

Institution: University of Cambridge
Unit of Assessment: UoA2. Public Health, Health Services and Primary Care
1 Unit context and structure, research and impact strategy

Our mission is to deliver societal impact and improvements in health and healthcare through deeper understanding of conditions of public health importance, developing and evaluating novel approaches to prevent and treat these conditions, and creating a compelling evidence-base for policy and practice.

1.1 About us: structure, vision, values, and goals of the unit

Our staff are based in **three closely-collaborating research centres** ([Box 1](#)) characterised by shared vision, combined research and teaching programmes, joint appointments, fluid flows of staff across our porous boundaries, deep stakeholder engagement, and extensive networks of national and international collaborators. We share the exceptional intellectual and physical infrastructures of two campuses in which we are co-located: the **Cambridge Biomedical Campus** (Europe's largest health and biomedical research centre) and the **Wellcome Genome Campus** (Europe's largest genome and biodata research centre).

Box 1: Our three collaborating centres in population health research



**UNIVERSITY OF
CAMBRIDGE**

Department of Public Health
and Primary Care

A major centre distinctive for its multidisciplinary character and strengths across quantitative and qualitative methods, cohort studies, molecular epidemiology, public health, primary care, and health services. It comprises ~350 staff and graduate students (Head: Danesh).

MRC

Epidemiology Unit

A leading centre focused on understanding and controlling obesity, type 2 diabetes and related metabolic disorders in the UK and around the world. Comprising ~200 staff and graduate students, it transferred into the University in 2013 and was fully renewed in 2020 for a further five-year cycle (Director: Wareham).

MRC

Biostatistics Unit

One of Europe's largest academic groups of biostatisticians and data scientists, focused on major analytical challenges in biomedicine and public health. Comprising ~100 staff and graduate students, it transferred into the University in 2016 and was fully renewed in 2018 for a further five-year cycle (Director: Richardson).

Our **vision** for population health research is to generate high-quality evidence to improve the health of populations in the UK and worldwide. We are guided by strong **values**, including commitments to scientific excellence, serving the public good, and creating a positive, nurturing

and collaborative environment for research and capacity development. We create a thriving intellectual environment where the **most valuable asset is the people** who conceive, drive, and deliver research through their vision, imagination and intellectual energy.

Our **goals** are to create a compelling evidence-base for reducing premature death, disability, and morbidity, promoting health and well-being throughout the lifecourse, addressing health inequalities, and supporting health and healthcare policy and practice. We tackle grand challenges, responding to **major public health need** in the UK and globally. Our structures are designed for **strength in pursuing long-term objectives**, while retaining the **agility to respond to emerging crises and urgent need**. Through high-impact programmes, we have delivered timely and influential evidence informing, for example, policy decisions on alcohol and tobacco control, planning for influenza epidemics, and NHS Health Checks.

We have also mobilised rapid responses to the **Covid-19 pandemic** ([Section 4.7](#)), yielding highly-practical, actionable research that directly supports policy and practice, for example, through subgroups of the **Scientific Advisory Group for Emergencies** (De Angelis, Marteau), the **Cabinet Office's International Best Practice Advisory Group** and the **Royal Society's Data Evaluation and Learning for Viral Epidemics** (DELVE) initiative (Richardson) and the **Covid-19 Genomics UK consortium** (Danesh), the world's largest SARS-CoV-2 genome surveillance effort.

Our research ranges from **innovation** in quantitative methods and aetiological epidemiology through to **development and evaluation** of interventions to prevent and manage illness, promote the health of populations, and optimise organisation and delivery of healthcare. We encompass the range of population health research approaches, from data science through to molecular epidemiology, social and behavioural sciences, and applied health research disciplines. We deliver on our mission by promoting **interdisciplinary research** and nurturing **team science**. Our efforts are greatly facilitated by the powerful **collaborative research infrastructures** and other assets we have created, and by our coalition-building strengths in securing impact.

1.2 Achievements since REF2014




Among achievements since 2014 ([Table 1](#)), we have greatly **expanded our research output**, spanning multiple areas and cutting-edge methodologies, publishing over 9,000 outputs in peer-reviewed journals. We have **strengthened and diversified our research leadership**, appointing more than 20 additional senior faculty ([Section 2.1](#)). We have established multiple **interdisciplinary cross-departmental research centres and thematic collaborations**, including The Healthcare Improvement Studies (THIS) Institute, the Cambridge site of Health Data Research UK (HDRUK) and the NIHR Global Diet and Activity Research Group and Network.

We **co-lead and support multiple national and international initiatives**, including HDRUK, NIHR BioResource, UK Biobank, International Common Disease Alliance and the International 100K Cohorts Consortium. We have created novel **cross-sectoral research partnerships**, exemplified by the National Diet and Nutrition Survey, in conjunction with Public Health England (PHE) and the Food Standards Agency, and our partnership with AstraZeneca's Centre for Genomics Research.

We have achieved major **societal and health impact**, improving quality and quantity of life for many thousands of people every year in the UK and globally: in areas as diverse as cancer, HIV prevention, screening for cardiometabolic conditions and food and transport policies.

We have laid **extensive foundations for future research**, leading and supporting major population resources that are broad and deep, encompassing different study designs, geographical locations, risk factors and disease outcomes ([Box 2](#)).

Table 1: Examples of achievements since REF2014

Areas of key research contributions	Examples of outputs across these research areas	Examples of impact
 <p>Health data science: creating innovative, open-access tools to advance study of multi-dimensional datasets (e.g. Section 1.4.1)</p> <p>Clinical and molecular epidemiology: laying foundations for novel interventions by identifying new causes of major diseases (e.g. Section 1.4.2)</p> <p>Applied health research: developing and evaluating interventions to prevent and treat major conditions, and improving health and healthcare (e.g. Section 1.4.3)</p> <p>Global health research: contributing toward the UN's Sustainable Development Goals, and identifying distinctive risk factors and interventions in understudied populations (e.g. Section 1.4.4)</p>	 <p>Publications: >9,000 papers with ~330,000 citations.</p> <p>New population resources and trials: e.g. recruitment of 300,000 participants into population biobanks in UK and South Asia, and randomisation of ~1 million people into pragmatic trials (e.g. Boxes 2 and 7)</p> <p>Novel tools and methods: e.g. Polygenic Score Catalog, PhenoScanner, MR-Egger (e.g. Box 3 and 10)</p> <p>Leadership of national and international research programmes, e.g. HDRUK, NIHR BioResource, UK Biobank, WHO Hearts (e.g. Section 4.1)</p> <p>Extensive cross-sectoral collaborations and engagements, nationally and globally, e.g. local authorities, Food Standards Agency, AstraZeneca (e.g. Box 16 and 17)</p>	 <p>Improving the health of populations: through better prevention and treatments, e.g. for common cancers, cardiometabolic conditions, HIV (e.g. Section 1.7)</p> <p>Evidence and tools that underpin national and global guidelines, e.g. NICE, PHE, European Centre for Disease Control, WHO (e.g. Boxes 19 and 20)</p> <p>Empowering patients to make high-stakes decisions (e.g. about cancer treatment and end-of-life-care) through personalised, patient-centred approaches (e.g. Box 10)</p> <p>Public engagement and public attitudes towards risk-related behaviours (e.g. physical activity and diet) (e.g. Box 11)</p> <p>Developing major new research capacity including ~20 senior faculty, ~70 early-career researchers and ~110 PhD graduates (e.g. Boxes 13 and 18)</p>

Box 2: Examples of our strategic development of population resources since REF2014

- We have made detailed molecular measurements and extended participant follow-up in the 520,000-participant EPIC cohort, in which we lead pan-European studies of type 2 diabetes (EPIC-InterAct), coronary disease (EPIC-Heart), and stroke (EPIC-CVD).
- We have substantially enhanced Cambridge-led cohorts (multi-omic measurements in the 50,000-participant INTERVAL and 12,000-participant Fenland studies) and contributed to enhancements of UK Biobank (accelerometry, telomere length) and South Asia Biobank (diet and physical activity determinants).
- We have recruited ~200,000 participants across England into cohorts involving genomics, biomarkers and health record linkages, and have consent for recontact.
- We have recruited ~100,000 participants in South Asia into multi-dimensional studies, including UKRI-funded BELIEVE in Bangladesh and MRC-funded MAVERIK in Malaysia.
- We have created a Wellcome-funded 20,000-participant cohort to study persistent microbial carriage.
- We co-lead and contribute to major new global consortia, including EU-InterConnect, HDRUK Multi-omics Cohorts Consortium, and International Common Disease Alliance.

1.3 Research strategy

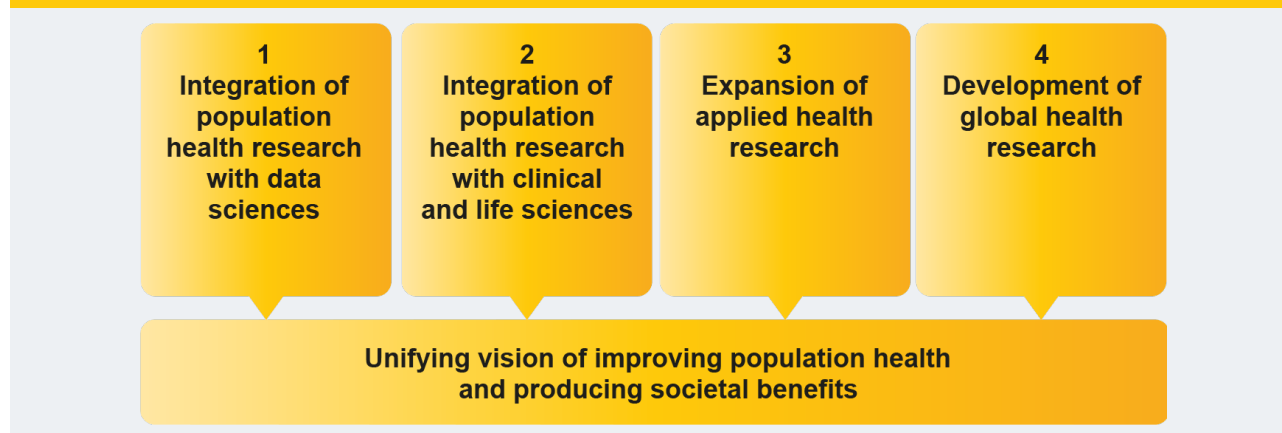
Across UoA2, **our goals** are to:

- **Generate highly actionable evidence** that can promote health and wellbeing and support policy and practice.
- **Promote aetiological discovery**, with the aim of finding new targets for disease prevention and control.
- Develop and evaluate **new interventions** to promote health and to prevent disease, avoidable morbidity and harm.
- Produce an evidence-base for **improving the organisation, quality, safety and delivery of care**.
- Develop and evaluate **new approaches to predict disease**, including early detection.
- Create tools and resources, including **cutting-edge analytical methods and population resources**, with direct applications to improve health.
- Create a **thriving intellectual culture and organisational systems** to support every individual and team to do their best work.
- **Build capacity**, attracting talented early-career researchers and **integrate training with high-quality research**.

We organise our work around four inter-related priority areas ([Figure 1](#)). To achieve our goals, we emphasise cross-disciplinary working ([Section 1.5](#)), ethical, open and reproducible research conduct ([Section 1.6](#)), achievement of societal and health impact ([Section 1.7](#)), capacity-building ([Section 2](#)), infrastructure-building ([Section 3](#)), and contributions to the research base, economy, and society ([Section 4](#)).

1.4 Strategic priorities

Figure 1: Our four strategic priorities



1.4.1 Strategic priority 1: Integration of population health research with data sciences

We develop and apply innovative open data science methods, integrating them deeply into population studies. Our rationale is to optimise knowledge-generation from large-scale cohorts featuring multi-dimensional data ([Section 4.1](#)) and ensure robust scientific progress by making reliable inferences ([Box 3](#)).

We have achieved our REF2014 goal of substantially expanding our data science endeavours. The **MRC Biostatistics Unit** has, for example, greatly augmented research programmes in statistical ‘omics, data-driven methods to improve population health, and trial design and analysis. Internationally, we have partnered with Australia’s Baker Institute, launching in 2018 the **Cambridge-Baker Centre for Systems Genomics** (Director: Inouye), a GBP2.5 million partnership to improve disease prediction and aetiological understanding using computational approaches. Another effort with global reach is the **Cambridge Centre for Artificial Intelligence in Medicine** led by van der Schaar (UoA10; jointly appointed Public Health/Mathematics) with a GBP7 million award from AstraZeneca and GlaxoSmithKline in 2020.

Nationally, we are a founding partner of the **Alan Turing Institute**, established in 2015, contributing several **Turing Fellows** in health data science (Inouye, Richardson, Wood). In 2018, we were selected as one of the six original sites of **HDRUK**, a GBP55 million national institute for health data science. HDRUK-Cambridge (Director: Danesh) is a partnership of the Wellcome Sanger Institute, EMBL-European Bioinformatics Institute (EBI), the University, and its associated hospitals. In 2019, we were awarded GBP5 million to mobilise genomic, e-health records, and other data related to inflammatory bowel disease in a **HDRUK Data Research Hub**. In 2020, we co-founded a **Wellcome PhD Programme in Health Data Science**, a GBP3 million joint HDRUK/Turing initiative. We collaborate closely in the EPSRC-funded **Cambridge Centre for the Mathematics of Information in Healthcare**, renewed with a GBP3 million award in 2020.

Further development of this priority area will focus on expanding collaborations with leading partners, both academic (e.g. EMBL-EBI, Turing) and in the tech industry (e.g. Amazon, Benevolent AI, Microsoft Research), to accelerate our creation and application of innovative methods.

Examples of our partners in health data science efforts



Box 3: Examples of tools created by our data science research since REF2014

- Methods to estimate R for SARS-CoV-2, informing SAGE and PHE.
- Multistate models characterising disease progression in chronic diseases.
- Methods for Mendelian randomisation (MR), including MR-Egger and multivariable MR.
- A comprehensive framework for Bayesian multi-parameter evidence synthesis to estimate disease burden.
- Horizontal integration of genetic studies of different traits through co-localisation.
- User-friendly methods for handling missing data.
- Complex algorithms for estimating future cancer risks.
- Methods to detect genetic causes of rare diseases.
- Machine learning systems for automating clinical prognostic modelling.
- 'Green' algorithms to facilitate environmentally-friendly computational research (<http://www.green-algorithms.org>)

1.4.2 Strategic priority 2: Integration of population health research with clinical and life sciences

A second strategic priority is the deep integration of aetiological epidemiology with clinical and life sciences. Our rationale is to translate epidemiological discoveries into actionable insights by identifying molecular mechanisms amenable to modification by new interventions.

Consistent with our REF2014 aim, we have succeeded in **prioritising population health research in the NIHR Cambridge Biomedical Research Centre (BRC)**, the main vehicle for translational research in our campus, renewed in 2017 with an overall GBP114 million award. For example, we lead the **BRC Diet, Nutrition and Lifestyle theme** (GBP3 million; Wareham/Forouhi), focused on development of national and international platforms for assessment of diet, nutrition and physical activity, and supporting methodological knowledge exchange through online tools ([Section 1.6](#)). In 2018, we were awarded scientific leadership of the

National Diet and Nutrition Survey, the UK's major surveillance investment in diet and nutrition, funded by PHE and the Food Standards Agency (GBP17 million).

We lead the **BRC Population and Data Science theme** (GBP5 million; Danesh/Richardson/Wood), focused on biostatistical methodology, multi-purpose cohorts, and clinical informatics, including strategically-guided development of Cambridge University Hospital's GBP200 million Epic-based IT system (recognised as a "Global Digital Exemplar" by NHS England) for research purposes. We **co-lead the NIHR BioResource** (Bradley [UoA1] /Di Angelantonio/Danesh) of over 150,000 patients and healthy volunteers consented to recall by genotype/phenotype, supported by the BRC and an additional NIHR GBP37 million award in 2017. We also lead the **BRC-supported Centre for Naturally Randomised Trials** (FERENCE), established in 2018 and focused on translational linkages with industry to inform clinical practice by leveraging principles of Mendelian randomisation.

Our further development of this priority area will focus on accelerating translational research ([Box 4](#)) through a strategy of embedding population health in thematic multidisciplinary institutes able to tackle major threats to health. Introduced to our campus several years ago by the **Institute of Metabolic Science** (co-Directors O'Rahilly[UoA1]/Wareham) – a world-leading institute with highly-integrated research across population and laboratory sciences – we are extending this approach to multiple additional areas.



Complementing our holistic, cross-cutting multi-disease approaches, we are embedding population health research in thematic multidisciplinary institutes: (centres, clockwise from top left) metabolic, cardiorespiratory, cancer, infection/immunity, and the Royal Papworth Hospital.

Cross-disciplinary cardiovascular research has been strengthened through a GBP6 million award in 2019 for the **Cambridge BHF Centre of Excellence** (Bennett [UoA1] /Danesh) and a four-year **BHF PhD Programme**. From 2022, the **Cambridge Heart and Lung Research Institute** (GBP60 million) will co-locate more than 100 UoA2 cardiovascular researchers with around 300 clinical and genomic researchers, benefiting from strategic co-location with the **Royal Papworth Hospital** (GBP165 million; opened 2020), one of Europe's largest cardiothoracic centres, and **AstraZeneca's new global research headquarters** (GBP500 million; opening 2021).

Box 4: Examples of insights and translational advances from our cardio-metabolic research since REF2014

- Pioneering genomic studies of the human plasma proteome and metabolome, providing a toolkit for Mendelian randomisation studies.
- Discovery of >10,000 genetic variants determining blood cell traits, yielding insights into the differentiation of blood cells and their roles in common diseases.
- Discovery of functionally significant variants for insulin resistance and puberty timing, advancing understanding of human development and metabolic disease.
- Demonstration that safe limits for alcohol consumption should be lower than previously recommended, supporting UK policy and shaping Australia's new guidelines.
- Population studies that have shaped phase 3 trials of lipoprotein(a)-lowering and supported US and EU regulatory approval of bempedoic acid to treat LDL-cholesterol.
- Trials and modelling that underpin the UK's national abdominal aortic aneurysm screening programme.

Our strengths in multidisciplinary **cancer research** have been further enhanced by positioning of our researchers (e.g. Antoniou, Easton, Pharoah) as key investigators in campus-wide initiatives led by Gilbertson (UoA1), including the **CRUK Major Centre** (GBP35 million), **CRUK Cambridge Centre Early Detection Programme**, and **Mark Foundation Institute for Integrated Cancer Medicine** (GBP8.6 million). As key investigators in the planned **Cambridge Cancer Research Hospital** (government pledge of GBP120 million), our researchers will further propel our translational agenda ([Box 5](#)).

Box 5: Examples of insights and translational advances from our cancer research since REF2014

- Discovery of hundreds of genetic variants determining breast and ovarian cancer risk, underpinning stratified screening trials and clinical genetic tests.
- Shaping national (e.g. NICE) and international (e.g. American Cancer Society) clinical management guidelines for women who carry major susceptibility gene variants.
- Development of widely-used risk prediction and prognostic tools for cancer, incorporated into clinical management guidelines and decision-support tools worldwide (**BOADICEA** and **PREDICT** – see **impact case studies**).
- Development and implementation of improved cancer diagnostic testing strategies for general practitioners, supported by a CRUK Catalyst Award.

1.4.3 Strategic priority 3: Expansion of applied health research

We have greatly expanded our programme of applied health research, achieving our REF2014 goal of enhancing capacity in this area. Our guiding rationale is that applied research directly serves the needs of policy and practice in the UK and globally for high-quality evidence. We have

established multiple new multidisciplinary centres and strengthened existing centres, yielding important findings spanning primary, acute, mental health and community care ([Box 6](#)).

A major new centre is **The Healthcare Improvement Studies (THIS) Institute** (Director: Dixon-Woods), established in 2018 with GBP42.5 million core funding from the Health Foundation to strengthen the evidence-base for improving the quality and safety of healthcare. Another example is the **NIHR Blood and Transplant Research Unit in Donor Health and Genomics** (Director: Di Angelantonio), established in 2015 with a GBP5 million award as a partnership of the University, NHS Blood and Transplant, Wellcome Sanger Institute and Oxford University to improve the safety and efficiency of blood donation.

Several centres have expanded considerably since REF2014, including the **Centre for Diet and Activity Research** (CEDAR; Director: Wareham), a UKCRC Centre of Excellence in Public Health. Its research includes a focus on wider determinants of diet and physical activity and population-level interventions, including a UKRI-funded GBP4 million interdisciplinary initiative to help transform the UK's urban food system. The **Cambridge Centre for Health Services Research** (Co-Directors: Morris/Sussex), a research collaboration between the University and RAND Europe, was further strengthened by the appointment in 2019 of the University's **inaugural chair in health economics** as the RAND Professor of Health Services Research (Morris). The **Behaviour and Health Research Unit** (Director: Marteau), funded since 2018 by a GBP3 million Wellcome Collaborative Award, generates evidence to support sustained behaviour change to improve health outcomes and reduce health inequalities.

Our applied research efforts align closely with national public health priorities. We have provided co-leadership of multiple NIHR-funded initiatives, including the eight-university **NIHR School for Public Health Research** (Cambridge lead: Brayne), nine-university **NIHR School for Primary Care Research** (Cambridge lead: Mant), and three-university **NIHR Health Protection Unit on Evaluation of Interventions** (Cambridge lead: De Angelis).

Created in 2019 following two previous CLAHRC awards, the **NIHR Applied Research Collaboration** (GBP13 million; involving the Universities of Cambridge, Hertfordshire, East Anglia, and Essex) tackles challenges related to healthy ageing, frailty, multimorbidity and end-of-life care (Director: Jones [UoA4]; theme leaders: Barclay, Brayne). We also lead multiple **NIHR programme grants** (e.g. Griffin, Mant, Marteau, Sutton) and the **Public Health Research Consortium**, a Department of Health and Social Care Policy Research Unit (White).

Examples of our growing multidisciplinary centres in applied health research



Box 6: Examples of insights and translational advances from our applied health research since REF2014

- Demonstration of the value of self-monitoring and self-management in primary care in the control of hypertension, adopted in US and European guidelines.
- Identification of optimum frequencies of blood donation through the first-ever RCT of varying the frequency of blood donation, influencing practices globally (see **Blood Donation/Transfusion impact case study**).
- Development of interventions for smoking cessation using tailored text messaging.
- Development and testing of tailored interventions for physical activity and medication adherence.
- Leading the national evaluation of the Soft Drinks Industry Levy (see **Sugar Consumption impact case study**).
- Identifying how specific patient populations (such as those of minority ethnicity) may have poorer experiences of care.
- Characterising features of very safe maternity units to inform improvement strategies.
- Developing methodology adopted by PHE to monitor and predict pandemic influenza using multiple surveillance streams.

Our further development of this priority area will emphasise sustainability, whole-systems approaches, digital health, data science techniques, and remote study methods already successfully employed in the Covid-19 response ([Section 4.7](#)), for example **Thiscovery**, an online platform enabling large-scale multi-stakeholder engagement (including NHS staff and patients) in studies to improve quality and safety in healthcare. We will also continue to strengthen our portfolio of high-quality, large-scale **pragmatic trials** ([Box 7](#)), coordinated through local infrastructures (e.g. the UKCRC-accredited **Cambridge Epidemiology & Trials Unit**) and external collaboration.

Box 7: Examples of Cambridge-led pragmatic trials since REF2014

- A cluster-RCT of 1.3 million blood donors (STRIDES) to evaluate simple interventions to prevent vasovagal reactions during blood donation.
- A cluster-RCT in primary care of 126,000 people (SAFER) to inform the National Screening Committee about the value of screening for atrial fibrillation.
- An RCT of different screening approaches in 13,000 women at high risk of breast cancer due to high breast density (BRAID) to inform the NHS Breast Screening Programme.
- A portfolio of evaluations of behavioural interventions, including GoActive, a school-based cluster-RCT involving 16 schools.

1.4.4 Development of global health research

A fourth, more recent, strategic priority is to develop global health research. We seek to contribute to the UN's Sustainable Development Goals by providing evidence-based context-specific solutions to control non-communicable diseases (NCDs) in low- and middle-income countries, as

well as provide novel aetiological insights in understudied populations, building on progress already made ([Box 8](#)).

Box 8: Examples of insights and translational advances from our global health research since REF2014

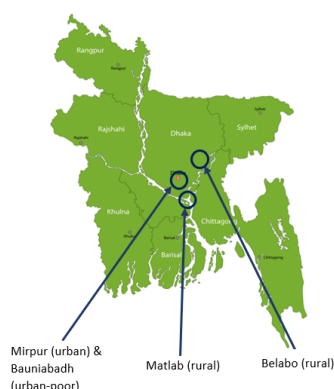
- Development and evaluation of cardiovascular disease prediction tools, calibrated for 21 global regions, adopted in the WHO Hearts Technical Package.
- Demonstration that overweight and obesity are associated with higher mortality worldwide, supporting WHO guidelines to combat all excess adiposity (not just morbid obesity).
- Discovery of thousands of rare “null” genetic mutations in consanguineous South Asians, providing a roadmap for studying phenotypic consequences of gene “knock-outs”.
- Development of a participatory coalition-building approach for healthy urban planning in African cities.
- Identification of implications of Covid-19 control measures for diet and physical activity in rapidly urbanising low- and middle-income countries.

Cambridge’s expanding portfolio of **NCD population resources in South(east) Asia** (led by Chowdhury/Di Angelantonio/Danesh) addresses the region’s distinctive challenges, including arsenic-contaminated water and poor air quality. In 2017, we received a GBP8 million award from UKRI to establish **CAPABLE** (Danesh/Chowdhury/Di Angelantonio) to create a 150,000-participant cohort in Bangladesh to support training and applied health research in NCD control, supplementing our portfolio of population resources ([Box 9](#)).



Rural site of a large household-based longitudinal study in Bangladesh that serves training and NCD control needs.

In 2020, we launched a strategic collaboration with Regeneron, a pharmaceutical company, to sequence genomes of this Bangladeshi cohort to advance understanding of NCDs. Further initiatives in this region include programmes on investigating breast cancer susceptibility in the multi-ethnic Malaysian population, funded by MRC and Wellcome (Antoniou/Easton).



Box 9: Examples of population resources created in South Asia since REF2014

- **BELIEVE**: a household-based cohort in Bangladesh recruiting 150,000 participants (~75,000 already recruited), recording biological, behavioural, environmental and structural risk factors.
- **SHINES**: a Sri Lankan cohort that has recruited ~10,000 participants, following a similar approach to BELIEVE.
- **BRAVE**: a retrospective case-control study (>8,000 cases and >8,000 controls recruited) of acute myocardial infarction in Bangladesh.
- **MAVERIK**: a retrospective case-control study (>2,500 cases and >2,500 controls recruited) of acute myocardial infarction in Malaysia.

Another major initiative is the **Global Diet and Activity Research Group and Network** (GDAR; Wareham/Unwin/Oni), established in 2017 with a GBP2.5 million NIHR award. It aims to help prevent NCDs in low- and middle-income countries (particularly in Africa and the Caribbean) through the development of population-level interventions aimed at diet and physical inactivity. It includes the nine-country **African Academic Consortium on Physical Activity**. We collaborate with the **Wellcome Cambridge Centre for Global Health Research** (led from the University's School of Biological Sciences), which promotes capacity development in Africa, and **Cambridge-Africa**, a network of 50 African institutions across 18 countries, to prevent epidemics.

Aligned with our applied health research strategy, our further development of global health research will emphasise sustainability, whole-systems approaches, digital health and pragmatic trials, using key frameworks (e.g. a 'syndemic' lens) to develop joined-up solutions for NCDs, infectious diseases and structural inequalities.

1.5 Approach to interdisciplinary research

Our research tackles complex problems of pressing societal importance. Accordingly, our approach to interdisciplinary research is strategic (led by our priorities), agile (responsive to emergent questions), and curiosity-driven (arising from the creative synthesis and integration of concepts, methods, data and theories from multiple fields).

We form and foster highly-productive interdisciplinary collaborations to identify novel research questions, determine how to address them in new ways, and advance scientific inquiry through joint endeavours that transcend single disciplines. Our work in the area of **healthcare improvement**, for example, combines systems engineering, anthropology, sociology, psychology, law, organisation studies and data science. Similarly, our work to evaluate screening for atrial fibrillation in **general practice** combines expertise on sensor technology, artificial intelligence, anthropology, behavioural science, epidemiology and public health.

To encourage cross-sectoral and multidisciplinary research, we support **joint affiliations and appointments**, including with other University departments (e.g. Pharoah–Oncology; Ong–Paediatrics), external research organisations (e.g. Inouye–Baker Institute; Danesh–Sanger Institute), government agencies (e.g., DeAngelis-PHE), NHS bodies (e.g. Di Angelantonio–NHSBT; Lango Allen–NHS Genomic Medicine Centre), not-for-profit organisations (e.g. Morris–RAND Europe) and industry (e.g. Paul–AstraZeneca). Another example is embedding UoA2 researchers (e.g. Wallace, Kirk) in the Cambridge Institute of Therapeutic Immunology & Infectious Disease (GBP94 million; opened 2019).

University-wide research networks and collaborations play important roles in ensuring our connectivity, the relevance of our research questions, and cross-disciplinary strengths.

Cambridge Public Health (Chair: Brayne; established 2020) has an important role in facilitating research activity across the University, NHS, and beyond, building on the coordinating achievements of the Cambridge Institute of Public Health.

We are part of the **Cambridge Cardiovascular Interdisciplinary Research Centre** (established 2014), which brings together >500 researchers from multiple UoAs (1,2,5,6,9,12), our partner hospitals, industry and international collaborators (e.g. Harvard, National University of Singapore) to tackle grand challenges in cardiovascular research. We are partners in **the Cambridge Infectious Diseases Research Centre** (established 2016), which connects over 100 investigators across the Cambridge ecosystem. Further examples include **University-wide initiatives** in AI/Big Data, Food Security, Global Challenges, Health Economics, and Sensors.

We collaborate directly with departments across the University, ranging from Mathematics to Sociology. These partnerships connect deep expertise in diverse areas; for example, the CAPABLE project on **environmental determinants of global health** unites population health researchers with atmospheric scientists (Jones [UoA8]), environmental engineers (Fenner [UoA12]), and synthetic biologists (Ajioka [UoA1]).

1.6 Strategy to support ethical, open and reproducible research

We are fully committed to the **UK Concordat to Support Research Integrity**, **FAIR** data principles (findability, accessibility, interoperability, reusability), open-access deposition of pre-publication reports, and the San Francisco Declaration on Research Assessment (**DORA**). **The University's Office of Scholarly Communication** supports our commitment to disseminating research and scholarship widely.

1.6.1 Ethics, research governance and integrity

Standards of ethics, governance and integrity for our research are fundamental to our mission. We benefit from the expertise of the School of Clinical Medicine's multidisciplinary **Research Governance Team** and **Research Integrity Office**, which provides specialist knowledge on research ethics, information governance, and sharing and storing human tissue and data. We foster a **culture of constructive critique**, promoting transparency, open dialogue and research reproducibility through training and workshops. As a signatory of **DORA**, Cambridge is institutionally committed to measuring scientific output based on wise evaluation, avoiding use of journal-based metrics as a surrogate measure of quality of outputs.

1.6.2 Open research strategy

Delivering on our commitment to impact and interdisciplinarity, we **make our methods, results, and publications widely accessible**.

We promote **open access to publications** through the University's Open Access Policy and our network of enthusiastic champions. More than 95% of in-scope UoA2 publications submitted in REF2021 have been deposited via the Green Route (uploaded to the University's institutional repository) and published via the Gold route. The University Library's *Request a Copy* service enables online requests for any publication under embargo: several of the most-requested manuscripts have been from UoA2 (e.g. Kuchenbaecker, 2017).

We aim to make **data** as widely available as possible while safeguarding the privacy of participants, protecting confidential data and maintaining scientific integrity. We employ **multiple mechanisms to make data accessible**, including deposition at the European Genome-phenome Archive, posting via open-access public repositories (e.g. GWAS Catalog) without the need for application, and **data-sharing portals** (e.g. <https://epi-meta.mrc-epid.cam.ac.uk>). Since 2014, we have used such approaches to support many hundreds of external researchers to access, use, and publish data from our studies ([Section 4.1](#)).

To enable wider use of methods that enhance reproducibility, we create **open-access resources, software and tools** for multiple purposes ([Box 10](#)). One example, of many, is **PhenoScanner**, the first publicly available tool to enable rapid assessment of associations for millions of genetic variants with multiple phenotypes and diseases, accessed by more than 25,000 users in over 100 countries, yielding over a million website visits and queries. Another is the global **Polygenic Score Catalog** (<https://www.pgscatalog.org/>), a major initiative we co-produced with EMBL-EBI and HDRUK to enhance transparency and reproducibility. **FEAT** (<https://www.feet-tool.org.uk/>), a tool to map, measure and monitor access to food outlets at neighbourhood level, supports planning decisions and provides evidence to control obesity (**Food Environments impact case study**).



Box 10: Examples of our open-access resources and tools with major impacts

- The Multi-Parameter Evidence Synthesis model, adopted by PHE, triangulates multiple datasets to estimate HIV prevalence (**HIV impact case study**).
- BOADICEA, a web-based prediction tool endorsed by NICE, identifies women at high breast cancer risk to inform decisions such as pre-emptive surgical removal of breasts or ovaries (**BOADICEA impact case study**).
- The Propensity to Cycle Tool allows estimation of cycling potential and visualisation of routes (**Transport impact case study**).
- PREDICT, a web-based prediction tool endorsed by NICE, supports decision-making about chemotherapy for women with early-stage breast cancer (**PREDICT impact case study**).

1.7 Strategy for enhancing the health and broader societal impact of our research

Our strategy for achieving impact is multifaceted and characterised by multi-stakeholder engagement throughout the research lifecycle, beginning with the research questions we address through to communication of findings and curation of impact. Our studies are typically developed and delivered jointly with key groups to achieve shared goals, address important population health and service needs, and provide actionable, practical findings. Our work benefits from our agility, ability to convene coalitions of stakeholders, and expertise in mobilising expertise across disparate fields.

1.7.1 Deep stakeholder engagement in design and co-production of research

We are committed to co-production with end-users of research. We embrace **patient and public involvement and engagement** throughout the research process ([Figure 2](#)), **engaging diverse communities directly**, including marginalised groups in the UK and globally.

Figure 2: Designing and delivering research for impact by working in partnership



We also engage deeply with those who use and work in health and care. One example is our highly co-designed approach to research aimed at improving processes relating to emergency treatment decisions (see **ReSPECT impact case study**).



We are **skilled in engaging policy-makers early and often**. Our work on transport policies (see **Transport impact case study**) exemplifies our **cross-sectoral engagement approach**, working with governments, not-for-profit organisations, industry, civil society organisations, the media and communities (**Box 11**).

Box 11: Example of promoting population health through cross-sectoral engagement on transport decision-making, policy and planning

An example of highly practical support for decision-makers is our Propensity to Cycle tool. It is used by over 80 public authorities across England for preparing cycling and walking infrastructure plans, strategy documents and scenario-planning to inform cycling investment (**Transport impact case study**).



WWW.PCT.BIKE
PROPENSITY TO CYCLE TOOL

UoA2 researchers regularly provide evidence to parliamentary committees, executive agencies and non-departmental public bodies. We support policy through committee service, evidence provision, expert witness contributions and parliamentary placements. We work closely with the NHS, PHE, local authorities, and other bodies concerned with population health. As illustrated in the **Sugar Consumption impact case study**, this highly-engaged approach to policy-making contributed to the UK **government's introduction in 2016 of a levy on sugary drinks**, reducing sugar consumption and helping to address health inequalities.

Other examples of our ability to secure impact include the adoption of our innovative tools to monitor HIV prevalence and incidence (**HIV impact case study**) as the methods of choice by PHE, the European Centre for Disease Control, and other international bodies. Contributing to improvements in life expectancy and quality of life for thousands of HIV-infected individuals, and reducing HIV spread, these approaches have helped place the UK **on track to eliminate new HIV infections by 2030**. Our behavioural economic studies informed PHE's policy to reduce food portion size as part of its national childhood obesity strategy. Our major trial and modelling studies have been important to decisions about **the National Abdominal Aortic Aneurysm Screening Programme** for men in England and other countries, for example informing the government's decision not to extend such screening to women. Our trials and modelling work has influenced the **NHS Health Checks' introduction of diabetes risk scores and HbA1c tests** to identify people with previously undiagnosed diabetes.

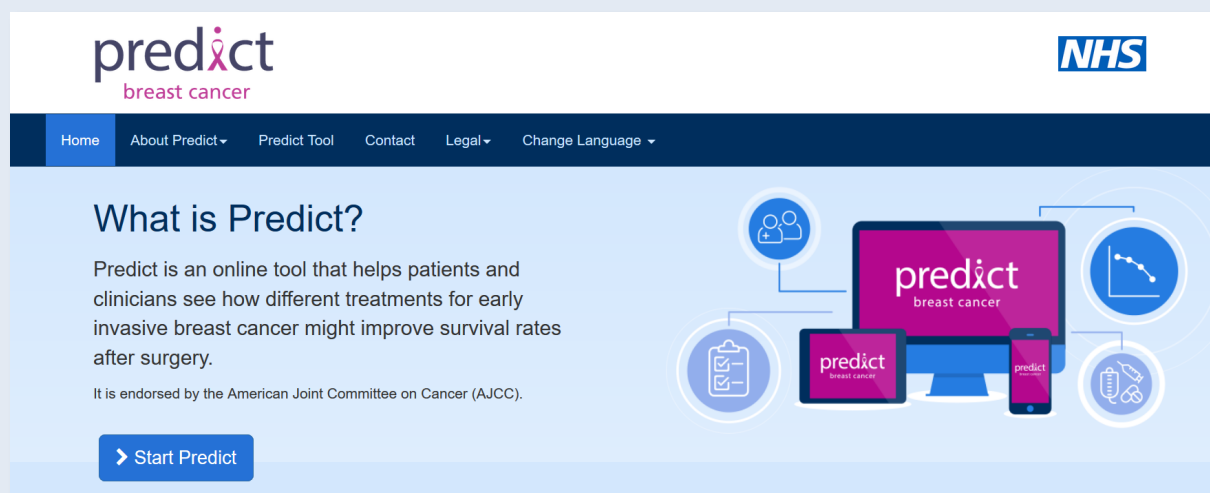
1.7.2 Communications and engagement

We use communications and engagement strategically to engage and develop positive relationships with stakeholder groups, partners, publics and audiences. These approaches help us to: identify effective ways of influencing key stakeholders; establish meaningful dialogues with purpose; improve the visibility of population health research; enable decision-makers and multiple publics to recognise the value of a scientific evidence-base in underpinning policy and practice; engage in advocacy; and create clear pathways for education, training, collaboration, and policy engagement. We dedicate significant resource – including more than a dozen staff across UoA2 – to communications and engagement.

Planned, purposeful communications, using evidence-based tactics, have been important in ensuring the impact of our research. As an example (**Food Environments impact case study**) Cambridge researchers worked with *The Guardian* to mark the launch of **Feat** (www.feet-tool.org.uk). The tool is now routinely-used in rejections of planning applications for new takeaway food outlets where likely adverse impact on health and equality are anticipated. Another example of our use of strategically-guided communication is our work on **PREDICT** ([Box 12](#)).

Box 12: Using communications to secure impact (PREDICT impact case study)

We partnered with the **Winton Centre for Risk Evidence Communication** on the **NHS PREDICT tool** for informed decision-making about breast cancer treatment. Working alongside patients, the public and healthcare professionals resulted in a tool that is useful and easily understood by all. PREDICT is used by oncologists to help guide treatment options for individual patients. The tool communicates the same information to patients, facilitating shared decision-making. Endorsed for use by NICE, the American Joint Committee on Cancer, and other major national and international bodies, PREDICT is used in more 200 countries and is accessed 350,000 times per year, contributing towards improved prognosis, reduced distress, and decreased healthcare costs. This work has won several prizes, including the **2018 Office for National Statistics Research Excellence People's Choice Award** and the **2019 National Cancer Research Institute Research Excellence Impact Award**.



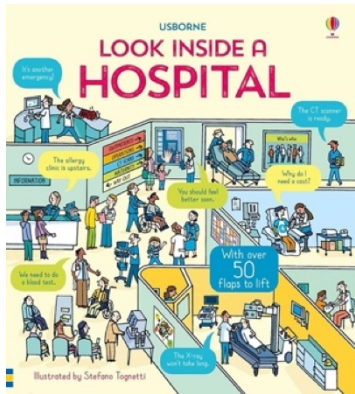
Working closely with the University's **Public Engagement Office** and others, we use multiple strategies to engage with diverse communities. We regularly participate in national public engagement events, including the **Hay Festival**, **Big Biology Week**, and **Pint of Science**. We have intensified engagement through **Citizen Science projects**, such as the use of crowdsourcing to classify tumour data in collaboration with CRUK; **arts-based** approaches, including 'Not Quite Right', an interactive drama performed UK-wide to engage people in healthcare improvement; and Snackington, **an online game** to explore neighbourhood influences on healthy food.



Examples of our wide-ranging public engagement activities.

We **engage deeply with local communities**, for example through open meetings with research participants, contributions to the curriculum of the University Technical College Cambridge, and participation in the **Cambridge Science Festival**, **Cambridge University Fun Lab**, **Famelab**, and **Bright Club Cambridge comedy nights**. During the Covid-19 pandemic, we were involved in the 'I'm a Scientist, Stay at Home' programme to engage school students in statistics.

We make regular appearances on radio and television; our work attracts mass media and social-media attention. For example, in partnership with the **NIHR Centre for Black and Minority Ethnic Health**, Forouhi helped organise, and featured in, a video appeal (including several celebrities) for more people of minority ethnicity to take part in Covid-19 research studies, viewed >125,000 times on Twitter and reported in >200 news outlets. Another example is our paper on alcohol consumption (Wood, 2018), which is in the all-time top 400 papers for social-media attention (Altmetric score >4500) and now underpins guidelines encouraging lower alcohol intake.



Our achievements have been recognised by the Vice-Chancellor's awards for Impact and Engagement in 2016 (**Sugar Consumption Impact Case Study**) and 2019 (**ReSPECT Impact Case Study**), Klingberg's shortlisting for the 2017 Max Perutz Science Writing Award, and Junior Magazine's award for 'best designed/illustrated book' for *Look Inside a Hospital*, a guide for children (Fritz).

People

2.1 Overview

Our approach to recruitment, development and progression of our staff and students is underpinned by our commitments to equality, diversity and inclusion (EDI). Our strategy is to identify and nurture the best talent at every level across all academic, academic-related, scientific support and operational roles. We engage in continuous improvement to optimise our working environment, culture and systems, using structured methods to gather and act on feedback to achieve our vision of “doing great work in a great place to work”.

The success of our approach is evident in the results of the most recent staff survey: 91% of our staff report being proud to work at the University and feel valued. We achieved the largest departmental Athena Swan Silver Award in 2013, covering the School of Clinical Medicine (including UoA2). It was renewed in 2016, marking our continued efforts to support and facilitate gender equality in the workplace. In 2019, the University's commitment to addressing systemic racism was recognised with an [Advance HE Race Equality Charter](#) Bronze award.

2.1.1 Equality, diversity and inclusion

Principles of **EDI** are central to how we operate. Through robust systems, we actively promote good practices and embed a supportive, positive culture. University- and School-wide **EDI Governance and Working Groups** are tasked with promoting **EDI**, reinforced by **Equality Champions** in each of our departments totalling a network of ~100 Equality Champions at the School of Clinical Medicine and an **EDI Coordinator** in our central HR Team. **EDI** is a standing item on our team meetings, encouraging consistent and systematic reflection and engagement.

The **Academic Women's Forum**, led by eminent female scientists (e.g. Deaton), provides peer-support and mentoring opportunities. **University Diversity Networks** enable staff with protected characteristics to develop communities beyond academic boundaries and encourage a sense of inclusivity. **University-level champions for Race and Inclusion, Disability and Wellbeing, Gender Equality and LGBTQ+** work to combat structural inequalities, including UoA2 staff (Martin, Forouhi). The University runs annual events for Black History Month, along with networking events for staff from Black, Asian and minority-ethnic backgrounds. The School of Clinical Medicine runs **focus groups for LGBTQ+** staff and those with **invisible disabilities/health conditions**.

Our systems are designed to ensure **fair processes for recruitment, funding applications and further development opportunities for all staff**. Staff involved in recruitment are required to undergo **EDI training** and pass an assessment. Recruitment of colleagues with disabilities is facilitated by the **University's Disability Resource Centre**. We collect data to monitor progress against our objectives, for example on protected characteristics among applicants (and those receiving offers) for staff and student positions ([Section 2.5](#)) to ensure **equality and inclusivity of access** to our opportunities.

University policies are **family-friendly**, offering flexible and remote working and generous maternity/paternity/adoption leave, and a range of programmes and initiatives to provide tailored support. The **University Returning Carers' Scheme**, launched in 2016, supports academic activity, builds up the research profiles of staff returning from a period away from work, and

provides up to GBP13,000 to support research activities and attendance at conferences and training courses. The University SPACE (**Supporting Parents and Carers**) network provides UoA2 members with information and points of contact during leave and upon their return. Since 2017, the University also provides **MyFamilyCare**, enabling access to **emergency childcare and a network of adult and eldercare providers**.

2.1.2 Staffing and people strategy

Our staffing and people strategy is designed to serve the needs of an evolving workforce that supports team science and multidisciplinary research. As with EDI, we actively promote good practice through our systems and purposeful cultural change. Senior academics (Karet, Forouhi, Deaton) serve as **Director of Organisation Affairs** (or equivalent roles) at School and departmental levels, providing leadership and coherence for professional development.

We create a **highly-stimulating intellectual environment**, for example through workshops, away-days, master classes, seminar series (including our flagship Bradford-Hill series) and team meetings across research groups. We foster a **dynamic teaching culture** by involving people at all levels – from senior faculty to early career researchers and PhD students seeking teaching experience – as well as colleagues from industry, the NHS, and PHE.

We are deeply committed to ensuring a respectful and safe workplace. We seek to create a **positive culture that rewards talent and secures the engagement, professional development, and health and wellbeing** of all staff. We clarify expectations of staff, including ‘Respect At Work’, in a **Code of Conduct**. Supporting this in practice, we provide bystander training to support appropriate challenge of poor behaviour, and we have reporting mechanisms in place.

Since REF2014, we have deployed multiple strategies to create a highly-optimised working environment. Important features include high-quality **inductions and regular career management reviews**. We **seek staff input systematically and regularly**, using surveys and other methods including focus groups. Findings are carefully scrutinised to identify areas for improvement. Actions are reported back using a “you said, we did” format, with staff engaged in suggesting, planning and testing improvements to systems, processes and environments through task-and-finish groups. Several initiatives support our goals, for example:

- High-quality **mentoring programmes**.
- A **comprehensive wellbeing programme** to improve the health, safety and wellbeing of staff, including a Festival of Wellbeing, annual Wellbeing Week and regular events (e.g. exercise classes).
- **Systematic induction and appraisal programmes** using methods that we have improved since REF2014, and now specifically responsive to the impact of Covid-19.
- **Affordable accommodation** for staff and post-graduate students through the **GBP1 billion Northwest Cambridge Development**, achieving a key REF2014 aim.
- **Support for staff at key career transition points**, including promotion and sabbatical leave.
- A **comprehensive range of compulsory and voluntary training schemes** for early- and mid-career staff, covering research, teaching, administration, and leadership.

We recognise and reward the achievements of staff at every level. The University’s **Professional Services Recognition Scheme** salutes the very best work across all professional services,

including HR, finance, and facilities management. UoA2 staff have been well-represented among the winners.



Our **Nominations Committee** meets quarterly to coordinate nominations for national and international prizes, national honours, and membership of learned societies, using transparent processes attentive to issues of EDI ([Section 4.6](#)).

2.1.3 Strengthening research leadership

We have realised our REF2014 aim of **strengthening and diversifying our research leadership** by recruiting researchers with internationally recognised expertise in priority areas and by cultivating our internal pipeline of emerging leaders. Since REF2014, we have appointed over 20 senior academics.

In line with our strategic priority areas ([Section 1.4](#)), recent appointments have particularly enhanced **health data science** (e.g. Astle, Barrett, Burgess, Inouye, Jaki, Kirk, Newcombe, van der Schaar, Villar, Wallace), **clinical and molecular epidemiology** (e.g. Ference, Paul), **applied health research** (e.g. Adams, Dixon-Woods, Di Angelantonio, Martin, Morris, Usher-Smith, Spathis, White), and **global health research** (e.g. Chowdhury, Mascie-Taylor, Oni, Unwin). The University's first-ever professorial appointments in **Health Economics** (Morris), **Population Health and Nutrition** (Forouhi), and **Blood Donor Health** (Di Angelantonio) are evidence of our emphasis on maximising multidisciplinary opportunities and capacity development.

2.1.4 Early-career researchers and career development

We continue to optimise our REF2014 goal of fostering an environment that attracts **talented early-career researchers and integrates training and mentoring with high-quality research**. Our approach to development is wide-ranging, enabling access to mentoring, scientific resources, transferable skills training and career opportunities awareness.

Early-career researchers benefit from multiple initiatives and forms of support. They include the University's **Postdoc Academy**, which offers induction, professional development and training activities, leadership and entrepreneurship training, a bespoke mentoring programme, connections

to employers, and a postdoc alumni scheme. Dedicated facilities include a **Post-Doctoral Centre** on our campus.

Box 13: Examples of external awards to our early-career researchers since REF2014

- **BHF Immediate Post-doctoral Fellowship** (Charlton)
- **Biometrika Fellowship** (Villar, Robertson)
- **Canadian Institutes of Health Research Post-doctoral Fellowship** (Hajna, Lambert)
- **CRUK Cancer Prevention Fellowship** (Usher-Smith)
- **Dunhill Medical Trust doctoral Fellowship** (Hartley)
- **Gillings Fellowship** (Roman-Urrestarazu)
- **MRC Career Development Award** (Asimit, Kiddle, Winpenny)
- **MRC-NIHR Clinical Academic Research Partnership Fellowship** (S Harrison)
- **NIHR Clinical Lecturer** (Ford, Mytton, Payne, Sinnott)
- **NIHR Doctoral Fellowship** (Dambha-Miller, Edwards, Mavrodaris)
- **NIHR Intermediate Fellowship** (Usher-Smith)
- **NIHR In-Practice Fellowship** (Llawarne, Lund)
- **NIHR Methodology Fellowship** (Harrison, Scott-Reid)
- **NIHR Pre-doctoral Fellowship** (Ekeke)
- **NIHR School for Primary Care Launching Fellowship** (Saunders)
- **Rutherford Fellowship** (Surendran)
- **UK Research Innovation Fellowship** (Peters)
- **Wellcome/Royal Society Sir Henry Dale Fellowship** (Burgess)
- **Wellcome Clinical PhD Fellowship** (Lund, Mytton, Podmore, Zhou)
- **Wellcome University Award in Bioethics** (Fritz)
- **Wellcome Society & Ethics Research Fellowship** (Pechey)

As a result of our efforts, we have achieved our aim of **developing a large cadre of early-career researchers through to independence**. We actively identify suitable fellowship schemes or other opportunities for early-career researchers, prepare and support them in making high-quality applications through mentoring, feedback on draft applications and practice interviews, and provide bridging-funding where possible.

Many have won prestigious external awards ([Box 13](#)) or have been promoted internally ([Box 14](#)). Others have gone on to assume senior leadership positions elsewhere in industry ([Section 4.2](#)) and academia ([Section 4.3](#)). A positive development has been the creation of new routes for promotion of highly skilled researchers with specialist skills who enable **team science**.

Box 14: Examples of promotions of our senior faculty since REF2014

- **Antoniou**, Professor of Cancer Risk Prediction
- **Barclay**, Senior Lecturer in General Practice & Palliative Care
- **Butterworth**, Reader in Molecular Epidemiology
- **De Angelis**, Professor of Statistical Science for Health
- **Duschinsky**, Senior Lecturer in Applied Social Science (UoA21)
- **Forouhi**, Professor of Population Health and Nutrition
- **Kaptoge**, Principal Research Associate in Statistical Epidemiology
- **Ong**, Professor of Paediatric Epidemiology
- **Perry**, Principal Research Associate in Genetic Epidemiology
- **White**, Professor of Population Health Research
- **Wood**, Reader in Health Data Science
- **Woodcock**, Reader in Transport and Health Modelling.

2.1.5 Clinical research staff

Our strategy is to identify and support development of potential clinical academics throughout the training and career lifecycle. We stimulate early interest in population health sciences as a career choice through **public outreach** activities, including school visits and science festivals. We educate and provide research placements for **medical students**, and we supervise research-oriented medical students on **joint MBChB/PhD programmes**.

We host and mentor **NIHR Academic Clinical Fellows, NIHR Clinical Lecturers, and recipients of other prestigious fellowships**. We support full-time NHS clinicians to transition into clinical-academic roles, including the **MRC/NIHR Clinical Academic Partnership Scheme** (e.g., S Harrison), and we contribute to the **professional training of public health trainees** in the East of England region through our MPhil course in Public Health ([Section 2.2.1](#)). We also integrate and develop clinical academics and NHS-employed active researchers through honorary clinical contracts.

2.2 Training and supervision of postgraduate research students

We foster a **vibrant training environment** that attracts talented individuals, providing high-quality education to enable excellent future contributions to science, industry, policy and practice. We have achieved our REF2014 aim of completing a transition to **four-year PhD programmes** for the majority of students. We have expanded our four-year interdisciplinary PhD programmes both through enlargement of MRC studentship programmes and other programmes supported by multiple sources ([Box 15](#)). Since REF2014, 113 PhD students across our centres have graduated, with 90% completing within four years.

Box 15: Examples of externally funded interdisciplinary PhD programmes since REF2014

- MRC PhD studentship programme
- Data science and health (MRC Industrial Strategy fund)
- Cardiovascular science (BHF four-year programme)
- Health data science (Wellcome-funded HDRUK/Turing programme)
- Population health research in cancer (CRUK)
- Public health research allied to the Centre for Diet and Activity Research (UKCRC)
- NIHR Collaborative Leadership in Applied Health and Care
- NIHR School for Public Health Research
- NIHR School for Primary Care Research
- Wellcome Clinical PhD Fellowship for GPs

Oversight for training of graduate students (Masters and doctoral) is provided by the University's Graduate School of Life Sciences: which provides induction, pastoral care, core skills and transferable skills training and career development. Students are expected to develop excellent presentation skills and give open seminars, which are well attended by students and faculty. Further **pastoral and social support** is provided through college affiliation.

We use transparent and inclusive processes to recruit the most talented postgraduate students worldwide. We are actively involved with the University's **Postgraduate Open Day**, enabling external applicants to visit our campus and meet potential supervisors. We have been able to attract **outstanding students, many supported by competitive awards**, including from the Turing Institute, BHF, Cambridge Trust (e.g. Commonwealth, Nehru), CRUK, ESRC, Gates Trust, MRC, NIHR/NHS, overseas governments, US NIH-Cambridge partnership and Wellcome.

Our PhD students are embedded in their primary supervisor's research group, supported by a wider team including senior PhD coordinators and college graduate tutors. Progress is monitored through regular meetings, termly reviews, and formal progression points. The **University's Disability Resource Centre** provides additional support for students with disabilities.

Masters courses

We currently run three connected **Masters courses**: in **Epidemiology** (director: Antoniou), **Public Health** (director: Adams), and **Primary Care Research** (director: Usher-Smith). We contribute significantly to the MPhil course in **Translational Biomedical Research**, established with a GBP5 million Wellcome/GSK award, and to a **Masters in Healthcare Data** (commenced in 2019 in conjunction with Cambridge University Hospitals and EMBL-European Bioinformatics Institute). In 2020, Cambridge was competitively awarded funding by HDRUK to establish a complementary new **Masters stream in Health Data Science**.

All Masters students have a named academic supervisor, drawn from faculty across our centres, to provide **one-to-one supervisions**. Students attend talks given by external and internal speakers, and develop **deep networks** internally and externally, for example through student exchange

programmes, including our partnership with the Netherlands Institute of Health Sciences in Rotterdam and ENSAE ParisTech, France's leading data science university.

In autumn 2021, we will launch modularised and specialised Masters courses in thematic areas corresponding to our strategic priorities ([Section 1.4](#)). We will also deliver short-course offerings to new audiences, including health professionals in clinical practice, third-year University students (including medical students), and postdoctoral and other researchers exploring discipline-hopping.

Income, infrastructure and facilities

Our strategy for income-generation and infrastructure-development is directly aligned with our vision, values, and strategic priorities ([Section 1.4](#)). We seek to achieve resilience and sustainability by diversifying our funding sources, developing infrastructure specifically tailored to our needs, and leveraging our broader environment's exceptional facilities.

3.1 Funding strategy and research income

We seek to support researchers to develop visionary ideas responsive to public health need, aiming to:

- Secure long-term strategic funding aligned directly with our vision ([Section 1](#)).
- Attract awards that catalyse our interdisciplinary strengths and collaborations ([Section 1](#)).
- Maximise societal and health impact ([Section 1](#)).
- Actively promote principles of Equality, Diversity and Inclusion (EDI) ([Section 2](#)).
- Support talented individuals to secure personal funding at all career stages ([Section 2](#)).

The 170% increase in our competitive peer-reviewed funding between 2014 and 2020 is evidence of the success of this strategy. Since 2014, we have won GBP171 million in external funds.

Sources include major grants and awards from the MRC, Wellcome, NIHR, a range of charities (e.g. Alzheimer's Society, BHF, CRUK, Health Foundation), NHS Blood and Transplant, European Commission, European Research Council, US NIH, and industry (e.g. AstraZeneca, Biogen, Merck, Novartis).

Examples of our major funders



Overall, 41% of our funding derives from Research Councils, 25% from NIHR and government, 20% from charities, and 13% from EU, NIH or other competitive international sources. Notable awards that have supported new strategic developments have included:

GBP42.5 million award from the Health Foundation

GBP17 million award from PHE and the Food Standards Agency

GBP8 million award from UKRI for global health research initiatives

GBP5 million award from HDRUK.

The MRC provides core support to the MRC Epidemiology Unit (GBP27.9 million, 2020-2025) and MRC Biostatistics Unit (GBP16 million, 2018-2023). We also benefit from substantial portions of institution-wide awards, including the GBP114 million NIHR award to the Cambridge Biomedical Research Centre. Our highly engaged cross-sectoral strategy has resulted in significant investment in externally funded senior posts ([Box 16](#)).

Examples of our cross-sectoral partners funding faculty positions since REF2014



Box 16: Examples of senior posts supported by external funds, illustrating our cross-sectoral partnerships

- **NHS Blood and Transplant** has funded the Professorship of Donor Health and a Senior University Lectureship in Transfusion and Transplantation Data Science.
- **RAND Europe** has funded the Professorship of Health Services Research.
- **The Health Foundation** has funded the Professorship of Healthcare Improvement Studies.
- **The Baker Institute** of Australia has funded the Directorship of the Cambridge Baker Systems Genomics Initiative.
- **PHE** has funded a University Lectureship in Public Health.
- **A philanthropic donation and Trinity College, Cambridge** have funded a University Lectureship in Palliative and End of Life Care.
- **Cambridge University Hospitals** has funded the Florence Nightingale Foundation Chair of Clinical Nursing Research.

3.2 Facilities for research and research impact

We have world-class facilities designed to support high-quality research and research impact.

3.2.1 Campus facilities

Researchers in UoA2 benefit from the infrastructure and facilities of two of Europe's leading research campuses: the **Cambridge Biomedical Campus** and the **Wellcome Genome Campus**, located ~10km from each other.

UoA2 researchers are mostly accommodated on the **Cambridge Biomedical Campus**, Europe's largest centre for health and medical research, hosting 20,000 employees of the University, hospitals, industry (e.g. AstraZeneca, GlaxoSmithKline) and linked research institutes. Since REF2014, about **GBP1 billion has been invested in enhancing the campus's physical infrastructure**, with planning permission for 75,000m² of additional space. From 2021/22, further space will be made available for over 100 UoA2 researchers as part of the **Cambridge Heart and Lung Research Institute** (GBP60 million; [Section 1.4](#)).



From 2022, more than 100 UoA2 researchers will be based in the multidisciplinary Cambridge Heart and Lung Research Institute, now under construction.

The Wellcome Genome Campus, which hosts our **HDRUK-Cambridge centre**, is home to some of the world's foremost data-driven research organisations, including the Sanger Institute and the EMBL-European Bioinformatics Institute. In 2019, we established a dedicated molecular laboratory for multi-omics and microbiome assays at the Sanger Institute to support HDRUK-Cambridge's population health studies. Our long-term strategy is to leverage further the intellectual and physical environment of the Genome Campus, which **has seen GBP3.2 billion invested in scientific research, infrastructure and campus development during the past two decades**. In 2020, the Wellcome Trust and local planning authorities endorsed a 25-year Vision Plan to double the size of the 2500-person Wellcome Genome Campus.



Health Data Research UK's Cambridge site is based at the Wellcome Sanger Institute, one of several strategic collaborations between UoA2 researchers and the Sanger Institute.

Infrastructural support for IT and data

State-of-the-art secure IT, data transfer and storage infrastructure are critical for UoA2 research. As reflected in our use of data- and biosample-rich research resources, UoA2 researchers benefit from facilities that provide massive computational and data storage capacity, biosample facilities, and state-of-the-art analytical tools. Since REF2014, the University has made major investments in energy-efficient, resilient high-performance computing and data storage.

Built in 2015 (and costing GBP20 million), the **West Cambridge Data Centre** is the central hub for all University research computing, including the **Cambridge High Performance Computing Cluster** which we intensively access. Hosting the Peta-5 system, one of the UK's largest and fastest academic supercomputers, it was recently updated with EPSRC/MRC/University funding, including an MRC Research Infrastructure Award of GBP25 million. Through HDRUK-Cambridge at the Wellcome Genome Campus, we also **access one of the largest coordinated set of computing assets to the life sciences in the world**, which includes around 200PB of data and 100,000 compute cores.



The University's GBP20 million data centre supports UoA2's large-scale computational needs, using an innovative 'green' energy approach.

The **Clinical School Computing Service** provides IT support services, including a private fibre Granta Backbone Network connecting all UoA2 facilities. UoA2 has a dedicated secure storage area for personal identifiable and sensitive research data that complies with the NHS Digital Data Security and Protection Toolkit ('Standards Met') and has ISO27001 Certification, allowing transfer of data from NHS Digital and PHE.

We have access to high-quality storage facilities, storing over 5 million sample aliquots (e.g. plasma, DNA) from hundreds of thousands of participants across our studies, mostly at the National Biosample Centre (Milton Keynes) and Fisher BioServices (Bishop's Stortford). With support from the Cambridge BRC, we have developed a **Biosample Repository** that enables rapid retrieval/formatting of samples. With University and MRC co-funding, we are developing a biosample storage facility tailored to the specific needs of large-scale molecular epidemiology.

■ Collaboration and contribution to the research base, economy and society

Consistent with our mission, **Cambridge contributions to the research base, economy and society have been wide-ranging and impactful. They include creation of major research platforms and assets that benefit the community at large, interventions and improvements that benefit public health and health systems, global thought leadership, engagement with key external stakeholders, input into strategic decisions about research funding, capacity-building and leadership for major scientific journals.**

4.1 Contributions to research base, collaborations, networks and partnerships

Our research collaborations and partnerships are extensive, reflecting our productive engagement with stakeholders ranging from patients and the public through to industry and policy-makers. We benefit greatly from our ecosystem: Cambridge is one of six nationally recognised UK Life Science Opportunity Zones and one of the world's most successful innovation ecosystems, hosting more than 4,300 knowledge-intensive firms employing 60,000 people. This critical mass facilitates cross-disciplinary collaboration with our major academic and NHS partners, industry, and broader stakeholders.

We also benefit from multiple strategic facilitating and network-building structures, including the University's **Centre for Science and Policy**, which runs a high-profile hosting programme for senior stakeholders from government and industry to enable policy-makers better understand, value and marshal scientific evidence in decision-making, and the **Public Health Genomics Foundation**, a not-for-profit policy institute which transferred into the University in 2018. We help convene the **East of England Academic Forum**, a vehicle for collaborative public health work involving of all universities in our region.

Researchers in UoA2 have consistently demonstrated national and international leadership in coordinating **major research collaborations and consortia that serve as multi-purpose platforms** for epidemiology, public health, health services and policy research. These collaborations and consortia **benefit the scientific community at large**, and bring together previously unconnected researchers from leading institutions worldwide. Examples include:

- Breast Cancer Association Consortium
- Consortium of Investigators of Modifiers of BRCA1 and BRCA2
- Emerging Risk Factors Collaboration
- EPIC-InterAct and EPIC-CVD
- EU-InterConnect
- Global BMI and Mortality Consortium
- International Children's Accelerometry Database
- Ovarian Cancer Association Consortium
- Million Hearts Project.

We are involved in **multiple cross-HEI collaborative research platforms**. One example is **UK Biobank (UKB)**. Danesh, a member of its Strategic Oversight Committee, has co-led telomere

length assessment in all UKB participants with Leicester University. Wareham is a member of UKB's Enhancements Committee and chairs the Physical Activity Working group. Danesh and Wareham were PIs in the UK Cardiometabolic Consortium, which helped to fund genotyping in all UKB participants; Butterworth helped design the gene array used in UKB.

The Cambridge-led **NIHR BioResource** – which involves over 150,000 patients and healthy volunteers across England who have provided DNA and consented to join research studies investigating the links between genes, the environment, health and disease – has enabled hundreds of studies nationally since REF2014. Danesh and Di Angelantonio are PIs of component cohorts of the NIHR BioResource; Danesh also serves on the Operations Team.

We are closely involved in the national implementation projects of **HDRUK**, building national infrastructure in relation to multi-omics (Butterworth, Langenberg, Wareham, Danesh), multi-morbidity (Richardson), and natural language processing (Di Angelantonio, Collier [UoA26]). Other examples of our wide-reaching platform work include contributions to the GBP79 million **Our Future Health cohort** via its science working group (Di Angelantonio, Danesh) and gene array design group (Butterworth), and **Dementia Platforms UK**, in which Brayne and Richardson are investigators.

As described in [Section 1.7](#), we engage with stakeholders across multiple sectors from academia, government, policy and industry, as well as patients, patients' organisations and the public, illustrated by the **Blood Donation/Transfusion impact case study** ([Box 17](#)). Our guiding rationale is to enrich research perspectives, co-produce studies, and maximise impact.

A longstanding example is the **Cambridge Centre for Health Services Research**, a ten-year partnership between the University and RAND Europe, a not-for-profit research organisation, focusing on research that informs health policy and practice. Another example is **BigData@Heart**, a public-private EUR19 million consortium funded by the EU's Innovative Medicines Initiative that is developing data-driven translational research platforms, involving Cambridge, other universities, patient-focused networks, learned societies and industry.

BigData@Heart, a pan-European translational initiative, illustrates our multi-institutional cross-sectoral research approach



 UMC Utrecht	 CHARITÉ UNIVERSITÄTSMEDIZIN BERLIN	 ESC European Society of Cardiology	 ehn fighting heart disease and strokes european heart network	 UCL
 UNIVERSITY OF CAMBRIDGE	 ICHOM	 INCLIVA Instituto de Investigación Sanitaria	 KAROLINSKA INSTITUTET Karolinska Institutet	 UNIVERSITÄT HAMBURG Universitätsklinikum Hamburg-Eppendorf
 Med Law consult	 UNIVERSITY OF BIRMINGHAM	 UCR Uppsala Clinical Research Center Part of Uppsala University and Uppsala University Hospital	 thehyve	 BAYER
 NOVARTIS	 SERVIER	 SomaLogic	 VIFOR PHARMA	

Box 17: Example of cross-sectoral collaboration: NHS Blood and Transplant
(see **Blood Donation/Transfusion impact case study**)

Cambridge researchers and **NHS Blood and Transplant** (NHSBT), England's national blood service, have worked closely together to address the problems of the weak evidence-base for blood donation safety and efficiency.

In 2015, the NIHR Blood and Transplant Research Unit in Donor Health and Genomics was established in Cambridge, in partnership with NHSBT, Wellcome Sanger Institute and Oxford University. Studies are developed and delivered jointly to provide actionable, practical findings that directly benefit donors, recipients, and health systems. Findings are presented regularly to NHSBT's senior leadership team and to national government committees, ensuring our research has rapid impact.

Our findings have changed policies and practices in the UK, USA, Canada, and the Netherlands, contributing to improvements in blood supply, prevention of anaemia, and efficiency of blood services, as well as more personalised matching of donated blood with recipients.

4.2 Contributions to the economy

Our campus provides gross added value of GBP5 billion to our regional economy (CUHP economic modelling), drawing on the **Office of Translational Research** and **Cambridge Enterprise**, the University's Technology Transfer office, for comprehensive support to translate discoveries into health and societal improvements. Our contributions to the UK and global economy are wider-ranging, achieved through partnerships with industry, government and beyond to improve health and wellbeing.

We have delivered substantial **benefits for the NHS and UK economy by improving population health**. Our evidence-based prevention strategies for earlier detection and control of HIV, for example, have helped the NHS save at least GBP4 million per year since 2014, reducing healthcare costs associated with late HIV diagnoses (**HIV impact case study**). Our prediction tools have allowed better targeting of chemotherapy in women with early breast cancer, sparing 11,000 women from chemotherapy they did not need and saving the NHS many millions of pounds (**PREDICT impact case study**). Our development of more efficient and safer blood donation methods have enabled collection of an additional 40,000 litres of blood annually, equivalent in value to GBP10 million annually (**Blood Donation/Transfusion impact case study**).

We make multiple contributions to the economy through our extensive industry links. As well as working with small, agile companies (e.g. Huma, Nightingale Health, VITAS), we collaborate with and advise the pharmaceutical industry extensively, including Amgen, AstraZeneca, GlaxoSmithKline, Lilly, Merck, Novartis, Pfizer, Sanofi and Takeda. We have built several partnerships with companies in **Cambridge's innovation ecosystem**, exemplified by our partnership with AstraZeneca's Centre for Genomics.

To tailor our industry collaborations to research needs, we have adopted different models, including **pre-competitive consortia** (e.g. with Merck and Biogen to identify novel therapeutic targets), **multi-institutional public-private partnerships** (e.g. BigData@Heart), and **collaboration based on exchange of data from innovative assay technologies** (e.g. with SomaLogic and Regeneron).

Further serving the needs of the economy, **many UoA2-trained researchers have in recent years been appointed to key positions in industry**, including, for example: Freitag (Vice-President, Biomedical Data Science-Bayer); Howson (Senior Director, Genetics-NovoNordisk); Ishihara (Senior Epidemiologist-Roche); Lotta (Head, Cardiovascular /Metabolic/Musculoskeletal Genetics-Regeneron); Paul (Director, Cardiovascular-AstraZeneca); Scott (Senior Investigator, Genetics-GSK); D Thompson (Senior Scientist-Genomics Plc).

4.3 Contributions to research capacity-building

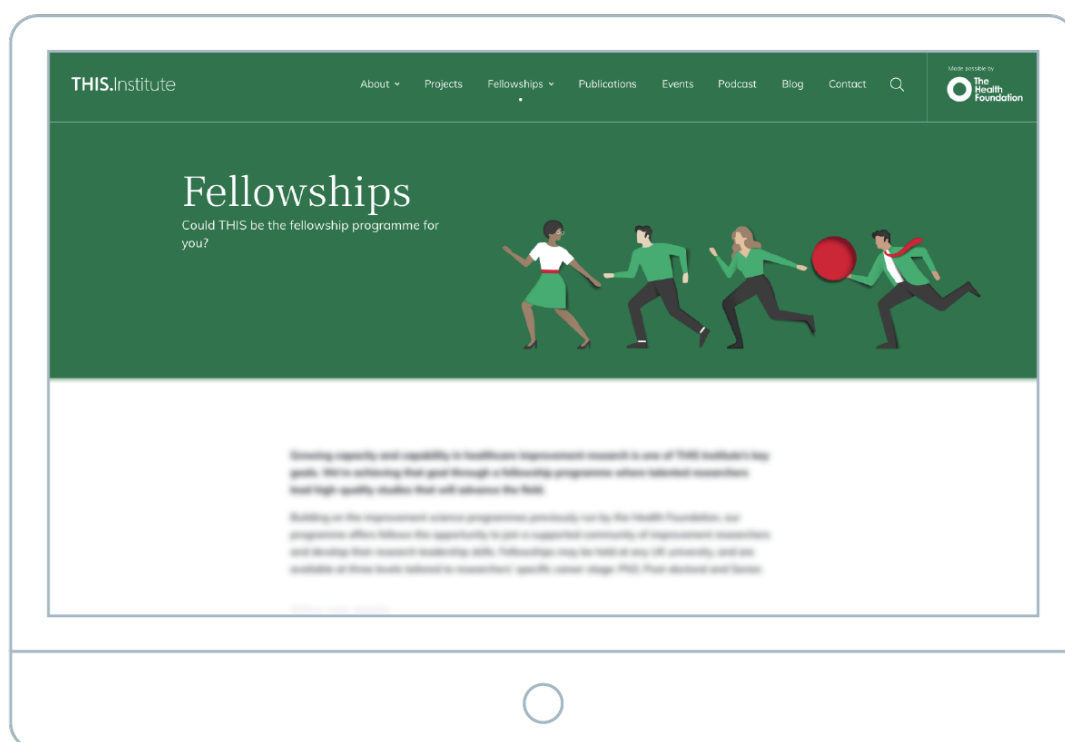
Through our education and training efforts, we make major contributions to economy and society by developing **highly-skilled clinicians and researchers** capable of providing leadership in the UK and globally. We have made a particular commitment, since 2014, to expanding opportunities for **clinical academic careers for nurses, midwives and allied health professionals** at Cambridge University Hospitals (lead: Deaton), including internships and predoctoral and postdoctoral bridging fellowships.

We **develop researchers** through our Masters and doctoral programmes ([Section 2.2.1](#)). We contribute to **academic researchers' professional development** by hosting **NIHR Academic Clinical Fellowships** in general practice, palliative medicine, and public health, and we provide **professional public health training** (e.g. most of the East of England public health trainees take our Masters course in Public Health). We lead and contribute to **major international training programmes**, including the WHO/International Diabetes Federation, the Swedish National Research School in General Practice, and multiple capacity-building initiatives in low- and middle-income countries. Many Cambridge trainees and early-career researchers have gone on to assume leadership positions in UK and international academia ([Box 18](#)).

Box 18: Examples of Cambridge researchers appointed to senior positions in academia since REF2014

UK	International
Farquhar (Professor, East Anglia)	Ekelund (Professor, Norwegian School of Sports Sciences)
Kellar (Associate Professor, Leeds)	Franco (Director, University of Bern)
Mander (Professor, Cardiff)	Lamé (Assistant Professor, CentraleSupélec, Paris)
Payne (Senior Lecturer, Bristol)	Pindis (Assistant Professor, University of Illinois, USA)
Peters (Reader, Imperial)	Saleheen (Associate Professor, Columbia University, USA)
Sharples (Professor, LSHTM)	Mukherjee Sach (Group Leader, DZNE, Bonn)
Sweeting (Associate Professor, Leicester)	Whitford (Professor, Dublin)
Walter (Professor, QMUL)	Willeit (Associate Professor, Innsbruck)
Wason (Professor, Newcastle)	Zheng (Group Leader, Hangzhou, China)
White (Professor, UCL)	

Cambridge makes a further important contribution through **THIS Institute's national fellowship programme**, which develops research capacity UK-wide in the study of healthcare improvement. Since 2018, it has made a substantial investment in the UK's capability for improvement research that benefits researchers, providing funding for stipend/salary and expenses at every level, from PhD to professorial, in 17 universities across the UK.



4.4 Supporting policy, practice and research strategy

Globally, UoA2 researchers at Cambridge are very well-represented on the WHO and other international bodies, where we make important contributions to science and policy ([Box 19](#)).

Box 19: Examples of our faculty's engagements with major international bodies

- Member, G8 dementia research summit organising committee (Brayne).
- Adviser, WHO HIV Modelling in Europe Group (De Angelis).
- Member, International Diabetes Federation (Forouhi).
- Member, European Society of Cardiology guidelines task forces (Deaton).
- Member, WHO cardiovascular risk prediction expert committee (Di Angelantonio).
- Member, US National Cancer Institute's PDQ® Cancer Genetics Advisory Board (Pharoah).
- Advisers, World Economic Forum and WHO on ageing (Van Bortel, Lafortune).
- Member, WHO expert committee on HbA1c in the diagnosis of diabetes (Wareham).

Nationally, Cambridge has key leadership roles in **major academic partnerships**, including the Turing Institute, HDRUK, NIHR School for Public Health Research, NIHR Applied Research Collaborations, NIHR BioResource and UK Biobank.

We are well-represented on **national policy bodies**, enabling scientific influence and contribution to policy-making. Our faculty have **significant roles in the National Institute for Health and Care Excellence (NICE)**, through membership of the Expert Advisory Group for the NICE Centre for Guidelines (De Angelis, Pharoah, Sutton), the dementia, disability, and frailty in later life prevention guidelines development committee (Lafortune), the technology-based interventions for behaviour change guideline committee (Sutton), and the implementation strategy group (Martin). We provide chairing for several guidelines committees (Mant) and the Public Health Programme Development Group on prevention of diabetes (Wareham), as well as the vice-chair of the Public Health Advisory Committee (Morris).

UoA2 researchers are highly active in **Public Health England**, including De Angelis, a team leader at PHE in statistical modelling of blood-borne viruses and influenza pandemic preparedness. Our researchers serve on the National Surveillance Committee (Brayne), Behavioural and Social Sciences Strategy Group (Sutton), and Advisory Panels for NHS Health Checks and National Diabetes Prevention Programme (Wareham). Examples of engagements with other national bodies are listed in [Box 20](#).

Box 20: Examples of our engagement with government, NIHR, and NHS

- SAGE for Covid-19 (Allara, De Angelis, Marteau).
- SAGE for Pandemic Influenza; Scientific Pandemic Influenza Advisory Committee (De Angelis).
- Infected Blood Inquiry (De Angelis, Dixon-Woods).
- Berwick Report on patient safety; Wachter Report on IT in the NHS (Dixon-Woods).
- Topol Review on healthcare workforce (Easton).
- Rehabilitation Working Group for the National Stroke Strategy (Mant).
- Cabinet Office Behavioural Insights Team; Director of DHSC-funded Policy Research Unit (Marteau).
- NIHR/DiabetesUK Diabetes Research Strategy Steering Group (Forouhi).
- NETSCC National Stakeholder Advisory Group (Martin).
- Committee on Medical Aspects of Ionising Radiation in the Environment, DHSC (Pharoah).
- DHSC Healthcare-Associated Infections Research Priorities Advisory Group (Sutton).

We have multiple **professional leadership roles**, including: Chair, British Psychological Society's Behaviour Change Advisory Group (Sutton); Chair, Faculty of Public Health Academic and Research Committee; working group member for the *AMS Health of the Public 2040 Report* (Brayne); President of the Royal Statistical Society (Richardson); President, UK Society for Social

Medicine (White); President, UK Society for Behavioural Medicine (White); and AMS representative for IAP statement on dementia (Brayne, Marteau).

4.5 Contributions to funding bodies and journals

Through leadership roles, our faculty have helped to build the strategic vision for population health research nationally and globally. UoA2 researchers have, for example, made significant contributions to the research base through participation in peer-review, funding panels ([Box 21](#)) and journal editorships ([Box 22](#)).

Box 21: Examples of our leadership contributions to major funding panels

Wellcome funding panels

e.g. Wellcome Population and Public Health Expert Review Group Board (Brayne [Chair]), Population Genetics Expert Review Board (Danesh [Deputy Chair], Easton), Wellcome Expert Review Group on Humanities/Social Science (Marteau [Chair], Dixon-Woods [Chair]).

MRC panels

e.g. Strategy Board (Wareham), Population and Systems Medicine Board (Danesh, Richardson, Wareham), Population Health Sciences Group (Wareham [Chair], White), Infection and Immunity Board (De Angelis), Global Health Group (Danesh), Methodology Board (Richardson, Sutton), HDRUK Review Panel (van der Schaar).

NIHR and NHS funding panels

e.g. NHSBT R&D Committee (Di Angelantonio), NIHR Programme Grants (Mant [Chair], Sutton), NIHR Health Services and Delivery Research Programme (Morris), NIHR In-Practice Fellowship Panel (Mant), NIHR Public Health Research (Morris, Wareham [Deputy Chair], White [Director]), NIHR Advanced Career Fellowships (Deaton), NIHR Programme Grants for Applied Research (Morris).

Major charity and international funding panels

e.g. Alzheimer's Society (Brayne [co-Chair]), BHF Chairs/Programme Grants (Wareham), BHF Projects Grants (Di Angelantonio, Danesh), BHF-Turing Institute (Danesh, van der Schaar), BHF Fellowships (Deaton), Gates Foundation Clinical Trials Advisory Board (Villar), Breast Cancer Now (Antoniou, Easton, Pharoah), CRUK Science Committee (Easton), Danish Diabetes Academy Committee (Griffin), Diabetes UK Research (Forouhi, Wareham), Genome Canada (Easton), German Federal Ministry of Education and Research (Sutton), Health Foundation (Martin), Health Research Board (Lafortune, Mant), Norwegian Health Association (Deaton [Chair]), Research Council of Norway (Sutton), Stroke Association (Mant).

Box 22: Examples of our faculty's contributions to journal editorial boards

- *Atherosclerosis* (Di Angelantonio)
- *Biometrics* (Barrett, Su, Villar)
- *BMJ Quality & Safety* (Dixon-Woods [co-Editor-in-Chief])
- *BMJ* (Dixon-Woods [Advisory Editorial Board])
- *Diabetes* (Wareham [Associate Editor])
- *Diabetologia* (Wareham)
- *European Journal of Cardiovascular Nursing* (Deaton)
- *European Journal of Epidemiology* (Brayne, Danesh)
- *European Journal of Preventive Cardiology* (Deaton)
- *Familial Cancer* (Easton)
- *Human Genomics* (Danesh)
- *Lancet Diabetes & Endocrinology* (Forouhi)
- *PLoS Medicine* (Adams, Brayne, Danesh, Langenberg)
- *Statistical Methods in Medical Research* (DeAngelis, Tom)



4.6 Recognition of research leadership

The achievements and standing of UoA2 researchers are recognised internationally through invitations to give prestigious lectures – including the Harveian Oration 2018 (Dixon-Woods) and Archie Cochrane lecture 2014 (Danesh) – election to learned societies, and major prizes and awards ([Box 23](#)). Since REF2014, crown honours have been awarded to Marteau (DBE), Brayne (CBE) and Richardson (CBE).

Academy of Medical Sciences fellows:

Brayne, Danesh, Dixon-Woods, Easton, Griffin, Mant, Marteau, Richardson, Wareham.

Current or recent past NIHR senior investigators:

Brayne, Danesh, Dixon-Woods, Griffin, Mant, Marteau, Sutton, Wareham, White.

Box 23: Examples of major prizes and awards to our faculty since REF2014

- **Académico de Honor, Royal Academy of Medicine of Spain** (Mant)
- **Basser Global Prize for BRCA1/2 research** (Antoniou, Easton)
- **Doctor Honoris Causa, University of Oslo** (Richardson)
- **Fellow of the Academy of Social Sciences** (Martin)
- **Helmholtz International Fellow Award** (Langenberg)
- **Honorary Fellowships of the RCP and RCGP** (Dixon-Woods)
- **Honorary Doctor of Medicine, Karolinska Institutet, Sweden** (Easton)
- **John Graunt Prize for Extraordinary Achievement in Population Sciences** (Pharoah)
- **MD h.c. Honorary Doctor Umeå University, Sweden** (Griffin)

4.7 Contributions to Covid-19 response efforts

Since 2020, our researchers have rapidly mobilised across our four priority areas ([Section 1.4](#)) to make wide-ranging, timely and **high-impact contributions to the Covid-19 response**, in collaboration with government and multiple partners.

Our **health data science** efforts have included regular statistical modelling of infections and deaths as part of SAGE (De Angelis, a member of SPI-M), biostatistical leadership of the adaptive trial design of RECOVERY (Jaki), and identification of early-predictors of adverse Covid-19 outcomes using machine learning (Astle). To characterise the interplay of cardiovascular co-morbidity and Covid-19, we have created a database of five billion records on 54 million people in England (Wood), in collaboration with the BHF Data Science Centre, NHS Digital and others.

Our **clinical and molecular epidemiology** efforts have helped monitor and control Covid-19, supporting COG-UK, the world's largest viral genome surveillance effort (Danesh). With HDRUK, we have created a publicly accessible Covid-19 risk calculator showing how age, sex and underlying health conditions can affect mortality rates in different scenarios (Langenberg). We have evaluated the population performance of lateral flow tests with PHE (Kaptoge), created an open-access platform to prioritise Covid-19 drug repurposing efforts (Pietzner), and contributed to the global Covid-19 Host Genetics Initiative (Butterworth). We have informed optimal safe restoration of the National Abdominal Aortic Aneurysm Screening following Covid-19 disruption (Harrison/Kim). We have re-purposed major cohorts, including INTERVAL (Di Angelantonio) and Fenland (Wareham), to track symptoms, biomarkers, antibodies, and health records related to Covid-19, contributing to the government's "pillar 4" testing.

Our **applied health research** efforts have evaluated the impact of wearing face coverings and other behavioural interventions as part of SAGE (Marteau, a member of SAGE and SPI-B), developed guidance for symptom management, family/lay carer administration of end-of-life care drugs during the pandemic (Barclay), developed new pandemic-secure pathways for obstetric emergencies in women (Dixon-Woods) and developed evidence on remote care of people with chronic lung disease (Martin).

Our **global health research** efforts have informed the government of Bangladesh's Covid-19 response through surveillance efforts in urban-poor and rural areas (Di Angelantonio), and

developed practice and policy recommendations to reduce the spread of Covid-19 among informal settlements in Africa (Oni, a member of Independent SAGE).

Our Covid-19 contributions have been recognised by **senior government officials** including the UK Government's Chief Scientific Adviser ([Box 24](#)), England's Chief Medical Officer, and Director General of the Covid-19 Taskforce.

Box 24: Extract from letter dated 11 June 2020 to the Vice-Chancellor from **Professor Sir Patrick Vallance, UK Government Chief Scientific Adviser**



Government
Office for Science

*In our work to understand and track the spread of this new coronavirus, we rely heavily on the expertise of our world-leading scientific community. The support we have received from so many institutions and academic teams has made a decisive impact on the valuable scientific advice we have been providing to Government through SAGE. I am hugely grateful for their efforts and would particularly like to highlight the continuing contribution of Professor Julia Gog, **Professor Daniela De Angelis**, **Professor Dame Theresa Marteau**, Professor Sir David Spiegelhalter, Dr Shaun Fitzgerald and Dr Joshua Blake to the work of SAGE.*

4.8 Conclusion

Our striking progress since REF2014 has led to scientific advances, societal impact and improvements in health and healthcare for many thousands of people in the UK and globally. Our efforts are guided by our strong values of scientific excellence, commitment to public health and the public good, respect for patients and communities, and creation of a positive, nurturing and collaborative research environment. Our future work will realise our vision for improving the health of populations through creating a compelling evidence-base in line with our strategic priorities.