, including to low-and middle-income countries' settings.

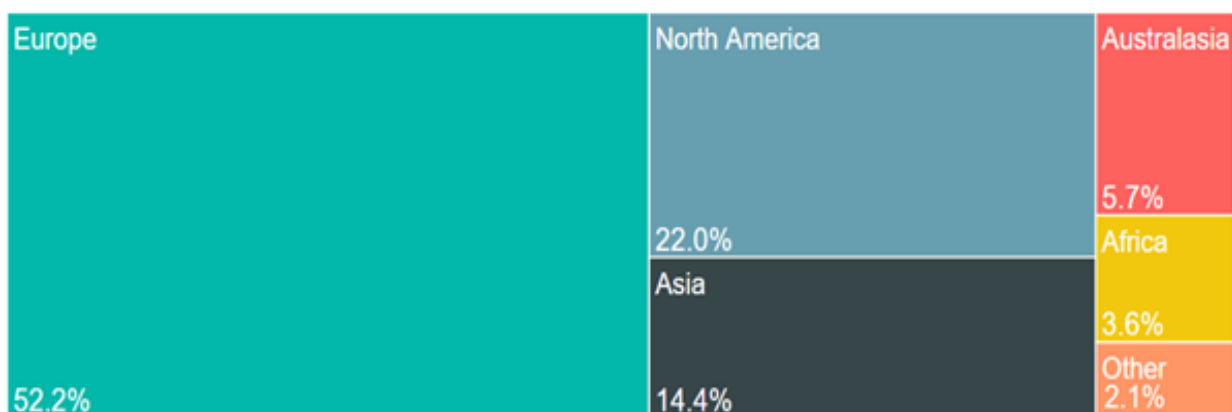


Figure 4.1 Main regions of international authors on included outputs

We drive forward research strength and multidisciplinary collaboration for translation to global settings with south-north and south-south as well as north-south learning. Supported by the new **King's Global Health Institute** (REF5a), we have an expanding research programme in dental, palliative care, tele-health and women and children's health in low-and middle-income countries including India, Pakistan and those in Sub Saharan Africa.

Gallagher, a Dean for International Affairs, assists the WHO on workforce issues; Pitts leads the Global Collaboratory for Caries Management Initiative [ICS -03], is chair of the Alliance for Cavity Free Future and (with Bartlett) co-chair of the Erosive Tooth Wear Foundation [ICS-06]. As part of the King's Sierra Leone Partnership we are working with local leaders to help address their 'silent epidemic' of tooth decay.

Harding, R leads two new UKRI funded studies; i) MAP-care, Multimorbid Ageing, Primary Palliative Care in Ghana, Malawi and Zimbabwe, to create an African patient and public involvement palliative care network, and develop novel care to integrate value-based care, patient-centred outcome measurement, a decision support tool and staff mentorship and; ii) to develop a theory-based workforce approach to strengthen health systems through person-centred care.

## Unit-level environment template (REF5b)

von Dadelszen, Poston, Magee, Sandall, Tribe, Shennan are studying pregnancies affected by placental disorders amongst >6000 women in The Gambia, Kenya, and Mozambique. The teams developed a simple vital signs monitor, the CRADLE VSA, used in >500,000 women in Sub-Saharan Africa, South Asia and the Caribbean in research and, now adopted widely e.g. by UNICEF in Mali and Ugandan Refugee Camps, and by UNICEF, DfID and the Government in Sierra Leone (Shennan).

We collaborate with diverse organisations, including universities, learned societies, charities, industry, hospices, as appropriate to improve our science, relevance, productivity and impact.

To facilitate translation of our research to the clinic, we have formed extensive networks and partnerships with key research users. These include health service providers, clinicians, service managers and directors in hospitals, hospices and community services, in the NHS, the voluntary sector and clinical services overseas, which have adopted our research to increase our impact.

Through these research and clinical collaborations and partnerships our research has led to new ways to predict and prevent serious illnesses and deaths, extended the quality and quantity of life, raised the profile of neglected groups and problems, discovered and tested solutions and improved universal access to many aspects of care in the UK, Europe, Australia, Asia and Africa.

IPS entered into a **strategic partnership with Public Health England** in 2015 to develop new research tools and antimicrobials to tackle antimicrobial resistance. Investigators from IPS (Mason, Castagnolo, Rahman, Panaretou, Amison, Pitchford Page) have active research projects, iCASE PhD studentships and/or grants jointly with Public Health England (Sutton, Bacon and Hind). This partnership has also resulted in 3 new patents and formation of a new spin out company. Dr Mark Sutton, who is the microbiology team leader at Public Health England, has a senior visiting appointment in IPS to strengthen the relationship.

### **Clinical academic and Category C category contributions with NHS and related bodies**

Partnerships with Category C staff (i.e., NHS, Industry or charity funded) are core to our scientific, impact and career development strategies (section 1).

King's has increasingly supported honorary university appointments and promotion for research active clinicians, who work alongside academic teams on shared projects. Category C staff are co-leaders of our Institutes and Clinical Academic Groups (all have clinical and academic leads), and have access to infrastructure equal to King's employed staff, including in seminars, research and staff development meetings.

IPS has extended its infrastructure reach outside King's by making senior visiting appointments including Professor Sir Anthony Coates (St George's University of London), Professor Sir Kent Woods (MHRA), Professor Barbara Mulloy and Dr Elaine Gray (NIBSC), and leading figures from the pharmaceutical industry. These appointments strengthen our influence on government and policy makers and raise the visibility of IPS.

These visitors contribute to our education programmes and the vibrancy of our research environment. The close association with KHP has led to the creation of a range of pioneering clinical academic positions for practitioners in the Trusts, providing the incumbents with appropriate recognition and status, and IPS with increased access to clinicians for research and teaching. **This is the first time such clinical pharmacy academics have been so recognised** in King's – we currently have **more than 50 such appointments**.

SoLCS has created honorary clinical Professorships since 2014 in recognition of excellence in research including; Oteng-Ntim, Khalaf; Inusa, Barker and Jackson; a further 28 clinicians have been awarded honorary titles for their key roles in research.

## Unit-level environment template (REF5b)

Collaborations with clinical care providers have enabled us to undertake clinical trials and translate research into practice in multiple settings, in the UK and overseas. For example, in the UK and Africa, we demonstrated the efficacy of placental growth factor measurement in the management of pre-eclampsia, and the efficacy of abdominal cerclage in the prevention of pre-term birth.

We developed the curriculum for the DAFNEplus intervention for self-management in type 1 diabetes (Amiel, Choudhary), and a type 1 diabetes consultation tool (T1C) for diabetes consultations, which is now adopted internationally (Choudhary).

We found that surgery is more effective than medical treatment in controlling glycaemia in obese people with type 2 diabetes and proposed the inclusion of metabolic surgery in the treatment algorithm for type 2 diabetes (Rubino).

We are improving access to palliative and end of life care in underserved groups, nationally and globally, underpinning a move towards universal access. UOA3 researchers developed the Palliative care Outcome Scale (POS), which, in the UK, is recommended as part of the Palliative Care Clinical Dataset; its renal version was used to develop a national programme supported by NHS England. POS registered users, via the dedicated website, increased to 14,871 from 150 countries in 2020 [ICS-09].

Our evidence-based tools to better manage severe breathlessness in advanced illness (Higginson) are now widely used in clinical teams across Europe, Australia and the Americas [ICS-02].

## 4.2 Contribution to economy, industry and charitable sectors

### Industry and Patents

We collaborate and partner with pharmaceutical and diagnostic companies, including; Unilever (an on-site hub), Merck, PIGF HOLOGIC, Quidel, Roche, Sanofi, Pfizer, Danone, Novo Nordisk, Evolve Biosystems, ZOE, engineering, care homes, and in developing wound care products with the fashion industry. This is aided by the extensive King's infrastructure for commercialisation (section 3).

For example, we have developed novel drugs and drug classes for both treatment and diagnosis (including in Thalassaemia, Parkinson's, prostate cancer, and asthma/COPD).

We have collaborated with Durham University (health photonics) to address an unmet clinical need in dentistry through the development of a commercially viable system for safe detection and monitoring of initial-stage dental decay in 3D. This patented development is now being taken forward as a Spin-out Company – NirVisio.

Patents filed over this REF period include; a patent based around Candidalysin, a hypha specific cytolytic peptide toxin (Moyes); fabrication of solid dosage form through 3D printing (Alhnan); polypeptides for Use in Therapy (Persaud); engineered skin equivalent, method of manufacture thereof and products derived therefrom (Ilic); formation of new dental materials that stimulate repair (Sharpe); method for detecting the presence of the viable cells in an endodontic sample (Mannocci); Trans Buccal Naloxone (Royall).

King's is the grant-holding partner of **MedCity** (REF5a) the cluster organisation for the health and life sciences sector in London, which helps UOA3 teams drive growth and investment for the health and wealth of the population, particularly through attracting commercial investment from venture capital and large companies.



**Charity and third sector partnerships**

We partner with key international charities, for example the Foundation of European Nurses in Diabetes, hosting their centre and Professor (Forbes,A), and Cicely Saunders International (delivering international capacity building).

We partner with local charities such as Guy's and St Thomas' Charity and local hospices, and national charities such as Tommy's (the largest UK charity researching the causes and prevention of pregnancy complications, miscarriage, stillbirth, premature birth and neonatal death), Diabetes UK, Hospice UK, The True Colours Trust and many more.

In 2016/2017, the Fetal Medicine Foundation charity donated £22 million to KCH NHS Trust for investment in fetal medicine services and a new Fetal Medicine Research Institute (figure 4.2), with its internationally acclaimed clinical research programme (Director: Nicolaides).



*Figure 4.2 External view of the Fetal Medicine Research Institute, Denmark Hill Campus, King's, and internal view, allied health professionals and charities networking*

**Partnerships with patients and the public**

As outlined in sections 1 and 3 we partner with patients and the public, and support infrastructure to do this, to enrich our research, dissemination and implementation. These are key drivers of, and contributors to our programmes, and are funded following NIHR Involve best practice.

**4.3 Contribution to Society Through Changes in Health Care Policy**

We contribute to the evidence base used by policy makers in the UK Department of Health and Social Care, NHS England, Public Health England, Monitor, Scottish and Welsh Health and Social Services, the National Institute for Health and Clinical Excellence (NICE) and governments and policies overseas in high, medium and low resource regions, and inter-governmental organisations such as the WHO and the European Commission.

This is achieved through our extensive networks and exchanges, and collaboration with King's Policy Institute. For example, UOA3 researchers have:

- impacted on individual and umbrella service-user organisations that influence policy such as the European Cancer Patient Coalition, the National Childbirth Trust and the Neurological Alliance
- formed the Alliance for a Cavity Free Future (ACFF) which worked with King's Policy Institute to hold three innovative Dental "Policy Labs". These were attended by Chief Dental Officers from UK, Europe, North America and Asia and have already led to significant changes in policy and practice in a number of countries including France and Belgium [ICS-03]

**Unit-level environment template (REF5b)**

- changed multiple international guidelines, for example; reversed existing public health strategy for peanut allergy treatment in children [ICS-08]; new access to palliative care for people with HIV or Heart Failure [ICS-09]; new prescribing guidelines and practice for antibiotic use in children [ICS-01]
- changed multiple National Institute of Health and Care Excellence (NICE) guidelines including on: antimicrobial stewardship - changing risk-related behaviours in the general population; Vitamin D: increasing supplement use in at-risk groups; Preventing Suicide in community and custodial settings, (all Prevost, plus 6 other NICE guidelines); management of irritable bowel syndrome (IBS, the low FODMAP diet (Fermentable Oligo-saccharides, Di-saccharides, Mono-saccharides and Polyols)(Whelan); respiratory and end of life care on management of breathlessness and access to care (Maddocks); the control of blood pressure in pregnancy (Magee). Renton is Clinical NICE advisor for M3M surgical guidelines
- changed multiple other guidelines for example, updated Faculty of General Dental Practice (guidelines for antimicrobial prescribing in dentistry, Ide); Royal College of Obstetrics and Gynaecology Green Top Guidelines, European Society of Human Reproduction and Embryology guidelines; Maudsley Prescribing Guidelines in Psychiatry; management in pregnant women of: Sepsis; Hypertension in Pregnancy
- contributed to the international consensus on the use of continuous glucose monitoring in diabetes (Amiel)
- found that women who receive continuity of care before, during and after birth are less likely to have a preterm birth and lose babies informing Australian, Irish, WHO and UK maternity policy
- led an evidence-based model of a prematurity surveillance clinic, now approved by the NHS for adoption across the UK
- developed an app for prediction of premature birth recommended by NHS England, which has been downloaded > 2000 times
- discovered that measurement of a placental protein in maternal blood can improve outcomes for women with threatened pre-eclampsia, adopted for use in the NHS
- changed NHS commissioning through evaluation of specialist rehabilitation services and outcome and complexity assessment [ICS-11]
- developed UK guidelines for investigation and management of failing pancreas grafts, which were adopted by the Pancreas Advisory Group and the British Transplant Society (Choudhary,)
- changed national and international prescribing guidelines for anticoagulant drugs in high-risk populations leading to health care improvements for the population (Patel)
- led to action to reduce polypharmacy related deaths (Copeland)
- collaborated with Public Health England to improve understanding of and tackle antimicrobial resistance (Bruce).

Our findings are used by multiple national/international professional associations including: the UK Royal Colleges (across professions and specialty), European Association for Palliative Care (EAPC), Association for Palliative Medicine (APM), British Society of Rehabilitation Medicine (BSRM), British Society for Maternal and Fetal Medicine, Society for Reproductive Investigation (SRI, USA), International Society for the Study of Hypertension in Pregnancy, International Society for the Developmental Origins of Health and Disease, the Physiological Society, the International Confederation of Midwives, Federation of European Nutrition Societies.

TwinsUK data and samples are used by a large body of external researchers worldwide. Freely accessible 'omics data include gene expression, whole genome sequences epigenetics and microbiome (all deposited in appropriate repositories such as European Genome Archive or ArrayExpress). TwinsUK approves ~130 data or sample applications per year and has shared over 150,000 samples with external groups since 2012 from our biobank. Genome-wide summary statistics are incorporated into freely accessible online portals such as the Type 2 Diabetes Knowledge Portal and the Metabolomics Genome-wide association studies server.

## 4.4 Contributions and collaboration to strengthen the research base

### National Institute for Health Research (NIHR)

Integration and co-working with NIHR infrastructure (section 3) and clinical services locally, nationally and internationally gives our teams across the UOA multiple layers of co-working and collaboration to boost sustainability and innovation.

We have two **NIHR Research Professors** Chappell and Howard (latter is IoPPN, UOA4, Perinatal Mental Health in key collaboration) and nine **NIHR Senior Investigators** (including Emeritus): Chappell, Greenough, Higginson, Howard (IoPPN), Manthorpe, Poston, Sandall, Spector, Williamson.

The **NIHR awarded national leadership for palliative and end of life care** jointly to South London NIHR Applied Research Collaborative (ARC) and East of England ARC (Higginson with Barclay, Cambridge).

Teams from our UOA lead key components of the NIHR South London Clinical Research Network; Shennan is joint Clinical Director the South London Network; Renton then Bannerjee leads for dental studies; Bajwah for palliative care; Winkley for diabetes; Mr N Kametas (King's College Hospital, Category C) for reproductive health and childbirth.

The Cicely Saunders Institute hosts the Clinical Research Network South London palliative care research nurses, who lead recruitment and provide training across South London and nationally.

Recruitment to NIHR portfolio clinical trials in South London in Women and Child Health is regularly the highest of any UK institution; 16,392 were recruited for women's health 2015-2020.

Over the last five years, the Department of Twin Research and Genetic Epidemiology has enrolled 21,565 twins in clinical studies (R & D EDGE Data), including 6,620 to CRN portfolio studies.

Teams across the UOA are active in supporting NIHR funding panels and reviews.

### Cross-disciplinary and interdisciplinary collaborations

In this REF period, we have held interdisciplinary research grants with all nine King's Health Faculties, and multiple other partners including clinical, industry, charity and patient-led organisations.

Our cross- and interdisciplinary collaborations drive new methods to deliver substantial contributions to the research base, economy and society, for example:

#### *Significant advances in the understanding of the aetiology of disease:*

- TwinsUK registry the major genomic epidemiology resource with data from over 15,000 adult twins has led to understanding of the genetic basis of several common diseases.
- Identified nearly 450 genetic loci associated with myopia, leading to a new understanding of myopia development.
- Showed that colonic short chain fatty acids improve beta-cell function in humans by decreasing beta-cell apoptosis and increasing insulin secretion (Persaud).

#### *Significant improvement in research methods:*

- Developed outcome and economic measures, and trial methods to appropriately detect change in progressive illness and for older, frail populations.
- Produced guidance in the methods of involving people who lack capacity in research (Evans).

## Unit-level environment template (REF5b)

- Advanced methods of data linkage and electronic health records for more efficient, collaborative research, e.g. in women's health to create a dynamic Learning Health System.
- Refined novel adaptive designs for clinical trials (e.g. UKRI-funded TRIBUTE trial in Inflammatory Bowel Disease, Prevost).

### *Significant improvements in health:*

- Improved mental health practice, service development, education and policy, supporting the development of a 'recovery research' community in mental health (Leamy).
- Found that a maternal lifestyle (nutrition and physical activity) intervention in obese pregnant women reduces maternal weight gain and improves maternal metabolic health (Poston).
- Developed a model of the management of dental anxiety of stepped care with psychological interventions tailored to the individual's level of dental anxiety. This has been implemented through the development of dental services delivering Cognitive Behavioural Therapy for dental phobia, interventions to support children attending for General Anaesthetic and interventions to support the oral health of people who are anxious about visiting the dentist.

### *Significant improvements in care:*

- Developed a user-friendly way of identifying non-adherence in routine care and training clinicians in how best to help patients deal with medication adherence challenges.
- Developed and validated methods to evaluate rehabilitation, with tools to match programmes to individual patient needs, measure outcomes and demonstrate value for money, with average net life-time savings in care costs of >£670,000 per patient (Turner-Stokes).

## 4.5 Wider contributions to research environment beyond King's

UOA3 staff at all stages of their career contribute to the wider research environment beyond King's. They support the research funding and publication processes, take on advisory roles and serve on multiple committees and advisory panels. Much of their work has been recognised in national and international honours and prizes. Below are some examples of this work:

### *National Leadership Roles:*

**Chappell**, Chief Scientific Adviser, Department of Health & Social Care (from August 2021).  
**Sandall**, NHS England and Improvement's Head of Midwifery Research (2021).

### *Selected Journal Editors/Editorial Board members:*

**Banerjee**, Oral Health & Preventive Dentistry (Editor in Chief), **Choudhary**, Diabetic Medicine (Associate Editor); **Norman**, International Journal of Nursing Studies (Editor in Chief), **Page**, Pharmacological Reviews, (Associate Editor), **Persaud**, Diabetic Medicine (Basic Science Editor), **Proctor**, Archives of Oral Biology (Editor in Chief), **Simpson**, Journal of Mental Health (Editor), **Xyrichis**, Journal of Interprofessional Care (Editor in Chief), **Williams**, F European Spine Journal and Pain (Associate editor).

### *Funding panels:*

**Bewick**, Grant review committee for EFSD Sanofi programme, **Chappell**, Chair NIHR Health Technology Assessment Clinical Evaluation and Trials committee, **Evans**, NIHR Central Commissioning Facility – appointed College of Experts for the Joint DHSC/UKRI Global Effort of COVID-19 (GECO) Health Research call, Marie Curie, **Forbes, A**, Novo Nordisk UK Research charity board, **Hammond**, Chair, Fight for Sight Grants Advisory Panel, **Gao**, NIHR Programme Grants for Applied Research; European Commission, Horizon 2020, **Harding, S**, NIHR COVID-19 funding panel, **Higginson**, NIHR HTA Efficient Designs Panel; NIHR Palliative Care Panel, NIHR Health Services and Development Research Panel, **Howard**, MRC Panel Newton Fund, **Jones(P)**, Diabetes Research and Wellness Foundation Research Advisory Board, NC3Rs Fellowship Panel, **King**, Diabetes UK Research Committee, **Liu, K**, (ERC) Chair BBSRC People and Talent Early career researchers subgroup, **MacDermott (ERC)** UKRI COVID-19 funding panel, **Magee**, Chair, Maternal Medicine Clinical Studies Group, RCOG; WHO Maternal Morbidity Working Group, **Naglik**, Research Foundation Flanders (Belgium) Grant Panel Board Member; **Persaud**,



## Unit-level environment template (REF5b)

EFSD/Boehringer Ingelheim and EFSD/MSD grant research committees; Diabetes UK research committee; Diabetes Research and Wellness Foundation Swedish Research Advisory Board; **Poston**, MRC Global Health Board; MRC African Research Leader Board; Wellcome Trust Sir Henry Dale Fellowship Committee; **Prevost**, NIHR Public Health Research Funding Committee, NIHR COVID Recovery and Learning Research Funding Committee, **Robert**, Royal College of Physicians of Ireland, Grant Selection Review Panel, **Sandall**, NIHR Advanced Fellowship Panel; MRC-NIHR panel for research to improve global maternal and neonatal health; **Shennan**, HTA Commissioning Board, **Streit**, BBSRC: Lola Committee, **Sturt**, Novo Nordisk UK Research Foundation funding panel, **Tribe**, Wellbeing of Women Research Advisory Committee; **Tucker**, Chair, RNID International Discovery grant panel, **Taylor**, Wellbeing of Women Committee, **Tribe**, Wellbeing of Women, Wellcome Trust Physiology Panel, Canada (CIHR); **Weinman**, NIHR sub-board for Programme Grants for Applied Research and Programme Development Grants; **Williams,F**, Paget Trust Research Subcommittee, Discovering Innovative Solutions for Conditions of the Spine(DISCs) executive committee; **Whelan**, NIHR Integrated Clinical Academic Programme; **Williamson** MRC PSMB Board; MRC Population Health Strategy Group, MRC Multimorbidity Working Group, Society of Endocrinology Science Committee.

### *Other Societies, Committees, Panels:*

**Chappell**, President, Blair Bell Research Society, Royal College of Obstetricians and Gynaecologists (RCOG); National Maternal Early Warning Score (MEWS) design group, NHS England; COVID-19 Recovery and Learning Funding Committee; NIHR EME Strategic Advisory Committee, **Higginson**, Academy of Medical Sciences, co-chair of End of life and palliative care policy catalysis, member of Public Health group, **Lee**, Member of NICE Guideline committee for Atrial Fibrillation, **Legido-Quigley**, Scientific Advisory Board Member, Institute Pasteur, Lille, France, **Liu,Y.F (ECR)**, TrialNet Steering Committee member, **Page**, President Elect of the British Pharmacological Society, **Poston**, Scientific Advisory Committee on Nutrition, and Maternal and Child Nutrition Sub- Group; Public Health England; Royal College of Obstetricians and Gynaecologists (RCOG) Chair Research Committee, **Sandall**, NIHR Academy Nursing and Midwifery Incubator Member; NICE implementation Strategy Group Member, NHS England, London Maternity Strategic Clinical Leadership Group, NHS England Maternity transformation; Continuity of Care Expert Group; NHS England London Capital Midwife Steering Group; WHO South-East Asia Region Technical Advisory Group for Women's and Children's Health (SEAR-TAG); WHO Strategic and Technical Advisory Group of Experts (STAGE) for maternal, newborn, child, adolescent health and nutrition reporting to Director General; Australia Centre for Stillbirth Research Excellence – Safer baby Bundle Timing of Birth Research Group; Global RMC Council member, White Ribbon Alliance. **Spector**, Member of Spi-M reporting to SAGE during COVID-19 pandemic, **Tribe**, Chair, the Physiological Society Membership and Grants Committee, The Preterm Birth International Collaborative, PREBIC, European Chapter Executive, USA Society for Reproductive Investigation Membership and Nominations Committee. **von Dadelzen**, Chair, Global Health Clinical Studies Group, Royal College of Obstetricians and Gynaecologists, **Williams,C** UK Medicines and Healthcare Regulatory Agency Expert opioids expert working group committee, UK Medicines and Healthcare Regulatory Agency Expert committee (rheumatology), **Williamson**, British Maternal and Fetal Medicine Society Executive.

### *National Honours:*

**DBE**, Rafferty, **CBE** Sandall, Poston. **OBE**, Higginson, Page, Spector, Thatcher, Wolfe, Shennan. **MBE**, Gallagher. **Order of the Star of Italy**, Di Silvio

### *Research Prizes:*

**Amison (ECR)**, 2019 American Journal of Respiratory Cell and Molecular Biology Award for Most Outstanding Paper by a Junior Investigator, **Bartlett**, IADR distinguished scientist 2017, **Copeland**, British Pharmacological Society's Bill Bowman Travelling Prize Lectureship in 2018, **Cobourne**, Charles Tomes Medal (2015), Royal College of Surgeons of England, **Curtis**, European Federation of Periodontology: Distinguished Scientist Award 2016, **Higginson**, Trial of the Year 2014, American Society of Clinical Oncology for breathlessness trial, European Association for Palliative Care, Ventafridda award (2018), **Lack**, Trial of the Year 2015 awarded by the Society for Clinical Trials for "Randomized Trial of Peanut Consumption in Infants at Risk for

## Unit-level environment template (REF5b)

Peanut Allergy”, European Academy of Allergy & Clinical Immunology Daniel Bovet Award 2018, **Ovadia (ECR)**, RCOG Harold Malkin Award 2019, **Poston**, USA Society of Reproductive Investigation, Life Time Achievement Award 2017; **Sleeman**, 1st European Association of Palliative Care award for Women in Palliative Care; **Tribe**, Physiological Society GL Brown Prize Lecture Award, 2019.

### *Fellowships:*

There are 10 Fellows of the Academy of Medical Sciences in UOA3 during this REF period; 5 men (**Challacombe, Curtis, Houslay, Lack, Spector**) and 5 women (**Chappell, Higginson, Poston, Rafferty, Williamson**).

Examples of other Fellowships held are **Coward**, Fellow of the Institute of Maxillofacial Prosthetists & Technologists, **Deb**, Fellow of the Royal Society of Chemistry, **Di Silvio**, Fellow of Biomaterials Science and Engineering, Fellow Institute of Materials, Mining and Minerals, **Harris**, Fellow of the European Academy of Nursing Science, **Houlsay**, Fellow of the Royal Society of Edinburgh; Fellow of the Royal Society of Biology, **Lack, Wolfe** Fellow of the Royal College of Paediatrics and Child Health, **Maret, Mason**, Fellow of the Royal Society of Chemistry, **Nandi**, Fellow of the British Pharmacological Society, **Norman**, Fellow of the American Academy of Nursing, Fellow of the Royal College of Nursing, **Pitchford**, Fellow of British Pharmacology Society (in process), **Renton**, Honorary Fellow American Association of Oral and Maxillofacial Surgeons, **Rose**, Fellow of the American Academy of Nurses, **Salvage**, Elected fellow of the British Pharmacological Society, **Sleeman**, Winston Churchill Memorial Trust fellowship, **Taylor**, Fellow of Royal College of Physicians (Edinburgh) - the only pharmacist fellow, **Thurston**, Fellow of the Royal Pharmaceutical Society, Fellow of the Academy of Pharmaceutical Sciences, **Tribe**, Physiology Society Fellow, **Villasaliu**, Fellowship of the Academy of Pharmaceutical Sciences of Great Britain, **Woodward**, Fellow Royal College of Nursing.