Institution: University College London (UCL)

Unit of Assessment: 2 (Public Health, Health Services and Primary Care)

1. Unit context and structure, research and impact strategy

1.1 Overview: context and structure
The overarching aim of UCL's research in public health, health services, and primary care is to transform global well-being and prosperity by addressing major challenges in patient and population health and reducing inequalities across the globe. The 236 (208.1 FTE) staff in this Unit of Assessment (UoA) are scientists and clinicians working across four major themes (lifecourse, public health and health services; big data and advanced analytics; clinical trials; and global health) who work closely with the NHS, Public Health England (PHE), industry, and the third sector. This is an environment designed to ensure vitality, future sustainability and breadth, strength and depth in undertaking world-leading population health research. We realise our researchers' full potential and maximise our impact by creating and sustaining a physical environment and research culture that foster and actively promote interdisciplinarity, collaboration, enterprise, impact for society and the economy, the development of early scientific careers, and equality, diversity and inclusion (EDI) in everything we do. This is exemplified by:

- **Creation of a positive and diverse research culture:** our staff work within institutes that embed strong EDI principles, evidenced by two gold, two silver, and three bronze Athena SWAN awards, led by a dedicated unit-wide senior leadership role (Vice Dean for EDI).
- **Major investment in outstanding facilities and infrastructure:** significant investment in cohort curation, including the Bloomsbury Centre for Clinical Phenotyping (£2M), and in data science, establishing the UCL Data Safe Haven (£3.4M) and refurbishing the Institute of Health Informatics (£2.9M).
- **Innovation and strategic development:** the UCL Global Business School for Health (2020) and UCL Health of the Public (2019) were established, and new institutes created, including the Institute for Clinical Trials and Methodology (2013), Institute for Global Health (2013), and Institute of Health Informatics (2014).
- **Growth in research quality and achievements:** since 2014, more than 9,500 peer-reviewed research papers have been published receiving >236,000 citations with over 470 'highly cited articles' (top 1% in their field). Seventeen UoA2 researchers are Web of Science Highly Cited Researchers. UCL is now ranked 7th in the world and 2nd in the UK for Public Health Research (Shanghai Global Ranking of Academic Subjects 2020) and 7th in the world (1st in the UK) for Digital Health Publications (HealthXL's Digital Health Evidence Report 2019); as evidence of our achievements, 18 UoA2-returned staff are Fellows of the Academy of Medical Sciences, including its President, Professor Dame Anne **Johnson**.
- **Growth in research income:** since August 2013, new research awards totalling £350M have been secured. Research income (based on expenditure, as reported in REF4b) totalled £340M, representing >£233K income per FTE per annum compared with £131K in REF2014.
- **Major investment in training and early careers:** 20% of staff submitted are Early Career Researchers, testifying to our vitality, and the prioritisation of early careers activity. We have an extremely vibrant doctoral programme, with 284 doctoral awards made during the census period (up from 120 in REF2014).
- **External collaborations and Team Science:** our staff undertake significant external collaboration spanning many specialties and nearly all global regions, as evidenced by 57% of all published papers in the submission period having a co-author from a non-UK institution. Our environment fosters and actively promotes interdisciplinarity: 76% of staff in this submission are involved in interdisciplinary collaborations.
- **Research with policy impact:** we submit 10 impact statements (§1.5), and our policy impact is exemplified by our contribution to the COVID-19 response, including through

staff serving on SAGE and NERV-TAG, advising the House of Lords Science and Technology Committee, and leading major COVID studies feeding into government and public health policy.

The staff returned here are located within UCL's Faculty of Population Health Sciences (FPHS) plus five staff from other Faculties. FPHS (**Hart**, Dean) integrates population health with the broader research, teaching and innovation of the UCL School of Life and Medical Sciences (SLMS). Staff work in four institutes within FPHS: Institute of Epidemiology and Healthcare (IEHC; Director **Hayward**); Institute of Health Informatics (IHI; **Hemingway**); Institute of Clinical Trials and Methodology (ICTM; **Parmar**); Institute for Global Health (IGH; **Abubakar**). We also return staff whose research focuses on public health, primary care, or health services research working in the Great Ormond Street Institute of Child Health (GOS ICH; Smyth), Institute of Cardiovascular Science (ICS; **Hingorani**) and Institute for Women's Health (IfWH; David), all within FPHS, and five other departments outside FPHS (Statistical Sciences, Institute of Advanced Studies, Institute of Sport and Exercise Science, and Institute of Risk and Disaster Reduction).

The Unit is embedded within a highly networked wider research environment to enable collaborative and innovative research. Applied health research is supported by major infrastructure investment, including the NIHR CLAHRC and its successor, the ARC (§1.3). We align strategically with our partner NHS Trusts, co-locating staff with University College London Hospitals Foundation Trust; the Royal Free London Foundation Trust; Camden and Islington Foundation Trust; Great Ormond Street Hospital NHS Trust; North East London Foundation Trust; and Central and North West London NHS Community Trust. Our health informatics research platforms are regional, national and global, including through HDR-UK, and our global health research network extends through >60 countries to tackle some of the most challenging global health problems.

1.2 Research mission and delivery strategy

Our mission is to improve human health and reduce inequalities over the life course from preconception to old age, and across generations. We aim to deliver outstanding research, education and impact for improved human health globally. We do this by: (1) improving understanding of the foundations of health and aetiology of disease, (2) identifying, evaluating and implementing interventions and policies to promote health and improve health outcomes and disease management, and (3) continually developing our research workforce, infrastructures, interdisciplinary working and methodologies.

Our research is organised around four themes: Theme A - Lifecourse Epidemiology, Public Health and Health Services Research; Theme B - Big data and Advanced Analytics; Theme C - Clinical Trials and Methodology; and Theme D - Global Health and Partnerships (Figure 1). Key mechanisms for delivering our research and impact strategy across these themes are:

- **Focused Institutes and Research Centres** with clear, transparent and ambitious research strategies (§1.6).
- **World-class infrastructure** including cohorts, population surveys, translational health services research, and health informatics (§3).
- **Extensive national and international collaboration** using our public health, primary care and health services expertise to lead and contribute to synergistic collaborations and maximise the value of our outputs to the research community and public, for example, through UCL's Grand Challenges Programme, collaborative health services, applied research infrastructure, and NIHR policy research units (§1.3, §1.5, and §1.6).
- **Nurturing successful research leadership** within an effective research environment and infrastructure (§2.1). Providing excellent training and development opportunities, with internationally outstanding leaders in public health research. Since 2014, 42 UoA2 staff have been promoted to professorial grade (62% female), 56 to associate professor or equivalent (75% female), and 37 to lecturer, senior research associate, or senior research fellow (84% female).

- **Strong career development** through improved appraisal and career development, excellent support in writing skills (grants-person-ship), and our active Early Careers Networks, as well as priority given to career advancement of clinical academics with joint or honorary contracts with the NHS or PHE (§2.1).
- **Supporting sustained funding success** within longstanding research programmes, such as our MRC-funded cohort research, and through fellowships and standalone funding (§3).
- **Developing a fair and inclusive culture** through open discussion of issues such as racism, bullying and harassment and continued actions to address these (§2.3).
- **Excellent doctoral training programmes** with funding from Wellcome, MRC, and ESRC, and a track record of successful fellowship awards from these and other funders, including NIHR, health charities, and industry (§2.2).
- **Innovative and vibrant public engagement**, for example, we established the Co-Production Collective in collaboration with UCL Culture and with **Hart** as Chair of the Allies Group, with support from Wellcome (§4.4.4).
- **Interdisciplinarity**: UCL Health of the Public (co-Directors: **Hart** and **Johnson**) was created with investment from the UCL Provost's Strategic Development fund to bring UCL's transdisciplinary multi-faculty expertise together to improve health for all (§1.3.6)
- **Citizenship**: our staff serve as chairs or panel members for all major national and international grant funding and fellowship panels and contribute extensively to national and international policy and guideline development bodies, including NICE and WHO (§4.3).

LONGITUDINAL & LIFE COURSE RESEARCH
Epidemiology & public health
Behavioural science & health
Primary care & population health
Paediatric epidemiology
Cardiovascular disease

BIG DATA & ADVANCED ANALYTICS
Discovery science
Precision medicine
Public health
Learning health systems
Citizen driven health

CLINICAL TRIALS
Methodological research
Cancer trials
Infectious disease trials
(HIV, TB, COVID)

GLOBAL HEALTH RESEARCH
Climate, migration, conflict
Gender & global health
Women, children, adolescents
Infectious disease
Health economics
Non-communicable disease
Pragmatic trials
Modelling & evaluation

SLMS Research Coordination Office and Translational Research Office
European Research and Innovation Office
UCL Business and UCL Consultants
HDR-UK
UCL Partners Academic Health Science Centre/Network
University College London Hospitals NHS Foundation Trust
Royal Free Hospital NHS Foundation Trust
UCL Health of the Public
UCL Grand Challenges Programme
Global Engagement Office
Doctoral Training Centres

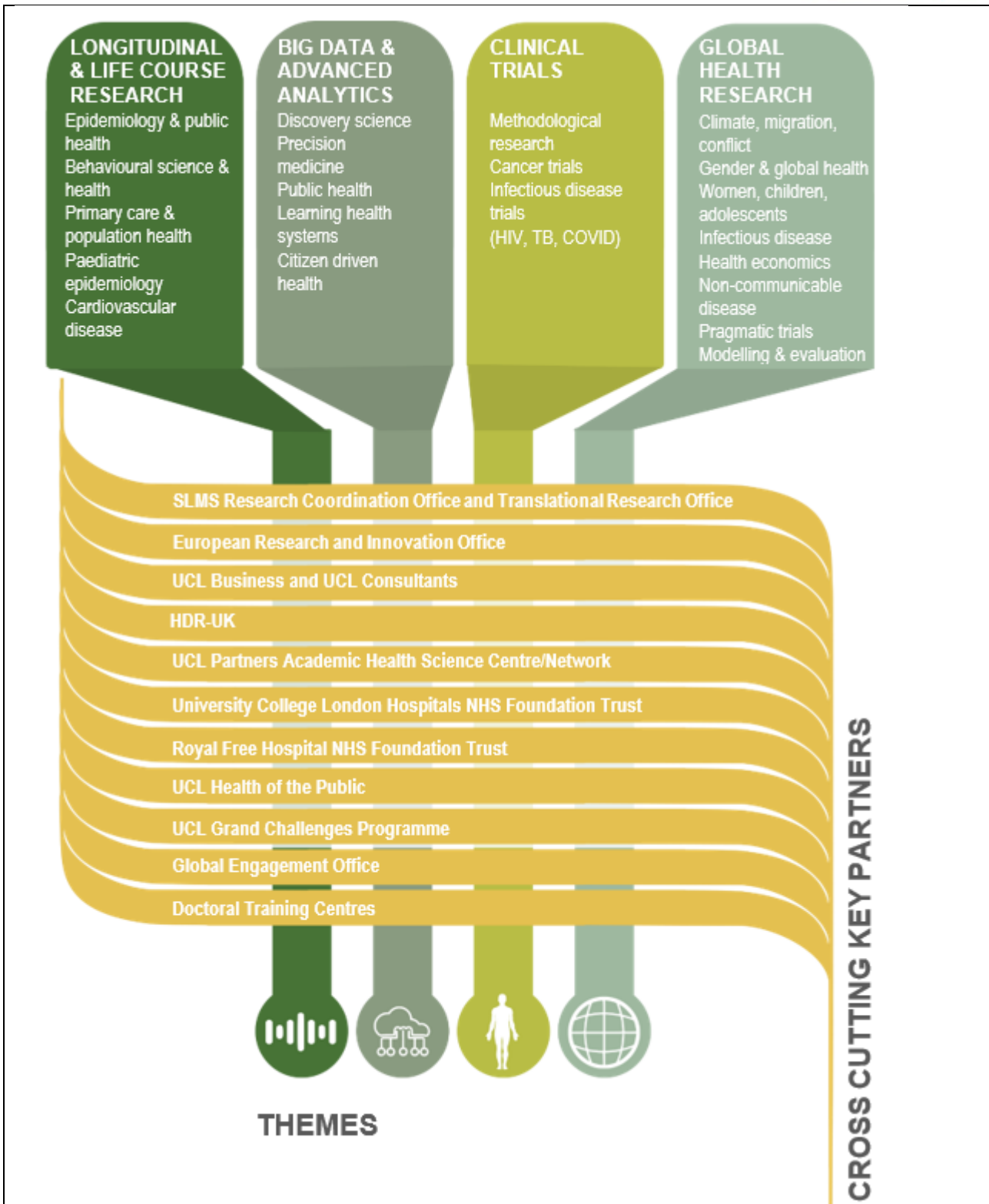**CROSS CUTTING KEY PARTNERS**

THEMES

Figure 1. Columns: research themes. Rows: key partners for facilitating research and translation.

1.3 Development of Research Environment since REF2014
Our REF2014 research strategy focused on developing the vitality and sustainability of our environment through growth and innovations, while enhancing existing successful programmes of work, through new staff appointments, staff promotions and resource allocation. Here we highlight key advances that have enabled us to successfully deliver on our 2014 submission priorities and maximise world class academic, clinical, policy, and non-academic impact.

1) In Theme A, we have continued to build on our existing strengths in **life course epidemiology and inequalities,** led by the Institute for Epidemiology and Healthcare (Director **Hayward**), and 24% of UoA2's submitted research output is based on analysis of our cohorts and major population surveys. Our unit hosts or has strong links to 14 of UK's population-based cohort studies, including the oldest and the newest British birth cohort studies, and the largest tri-ethnic UK cohort. Our strengths in life course epidemiology have been accelerated by the MRC Unit for Lifelong Health and Ageing, which joined in 2013. This has permitted greater collaboration with existing ageing cohorts held at UCL (Whitehall, English Longitudinal Study of Ageing, British Regional Heart Study) and with other groupings at UCL, including the Dementia Research Centre in the Faculty of Brain Sciences (directed by Fox, UoA4) and the Institute of Healthy Ageing in the Faculty of Life Sciences (directed by Partridge**,** UoA5). Core MRC investment (£400k) was augmented by £230k from UCL (§3.3), including the creation of a clinical phenotyping unit of healthy ageing with UCLH. We have also established close links with the UCL Institute of Education, strengthening collaboration with the Centre for Longitudinal Studies (CLS). CLS houses the remaining three UK national birth cohort studies (1958, 1970 and Millennium studies), and manages the ESRC/MRC Cohort & Longitudinal Studies Enhancement Resources (CLOSER) consortium, maximising the use, value and impact of the UK's leading cohort studies. We thus host the largest centre for birth cohort studies in the world with focused disciplinary expertise in longitudinal epidemiology.

2) We have strengthened **health services, primary care and applied population health research** in Theme A through the NIHR CLAHRC North Thames (Director **Raine**) and its successor, the ARC. This enables close working with local health services, local authorities and patient groups to identify and evaluate interventions that improve health and social care. The CLARHC and ARC link UoA2 to UCL Partners and over six million people in the UK's largest academic health science system, delivering patient and public centred population health research. UCLP now comprises >40 organisations, including the NHS, higher education, and local authorities. It is one of eight NIHR Academic Health Science Centres (AHSC), combining excellence in research, health education and patient care in applied public health research and evaluative practice. We are one of eight academic centres with excellence in applied public health research that together form the NIHR School for Public Health Research (UCL PI Michie (UoA4), with **Raine, Viner),** and one of nine academic centres for primary care research in England, forming the NIHR School for Primary Care Research (UCL PI, **Murray**)**.** We also host the NIHR Health Protection Research Unit (HPRU) in Blood Borne and Sexually Transmitted Infections with PHE (**Sabin,** £5M, 2014, renewed with £4M, 2019), reflecting that 16% of UoA2's outputs are studies of HIV and STIs. We co-host the UK Prevention Research Programme ActEarly City Collaboratory (§4.2)(**Hayward** (UCL PI, £6M), and the UCL Institute of Health Equity (**Marmot**), which has international reach on global policy in health inequalities. Together these investments provide an exceptionally vibrant research environment for public health, primary care, health services and applied research spanning a wide range of non-communicable chronic diseases (36% of our outputs) and communicable diseases (26%).

3) Our Theme B research in **big data and health informatics research** has been transformed by establishment in 2014 of the **Institute of Health Informatics (IHI)**, and 14% of our outputs are analyses of electronic health records or digital health interventions. Led by **Hemingway**, it was a founder member of the world's first national institute of data science for health (Farr Institute (2013-2018), now HDR-UK from 2018, with **Hemingway** as London hub director). IHI has cross-UCL support and funding, including from UCL Computer Science, and has attracted research income of >£15M since its creation; investment has expanded senior leadership from one to seven Professors. We also offer the largest portfolio of post-graduate teaching programmes in health informatics with >220 current postgraduate students, making a significant contribution to future generations of health informaticians. The CALIBER phenotype library (**Denaxas)** is the UK's research platform for reproducible, 'research ready' definitions of diseases from linked electronic health records across primary and secondary care. Used in hundreds of research publications, it has been recognised internationally (NIH), and adopted and expanded in HDR-UK, linking to The HDR-UK Gateway. IHI investigators informed the development of the British Heart Foundation Data Science Centre and are at the forefront of

methods to create cohorts in the first analyses on all 56M citizens in England in the NHS Digital Trusted Research Environment (**Denaxas, Hemingway**). This research environment underpins UCL's leading position (first equal with the Max Planck Society) in Europe for digital health publications (HealthXL, 2019) and first in the UK for medical informatics research (RAND independent report, 2014).

4) In Theme C, our ground-breaking work on **Clinical Trials and Methodology** has been enabled by establishing (2013) and expanding the UCL Institute for Clinical Trials and Methodology (ICTM), the largest of its kind in Europe; 28% of our research outputs are randomised controlled trials and 8% meta-analyses. The ICTM is a centre of excellence for clinical trials, meta-analysis and epidemiological studies that brings together four clinical trials units: the MRC Clinical Trials Unit (MRC CTU – **Parmar**), the PRIMENT Clinical Trials Unit (primary care, mental health and community care interventions - **Nazareth, Rait**), the Comprehensive Clinical Trials Unit at UCL (**Freemantle**) and the CRUK & UCL Cancer Trials Centre (Ledermann, UoA1). ICTM's influence on clinical research extends throughout UoA2 and the wider UCL community, as well as nationally and internationally. It has attracted research funding totalling £172M. The MRC-CTU was the core of the London Hub, and in 2018, this initiative became the MRC-NIHR Trials Methodology Research Partnership. The MRC-CTU was instrumental in setting up the London site for trials methodology (within HDR-UK, 2018) using electronic health records to increase recruitment efficiency and enhance outcome measurement.

5) **Global health research** (Theme D) has been strengthened by creating (2013) and expanding the UCL Institute for Global Health (IGH) as a centre of research and teaching excellence. 15% of our outputs are global health studies in low- or middle-income countries. Under **Abubakar**, IGH has grown to >150 staff in 2020, with eight Professorial appointments or promotions, including six women, in the past three years (**Prost, Sonnenberg, Rodger, Shahmanesh, Mercer, Skordis, Copas, Gilson**), and research income of nearly £40M. IGH houses The Lancet Countdown: Tracking Progress on Health and Climate Change, The UCL Lancet Commission on Migration and Health, and Global Health 50:50. IGH was the foundation host for the Global Alliance for Chronic Diseases (GADC) and incubated it to its current standing as an alliance of research funders. We work across >60 countries to give global reach and influence. IGH has developed strong synergistic research links with the Wellcome-funded Africa Health Research Institute (AHRI) in KwaZulu Natal, South Africa, including through jointly appointed staff (**Shahmanesh**), who enable cross-disciplinary research on disadvantaged communities with high burden of HIV. Our research shapes global policy on climate, migration and gender, maternal and child health, emerging and chronic infectious diseases, non-communicable diseases, and maternal and child health, and global health economics.

6) We recognise the importance that disciplines outside health sciences can make to research improving the health of the public. To strengthen **interdisciplinary research and collaboration**, our Unit works closely with UCL's eleven Faculties to create Domains including cancer, eResearch, food metabolism and society, microbiology, neuroscience, personalised medicine, and populations and lifelong health. In particular, the Populations and Lifelong Health Domain (led by **Johnson**) has reinforced links between population health in UoA2 and many other disciplines, including urban development expertise (Complex Urban Systems for Sustainability and Health (CUSSH)), infection and immunity (Africa Health Research Institute), computer science (Farr and HDR-UK) and through ActEarly (§4.2). In 2019, UCL further boosted cross-disciplinary population health by investing £0.5M to establish UCL Health of the Public, led by **Hart** and **Johnson**. This virtual School builds on recommendations in the Academy of Medical Sciences Health of the Public in 2040 report (**Johnson**) to change the paradigm of population health research to a truly transdisciplinary endeavour. UCL Health of the Public is developing new cross-disciplinary research communities, supporting strategic cross-disciplinary grant applications, developing new cross-disciplinary educational offerings, and showcasing UCL's expertise. In one recent example, UCL Health of the Public launched the 'Coronavirus: The Whole Story' podcast series to highlight UCL's cross-cutting research and expertise in tackling the COVID-19 pandemic; it had received ~30,000 listens by 31 July 2020.

1.4 Open Science, research reproducibility, and integrity

We are committed to research transparency and integrity, underpinned by the institutional statements/policies described in REF5a. All research in UoA2 meets UCL's Statement on Research Integrity (incorporating the principles of the UK Concordat to Support Research Integrity), Code of Conduct for Research, and Statement on Transparency in Research. We are committed to Open Science and signed the Declaration on Research Assessment (DORA) in 2015. UCL is a founding member of the UK Reproducibility Network. Extensive training and enabling mechanisms (including recognition in promotions criteria) have been developed (§2). UCL has research governance policies (REF5a) that underpin expectations about research conduct. The Code of Conduct for Research articulates the expectations and defines action to be taken in the event of suspected research misconduct. All issues relating to confidentiality and security in the use of patient and participant data fall under UCL's Data Protection policies and the Data Protection Office provides extensive training, guidance, and support.

Open Science is strongly embedded in our research environment and our Unit has access to UCL's centralised resources and procedures for implementation of open access compliance, including administrative staff time and training for all staff to make all publications available in UCL Discovery (REF5a). UCL Discovery provides free and unrestricted access to ~10,000 texts authored by UoA2 researchers. Of all UoA2 articles and conference papers that were accepted for publication from 1 April 2016, 97% have been deposited in UCL Discovery, are gold open access or qualify for exceptions, and 91% comply with or have exceptions to the REF open access policy.

Staff across UoA2 have led and contributed to initiatives to enhance research reproducibility, integrity, data sharing, and transparency. One third have published papers or undertaken activities that specifically promote research reproducibility, including defining guidelines or setting community standards. For example, **Murray** was part of a collaborative that developed the STARI guidelines to improve reporting of implementation research (*BMJ*) and **Field** led an international collaboration publishing a STROBE extension for reporting of research using metagenomics (*Lancet Infectious Diseases)*. Nearly half of staff made research data, software, or code available using open-source sharing platforms. Our health informatics platforms meet the research data management principles of being 'Findable, Accessible, Interoperable, and Reusable' (FAIR), as exemplified by the CALIBER platform (**Denaxas**). One third of staff have published research that reproduced key findings in their field, and a similar proportion contributed to best reporting practices, for example, pre-registration, full design, analysis reporting and publication of datasets.

1.5 Research and impact strategy

Achieving real world impact is at the heart of our work. This is exemplified by the impact studies developed for this submission; the initial strong "shortlist" of 23 statements was reduced to 10 based on our WTE numbers. Unsubmitted statements led to research impacts such as: improving bowel cancer screening uptake (**Raine**); improving the international management of lung cancer (**Burdett**); NHS reorganisation to reduce weekend mortality (**Freemantle**); supporting local, national and international bodies to address health inequalities (**Marmot**); improving HIV management in pregnancy (**Thorne**); improving childhood pneumonia outcomes in low-income settings (**Colbourn**); reducing the burden of diabetes in Bangladesh (**Fottrell**); promoting gender equity in international health organisations (**Hawkes**); changing the law on child physical punishment in Scotland (**Kelly**); national digital health interventions for diabetes (**Murray**); preventing childhood blindness (**Rahi**); increasing influenza vaccination of healthcare workers (**Hayward**); supporting return-to-school for children in the COVID-19 pandemic (**Viner**). Submitted impact studies had major influences on a wide range of stakeholders as summarised below.

These and other impacts of our research on society and the economy are maximised through development of strategies for patient, public, health service and policy involvement and engagement in research, extending the global reach of our research especially in low- and middle-income countries and enterprise support. We do this through engagement with the REF

Impact Team, UCL's Social Policy Unit, UCL Innovation and UCL Enterprise, UCL Grand Challenges, UCL Consultants and UCL Business (§3.2.2), the Academic Health Partnerships (AHPs), AHSCs, UCL Global Engagement Fund, UCL Public Engagement, and the UCL Co-Production Collective.

To achieve targeted and measurable research impact, our primary users and beneficiaries are:

- **Patients, their families and carers, and people at risk of conditions affecting health and well-being,** who benefit from: our work investigating the factors that determine health and disease in populations; our research developing, testing, and measuring the impact of interventions and service improvement to enhance the health and wellbeing of the public; and our efforts to reduce inequalities in health status. For example, in the field of HIV prevention, our research has changed global policy so that therapy is now offered to all people living with diagnosed HIV and includes the PARTNER study, which underpinned the hugely influential international U=U campaign (Undetectable = Untransmittable), which is endorsed by the World Health Organization (WHO) and all major global HIV organisations (**Rodger**, UCLUoA2_ROD). Our research on extreme health inequalities led to the world's largest ever health-led housing initiative (Every-One In), housing 35,000 homeless people during the pandemic (**Hayward**, UCLUoA2_COV). Our research on smoking cessation led to the annual Stoptober campaign (**Brown** and **West**, UCLUoA2_BRO).
- **Local, national and international healthcare providers** with whom we partner to unlock the benefits of patient data and make healthcare accessible to all. We rapidly disseminate and translate research findings into clinical and public health practice, and we establish standards of prevention, investigation, diagnosis and treatment. For example, we host CogStack, a platform that extracts data from unstructured text in electronic health records. The technology was cited in the UK Chief Medical Officer's Annual Report 2016, included as a flagship case study in the NHSX Report 'AI: How to get it right' and recognised in speeches given by the Secretary of State for Health. Analyses of the UoA2-hosted CALIBER research platform led to multiple changes to cardiovascular disease management and guidance (**Hemingway,** UCLUoA2_HEM). **Fulop** and **Morris's** research evaluating the impact of stroke service centralisation supported implementation in Manchester and informed the 2016 National Clinical Strategy for Scotland, 2016 National Clinical Guidance for Stroke, and 2019 NHS Long Term Plan (UCLUoA2_FUL). Research from our HPRU on blood borne and sexually transmitted infections (STIs) and from the National Survey of Sexual Attitudes and Lifestyles (Natsal) led to major changes in prevention and management of HIV and STIs (UCLUoA2_PHI; UCLUoA2_SON). **Shallcross'** research has guided policies to control COVID-19 in nursing homes (UCLUoA2_SHA).
- **Industry and entrepreneurs** with whom our researchers actively partner to improve policy, practice and guidance impact. We are extremely active in clinical trials where industry collaboration has been instrumental in achieving our goals. For example, the STAMPEDE trial for prostate cancer has received >£1M from CRUK and >£7M from industry (**Parmar,** UCLUoA2_PAR). We work with big tech, including a collaboration between Google DeepMind and the Royal Free Hospital NHS Foundation Trust to identify and manage acute kidney injury (**Raine**). Through UCL Consultants and UCL Business, we use commercialisation to support sustainability of specific interventions, for example HeLP-Diabetes, and widen our impact with real world stakeholders, for example, through the Institute of Health Equity (**Marmot**)(§3.2.2).
- **Government Departments, non-governmental organisations and other policy makers** via research units dedicated to generating the evidence base to inform policy, for example, through the NIHR Children and Families Policy Research Unit (**Gilbert**), the NIHR Obesity Policy Research Unit (**Viner**), and the NIHR Cancer Awareness, Screening and Early Diagnosis Policy Research Unit (**Raine**) (§4); through membership of key committees influencing policy through direct interaction; through input into NICE guidelines; and through advice to UK Government Departments and Ministers of State, all-party Parliamentary Groups, and House of Commons Select Committees, NHS

England, NHS Improvement, PHE and London structures including the Greater London Authority and Healthy London Partnership.
- **Media and cultural organisations and the public** through communicating our research findings with a broad range of audiences and through dialogue to inform our research priorities, including through 'It's All Academic: The Campaign for UCL' (§4).

We expect our academic staff to seek out and actively pursue opportunities to engage directly with external organisations and key research users in ways that result in the direct transfer of expertise and knowledge to transform and benefit society, as exemplified by our Impact Case Studies. UCL's promotions process, the Academic Career Framework (§2.1.1), explicitly recognises and rewards these activities.

1.6 Research themes
Below we describe our research aims and research environment organised by theme.

A) Lifecourse Epidemiology, Public Health and Health Services Research

Our unit has unrivalled resources in population and clinical cohorts across the life course. We use our extensive portfolio of population cohorts spanning prenatal/neonatal stages to old age to advance understanding of health, the development of disease and functional ageing. We also have extensive infrastructure and expertise in health services research spanning the community, primary and secondary care.

Our research aims are to:

- Tackle population-level socioeconomic and health challenges to enhance and extend healthy, economically productive, and socially connected lives
- Coalesce multi-disciplinary expertise in biomedical, social and engineering science to enrich the breadth and granularity of data collected in population studies and increase our ability to address complex questions
- Improve the delivery of health services and healthcare across community, primary and secondary care settings
- Train the next generation of scientists, and increase capacity, particularly through Fellowships.

Success will lead to increased cross-cohort working, methodological advancement and consistency in data collection, data-linkage and biomarkers, a cadre of researchers able to utilise cohorts to elucidate changing biological and social drivers of health, increased national and international impacts on health policy and practice and reductions in inequalities.

The main organisational units contributing to this theme are Epidemiology and Public Health (A1), Behavioural Science and Health (A2), Primary Care, Population Health, and Applied Health Research (A3), Paediatric Epidemiology (A4), and Cardiovascular Science (A5).

Strategic achievements in this REF period

(A1) Located within IEHC, the **Department of Epidemiology and Public Health (EPH)** (Director **McMunn**) undertakes life-course and populations surveys. The research environment includes some of the most important population health data resources globally: Whitehall II **(Kivimaki, Brunner)**; International Centre for Longitudinal Studies in Society & Health (ICLS), undertaking analyses of major ESRC investments, including the British Birth Cohort studies and Understanding Society **(Sacker, Kelly, McMunn)**; the Eastern Europe Research Group leading cohort studies across Europe **(Bobak, Pickhart)**; the Health Survey for England (HSE) **(Mindell)**; and the ONS Longitudinal Study, including follow-up of 1% of the Census in England **(Shelton).** The Institute of Health Equity (led by **Marmot**) develops strategies that reduce health inequities. The UCL Collaborative Centre for Inclusion Health **(Hayward)** seeks to prevent and redress the health harms of extreme social inequalities. For example, its work on 'Management

and Control of Tuberculosis in Hard-to-Reach Groups' led to WHO recommending Smartphone-enabled Video Observed Treatment for tuberculosis (UCLUoA2_HAY_VOT). The Centre's Inclusion Health Lancet publications influenced the Government's Rough Sleeper Strategy and creation of an Inclusion Health Unit at PHE. The UCL Centre for Dental Public Health (**Watts**) is a WHO Collaborating Centre for Oral Health Inequalities and Public Health. Three researchers are in the top 1% of highly cited researchers globally (**Marmot, Kivimaki, Brunner**).

(A2) The **Department of Behavioural Science and Health (BSH)** (Director **Steptoe**) investigates how human behaviour impacts health and health outcomes. The environment is highly interdisciplinary, applying health and social psychology, aetiological and health care epidemiology, psychobiology, exercise science, behaviour genetics, dietetics, communication sciences, and health services research to achieve better understanding of disease prevention, early detection, and prognosis. There are six research themes: Cancer Communication and Screening (**von Wagner**) has influenced methods to improve uptake of NHS cancer screening programmes; Epidemiology of Cancer Healthcare and Outcomes (ECHO) (**Lyratzopoulos**) has improved reporting of patient experience, diagnostic activity and stage of diagnosis metrics; Energy Balance and Cancer (**Fisher**) focuses on diet and exercise to support recovery from cancer; Obesity (**Llewellyn**) has a particular emphasis on the role of appetite on weight; the Psychobiology group (**Steptoe** and **Fancourt**) leads the English Longitudinal Study of Ageing (ELSA), which provides evidence underpinning policy to Department of Health and Social Care (DSHC), Department of Work and Pensions, DCMS, Department for Transport, and MHCLG. The group also leads on art, culture and health research. Research papers and consultancy with the UK Arts Council has led to health being a new priority in the 2020-2030 Arts Council England funding strategy and **Fancourt** led the WHO Review of Evidence on Art Interventions and Health. The UCL Tobacco and Alcohol Research Group (UTARG) (**West, Brown**) lead national surveys of smoking and alcohol behaviour (UCLUoA2_BRO).

(A3) The **Department of Primary Care and Population Health (PCPH) (**Director **Stevenson)** and the **Department of Applied Health Research (DAHR)** (Director **Raine**) drive innovative health services research across community, primary care and secondary care settings. PCPH is one of nine members of the NIHR National School for Primary Care Research (**Murray**). A major focus of the school has been capacity building (6 In Practice Fellows, 1 GP fellowship, 23 NIHR Academic Clinical Fellows and 6 Clinical Lecturers, and 11 postdoctoral fellowships since 2014), supporting the development of careers in primary care research. PCPH hosts the London Research Design Service (**Nazareth**) and the PRIMENT Clinical Trials Unit (**Nazareth, Rait**). PRIMENT evaluates complex interventions, medicines and psychiatric interventions in primary care and community settings with 34 completed projects and 15 currently supported. The Centre for Ageing Population Studies (CAPS) **(Walters)** collaborates with the UCL Institute of Neurology and Department of Psychiatry to improve care of dementia and other neurological diseases. **Walters** co-leads the Public Mental Health Programme, one of the three flagship programmes for the NIHR School for Public Health Research (2019-2022 NIHR). The eHealth Unit (**Murray, Stevenson**) develops digital technologies to improve health and health care including development, evaluation and implementation of a computer-based self-management programme for people with type-2 diabetes (**Murray**, NIHR). Sexual health work includes an interactive computer-based intervention for condom use training (**Bailey,** NIHR); Sexunzipped is now incorporated into the Brook website and Contraception Choices web-based decision aid. **DAHR** hosts the NIHR ARC North Thames (**Raine**). The Health Economics Group (**Lorgelly**) investigates health care and public health interventions. The Health Care Organisation and Management Group (**Fulop**) evaluates health service re-organisations and improvements. The Cancer Screening Group (**Pashayan**) investigates the role of genomics in cancer screening.

(A4) Focusing on **paediatric epidemiology**, the **Department of Population, Policy and Practice (PPP)** (Director **Rahi**) is located within the UCL Great Ormond Street Institute of Child Health (GOSICH) and thus part of the largest concentration of child health research in Europe (other GOSICH staff are submitted under UoA1). The environment fosters research to enhance child health and development through interdisciplinary team science, addressing the determinants of health and improving prevention, treatment and supportive care. **Stephenson**

and now **Gilbert** lead the NIHR Policy Research Unit for Children, Young People and Families (2010-2018). The policy unit was recently renewed (2018-2023). This places UoA2 staff at the heart of providing evidence to inform child health policy making, with regular meetings with DHSC, PHE and NHSE and the cross-government family policy group. Additional areas of focus include: maternal and childhood infections, including Zika in Latin America and HIV and TB in Eastern Europe **(Thorne)**; Child mental health, including psychological wellbeing in young people with epilepsy **(Shafran);** infant and childhood nutrition, including nutrition intervention studies using data linkage and integrated multisector community participatory research in India and the UK (**Fewtrell, Lakhanpaul)**; congenital Hypothyroidism, including the UK Collaborative Study of Congenital Hypothyroidism and British Paediatric Surveillance Unit Study of Hypothyroidism **(Knowles)**; eyes and vision, including harmonisation of measures across longitudinal cohort studies **(Rahi)**; and paediatric palliative care, including the Louis Dundas Centre conducting research with children with life-limiting conditions **(Bluebond-Langner)**.

(A5) The **Institute of Cardiovascular Science (**Director **Hingorani)** was founded in 2011 as a world-class centre of excellence in pioneering novel, integrative strategies in preventative and therapeutic cardiovascular medicine. The Research Department of Population Science and Experimental Medicine (**Hughes**) is submitted under UoA2. The environment is set up to develop, apply and exploit innovative and detailed non-invasive phenotypic characterisation techniques in observational studies and clinical trials to understand the aetiology, mechanisms and targets for intervention in cardiometabolic disease and hypertension. This includes the MRC Unit for Lifelong Health and Ageing, home of the 1946 Birth Cohort, as well as follow-up of the Southall and Brent Revisited (SABRE) cohort (**Chaturvedi**), and participants in ALSPAC (**Hughes**).

B) Big Data and Advanced Analytics

Health informatics research is a centrally supported strategic priority area of research and methodological innovation that underpins our research-enabling environment.

Our research aims are to:

- Deliver impactful research using health data and digital technology to deliver benefits to health and healthcare
- Harness and influence rapidly emerging opportunities in 'big data' for health-spanning patient data in electronic health records, genomics, mobile and wearables and wider societal data
- Establish a Data Lab as a service facility enabling efficient, tooled access to big data across UCL.

Success will lead to UoA2 retaining academic competitiveness in the national context of HDR-UK, many more UoA2 staff and other UCL scientists enriching their research with big data and artificial intelligence, increased clinical, healthcare and policy impacts, and income generation with industry collaboration for societal impact.

Strategic achievements in this REF period

Health data are increasing in size and complexity and the UK has some of the richest health data in the world. The UCL Institute of Health Informatics (IHI) has created an environment that specialises in utilising these data to better understand health and disease.

IHI's work is supported by leadership of major infrastructure grants (§3). HDR-UK currently has £220M under direct management, and IHI achievements inform strategic direction. The environment has a particular focus on pioneering electronic health record research in cardiovascular disease. This includes: improving the quality of care of patients with heart disease (**Hemingway,** NIHR, MRC, Wellcome, EU**)**; securing the first linkage of primary care records with a non-cancer disease registry, the myocardial infarction national audit project

(MINAP); and establishing the British Heart Foundation Cardiovascular Data Science Centre and the EU Big Data@Heart Programme.

CALIBER provides researchers with re-usable research ready phenotypes from primary care data (now for 10m patients with 400m person years of follow-up), linked to other sources. UCL led this initiative from 2010 and it has grown to become the HDR-UK national standard with around 1000 unique users per month (up from ~250 in 2018). This underpinned COVID-19 research on excess deaths in people with underlying conditions (**Banerjee),** including OurRisk calculator with 1.3M page views. IHI research also provided the first empirical demonstration during the pandemic of the radical drop in cancer diagnostic and treatment services, linking this to projected excess mortality **(Lai).**

Research in public health data science includes a wide range of research using electronic health records to understand antibiotic prescribing and guide antimicrobial stewardship (**Hayward**, **Shallcross** – ESRC, NIHR), research measuring health needs in vulnerable populations through data linkage, such as the Wellcome Million Migrant study and an NIHR-funded evaluation of homeless health services (**Aldridge**).

Gilbert leads a data linkage programme that integrates exceptionally rich and well-curated national administrative data for child and family health, social care and education, with economic, statistical and qualitative methods to ensure timely, relevant and robust evidence for policymakers. This has included leadership of Maternal and Child Health aspects within the CHAPTER grant (now HDR-UK), and partnership in the Administrative Data Research Centre led by the University of Southampton to analyse data from education, health, crime, environment, economic and welfare sectors. **Gilbert** also leads the Improving Public Health theme for HDR-UK 2018-23 across five London sites, and is a key partner in the UK Prevention Research Partnership network (UKRI, MRC).

C) Clinical Trials

We host one of the leading clinical trials centres in Europe (§1.3), bringing together expertise across the Unit and strengthening methodology within the field.

Our research aims are to:

- Improve patient outcomes through designing and running better and more efficient clinical trials
- Identify research questions that are relevant and important for key stakeholders, and the types of evidence needed to implement excellent research
- Maximise the likelihood of our research influencing policy, practice and future research.

Success will ensure ongoing knowledge transfer and exchange priorities to advance excellent, high-impact research that is relevant to policymakers, health workers and patients.

Strategic achievements in this REF period

The **Institute of Clinical Trials and Methodology (ICTM)** undertakes clinical trials, meta-analyses and cohort studies, focusing on cancer and infectious diseases, as well as on methodology.

We have developed a research environment with strategic expertise and achievement in the following areas:

Methodological research: The MRC network of hubs for trials (**Parmar**) was established to co-ordinate methodology research across the UK, develop new methodologies and train the next generation of methodologists. The CTU was the core of the London Hub, and in 2018 this initiative became the MRC-NIHR Trials Methodology Research Partnership. The London Hub

focuses on developing and supporting innovative methodology. For example, adaptive trial designs, multi-arm-multi-stage (MAMS) platform trials, new approaches to handling missing outcome data, and methods for meta- and network meta-analysis. The CTU was also instrumental in setting up the London substantive site for trials methodology (within HDR-UK in 2018) using electronic health records to increase efficiency of recruitment into trials and enhance outcome data collection.

Cancer Trials: The STAMPEDE trial, led by MRC-CTU (**Parmar**), has recruited over 10,000 patients with prostate cancer since 2005. The trial will report on ten randomised comparisons over 20 years, two of which have shown improvements in survival from adding chemotherapeutic agents (docetaxel and abiraterone) to long-term hormone therapy and changed clinical practice internationally (UCLUoA2_SYD).

HIV Trials: ICTM collaborates on the European HIV Vaccine Alliance (**McCormack**) and plays a major role on INSIGHT (International Network for Strategic Initiatives in Global HIV Trials) (**Babiker**, NIH), including SMART and START, which have redefined our understanding of HIV pathogenesis and informed global HIV treatment guidelines. The PENTA Foundation (**Gibb**) conducts RCTs in children and adolescents accelerating access to antiretroviral formulations for young people, and the CHAPAS trials collaboration (**Gibb**) has brought simple dosing of antiretrovirals to Africa. These trials have contributed to the licensing of child-friendly formulations by the FDA and/or WHO prequalification and led to an enduring programme of child and adolescent RCTs in Africa, for example, the BREATHER-PLUS trial.

Tuberculosis Trials: USAID and MRC co-funded the STREAM-1 trial that has led to reductions in treatment duration for multidrug resistant tuberculosis (MDRTB) and STREAM-2 which is assessing a fully oral MDRTB 9-month regime (**Nunn**). UoA2 also plays a key role in the TB Alliance TB-New Combination studies (**Crook**) and the MRC Truncate TB trial (**Crook**), as well as paediatric TB trials (**Gibb** and **Crook**) and TRUNCATE (**Paton**).

D) Global Health Research and Partnerships

The **UCL Institute for Global Health (IGH)** forms the strategic centre of global health research collaborations across UCL by convening and engaging the breadth and depth of expertise across the University (§3.1). Our approach combines interdisciplinary research with community engagement to develop and implement practical solutions to global health problems affecting the poorest communities.

Our research aims are to:

- Address global challenges through our disciplinary excellence and interdisciplinary approach
- Make UCL an accessible organisation, actively involved in public engagement and discussion on issues with the greatest impact on global health
- Continue inclusive research with disadvantaged and vulnerable groups, and building relationships with business and philanthropic partners
- Offer global leadership in the integration of research and education, underpinning an inspirational and excellent student experience
- Provide academic leadership in building a cadre of early-and mid-career academics to enhance our standing as a world-leading global health organisation.

Success will increase UCL's global recognition through our research, education and impact, and develop our global health research capacity. It will result in shared strategic vision and partnerships, and an increase in externally funded Fellowships and Chair positions for current staff, funded translational projects, and out-licensed IP, and improved income generation from enterprise.

Strategic achievements in this REF period

We seek solutions that address the social inequalities and determinants of health, as well as the underlying medical problems. Our Unit's researchers collect evidence in the real world, evaluate interventions with communities and put research into practice so we can provide practical solutions for policymakers. Our research spans global health at international and regional levels, as well as in the UK and Europe, where a major focus is on infections of global importance (HIV, STIs and TB). The cognate research groups forming our research environment are described below.

The Centre for Climate Change, Migration, Conflict and Health **(Seal, Kelman)**, hosts the Lancet Countdown: Tracking progress on health and climate change, (**Costello**, Wellcome) and the Lancet Commission on Migration and Health, which has impacted global migration and health policy (**Abubakar**); the Centre for Pragmatic Global Health Trials **(Copas)** aims to promote methodological excellence in the conduct of pragmatic trials and global clinical trials (e.g. low birth weight, contraception, tuberculosis, HIV testing), working closely with ICTM; the Centre for Gender and Global Health **(Hawkes)** promotes a transformative approach to gender and health in research, policy and practice. The Centre led the highly successful globalhealth5050.org programme reviewing gender equality in ~200 organisations.

The Centre for Clinical Research, Epidemiology Modelling and Evaluation **(Phillips, Sabin)** leads the NIHR HPRU in BBSTIs in collaboration with PHE, and has a long history of informing the management and control of HIV through leadership of cohorts such as the UK Collaborative HIV Cohort and the UK HIV Drug Resistance Database (**Sabin,** MRC) and partnership in the European Network of HIV/AIDS Cohort Studies (**Phillips**, EU); The Centre for Clinical Research in Infection and Sexual Health **(Gilson)** undertakes a wide range of studies to improve the clinical management and prevention of HIV, STIs and other infections. **Shahmanesh** works between UCL and AHRI and leads a research programme involving complex biosocial interventions (e.g. DREAMS and MTV-Shuga) to improve young adult health in rural South Africa (NIHR, MRC, Engineering and Physical Sciences Research Councils, the Bill and Melinda Gates Foundation, Wellcome, 3ie, and UNITAID); The Centre for Population Research in Sexual Health and HIV **(Mercer, Sonnenberg)** leads the ground-breaking National Surveys of Sexual Attitudes and Lifestyle (Natsal), which have directly impacted public health policy (UCLUoA2_SON). The Centre for Molecular Epidemiology and Translational Research **(Field)** drives transdisciplinary research incorporating molecular and 'omic technologies into large-scale clinical and population studies. This includes research on TB (EU-funded E-DETECT TB programme, NIHR RID-TB programme), STIs, and emerging infections.

The Centre for Global Non-Communicable Diseases (NCD) (**Fottrell**) focuses on NCD research in low, middle and high income countries; the Centre for Health of Women Children and Adolescents (**Osrin**) conducts research in India and Nepal to improve maternal and child health, sexual and reproductive health and mental health, and reduce violence against women and girls (the NIHR Global Health Group); the Centre for Global Health Economics **(Skordis-Worral)** conducts economic evaluations and is integral to the UCL health economics network convened by the Populations and Lifelong Health Domain. Their work developing priority setting tools (www.hiptool.org) in partnership with the World Bank, WHO and with funding from the Bill and Melinda Gates Foundation is informing international plans for Universal Health Coverage.

1.6.1 COVID research

Our Unit's expertise has been deployed in leading some of the largest observational studies of COVID-19 in the UK as well as a large portfolio of international RCTs on COVID-19 funded by NIH (**Pett, Babiker**). **Hayward** and **Aldridge** lead the Virus Watch study and the linked COVID-Equity study to understand community incidence, symptom profiles, and transmission of COVID-19 in relation to population movement, behaviour and sociodemographic factors (£3.2M & £1.9M, NIHR/UKRI). **Shallcross** leads COVID-19 research in care homes (VIVALDI 1 and 2), a study prioritised by the Chief Medical Officer (£6.9M, DHSC) to understand and control infection within staff and residents. **Fancourt** and **Steptoe** lead the COVID-19 Social Study, which is the UK's largest study into the psychological and social effects of the virus and pandemic control measures and involves >70,000 adults surveyed weekly to a total of >850,000 (£0.7M, Nuffield

Foundation). These studies already feed into policy groups including NERV-Tag, SAGE and subgroups, PHE, DHSC, Senior Clinicians Group (CMOs), JCVI, and WHO. COVID-19 clinical trials include ACTT (INSIGHT-10), which led to the fast-track approval of remdesivir, TICO/ACTIV-3, a MAMS trial of neutralising monoclonal antibodies in hospitalised adults with COVID-19, and the ITAC (INSIGHT-13) trial of immunoglobulin hyper-enriched for COVID-19 antibodies. The CTU's network for COVID-19 RCTs includes the UK, Greece, Italy, France, Mozambique, Ethiopia and Uganda (~\$2.3M). Our contribution to and impacts on COVID-19 policy are described below (§4.4.1).

2. People

2.1 Staffing, recruitment and development

The Unit attracts, develops and retains a cadre of academic leaders with international standing, through effective succession planning, a positive and supportive culture, and a comprehensive programme of support and development opportunities to ensure a vibrant and inspiring research environment. We prioritise empowering and developing staff, students and teams to reach their full potential, including through implementation of the RCUK Concordat to Support the Career Development of Researchers. To ensure that we are aware of any staff concerns, and to assist in the design of support mechanisms, UCL runs staff surveys biennially.

Our recruitment strategy comprises two main components developed with a firm commitment to EDI principles (§2.3.3). First, new UCL-funded positions, often associated with education initiatives, enable recruitment of outstanding staff in open competition (for example, **Mannell**, subsequently awarded a UKRI Future Leaders Fellowship). Second, we encourage, retain and integrate as many early career researchers (ECRs) as possible via fellowships of all kinds, to enhance their development and the vitality of our research teams. We support these staff as part of our investment in human capital that underpins our research environment, including bridging funds for ECRs between contracts (for example, **Lai,** Wellcome Trust Institutional Strategic Support Fund). The ablest ECRs move on to more senior fellowships and UCL-funded posts (for example, **Aldridge, Shallcross, Fancourt, Field, Devakumar, Harling, Davies**). As one indicator of the success of our strategy, four prestigious UKRI Future Leaders Fellowships have been awarded to UoA2 since their launch in 2019, with Unit-level support that included commitment to an open-ended position.

2.1.1 Appraisal and promotions

All UoA2 staff are appraised annually within the UCL Appraisal, Review and Development scheme, which includes setting of specific research, education, training, and personal development objectives. A constructive and robust appraisal process provides equitable support for promotion, mentoring and training. An appraisal season (January-March) was introduced in 2018 and engagement has vastly improved (at least 94% of staff had received an appraisal in 2019, compared to ~80% previously). To further improve appraisal quality, we have trialled an appraisal checklist, designed to ensure discussion about promotion eligibility and support, career development, mentoring, training requirements and work/life balance, and introduced an optional second appraiser in 2019.

Academic and research staff are recognised and rewarded via UCL's Academic Career Framework, which was comprehensively revised in 2017-18 to include explicit criteria and a broader outline of skills areas (including increased emphasis on teaching) across all career paths. Promotions are not contingent on securing grant funding but on ability and achievements, and the DORA commitments to research evaluation are recognised, as are contributions to Open Science. Whether academic staff deliver research or education, specialise in public engagement or enterprise, or focus on institutional citizenship, the framework ensures that impact is measured fairly and consistently. Since REF2014, 42 UoA2 staff have been promoted to professorial grade (62% female), 56 to associate professor or equivalent (75% female), and 37 to lecturer, senior research associate, or senior research fellow (84% female).

2.1.2.1 Nurturing leadership
Nurturing research leadership is a major priority, and we actively encourage and invest in UoA2 staff and enable their participation in UCL's leadership programmes. These include 'Women in Research' (undertaken by 8 UoA2 staff), 'Women in Leadership' (17 staff), 'Senior Women in Leadership' (10 staff), 'Emerging Leaders' for Black, Asian, and Minority Ethnic Staff (3 staff), and the flagship 'Future Leaders' programme (10 staff) that was co-developed by **Hart**. These programmes prepared many staff for significant leadership roles, including **Kelly, Lorgelly, Sonnenberg, Abubakar, Hayward** and **Skordis**.

2.1.2.2 Careers development, mentoring, and training
UCL's Academic Careers Office (ACO) promotes and supports all aspects of academic and clinical academic careers through a range of programmes and support schemes. Their career schemes give researchers the funding, skills and personal qualities necessary to succeed. One highlight is the *ADAPT to Thrive* series, where researchers share stories of their failures (*Festival of Failure*), aiming to normalise failure and build a more resilient research community. Other schemes include Eureka@UCL, focused on translational research, and Clinician Coders, which provides clinical academics with data science skills. ACO funding aims to provide skills training for all academics, including MRC Skills Development Fellowships, the Wellcome Clinical PhD Programme, the NIHR Integrated Academic Training Programme (responsible for training 52 Academic Clinical Fellows and 17 Academic Clinical Lecturers based within UoA2 from 2014-2020), and the UCLH BRC Education Academy. In 2019-20, the ACO trained >1000 UCL research staff. UCL also provides a comprehensive mentoring programme for academic and research staff, with mentors and mentees provided with online training, a mentoring framework, guidance, and a learning log.

We are committed to continuing professional development for all staff at all levels. All staff have protected time to complete 10 days per year of skills training and participate in diverse training schemes, including preparing early- and mid-career researchers as independent researchers (scientific writing, grant preparation) or for alternative career paths. Courses in fair recruitment and PhD supervisor training are compulsory for staff involved in recruitment or PhD supervision.

We fully participate in UCL's sabbatical policy, providing paid leave free from teaching and administrative duties, which is designed to enable staff to maintain a high calibre of research, scholarship, teaching and innovation. For example, **Mindell** took up a visiting Professorship at the University of Otago (2019) and **Sheringham** held a visiting Fellowship at the Nuffield Trust (2017). Other staff have taken secondment opportunities, for example, **Stephenson** was Chair of the UK General Medical Council (2015-2019) and Chair of the Health Research Authority for England (2019-).

2.1.3 Support for early career researchers
One fifth of staff submitted under UoA2 are early career researchers, testifying to the vitality of the Unit, and the prioritisation of early careers activity. All parts of UoA2 have dedicated programmes for development of researchers at the beginning of their careers. For example, through careers advice surgeries, chalkboard meetings supporting development of research ideas, and internal grant panels providing peer review to strengthen applications.

Career development and integration of early career researchers within UoA2 is supported by the UCL Health of the Public Early Careers Network (ECN). The ECN provides opportunities to meet peers, share experiences and initiate collaborations. Since 2014, the ECN has delivered >40 career development events attended by 100's of early career researchers, such as 'Get that grant seminars', as well as disseminating information about jobs, training, and funding. The ECN is also aligned with dedicated strategies for early career researchers embedded in Athena SWAN action plans.

UCL Careers provides additional dedicated support for UCL's postdoctoral community, including one-to-one advice, events and workshops. UCL also provides a comprehensive Research Staff Development Programme run by UCL's HR Organisational Development (OD) team, covering

core research and leadership skills. The OD team organised a Postdoc Appreciation Week (September 2019), including a festival of events to celebrate the largest community of researchers in the UK. The UCL Research Coordination Office (RCO) manages the Wellcome Trust Institutional Strategic Support Fund to enable support of UCL researchers at all stages of their career, with 22 awards made in the submission period (>£546k). UCL Excellence in Health Prize (1st prize £5,000, 2nd prize £2,000) is organised by the Populations and Lifelong Health Domain for early careers researchers, and includes support for career development, tailored mentoring, and research dissemination. The UCL Bogue Fellowship scheme supports postgraduate research students to visit North America (successful applicants from IGH and ICH).

Teaching opportunities are key to diversifying the skills portfolio of these staff. We provide dedicated training through UCL Arena Fellowships (accredited by the Higher Education Academy), and UoA2 staff have been awarded 75 Associate Fellowships, 54 Fellowships, 12 Senior Fellowships, and one Principal Fellowship.

2.2 Research students
Postgraduate training is a central feature of our research and scholarly activity. In total, 329 new postgraduate research (PGR) students enrolled in the REF period. The number of PGR students increased from 381 in 2017-8 to 417 in 2020-21. A total of 284 doctoral degrees were awarded in the REF period, an increase of 130% from REF2014 (120 awards). The Unit participates in several prestigious Centres for Doctoral Training, including the UCL-Birkbeck MRC Doctoral Training Programme (DTP), and others outlined below.

Our commitment to doctoral research training is evidenced by initiatives on recruitment, programme development, progress monitoring, equality and diversity initiatives, and integration into the research culture. The success of these is confirmed by Postgraduate Research Experience Survey data which show that for the latest survey (2019), overall satisfaction was 85%.

2.2.1 Recruitment
Recruitment to PhD training is strong, based on broad marketing (mainly digital), UCL's reputation, and active staff engagement with other HEIs, third sector organisations, and industry, as well as from within our extensive postgraduate taught programmes. We organise open days for prospective students with representatives from all PhD programmes and show-casing work from existing students. Selection processes are criterion-based and geared to ensuring equality. For example, offers are made in the Institute for Global Health by two senior academics on the basis of a research proposal, blinded to all personal details, and the Institute of Child Health is to trial blinding applications to gender, nationality, and ethnicity.

2.2.2 Current programmes
Central to improving the quality of doctoral training is increased enrolment in well-resourced 4-year PhD programmes, supported by the ACO (§2.1.2.1), all incorporating mentorship schemes, cohort-building activities, and specifically addressing equality and diversity, and mental health issues. Programmes hosted by our submission include:

- The UCL-Birkbeck MRC DTP, which is the largest MRC-DTP in the UK (£15M, 2016-2021). The programme funds 122 students on 4-year studentships, National Productivity Investment Fund studentships and MRC iCASE studentships; the latter working between UCL academics and industrial partners, including a wide range of large (e.g., GSK, Astra Zeneca) and small-medium enterprises. UoA2 leads the Population, People and Data Pathway (**Zaninotto**)
- The Soc-B Centre for Doctoral Training is a unique 4-year PhD programme in biosocial research (£4.6M from ESRC/BBSRC, with ~£3M from UCL, 2017-2028) and combines the strengths of UCL and the Universities of Manchester and Essex (Director, **Kelly**, UCL Co-Directors **McMunn** and Gibbon)

- The largest NIHR Academic Clinical Fellowship and Clinical Lectureship programme in England and Wales
- A Wellcome Clinical PhD Programme that has enrolled 33 students since 2014
- The ESRC UCL, Bloomsbury & East London (UBEL) Doctoral Training Partnership: Life-course and Social Epidemiology pathway
- The UKRI-BBSRC London Interdisciplinary Doctoral (LIDo) DTP, which is a trans-London partnership of eight leading research organisations including UCL, with Associate Partners including Unilever, Food Standards Agency, Animal and Plant Health Agency and Royal Botanic Gardens (£16M, 2015; £21.7M, 2020); it admits 55-65 students per year
- The UKRI-funded UCL Centre for Doctoral Training in AI-enabled healthcare systems (led by Rees (UoA4), **Taylor**), which involves the UCL/UCLH and GOSH/ICH NIHR BRCs
- NIHR HPRU in Blood Borne and Sexually Transmitted Infections PhD Academy (**Rait**)
- NIHR Applied Research Collaborations North Thames funded PhD studentships
- NIHR School for Primary Care Research PhD studentships
- NIHR School for Public Health Research PhD studentships

2.2.3 Sustainable doctoral training
Specific governance processes, reviewed regularly, ensure that training is effective and sustainable, and that students are well supported. All newly enrolled PhD students attend a comprehensive induction process.

UCL Doctoral School supports all PhD students and provides quality control mechanisms for monitoring progress. Departmental Graduate Tutors (DGT) are responsible for ensuring fair and equitable student recruitment, appropriate supervision, progress from MPhil to PhD registration, and thesis submission. DGTs also advise students about how to access additional resources and provide support if they encounter difficulties. All students are matched to an experienced principal supervisor, with subsidiary supervisors contributing specific expertise. Staff are required to attend a training course on PhD supervision before supervising and must act as a subsidiary supervisor before progressing to primary supervisor. DGTs ensure that new primary supervisors are supported by an experienced secondary supervisor. Ongoing professional development for supervisors is led by the UCL Arena Centre, including regular workshops covering topics such introduction to supervision (undertaken by 121 staff), examining doctorates (41 staff), and positive working relationships.

The ratio of research students per approved principal supervisor is currently 1.4:1 (2020-2021). From 2019/20, all newly enrolled PhD students have had Thesis Committees (TC) to support the student and principal supervisor, improve the student experience and facilitate early detection of any issues. TCs have specific responsibility for the student's personal development. Each TC consists of at least two members of staff and the subsidiary supervisor and meets with the student at least four times during a 3-year PhD programme. Additional support comes from our peer mentoring scheme, where all newly enrolled students are matched with a senior student. Research student committee representatives ensure that students' voices shape and influence our policy.

Closure of non-essential research facilities due to COVID-19 has created major challenges for UCL's doctoral researchers, and we are extremely conscious that PhD students may feel isolated. To support all PhD students, UCL rapidly implemented measures to ensure continuity of supervision, support, training, and funding throughout the closure and beyond. These measures include the UCL Stipend Extension Scheme to support final-year funded students in submitting their doctoral thesis, by underwriting stipend funding for up to three months, and a Faculty scheme to provide financial assistance to PhD students who are carers. The Financial Assistance Fund for Postgraduate Research Students (FAF-PGR) also supports students who are in unexpected financial need and prioritises students with children (particularly single parents), with disabilities, and who are self-payers. There has been a concerted effort to ensure that social support activities are in place, for example, virtual common rooms, drop-in coffee mornings, social media groups and the popular cross-Institute film club moving to a virtual arena. We also implemented training for supervisors on remote supervision.

2.2.4 Career development and support
Particular emphasis is placed on careers guidance and skills development via the Doctoral School, UCL Careers Service, and the student's Institute and research group. The success of these mechanisms is confirmed by first destination data from the Graduate Outcomes Survey: of UoA2 PhD students graduating in 2017-18, 89% went on to graduate-level full- or part-time employment, and 4% to further study, with a median starting salary of £39K.

All students participate in the Doctoral Skills Development Programme and/or appropriate departmental courses equating to two weeks/year. Research students regularly assess and plan their skills training needs in discussion with their supervisory team and TC. We offer >220 courses across the full range of skills that align with the Vitae Researcher Development Framework. Training courses and activities are assigned a points value and students must accumulate 60 points over three years, or 80 points over four years. Research integrity training is mandated using the Dilemma Game. Students also access support mechanisms available to early career researchers (§2.1.3), including the Early Careers Networks, and the UCL Careers Team, who are dedicated to helping students find the right path to ensure future career success. The service also advises on opportunities during students' time at UCL to develop employability skills, encourages internships, and puts on events, workshops and one-to-one services. This central support is complemented by dedicated career events run across UoA2 with talks from relevant charities, NGOs, and industries. UCL Train and Engage is our flagship public engagement programme for postgraduate research students offering public engagement training and online modules, with awards of up to £1000 to run public engagement projects.

2.2.5 Progress monitoring
Progress is monitored using an online Research Student Log, which documents academic progression and skills development. The Log records supervision meetings and includes important milestones, and discussions on academic, generic and transferable skills training and training points for review by the supervisory team and DGTs. Submission is timely as evidenced by 85% of full-time 2013 entrants completing within a four-year period, and 75% (15/20) of all part-time PhD students starting in 2011 submitting within the prescribed seven-year period. Special systems have been established to support part-time PhD students, many of whom are clinicians, research assistants and/or have caring responsibilities. Work plans are scrutinised by DGTs to ensure that students are given adequate time and facilities for their doctoral studies and not disadvantaged by competing responsibilities.

2.2.6 Integration into research culture
Doctoral students are integral to our research activity. Most of our students are involved in collaborative, often interdisciplinary, projects and all are affiliated with specific research groups within UoA2. They participate actively in these research groups: attending meetings, leading and contributing to articles, giving presentations of their work, and attending conferences. Senior PhD students have opportunities to supervise summer studentships. The UCL Doctoral Students' Small Grants scheme offers awards of £2,000 for pairs of doctoral students from different faculties who want to carry out research-informed, societally relevant, cross-disciplinary activities. Other research engagement opportunities include Soapbox Science, social hackathons, and science blogs.

Students are encouraged to present at research conferences. Typically, students present at one or two national and one international conference, with funds available from the Doctoral School, the School of Life and Medical Sciences and from Institutes. We organise an annual Postgraduate Research Poster Symposium, which includes short oral presentations and posters (with prizes for each) and offers students throughout UoA2 the opportunity to present their research and network with students and staff. Postgraduates are strongly encouraged to enter the annual UCL Three Minute Thesis competition (3MT) with local rounds organised at Institute and then Faculty and national level. In 2016, a UoA2 student reached the national final, while in 2018, a UoA2 student was a national semi-finalist.

Finally, a three-day postgraduate social epidemiology conference is held at Cumberland Lodge every year. The programme is organised by the PhD students, providing an opportunity for intensive exchange with researchers outside the individual student's research group.

2.3 Promoting equality, diversity and inclusion
Our commitment to embedding Equality, Diversity and Inclusion (EDI) at the core of the Unit's work is demonstrated by the creation of a dedicated UoA-wide senior leadership role (the Vice Dean for EDI) in 2019. The Vice Dean for EDI works closely with the Dean, Institute Directors, other Vice Deans and local Directors of Operations, and leads the development and implementation of UoA2's EDI agenda. They chair termly EDI committee meetings at Faculty level to facilitate uptake of initiatives, efficient use of resources and sharing of best practise.

The main benchmark of gender equality in the sector is Athena SWAN awards from Advanced HE. All staff within UoA2 work within Institutes with Athena SWAN action plans and six Institutes hold Athena SWAN awards; two gold, two silver, and three bronze (there is only one other gold award at UCL and 16 across the UK). An improvement or sustained achievement in these awards was achieved at a time when the scope of criteria was widened; GOS ICH successfully moved up from silver to gold and IGH from bronze to silver, while ICS renewed their silver award and IfWH submitted their gold renewal.

Alongside gender and race, we recognise that other protected characteristics can influence the experience of working at UCL. UCL's disability equality guidance materials were shared with all managers in UoA2 and highlighted on our EDI web pages. Support for our LGBTQ+ staff and students is highlighted by our promotion and support for Out@UCL and Trans awareness training, and staff are encouraged to include their pronouns in email signatures and meeting registrations. Staff in UoA2 are also members of institutional and national EDI committees and networks which promote equity across protected characteristics (gender, race, disability and sexuality). These include: Provost's Inclusion Forum, Race Working Group (Race Equality Steering Group), LGBTQ+ Working Group (LEAG), Out@UCL, UCL Women, UCL Menopause Network, UCL Astrea, Disability Working Group and Enable@UCL.

2.3.1 Staff and student profile
The staff demographic profile has remained largely stable over the census period, with exceptions noted below. UoA2 has a higher proportion of female staff (66%) than UCL overall (44%), and 17% are BAME, with equal proportions of BAME males and females. UoA2 has a high proportion of international staff (15% EU, 15% rest of the world (ROW)). Overall, 6% of staff have a disclosed disability, and 3% identify as LGBT+. The age profile of UoA2 staff is similar to UCL overall (one third of staff fall into each of 25-34, 35-44, and 45–64 age categories). The demographic profile is similar whether analysed by headcount or FTE, indicating no significant differences in the characteristics of staff who work part-time. The post-graduate research student population is 77% female, with 48% identifying as non-white (an increase of 16% compared to 2013/14). Most students (68%) are from the UK, with 7% EU and 20% ROW, and 11% have a disclosed disability.

We have achieved a positive trajectory in the proportion of women holding senior grades during the census period with an increase from 50% to 70% for Grade 9 and from 46% to 54% for Grade 10. We attribute this to improvements in appraisal processes (§2.1.1), structured support for promotion, mentoring programmes, and improved leadership training for women. We nonetheless recognise a continuing challenge in the lower proportions of female staff at higher grades and we are developing strategies to address this. A similar challenge can be seen for BAME staff; 13% of those at Grade 10 are BAME compared to 23% at Grade 7. While we have not seen the same improvements in our ethnicity profile over time, we have implemented strategies to drive improvement in these areas (§2.3.2 and §2.3.3).

The UCL Code of Practice for REF was strictly applied throughout the output review for determining whether staff should be returned, and best EDI practice was observed. All staff in UoA2 undertake mandatory 'Diversity in the Workplace' training and staff involved in preparing

the final output submission attended additional face-to-face REF-specific EDI training. Outputs were nominated by eligible staff members and reviewed by a total of 154 staff (43% M, 57% F). Overall, 59% of HESA2 staff returned are female and 12% are BAME staff, and these groups were equally or slightly more likely to have an output attributed when compared to their male or white counterparts. Our aim is that sustained and widespread engagement with UCL EDI initiatives, such as the Inclusive Advocates and Emerging Leaders programmes as well as the Carer's Fund initiative (§2.3.2), will continue to enhance vitality, equality, diversity and inclusivity within our environment.

2.3.2 Creating an inclusive environment through recruitment, training and support strategies

All recruitment interview panels must ensure representation in terms of gender and ethnicity. UCL's Fair Recruitment Specialist (FRS) initiative is firmly embedded as part of UoA2 recruitment processes. From 2018, it has provided a pool of six highly trained BAME staff to participate in recruitment to increase perspectives in decision-making, mitigate against 'cloning' and the perpetuation of current profiles, reduce the possibility of stereotyping and improve candidate performance by reducing 'stereotype threat'. We have committed to train at least 10 new FRS staff within UoA2 to further expand this programme.

We have funded and promoted Unconscious Bias (UCB) training since 2014 and mandated this for all staff participating in recruitment panels. Newly promoted staff to grade 7 and 8 will also be invited to attend UCB training.

We are mindful of the additional burden facing staff with caring responsibilities and the potential negative impact on their careers, particularly of women. To mitigate these effects, we set up a Carer's Fund in 2019 to enable staff with dependents to attend meetings, conferences, workshops, and engage in other work-related activities that might not otherwise be possible. To date, 32 UoA2 staff have received awards, largely for childcare costs. Case studies on the website help to advertise the initiative.

UoA2 is actively promoting and participating in UCL's Inclusive Advocates initiative; a new sponsorship programme designed to ensure high-performing, under-represented groups reach their full potential at UCL. Following a targeted campaign, UoA2 has recruited 17 advocates, the highest number within UCL.

To further support BAME staff, UoA2 has funded three places on the Emerging Leaders programme, UCL's flagship leadership development programme for BAME staff, and has encouraged uptake of the 'Accelerate to leadership' scheme which trains and develops future BAME leaders to create a diverse internal talent pipeline for senior professional services roles.

2.3.3 Well-being and research culture

We prioritise staff well-being, including through the UCL Workplace Wellbeing campaign, 'Five Ways to Well-being', which was joined by the FPHS Faculty Office. In response to the lockdown caused by the COVID-19 pandemic, we funded and co-ordinated 'Inclusive Leadership Training' which concentrated on how to better manage teams remotely. Other activities include 'connection cafes' to give online space for socialising, short meditation breaks, yoga classes, coffee morning meetings, an Institute 'zen zone', regular quizzes and books clubs.

To combat sector-wide concern about bullying and harassment in academia, 22 'Where do you draw the line?' training workshops were facilitated during the REF period. This involves small-group collective analysis of factors that might create and sustain environments in which harassment and bullying occur and empowers participants to address negative behaviours. Since 2018, twelve senior staff have participated in additional follow-up training, 'Taking the Lead', which encourages our leaders to consider their responsibilities in creating and maintaining positive workplace cultures.

A session on 'Micro-inequalities in Higher Education' was presented at the FPHS Professional Services Staff Conference in 2019. The session explored what is meant by micro-inequalities and aggressions and their impact, and on how all members of UCL can play a role in addressing these. To help reduce the emotional labour which can be placed on BAME staff in trying to address these inequalities, we have committed to promoting and co-ordinating race allies training throughout UoA2 in 2021. This aims to guide our white members of staff in advocating against oppression.

3. Income, infrastructure and facilities

3.1 Income

UoA2 researchers have secured competitively awarded research funding totalling £350M and spent research income totalling £340M. This represents an average research income of £233K per FTE per annum (increased from £131K in REF2014). We have received competitive awards from all major funders, including NIHR (£71M), Wellcome (£19M), MRC (£97M), Bill & Melinda Gates (£3.7M), and the European Commission (£15M), often funding international collaborations (§4). Since 2013, we have secured 56 fellowships or personal awards totalling >£21M, including two UKRI Future Leader Fellowships (FLFs). Two additional FLFs (>£1M each) were awarded in the census period, with 2021 start dates. In addition, we secured two Sir Henry Wellcome Postdoctoral Fellowships and a Wellcome-funded Sir Henry Dale Fellowship, as well as other awards from MRC, NIHR, Wellcome, Academy of Medical Sciences, ESRC, Cancer Research UK, and the European Commission.

3.2 Strategies for research income generation

We take a multi-level approach in supporting researchers to obtain and manage funding for their research. Key to this is the provision of dedicated central operational support offices (see also REF5a). A roadshow is organised for new starters and officers visit Institutes to advertise these activities.

The **SLMS Research Coordination Office (RCO)** promotes cross-disciplinary research communities and collaborations, supports research funding applications, and develops our health-related research strategy. The RCO team has 3.4FTE dedicated to supporting UoA2 and offers one-to-one support to research staff at all levels (~50% success rate for fellowships) as well as coordination of large-scale strategic award applications across multiple organisations (>£43M to UoA2). The team works across the lifecycle of applications, identifying relevant funding and fellowship opportunities, working with researchers to hone applications and navigate pre-award processes, and providing interview preparation. The RCO also coordinates internal research initiatives, managing UCL's Wellcome Institutional Strategic Support Fund (ISSF) award and QR GCRF award, which pump prime research (£0.5M ISSF and £2.2M QR GCRF supporting UoA2), and managing the UCL Excellence Fellowships Programme, which supports early career researchers in establishing independent careers (**Shallcross**).

The **UCL/UCLH/Royal Free Joint Research Office (JRO)** supports researchers within UoA2 in the set-up and oversight of clinical research in the UK. The JRO provides proportional and safe research governance, with clear standard operating procedures. Its Clinical Research Support Centre sponsors major academic clinical trials and works in collaboration with UCL clinical trials units such as PRIMENT.

The **European Research and Innovation Office** works to keep UCL at the forefront of European collaborations. UCL remains one of the leading participants in the EU's Horizon 2020 and the European Research Council funding programmes. The team offers dedicated proposal support services to UCL PIs and project management services to successfully funded projects.

3.2.2 Commercialisation, technology and knowledge transfer

UCL Business Ltd is the technology transfer company of UCL. Part of UCL Innovation and Enterprise, it has responsibility for commercialising UCL's intellectual property through licensing agreements and formation of spin-out companies. For example, UCLB supported the Healthy

Living for People with Diabetes (HeLP-Diabetes) programme to improve diabetes control and reduce health care costs (**Murray**). Following establishment of a spin out, Help Digital Community Interest Company, NHSE licensed the programme in 2018 with the aim to give four million people with type-2 diabetes free access to this evidence-based self-management programme.

However, our main approach to translation is in impacting on policy and practice. We use knowledge transfer through consultancy as one tool to ensure our staff can contribute their expertise directly to the needs of the NHS, Local Authorities, governmental organisations, third sector and industry. **UCL Consultants Ltd** assists with contractual, commercial and project management services when UCL's academic community engages with external clients and has attracted £7.8M to UoA2 since 2014. For example, the Institute of Health Equity (**Allen**) utilises consultancy models to translate decades of research on inequalities into city-wide, national and international policy, practice and investment (Pan American Health Organisation, $626k), and **Hawkes** led on the 'Sex, Gender and COVID-19 Project' producing the world's largest analysis of sex and gender in national COVID-19 policies (Gates, $600k).

3.2.3 Scholarly infrastructure
UoA2 researchers have access to **16 UCL libraries and other scholarly learning spaces**, including specialist collections: GOSICH Library (including UCL's Global Health and Development Collection), UCL Science Library, Royal Free Hospital Medical Library, and the UCL School of Slavonic and East European Studies Library. A team of librarians provides a responsive in-depth enquiries service, as well as information skills training for researchers (for example, systematic literature review and citation management). They support Open Research through administration of the REF OA policy and the UCL OA Repository (§1.4).

3.3 Major research infrastructure investments
The following major infrastructure investments were made in the census period.

- The Bloomsbury Centre for Clinical Phenotyping is a new, purpose-built environment dedicated to clinical research (**Chaturvedi**, £2M, UCL; **Hughes**, £1M, British Heart Foundation), supporting the MRC National Survey of Health and Development (NSHD) and other UK birth cohorts and clinical studies.
- The MRC Lifelong Ageing Unit was consolidated and refurbished (£632K), including to host the MRC NSHD (**Chaturvedi**, £10.8M, 2013-2019; **Chaturvedi**, £9M, 2019-2024, MRC).
- The North Thames NIHR CLAHRC (**Raine,** £10M, 2014-2019) and ARC (£9M, 2019-2024) drive services and applied health research.
- The NIHR National School for Primary Care Research (**Murray,** £34M across the nine members 2014-2021, renewed with £32M from 2021-2026), including a public mental health flagship programme (£3M, 2019-2022).
- The NIHR School for Public Health Research (£1.7M, 2017) is one of eight academic centres with (UCL PI Michie (UoA4), with **Raine, Viner)**.
- NIHR Policy Research Units for Children, Young People and Families (**Stephenson**, £8.6M, 2010-2018), Obesity (**Viner**, £4.8M, 2017-2022), and Cancer Awareness, Screening and Early Diagnosis (**Raine** (UCL PI), £1M, 2019-2023).
- The MRC (**Hemingway,** £2M) and UCL (£0.9M) invested in refurbishment of 222 Euston Road to create a state-of-the-art building for the Institute for Health Informatics (IHI).
- The MRC-led consortium funded the UK Farr Institute of Health Informatics Research (now HDR-UK) that, in London, brings together the combined strengths of university partners (UCL, LSHTM, QMUL), the NHS organisations in UCLP, and PHE (**Hemingway**, £9.5M 2013-2018 MRC and £4M of UCL investment).
- The HDR-UK London Hub unites all five of London's major universities in biomedicine and health (UCL, Imperial College, King's College, LSHTM and QMUL) to address national research priorities in data science (**Hemingway**, £6.9M 2018-2023 and an HDR-UK capital award of £1M in 2018-19).

- The UCL Data Safe Haven (£3.4M) provides a state-of-the-art solution for storing, handling and analysing identifiable data.
- The eMedlab high-performance computing facility (£9M, MRC) is a collaborative resource shared by UCL IHI, QMUL, LSHTM, the Crick Institute, Wellcome Trust Sanger Institute and European Bioinformatics Institute.
- The MRC Clinical Trials Unit provides cross-Faculty trials expertise (£48M, 2013-2021).
- The London MRC-funded clinical trials Hub (**Parmar**, £4.6M 2008-2019) focuses on methodological innovation to solve challenges in clinical trials.
- The UCL PRIMENT Clinical Trials Unit partnership (**Nazareth, Rait**, £1.9M, 2008-2023, NIHR) works across Primary Care and Population Health, Psychiatry, and Statistical Science departments.
- The UK Prevention Research Programme (UKPRP) Act Early (**Hayward,** £6.5M, 2019-2024, MRC) provides investment for transdisciplinary research to address wider determinants of child health.

3.4. Significant grant income
Examples of major funding include:

Theme A (Lifecourse Epidemiology, Public Health and Health Services Research): Our collection of **cohorts and surveys**, including the Whitehall II study, funded by the MRC (**Kivimaki**, £4.1M, 2013-2023), the ICLS, which undertakes analyses of major ESRC investments (**Sacker,** £2.3M, 2013-2018, ESRC), and the Health Survey for England (**Mindell,** £1.4M, 2015-2020); on **health inequities**, research on TB in hard-to-reach groups is funded by an NIHR PGfAR (**Hayward,** £2.5M, 2011-2017); to advance **Cancer research**, the CRUK funded CanTest, a collaboration across eight universities focusing on diagnostic cancer research (**Lyratzopoulos,** £4.8M), a Senior Clinical Scientist Fellowship (**Lyratzopoulos**, £1M, 2015-2023) and a programme grant on energy balance and cancer (**Fisher**, £1.7M). Our work on **ageing** is advanced through the English Longitudinal Study of Ageing funded by the ESRC, NIH, BHF, UK Government and NIHR (**Steptoe**, £10.3M, 2014-2020), the PD-CARE study on personalised care for patients with Parkinson's Disease funded by NIHR PGfAR (**Walters,** £2.2M, 2018-2023), the APPLE Tree programme, funded by ESRC/NIHR, which focuses on active prevention of dementia (**Walters**, £3.9M, 2019-2023), and NIHR/ESRC-funded work to empower better end-of-life dementia care (**Davies**, £4.7M 2019-2023). On **tobacco control**, CRUK has funded research advancing population and individual approaches to smoking cessation (**West** £3.6M 2017-2021). We have received large grants to **support arts and culture**, including the Wellcome-funded effectiveness and implementation grant on scaling health-arts programmes (**Fancourt**, £2M), the UKRI-funded MARCH study on social, cultural and community assets in mental health (£1.2M), and the AHRC-funded HEartS study, a joint venture with the Royal College of Music and Imperial College London exploring the health, economic and social impact of the arts (£1M). Large grants funding **applied health and primary care research** are from NIHR to undertake a rapid evaluation of service innovations in the NHS (2018-23, £2M), a mixed-methods evaluation of specialist cancer surgery services (RESPECT-21) (2015-2020, £1.3M), and the London research design service (**Nazareth**, £2.8M, 2013-2023).

Theme B (Big Data and Advanced Analytics): The NIHR UCLH Biomedical Research Centre established a research theme on Healthcare Informatics, Genomics, Omics and Data science (HIGODS) to leverage research in rich, real-time hospital data (£2.8M 2017-2022, **Hemingway**). For **Cardiovascular disease**, an NIHR PGfAR award to improve quality of care for angina and heart attack (**Hemingway**, £1.5M, 2009-2014); a Wellcome-funded study linking the national cardiac event register with primary care records and highly phenotyped cohorts, which established CALIBER (**Hemingway**, £1.2M, 2009-2014); BigData@Heart: Big Data for Better Hearts study funded by the EU (**Hemingway**, £0.9M, 2017-2022), and the NIHR-funded Cochrane Heart Group (**Casas Romero, Bebiano Da Providencia E Costa**, £2M, 2015-2025). For **Public Health Data Science**, major awards to control antimicrobial resistance, including the ESRC-funded PASS (Preserving Antibiotics Through Safe Stewardship) (**Hayward**, £1.6M, 2017-2020) and an NIHR Career Development Fellowship to advance precision antibiotic

prescribing (**Shallcross**, £1.1M, 2017-2022). **Aldridge** was awarded a Wellcome Career Development Fellowship to investigate and improve migrant health (£1.2M 2017-2022). For **child health, Gilbert** led the Administrative Data Research Centre for England (ESRC, £1.9M, 2013-2018).

Theme C (Clinical Trials): In the field of **cancer**, NIHR funded a trial of molecular selection of therapy in colorectal cancer (**Kaplan**, 2013-2020, £2M) and the ADD-ASPIRIN Trial (**Langley**, £7.1M 2014-2020) assessing whether aspirin prevents relapse after solid tumour therapy. Industry has funded major cancer trials, including the RAMPART trial of adjuvant therapy (**Meade**, £15M 2018-2030, Astra Zeneca), Phase III RCT of sorafenib for resected renal cell carcinoma (**Parmar**, £2.7M, 2013-19, Bayer PLC) and a trial in relapsing ovarian cancer (**Parmar**, £3.4M 2013-2023, Astra Zeneca). In **infectious disease research**, major HIV trials funded by NIH are INSIGHT (**Babiker**, 2013-2023, £1.9M) and START (**Babiker**, £10.9M, 2013-2023), with funding from the EU (European HIV Vaccine Alliance, **McCormack**, £1.6M 2016-2020), PENTA Foundation (**Gibb**, £5.3M, 2015-2020), and Janssen (CHAPAS-4 trial, **Gibb**, £3.3M, 2017-2023) to investigate new second-line antiretroviral drugs in children with HIV. We also lead major TB trials, including STREAM-2 to assess a fully oral regime for multidrug-resistant TB (Janssen/IUATLD**, Nunn,** £6.1M, 2015-2020), new combination studies (TB Alliance, **Crook**, £1.7M 2018-2023), and the Truncate-TB trial, comparing novel combination regimens for drug-sensitive TB (MRC, **Crook**, £5M, 2014-2020).

Theme D (Global Health Research and Partnerships): Broad collaborations such as the Wellcome-funded Lancet Countdown on climate change (**Costello**, £5.5M, 2018-2023), and contributions through the Global Challenge Research Fund Hubs (2019-2024), Accelerating Achievement for Africa's Adolescents Hub led by Oxford University, South-South Migration Hub led by Coventry University, and Gender, Justice and Security Hub led by LSE (combined value of £1M). In **South Asia, Osrin** has a Wellcome Senior Research Fellowship (£2.4M), leads the NIHR Global Health Group, and undertakes Wellcome-funded cluster RCTs to prevent violence against women and children (£1.9M, 2011-2017), and **Fottrell** leads work on diabetes control (MRC, £1.5M). In **Africa, Colbourn** leads work on reducing childhood pneumonia in Nigeria, (Save the Children, UK/GSK partnership, £1.7M), and **Harling** holds a Henry Dale Fellowship to understand HIV epidemics through research on social networks (Wellcome, £1.2M). In the **UK and Europe**, our research focuses on infectious diseases with global importance, including through Natsal-4 (Wellcome/ESRC/DH, **Mercer, Sonnenberg**, £7.2M, 2019-2024), the NIHR HPRU in HIV, STIs and BBVs (**Sabin**, £4.5M 2014-2020, renewed 2019), the UK Collaborative HIV Cohort and UK HIV Drug Resistance Database (MRC**, Sabin**, £2.1M, 2014-2019), the European Network of HIV/AIDS Cohort Studies (EU**, Phillips**, £1.7M 2011-2015), HIV prevention and testing strategies among men who have sex with men (NIHR, **Rodger,** £1.4M, 2015-2020), and HPV treatment and prevention (NIHR**, Gilson**, £1.2M. 2013-2018). **Abubakar** leads a TB research network, including RID-TB (£2.5M, NIHR PGfAR, 2018-2023), E-DETECT TB (£1.8M, 2016-2019, EU), and collaborates through the Pan-African Network for Rapid Research, Response and Preparedness for Infectious Diseases Epidemics (PANDORA-ID-NET), which funds a multidisciplinary 'One Health' initiative in Africa (€10M, European and Developing Countries Clinical Trials Partnership).

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

4.1 Major institutional collaborations
Institutional collaborations underpin much our research. **ELSA** (§1.6.A2) is a major collaboration between UCL (**Steptoe**), the Institute for Fiscal Studies, NatCen Social Research, and the University of Manchester, which contributes to harmonization of cohort data internationally, including in the US, Europe, China and India. **The Lancet Countdown: Tracking Progress on Health and Climate Change** (§1.3, §1.6.D) brings together 35 leading academic institutions and UN agencies from every continent (**Costello**). The collaboration tracks annual indicators of progress, empowering the health profession and supporting policymakers. UoA2 (**Lyratzopoulos**) collaborates through **CRUK CanTest** (§3.4), a collaborative network of nine Universities (four in the UK, and in the US, Netherlands, Australia, and Denmark).

Many of our major institutional collaborations focus on improving health care delivery. Through **UCL Partners** we collaborate with >40 organisations across the NHS, higher education, local authorities, and industry and 6M citizens to improve patient care and population health. Our contribution to the **NIHR Applied Research Collaboration** represents a major initiative in applied health research with multiple successes (§1.3, 3.4). UoA2 played a leading role in establishing and developing the world's first national institute for data science and health. Initially the UK Farr Institute (2013-2018, a collaboration of 18 UK universities and four sites), UoA2 investigators made significant contributions to expanding to its successor **HDR-UK** (2018 onwards, 22 universities, seven sites, Alliance, Hubs and Gateway), which has now been established as the MRC's 5th Institute. UoA2 investigators who have shaped HDR-UK inter-institutional research priorities include **Denaxas, Gilbert, Parmar, Sydes,** and **Hemingway.**

UoA2's extensive work in clinical trials positions it at the heart of major trial networks and collaborations, including through the **UKCRC Registered Clinical Trials Units Network** and the **UK Clinical Research Network** (§1.3, §1.6.C). UoA2 was the core London Hub of the **MRC Network of Hubs for Trials Methodology Research (HTMR),** established to co-ordinate methodology research across the UK, develop new trial methodologies and train the next generation of methodologists. The network was initiated in 2008, and in 2018 became the **MRC-NIHR Trials Methodology Research Partnership**. The MRC CTU collaborates with >60 countries worldwide, and collaborative trials have had notable impact, including as part of the **International Network for Strategic Initiatives in Global HIV Trials** (§1.6.C).

Our work involves collaborations with many international health organisations. This includes **AHRI, World Bank, WHO** and **European Centre for Disease Control (ECDC).** The latter supported the **TB in Cities Group,** which led to further investment of EUR15M by the EU. UoA2 also leads the SHAER Partnership of civil society organisations and academia from Afghanistan, Kashmir, Turkey, South Africa and Tunisia, addressing trauma from gender-based violence.

4.2 Individual and team collaborations
Our Unit's institutional-level collaborations act to stimulate individual and team level collaboration: 89% of staff have collaborated with other UK organisations, and 86% with international organisations. Almost all UoA2 clinical trials benefit from collaborations, such as the prostate cancer PROMIS Trial (**Brown**) across 11 UK specialist hospitals and five academic institutions, and the Add Aspirin trial, collaborating with >120 hospitals nationally (**Langley**). While observational research such the National Surveys of Sexual Attitudes and Lifestyles (Natsal) have provided evidence underpinning public health policy, practice and research related to sexual health for >25 years through collaborations with policymakers and clinicians (**Mercer**, **Sonnenberg**; UCLUoA2_SON). Collaborations are frequently interdisciplinary, such as the NIHR Cancer Awareness Screening and Early Diagnosis Policy Research Unit (Deputy Director, **Raine**), a collaboration of 13 leading scientists from seven institutions working in partnership with the NIHR Health and Social Care Workforce Research Unit at King's College London. The formation of such interdisciplinary collaborations is supported by seed-funding initiatives under UCL Grand Challenges and through institute-wide, interdisciplinary research domains, including the Population and Lifelong Health Domain. **Hayward** was co-director of the UK-Prevention Research Partnership ActEarly, a City Collaboratory approach to promote good health and wellbeing. This highly interdisciplinary partnership (bringing together researchers from transport, built environment, education, law, social determinants, epidemiology, public health, economics, modelling and geography) between Bradford and Tower Hamlets Local Authorities is developing strong links with communities to tackle the wider determinants of child health and establish strong local research cultures (**Fancourt, Aldridge, Sheringham)**.

UoA2's research has wide international reach in South Asia (research leadership on violence against women and mental health: **Osrin**), USA, EU, South America (TBVac Study in Brazil, **Abubakar, Devakumar**), Australia (RCT methodology, **Pett**), China (psychological wellbeing in children; **Hesketh**), the Middle East (childhood nutrition: **Skordis**), South Asia (childhood

infections and nutrition; **Lakhanpaul, Heys**), and sub-Saharan Africa (women and children's health: **Hill**).

External collaborations are supported by honorary research positions (**Category C staff**). In total, 368 individuals, many with NHS appointments, held such positions on the census date, with 40 at professorial level. In addition, UoA2 hosted more than 25 visiting academics from across the globe for >12 months, including Brazil (**de Oliveria**), Japan (**Brunner**), New Zealand (**Murray**), China (**Steptoe**), USA (**Mercer**) and Europe (**Bobak**).

4.3 Contribution to the research base

- 51% of staff have served on national/international grant committees (**Law:** Chair, UKRI MRC Applied Global Health Research Board; **Sabin**: Chair, ERC Advanced Grants Panel; **Hart:** Chair, MRC Public Health Intervention Development Panel, DfID/MRC African Research Leader Scheme, and MRC Adolescent Health in LMICs, 2019)
- 24% of staff have been elected to learned societies/academies (including **Johnson:** Vice-President and now President, Academy of Medical Sciences) and 21% to other professional bodies (**Viner:** President, Royal College of Paediatrics and Child Health; **Fancourt**: Chair, Royal Society for Public Health Special Interest Group Arts & Health; **Fulop**: Chair, Health Services Research UK; **Johnson**: Chair, UK Committee for Strategic Coordination of Health of the Public Research)
- 52% of staff have given keynote lectures and 58% have contributed to organising conferences or meetings for their research community (**Murray:** Chair, Scientific Programme Committee, Medicine 2.0; **Banerjee**: keynote speaker, European Society of Clinical Pharmacy)
- 46% of staff have served on editorial boards (**Skuse**: Editor, British Journal of Psychiatry International; **Smith**: Deputy Editor, Journal of International AIDS Society) and 87% regularly peer-review academic publications.
- Two-thirds of staff have examined doctorates and 76% regularly referee grant proposals from across the spectrum of funders, including MRC, Wellcome, UKRI, ESRC, NIHR, and Cancer Research UK (CRUK).
- Major prizes and awards to staff in recognition of their contributions include the CRUK Future Leader Prize, 2016 (**Lyratzopoulos**), Union Medal of International Union of TB and Lung Disease, 2018 (**Nunn**), and Andrija Stampar Medal, Association of Schools of Public Health of Europe, 2018 (**Johnson**).

4.4 Collaboration with and contribution to the economy and society

UoA2 staff collaborate with research users in many sectors of the economy and society. 53% of staff collaborated with industry, commerce, third sector or other users as part of their research. These activities are key to maintaining the vibrancy of our research environment given the huge benefits for knowledge transfer and opportunities to influence research priorities. This includes expert review, advice and engagement with industry, including pharma (**Mocroft; Skordis**) and in facilitating access to publicly funded data (**Shelton** directs CeLSIUS, enabling wider use of ONS data). Beyond the academic sphere, 88% of staff are engaged with groups including health practitioners, policymakers, and local communities. Many staff have key roles in influencing policy, public health practice and civil society initiatives: 52% have sat on expert committees outside the university sector including the NICE Public Health Advisory Committee (Chair, **Law**), NICE Clinical and Public Health Guidance for Tuberculosis (Co-chairs, **Hayward, Abubakar**), NICE Integrated Health and Social Care for People Experiencing Homelessness (Topic Advisor, **Hayward**), the Patient Panel of the Policy Research Group for Cancer (**von Wagner**), and committees setting international normative standards in health (**Cambiano:** European AIDS Treatment Group; **Gibb:** Global Advocacy for HIV Prevention). Contribution to the economy and society is further exemplified by the award of translational research funding (**Freemantle; Gilbert**), patents (**Skuse; Dobson; Wu**) and licensing (**Murray**). Staff are trained and supported in collaborating with industry and society by UCL Business and UCL Consultants (§3.2.2), SLMS TRO (§3.2.1), and UCL Public Engagement Unit.

4.4.1 Response to the COVID-19 pandemic

UoA2 has made major contributions to national and international efforts to understand and mitigate the impacts of COVID-19 (§1.6.1). Our research has directly contributed to decisions on lockdown and other non-pharmaceutical interventions, COVID-19 clinical case definitions, capacity planning for Test, Trace and Isolate, winter planning, prioritisation of vaccination, staff testing, school reopening, and nursing homes. Our staff are members of the government's Oversight Committee of National Core Studies of COVID-19 (**Johnson**), Scientific Advisory Group for Emergencies (SAGE) (**Hayward, Viner**), SAGE Transmission Subgroup (**Johnson, Hayward**), SAGE Social Care subgroup (**Shallcross**), and Scientific Pandemic Influenza Group on Behaviours (SPI-B) (**Potts**). **Hayward** is a member of the New and Emerging Respiratory Virus Threats Advisory Group (NERVTAG) and **Hayward** and **Hemingway** were NERVTAG subgroup members advising on using electronic health records to inform vaccine prioritisation and shielding. **Hayward** was a member of the Pan London Homeless COVID-19 Response Co-ordinating Group, the London Rail COVID-19 advisory group, and the UKRI Rolling Call Review Panel for COVID-19 research. **Steptoe** was a member of the ESRC Rolling Call Panel for COVID-19 research. **Abubakar** is Scientific and Technical Adviser to the Nigerian COVID Presidential Advisory Group, member of the WHO COVID-19 Epidemiology Technical Advisory Group and Scientific Advisor to the House of Lords Science and Technology Committee Science of COVID-19 review. **Field** chaired the Royal Society's Data Evaluation and Learning for Viral Epidemics (DELVE) working group. UoA2 staff co-authored the influential Academy of Medical Sciences report, 'Coronavirus: preparing for challenges this winter' (**Harling, Field, Bailey, Johnson, Viner, Hayward**). Our staff provided support and advice to international organisations and national governments and non-governmental organisations (**Saville**, Nepal; **Seal**, Somalia) contributing to critical food and nutrition security responses. **Fancourt** launched the COVID-MINDS Network: an international network of >140 longitudinal studies exploring the global mental health impact of the pandemic. UCL Health of the Public 'Coronavirus: The Whole Story' podcast series highlights UCL's cross-cutting research and expertise in tackling the COVID-19 pandemic.

4.4.2 NHS, health and social care

Direct engagement with health and social care services is fundamental to our research. Major changes in the research accessibility and use of big data from the NHS underpins the 'practice to knowledge, knowledge to practice' translational research across UoA2, and we contribute a national focus through HDR-UK, London. In 2017, we established the Clinical Research Informatics Unit (20 staff) tasked with bridging research collaborations across UCL and UCLH **(Harris, Dobson).** These leading initiatives bring together clinical services, informatics and educational strengths across university partners and the NHS to deliver population-wide translational research, with benefits to the public and patients, policymakers and industry. Further examples include research partnership with the DHSC investigating adverse childhood experiences (**Lacey**), NHS patient experiences and access to services (**Lewis**), and engagement with Clinical Commissioning Groups and Local Authorities (**Walters**). All UK-based clinical trials involve NHS partners, and all trials in UoA2 work with patient and public representatives who sit on trial committees.

4.4.3 Policymakers

Much of UoA2's research informs national and international priorities and initiatives (§1.5). Staff routinely collaborate with central or local government bodies in the UK and abroad to influence policy. Examples include dedicated policy research units such as the Children and Families Policy Research Unit (**Gilbert, Stephenson**), Obesity Policy Research Unit (**Viner**), and membership of the Policy Research Unit in Cancer Screening, Awareness and Early Diagnosis (**Raine**), chair of the WHO TB Strategic and Technical Advisory Group (**Abubakar)**, and expert contributions and advice to parliamentary bodies (**Siassakos**, UK; **Bobek**, EU). The Global Health 50/50 report (**Hawkes**), which addresses gender equality in global health, was foreworded by Jacinda Ardern PM of New Zealand, launched by the President of Ethiopia, and featured op-eds by our advisors including Dr Tedros Adhanom Ghebreyesus, Director-General, WHO. The initiative engages directly with 140 global health organisations and has led to policy commitments to gender equality by major international organisations, such as UNICEF. Our

research has made major contributions to a diverse range of policy and practice guidelines including stroke (**Pizzo**), HIV (**Rodger, Bansi-Matharu, Philips**), cardiovascular disease (**Hemingway**), influenza immunisation of healthcare workers (**Hayward**), pneumonia (**Colbourn**), and mortality surveillance (**Fottrell**).

4.4.4 Engagement with communities, schools and education professionals
UoA2 demonstrates breadth and diversity in its interaction and partnership with communities. Nationally, this includes marginalised populations through the work of the UCL Collaborative Centre for Inclusion Health including people with experience of imprisonment (**Black**), drug use, homelessness and migration (**Aldridge, Hayward**), who are often engaged in the co-development of research design. The UCL Co-Production Collaborative supports researchers (**Heys, Woodhead**) to engage diverse voices in the prioritisation and development of research activities. Over a fifth of UoA2 staff have interacted, engaged or developed relationships with school and youth populations in the UK, often with an emphasis on widening participation in science and academia (**Jones; White; Lewis, Viner**). Internationally, much of our global health work revolves around community partnership and mobilisation to improve health outcomes including maternal mortality in Mexico (**Gamlin**), non-communicable diseases in Bangladesh (**Fottrell**), sexual health in South Africa (**Harling**), and women's, children's and adolescents' health in rural India (**Prost**), with the latter reaching an estimated 50,000 community groups in 2015-2020. Such community engagement includes citizen participation in the interpretation of research findings (**Mannell**).

In-person engagement and opportunities to collaborate with the public and groups typically not engaged in research are supported by funding and training through UCL Public Engagement. Since 2014, UCL Public Engagement have awarded 13 bursaries to advance UoA2's practice and culture of public and community engagement on public health, health services and primary care. For example, **Morrison**'s engagement with communities about diabetes through Jeevan Shakti Mela - a Festival for Lifeforce in rural Nepal was highly commended in the 2020 Provost's Public Engagement Awards. Delivery of events within the ESRC Festival of Social Science (**Poole**), Wellcome Packed Lunch, Cheltenham Science Festival, Science Museum Lates, TEDx talks and UCL's Bright Club (**Mercer**) and extensive work with the Science Media Centre (**Bedford**) represent a range of innovative approaches to engagement.

4.4.5 Collaboration with industry and research users
A third of UoA2 staff have engaged with industry, either through research partnership, training, and/or translation (§3.2.2). This is often via consultancy (UCLC has attracted £7.8M to UoA2 since 2014) to the pharmaceutical industry supporting clinical trials and intervention development (**White; Shahab; Lumbers**) or providing research training (**Sabin**). UoA2's expertise in global health has further contributed to commercial-sector led intervention design and evaluation strategies, such as **Mannell's** advisory role on Unilever's women's empowerment initiative in Kenya, and **Skordis's** collaboration with World Bank on financing policies in Afghanistan, Peru, South Arica and Zimbabwe. **Murray's** HeLP-Diabetes intervention been licensed for national roll out by NHS England and **Rahi's** group have developed patient-reported outcome measures now under licence. Such licencing and engagement are supported by UCLC, UCLB and the Vice Provost (Enterprise) office.

4.4.6 Media engagement
We engage diverse communities in our research across many media platforms. 61% of staff have engaged with media coverage of their work, including national press and on terrestrial, free-to-air TV and radio. This includes all leading broadcast and print media, including wide-reaching programmes such as the BBC Today Programme, BBC Panorama, Channel 4 News, Newsnight, Wall Street Journal, The Times, NY Times, Economist, CNN, Al Jazeera, The Telegraph, The Guardian. Media engagement is encouraged and supported by UCL Press centrally and by institute-level communications strategies and professionals who provide support and training. UoA2 also has a strong presence on social media, with regular Podcasts, blogs and individual institute and research-group Twitter accounts reaching many followers (**Costello** >70k followers). The **Marmot** Review 10 years on, which highlighted widening of health

inequalities received 85 million Twitter impressions. Public seminar series and the annual UCL Lancet Lecture Series, which has run since 2001 and included three Nobel Laureates, further help to maximise our research impact.

Concluding comments
The environment of our unit has advanced significantly since REF2014, supported by major investments. We prioritise vibrant, sustainable and multi-disciplinary approaches that support our staff to solve health problems across the globe. We actively engage with policy makers and stakeholders to maximise productivity, minimise public costs and deliver transformative benefits to individuals and communities.