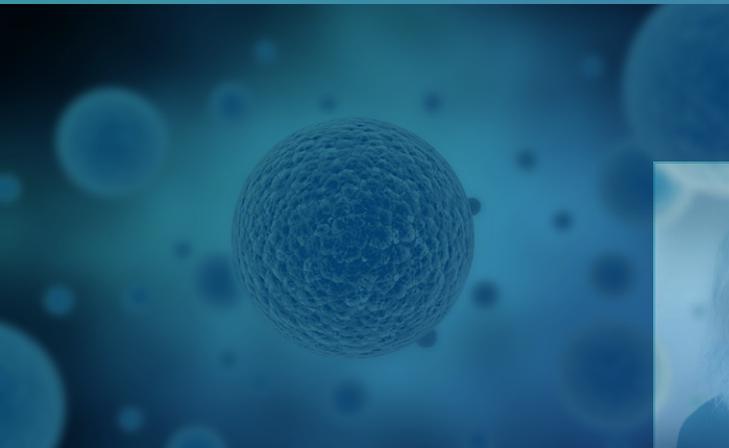




HDR UK Fellows

The UK's New Leaders
in Health Data Research



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Who we are

Health Data Research UK is the national institute for health data science.

What we do

Our mission is to unite the UK’s health and care data to enable discoveries that improve people’s lives. We do this by uniting, improving and using health and care data as one national institute.

Our vision

Our 20-year vision is for large scale data and advanced analytics to benefit every patient interaction, clinical trial, biomedical discovery and enhance public health.



Introduction

Andrew Morris

Director, Health Data Research UK

When we launched the fellowship programme in 2018, we recognised that the increasing importance of health data research meant we would need more talented specialists to join the field. However, I never could have imagined that by 2021 health data would be at the top of the international news agenda.

Throughout the COVID-19 pandemic, health data has been crucial in understanding the disease and how to stop it, from transmission rates and symptoms to new treatments and vaccine effectiveness.

The past two years have been a period of significant disruption and difficulty for all of us, however it also presented the opportunity for some Fellows to work on one of the most pressing issues in a generation.

Fellows have been able to directly influence policy, both nationally and internationally, including through membership of key advisory committees such as SAGE and SPI-M. One paper authored by a Fellow, Early dynamics of transmission and control of COVID-19: a mathematical modelling study, has been cited over 1,100 times.

Beyond COVID-19, there are many other significant health challenges, and many more will arise in the future. We do not know what these challenges will look like, but they will undoubtedly require experts from a range of backgrounds to apply cutting-edge data science approaches.

One Fellow, Dr Honghan Wu, was previously a semi-professional gamer and has secured over £25 million in funding during his fellowship and has deployed new tools to NHS trusts that improve electronic health records. Another, Dr Nick Dand, previously worked in insurance and during his fellowship discovered genetic markers that are now being tested in clinical trials to personalise treatments for psoriasis.

These diverse backgrounds and skills become even more valuable when they are combined. New collaborations between Fellows were sparked through our career development events to tackle challenges that are common across disparate fields. For instance, Fellows Dr Joram Posma and Dr Tim Beck set up joint research projects, including one to develop a tool to identify and extract data from smaller studies that might typically be overlooked.

Many of the Fellows have gone on to establish their own research groups, drawing in funding from a variety of sources and providing training to future generations of health data scientists. These are the crucial foundations needed to establish the UK as a world leader in this vital field and ultimately improve the health and care for patients and the public.



The COVID-19 pandemic has emphatically underlined the need and the ability of the health data science community to collaborate and respond to changing circumstances fast and effectively. Our Fellows have demonstrated that in abundance and have laid the groundwork for coping with future challenges.

The impact of their work is already being felt across the country and their research careers will continue to transform healthcare for generations to come.

Professor Andrew Morris CBE MD FRCP FRSE FMedSci

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Overview

Health data research is a rapidly growing area, combining expertise from a wide range of fields. The insights hidden within data are invaluable for improving healthcare, such as identifying people most at risk of becoming ill, diagnosing diseases earlier and providing better care.

To make the most of the enormous potential for this field, we need to increase research capacity by attracting brilliant minds from varied backgrounds. This human capital will bring fresh insights into how data can lead to lasting improvements to our health.

In 2018, HDR UK launched a three-year fellowship programme to nurture the next generation of health data researchers. The 46 UKRI Innovation Fellows and HDR UK Rutherford Fellows received three years of funding to pursue their research ideas, build up new networks and establish collaborations.

The Fellows came from a mix of clinical and academic backgrounds and have worked across a wide range of fields, from genetic diversity to the use of smart technology for gathering health data.

The programme targets the difficult stage when early-career researchers are aiming to become independent researchers. These Fellowships ease the transition and provide the stability needed to tackle some of our biggest health problems.

Together with the National Institute for Health Research Academy, we launched the Fellows Incubator to provide career development opportunities. This delivered bespoke, cutting-edge training and support to the Fellows to equip them with the skills needed to establish their own research groups.

As our inaugural Fellowships conclude, HDR UK has collated this summary of their research and their plans for the future. It is clear that the Fellows have made significant contributions to advancing knowledge, guiding policy and promoting the importance of health data research. In due course, we can look forward to following their careers as they become leaders in the field.



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Dr Chiara Batini

UKRI Innovation Fellow at University of Leicester

With a background in evolutionary biology, Dr Chiara Batini dedicated the first 10 years of her career to the study of human genetic diversity, with a special focus on sex-biased processes and the role of culture and climate in the history of Central African and European populations.

Shortly before starting her fellowship, she moved towards genomic research of clinical relevance, while integrating her skills in population genomics, in order to contribute to the development of precision medicine approaches in the context of multi-ethnicity.

Given the discipline hop from her previous career stage, the fellowship provided the ideal frame to create a new collaborative international network while developing leadership skills. Chiara has been involved in international projects focused on smoking cessation, respiratory health, environmental health and adolescent wellbeing, with special attention to the African continent.

She is part of the GCRF Delivery Group at her own institution and of the scientific advisory board for EXCEED, a longitudinal cohort of participants from the Midlands.

Chiara has contributed to publications on genetic epidemiology of smoking behaviour and lung function. Manuscripts in preparation include a focus on smoking behaviour in African individuals and pharmacogenomics of smoking cessation therapies and other commonly used drugs.

“Given the discipline hop from my previous career stage, the fellowship provided the ideal frame to create a new collaborative international network while developing leadership skills.”



Dr Tim Beck

UKRI Innovation Fellow, University of Leicester
Research Fellow, University of Leicester

Dr Beck’s background is in the semantics of phenotype where he has traversed the evolutionary tree from yeast to mouse to human bioinformatics and data science. Although their model organism differs, the various life sciences data communities have similar challenges when it comes to identifying, defining, and storing phenotype data within the research data life cycle. He felt he could contribute to health data research by leveraging semantics-based innovations established in other scientific domains.

Dr Beck is interested in the development of semantics capabilities to extract meaning from unstructured data, and to connect health-related research data, enabling them to be aligned and compared. Applied to the GWAS Central database of summary-level genome-wide association study findings, these approaches use ontologies to harmonise phenotype and disease descriptions to enable disease model information to be integrated, providing an holistic insight into the genetic causes of common diseases. Work with researchers from the NIHR Leicester BRC has developed a methodology to create disease specific ontologies to integrate observational data from primary and secondary care, participant questionnaires and laboratory results. Establishing successful local and national collaborations, including with other HDR UK Fellows, has helped validate Dr Beck’s work for new use cases. He has also collaborated internationally to tackle global health data integration challenges.

He now has a lectureship and is taking forward the research and collaborations the fellowship enabled.

“One of the best things about the fellowship is the freedom to follow your own instincts. With so many opportunities out there to bolster your research interests, I have honed my skills at identifying the right opportunity at the right time.”



Dr Daniel Bean

UKRI Innovation Fellow, King’s College London
Research fellow King’s College London

Dr Bean started out working with cell models and high throughput screening. He became more interested in teasing value out of the data as he simultaneously wanted to get closer to direct patient impact. Once Dr Bean began using health data he initially wanted to do any project, however small, that had some clinical use. Now he is interested in enabling projects to be done routinely and in developing methods to get more value from real-world clinical data.

Dr Bean says he was fortunate to already have access to the data he needed and was able to spend the entire fellowship hands-on with raw hospital data. He started with methods for graph models of patient data, but wanted to put something in clinical hands a lot sooner. Thus Dr Bean developed methods to calculate routine risk scores using NLP and looked at prescribing trends versus guidelines. Although the analysis was simple the project has provided him with a template and a first look “under the hood” at a hospital. More recently Dr Bean has taken a new approach and has been developing tools which let his clinical collaborators design models themselves. These are starting to be validated in a few haematological conditions. Throughout the fellowship Dr Bean contributed to making CogStack and MedCAT more established and more widely available to NHS trusts.

The fellowship enabled Dr Bean to learn what it takes to make a research idea into a reality, to get up and running in a hospital, and the kind of environment that makes it at least feasible. While Dr Bean wants to remain working in health data science he aims to step back from case-by-case projects and concentrate on generalising processes and making it possible to automate the bulk of analysis. This is where he believes AI/ML can make the greatest immediate contribution.

“I’ve learned a lot about what it takes to put state-of-the-art methods into hospitals. A part of that is research, but you also need a lot of people and support. And paperwork.”



Dr Ruth Blackburn

UKRI Innovation Fellow at University College London (UCL)

Dr Ruth Blackburn currently holds a post-doctoral UKRI Innovation Fellowship at the Institute of Health Informatics. Her fellowship focuses on using data science to examine adolescent health behaviours in schools, particularly those relating to self-harm, violence, and drug or alcohol use.

Ruth’s recent work has focused on measuring and addressing physical and mental health inequalities, particularly for vulnerable and hard-to-reach groups such as homeless people and women with substance misuse. She has worked with several teams, including the Administrative Data Research Centre for England (ADRC-E), Public Health England and UCL Infectious Disease Informatics, on a range of projects relating to infectious disease control. These include integrating viral genomic data and hospital electronic health records to identify in-hospital transmission of influenza, and evaluating the role of bacterial and viral respiratory pathogens as triggers for acute vascular events.

Ruth has a PhD in epidemiology, which formed part of the PRIMROSE programme of work to predict and manage cardiovascular risk in people with severe mental illness, such as schizophrenia and bipolar disorder. Her PhD research used UK primary care data from The Health Improvement Network (THIN) to investigate inequalities in statin prescribing and provides the first estimates of the effectiveness of statins for reducing first myocardial infarction and stroke in people with severe mental illness.





Dr Mwenza Blell

Rutherford Fellow, Newcastle University
Newcastle University Academic Track Fellow, Newcastle University

Dr Blell is a biosocial anthropologist working across the boundaries of biological anthropology, social anthropology, public health, science and technology studies and bioethics. She’s interested in the ways that health data are talked about, collected, shared, used, marketed and managed. Data and data-driven technologies have immense political relevance. Dr Blell’s work considers important aspects of the broader socio-cultural, historical, and political context in which health data and healthcare systems are situated.

Dr Blell’s fellowship was highly collaborative involving clinicians, data scientists, social scientists, philosophers and artists. She succeeded in winning research funding and disseminating her research via academic and non-academic forms of output. For example, Dr Blell is a named co-investigator on the €6m Horizon 2020 project EUCAN-Connect: A federated FAIR platform enabling large-scale analysis of high-value cohort data connecting Europe and Canada in personalised health in which she contributes to the ethical governance models. Dr Blell was invited to join the Global Alliance for Genomics and Health (GA4GH) and contributed to its Regulatory and Ethics Working Group. She also explored innovative modes for accessibly communicating ethical issues around health data technologies, working with creative artists to develop an app and video.

She was invited to speak at conferences and events due to her fellowship, including a plenary talk at the GenoPri19 conference, Boston, Massachusetts. This offered an opportunity to challenge contemporary discourses that suggest we live in a post-privacy society where concerns around genomic data protection are outdated. During the fellowship she also wrote publications about issues relating to the use of health and genomic data.

“It’s fascinating to watch health data science grow. I hope we can learn to take seriously the perspectives of those least well-served by existing systems. I believe this is the key to designing health data science systems that are truly just.”



Dr Jason Matthew Carson

UKRI Innovation Fellow, Swansea University
Research Fellow, Swansea University

Dr Carson followed a BSc in mathematics with an MSc in computational mechanics. During his PhD in mechanical engineering he developed a mathematical model of the human cardiovascular system during pregnancy. This research interested him in how mathematical modelling and health data could combine to provide insights into health problems.

During Dr Carson’s fellowship he developed a computer model to estimate the fractional flow reserve in a non-invasive manner. This clinical diagnostic measure estimates the severity of a partial blockage in the coronary arteries and is used to determine the likelihood of myocardial ischemia (a restriction of blood and thus oxygen to the heart). It is performed during cardiac catheterisation, where a pressure sensitive wire measures the pressure at the aorta and at a location downstream to a coronary artery stenosis. The research data was supplied by Derriford Hospital, University Hospitals Plymouth NHS Trust. Dr Carson’s software allows an entirely automated process using patient CT scans as an input. It performs a segmentation of the coronary arteries, then applies a computational fluid dynamics solver, which estimates blood pressures and flow rates. The pressure ratio, from the aorta to a point downstream of the partial blockage is used to estimate the functional impact of the vessel narrowing. Dr Carson’s work resulted in seven peer-reviewed publications, including a benchmark paper allowing other research groups to compare their techniques with anonymised patient data. Dr Carson is now developing a web-based platform incorporating his software.

“Becoming a Fellow allowed me to take the research in a direction that I deemed most appropriate. This provided valuable experience in leading and managing a research project which will be invaluable in my future career in research.”



Mr Chris Carrigan

UKRI Innovation Fellow at University of Leeds

Most of Mr Carrigan’s career has been in NHS health data. He was previously National Coordinator for Cancer Registration in England and Director of the National Cancer Intelligence Network. During that time, even though the volume of health data increased data controllers became more risk averse, so access for researchers became more difficult. Mr Carrigan felt that a strong, informed and effective patient voice was needed to unblock these things, in the interests of patients.

The fellowship allowed Mr Carrigan to use his professional experience and background, and to work closely with large numbers and groups of patients to understand and amplify their voices in areas where health data was not being used as effectively as it could, to improve outcomes for patients.

He had previously helped to establish a wide patient movement, called use MY data, and the fellowship allowed him to focus on the support and development of the movement, while building an integrated patient voice into the DATA-CAN hub where he has that PPIE lead.

DATA-CAN recruited and built a strong, resilient, inclusive and embedded PPIE function, putting it into all decision making processes and on operational and strategic groups. It built a framework of support and learning around the group, including regular learning and information sessions, which have been opened up to other PPIE groups.

Mr Carrigan is now both the PPIE Lead and the CEO for DATA-CAN, blending the roles in a way which ensures patients remain involved in all its work and decisions, including having the ultimate power of veto in uses of patient data.

Having seen increasing emphasis on patient involvement and governance, he feels the challenge is to make this work at industrial scale, but with individual voices – which is where he intends to play a role.

“In a world where we have more data than ever before, better and faster technology, and huge financial investment in big data, we must remember that programmes to use large-scale patient data should not be seen as primarily technical challenges, but challenges about people, views, hearts and minds.”



Dr Derek Corrigan

Research Fellow, Royal College of Surgeons in Ireland
Data Scientist, FutureNeuro Research Centre (Royal College of Surgeons in Ireland)

Dr Corrigan has 15 years of industry experience as a software developer and business intelligence consultant. His doctoral research focussed on the secondary use of aggregated electronic health data to support the generation of real world evidence and primary care decision support. Dr Corrigan is now researching clinical factors that positively influence epilepsy seizure response.

Dr Corrigan was in the second cohort for the The Farr Institute Future Leaders Programme in Health Data Science in 2017. As one of only two participants from outside the UK health system, this programme gave him valuable insights into the governance and operation of an established digital research programme. Dr Corrigan visited sites in the UK and saw what well-developed data science research facilities and data safe haven infrastructures could be developed to make the best use of EHR data for research. The programme helped him clarify his research interests, facilitating a move into a role as data scientist working on Ireland’s national epilepsy EHR. The knowledge Dr Corrigan developed through the programme directly led to the successful collaboration as a co-applicant for national funding in Ireland to participate in the development of a proof of concept safe haven infrastructure to support future data based health research in Ireland.

The best practices he observed in data based research have been applied in practice in their first successful analysis of clinical characteristics of 5,720 epilepsy patients attending epilepsy outpatient clinics in Ireland.

The programme also helped Dr Corrigan clarify his research interests which primarily relate to data-based digital health research.

“The NHS has always been a leader in digital health and the programme provided with a wonderful opportunity to learn from and develop valuable contact with those who will shape its future.”





Dr Kit Curtius

HDR UK Rutherford Fellow, Queen Mary University of London Assistant Professor, Division of Biomedical Informatics, Department of Medicine, University of California San Diego, CA, USA.

Dr Curtius received her PhD in applied mathematics at University of Washington. She became fascinated with how mathematical models can connect cancer evolution mechanisms to data through her research at Fred Hutchinson Cancer Research Center. Dr Curtius pursued a postdoc at Barts Cancer Institute, QMUL, in Professor Trevor Graham’s lab and was inspired to advance her career in connecting cancer modelling with health data through the opportunities made available by the Rutherford Fellowship.

During the fellowship Dr Curtius’s work on cancer modelling and statistical risk prediction has built the groundwork for her new research group, the Quantitative Cancer Control laboratory, at UCSD. First, she built a computational framework that connects stochastic models of cancer evolution with screening “windows of opportunity” (Curtius et al. Cancer Res 2021) and used such a stochastic model of esophageal adenocarcinoma (EAC) to determine that all EAC comes from precursor Barrett’s esophagus by analysing large epidemiological datasets (Curtius et al. Gut 2021). This work will impact clinical practice as it rigorously identifies the main at-risk group to target for effective EAC screening policies. Second, Dr Curtius created a clinical risk prediction tool for patients with inflammatory bowel disease (IBD) and low-grade dysplasia that takes patient-specific variables and predicts risk into future follow-up years on surveillance (Curtius et al. Gut 2021). She made this predictive model into a user-friendly web-tool called UC-CaRE (www.uc-care.uk) to help in shared decision-making in UK hospitals.

Finally, Dr Curtius continues to work with collaborators at Barts and St. Mark’s hospital in genomic biomarker discovery for IBD patients at-risk of colorectal cancer and a number of publications are being prepared.

“This fellowship was a fantastic initiative to bring mathematicians like myself into the health data research arena as key investigators. I gained confidence working in this interdisciplinary space and now feel prepared for leading my research group in the US.”



Dr Nick Dand

UKRI Innovation Fellow, King’s College London

Dr Dand is from a quantitative background, having begun his career in the insurance industry before discovering that his skillset could be put to good use in biomedical research. This led him to take a PhD in bioinformatics and a postdoc in genetic epidemiology. The HDR UK fellowship offered Dr Dand the opportunity to establish his own data-driven research direction, to complement the strong translational research programme of his colleagues at King’s.

Much of Dr Dand’s fellowship focused on psoriasis, one of the most common inflammatory skin diseases. This was a valuable opportunity to work with a large, deeply phenotyped dataset generated by the BSTOP and PSORT studies of outcomes to different treatments, comprising multi-omic and clinical data for several thousand people with psoriasis. He was the lead author on a publication revealing that the HLA-C*06:02 psoriasis susceptibility allele is differentially associated with response to the two leading biologic treatments for psoriasis. Dr Dand also contributed to projects led by PSORT collaborators assessing the influence of drug levels, anti-drug antibodies and immunological and transcriptomic profiles on biologic response. Some of the results are already being used in pilot clinical studies, where it is hoped that biomarker-informed treatment selection strategies will improve patient outcomes and reduce wastage of costly biologic therapies. Importantly, this work has opened up new avenues for collaboration. Dr Dand secured IMI funding as co-investigator of the BIOMAP consortium, aiming to identify molecular biomarkers of multiple clinical outcomes for both psoriasis and atopic dermatitis. Initial results are emerging from the consortium, including its work focused on psoriasis comorbidities.

During the COVID-19 pandemic, Dr Dand acquired hands-on epidemiology skills as the lead analyst for the global psoriasis registry PsoProtect, assessing the risk of severe COVID-19 outcomes attributable to different psoriasis treatments. Finally, throughout the fellowship he has led the analysis of a long-running international GWAS meta-analysis for psoriasis susceptibility. This was a considerable data collection and harmonisation effort, with initial results almost doubling the number of known psoriasis susceptibility loci. He says it will be exciting to see mechanistic insights emerging from the downstream analyses.

The fellowship has also enabled Dr Dand to transfer his analytical skills to other disease areas via new collaborations, often in a supervisory capacity. Projects focusing on frontal fibrosing alopecia, systemic lupus erythematosus and sarcopenia are well underway.

“I am very grateful to HDR UK, both for the funding that has allowed me to develop as an independent researcher, and for connecting me with a community of data-minded colleagues in London and across the UK.”



Dr Alastair Droop

HDR UK Rutherford Fellow

Dr Alastair Droop has a master’s by research in bioinformatics and a PhD in computational biology from the University of York. His PhD thesis focused on the application of large transcriptomics datasets to oil yield maximisation in Arabidopsis seeds using multivariate correlation analyses. Although his background is in molecular biology, Alastair has extensive experience in computer science and computational biology, gained during his role as a bioinformatician in the Leeds CRUK Centre.

Alastair’s previous role as the Leeds CRUK Centre bioinformatician required him to work on multiple projects simultaneously for multiple research groups. His role as UKRI Rutherford Research Fellow in LIDA has enabled him to move away from his previous, service-focussed position and to develop his own research within Leeds in the areas of computational biology and machine learning.





Rosalind Eggo

HDR UK Innovation Fellow, London School of Hygiene & Tropical Medicine

Dr Eggo is an infectious disease epidemiologist and mathematical modeller, researching the dynamics of transmission of viral pathogens, as well as the determinants of severe outcomes of infection. She has worked on the dynamics of infectious diseases since her MSc and PhD at Imperial College London. Dr Eggo focusses on the transmission and epidemiology of mostly respiratory viruses including pandemic-prone pathogen such as influenza and latterly, coronavirus. During work at the University of Texas at Austin, she developed an interest in how underlying co-morbidities affect the severity and reporting of respiratory virus infections.

During her fellowship Dr Eggo used NHS records to understand associations between the circulation of common respiratory viruses and exacerbations of chronic lung diseases. As COVID-19 arrived in the UK, Dr Eggo began responsive work on the pandemic, using health records and data from the UK and internationally to understand and quantify the expected size and severity of the future epidemic. Her work provided policy-relevant analyses of the characteristics of transmission, the potential impact of non-pharmaceutical interventions, and later, of vaccination strategies.

As a result of the fellowship Dr Eggo was able to establish her independence, pursue cutting edge research using health records, and win further funding in health data science research.

“The HDR UK fellowship allowed me the flexibility to respond directly to the COVID-19 pandemic and deliver policy-relevant data science research.”



Dr Michael Fleming

UKRI Innovation Fellow at University of Glasgow

Dr Michael Fleming is a statistician and a lecturer in public health within the Institute of Health and Wellbeing at the University of Glasgow. He has a BSc (honours) in Applied Mathematics and Astronomy, an MSc in Applied Statistics, and a PhD in Public Health.

Whilst long-standing interests include using novel record linkage techniques and statistical methods to analyse complex linked data for research purposes across the full spectrum of public health, Michael is particularly interested in maternal and child health. He previously worked as a statistician within the NHS working on a wide range of data linkage research projects before undertaking his PhD investigating educational and health outcomes of Scottish schoolchildren treated for chronic conditions. His subsequent HDR UK funded research fellowship built on that research by focussing more widely on child and adolescent health, neurodevelopmental, and educational outcomes related to childhood chronic conditions, early life factors, neonatal and childhood morbidity and maternal/obstetric factors including exposures in-utero. Michael continues to research this topic area in his current post whilst also teaching statistics and epidemiology to Master of Public Health students.

“My fellowship has been invaluable for my career progression. It gave me an opportunity to focus fully on my research and further develop and hone the many skills that I had learned throughout my PhD.”



Dr Gill Harper

UKRI Innovation Fellow, Queen Mary University of London
Post-doctoral Research Fellow in Health Data Science,
Queen Mary University of London

Dr Harper had previous experience of working on real-world public health and academic research projects that involved linking and analysing large-scale datasets including patient level EHRs. Her academic background was in health geography and population data science, and she was interested in the wider determinants of health, particularly the effect of household level geography and environment on health behaviours and outcomes. The fellowship was an exciting opportunity to bring all this experience together in a health data science framework.

Dr Harper’s fellowship focused on bringing geography into EHRs by linking individuals in EHRs to their household and local geographic environment as a context for understanding health behaviours and outcomes. She developed an algorithm that assigns Unique Property Reference Numbers (UPRNs) to patient addresses and pseudonymising them to create Residential Anonymous Linking Fields (RALFs) in near real-time. Unlike existing methods, the open source algorithm was transparent, validated, quality assured and proven to have a very high match and accuracy rate. A paper on the validation of the algorithm has been submitted for publication in a peer reviewed journal. Dr Harper undertook use cases of this UPRN infrastructure including measuring the clustering of multimorbidity in households and developing a household overcrowding measure. She contributed to the HDR UK MURMUR project 2021. Protocol for the development of the Wales Multimorbidity e-Cohort (WMC): data sources and methods to construct a population-based research platform to investigate multimorbidity. She was a co-lead on the HDRUK Public Health Environment and Health group.

“The fellowship provided me with the opportunity to consolidate my research in granular health geography and data integration in the context of health data science and become more integrated with a UK-wide network of inspiring health data scientists.”



Dr Lamiece Hassan

HDR UK Rutherford Fellow, University of Manchester
Research Fellow, University of Manchester

Dr Hassan’s background is in psychology and her PhD involved investigating changes in mental health among prisoners. She spent time working in prisons making appointments through the prison service to meet, interview and follow-up people individually. When prison health records went electronic, this meant large amounts of information were instantly available. She realised that this was the way forward.

Dr Hassan’s fellowship allowed her to develop her coding, data carpentry and data analysis skills, with a focus on natural language processing. Her main focus has been analysing unstructured social media data to gain insights about public views on health and care.

Social media can be invaluable in finding out what people think, say and feel in the real world – potentially bringing different insights to those gained from formal datasets, surveys or interviews. In one case, Dr Hassan used Twitter to find out more about what people felt about the risks of vaping at the time when news stories about potential lung damage related to e-cigarettes, were coming in the USA. Dr Hassan was also able to develop her interests in the ethical issues raised by using social media data and free text in clinical records for health research purposes.

She has collaborated with colleagues allied with the UK Health Text Mining Network (Healtex) to conduct and publish research into public attitudes on sharing clinical free text data and to propose standards for ethical text mining of social media data. Since the fellowship Dr Hassan has secured a Research Fellow post focusing on mental health data science.

Her new skills also enabled her to analyse large datasets addressing COVID-19 outcomes among people with mental illness. These have yielded publications in two top psychiatry journals.

“As a social scientist, the HDR UK Rutherford Fellowship was a fantastic development opportunity, equipping me with health data science skills and networks that have been transformative for my research.”





Dr Ewan Harrison

HDR UK UKRI Innovation Fellowship, Wellcome Sanger Institute Wellcome Sanger Institute – Career Development Fellow and University of Cambridge – Department of Medicine – Senior Research Associate & Department of Public Health and Primary Care – Honorary Senior Fellow

Dr Harrison is an academic microbiologist with an interest in infectious disease, particularly bacterial infection. He has had an interest in infectious disease since his teens. He worked for what is now Public Health England after completing his undergraduate studies and was involved in work on testing meningococcal B vaccines. This inspired him to pursue a PhD focussed on microbiology and the genomics. During this period, he started to develop his skills in computational biology. His post-doctoral studies used genomics to track the transmission and understand the biology of *Staphylococcus aureus* (*S. aureus*). The complexity of the issues involved led him to feel that a holistic approach was needed that united insights from many fields including health data science, human genetics and microbiology.

Dr Harrison’s fellowship allowed him to link conventional microbiology data with human genetics data, microbiome, e data and EHR data. The arrival of the pandemic meant the fellowship was divided in two – the first part looking at *S. aureus* and most of the second working on COVID-19. During the initial stages he took a cross-disciplinary approach to exploring why some adults are colonised by *S. aureus*, some have it present occasionally and others not at all. People who are colonised have a higher chance of becoming infected while in hospital, as *S. aureus* will readily enter wounds and their resistance is often lowered. Dr Harrison’s work aimed to understand if there are genetic differences between carriers and non-carriers or if multiple factors are at work. This can potentially lead to better policies on decolonisation of patients who carry MRSA (methicillin resistant *S. aureus*) and could have implications for the best use of antibiotics.

In March 2020 Dr Harrison was asked to help coordinate the set-up of the UK National COVID-19 sequencing programme COG-UK (COVID-19 Genomics UK consortium). This saw him involved in helping establish the network, working with other scientists across the UK to set the standards used across the consortium. He was also involved in determining its legal and ethical framework.

Dr Harrison has been working with HDR-UK to bring together different types of COVID-19 data for analysis. One strand of the research looks at the interaction between host and virus at a genetic level. The work of the consortium has led to a dataset of around a million genomes which will soon be made accessible to researchers through UK Trusted Research Environments (TRE) where it will be linked with the historic clinical data. This will enable questions to be addressed about why some patients are more severely affected than others and whether genetics play a part.

“Everything was very well set up throughout the fellowship and it was very well funded. The fellowships were really good and really useful, because they offered a great deal of academic freedom, so researchers could push ahead and pursue their goals, rather than being prescriptive. At the same time, I felt very personally supported and that was particularly so when I started working on COVID-19.

“The fellowship, expanded my network of contacts and collaborators enormously – there are now so many more great scientists that I can pick up the phone to and ask for their expertise and input. It has also provided many more opportunities for collaborations and to develop my career for the future.”



Dr Andreas Karwath

Rutherford Fellow, University of Birmingham
Associate Professor, University of Birmingham

Dr Karwath studied mathematics and applied computing in Germany and the UK and received his PhD from Aberystwyth University. He then spent time as post-doc in Freiburg and Mainz working in the areas of machine learning and AI. During this time Dr Karwath suffered from a virus induced heart failure (recovering within a year) which led him to shift his research focus towards health data science.

The main theme of Dr Karwath’s fellowship was research and development into the integration and analysis of structured and unstructured medical and clinical data. The main idea was to employ ML and AI techniques to learn representations of EHR records, allowing original clinical data to be compressed and to extract valuable information. This research has formed the basis of new collaborations within the HDR UK network and beyond and has led to several high impact publications. One, recently published in *The Lancet*, was concerned with the application of representation learning using structured information from patients suffering from heart failure and enabled the definition of new sub-phenotypes for treatment purposes. The fellowship also enabled Dr Karwath to continue his transition to independence, and to his current post as a Senior Lecturer in Health Data Science at the University of Birmingham. Within this role he holds the positions of deputy programme lead of the new MSc in Health Data Science. Additionally, his fellowship enabled him to participate in a number of successful grant applications with HDRUK, NIHR and others as co-investigator.

Dr Karwath aims to continue in this area of research and expand his research network.

“The fellowship allowed me to connect with a diverse group of fellows and other researchers. One of my personal highlights was taking an active part in the first HDR UK summer school in 2019 in St. Andrews.”



Dr Watjana Lilaonitkul

Rutherford Fellow at University College London (UCL)

Dr Lilaonitkul received her PhD in electrical engineering from MIT before going to Goldman Sachs as a derivative structurer specialising in computational statistics and dynamic time inferencing over large financial data sets. In 2018, she returned to academia on the Rutherford Fellowship based at UCL. This offered the opportunity to grow a research agenda of building AI technologies to assist medical devices and medical workflows across multiple diseases.

In 2019, Dr Lilaonitkul secured funding from the *CRUK/EPSRC Sandpit Award* as co-investigator for a proposed technology that localises colonic lesions using an AI-backed vibro-tactile sensor to detect changes in the tissue mechanical properties in conjunction with endoscopic visual inputs. In 2020, she secured funding as co-principal investigator from the *Moorfields Eye Charity Springboard Award* to uncover distinct progression phenotypes and the differential contribution of genetic factors in inherited rare eye diseases. The inability to disentangle the severity within distinct disease trajectories is a key obstacle to disease understanding and treatment development. Her work on the application of AI technologies in rare eye diseases has been funded by UCL Business Ltd for three patent filings.

During the pandemic she collaborated with researchers from UCL, King’s and Microsoft to delineate the impact of COVID-19 infection in high-risk populations. COVID-19 is biologically heterogeneous and yields high variance across prior attempts to define biomarkers. The project uses a machine learning approach to uncover disease phenotypes with distinct temporal progression patterns and was one of Microsoft’s 2021 *Studies in Pandemic Preparedness Programme* highlights.

The fellowship supported the creation of Dr Lilaonitkul’s UCL research group and allowed her to expand her collaboration network across different academic institutions and industries.

“Team Science at its best: HDR UK is a hub where like-minds, with a common aim of improving patients’ prospects, come together with the support of an amazing network of collaborators across disciplines and with access to research-ready nation-wide health data.”





Dr Claudia Lindner

Rutherford Fund Fellow, The University of Manchester
Sir Henry Dale Fellow, The University of Manchester

Dr Lindner’s research interests are in the automated analysis of medical images to study, diagnose and manage musculoskeletal disorders. Claudia uses methods from computer vision, machine learning and data science to develop accurate systems for outlining and analysing structures in widely used medical images such as radiographs. During her HDR UK Fellowship, she collected over 18,000 anonymised radiographic images and outcomes data for over 1,800 knee replacement surgeries, and developed technology based on BoneFinder® (www.bone-finder.com) to automatically outline bones and implants in knee radiographs. Further, as a co-investigator of the AUGMENT Study, she contributed to the automated analysis of knee and hip DXA images from the UK Biobank cohort.

Claudia’s career includes over 15 years in the development and application of computational methods working within multi-disciplinary teams in industrial and academic settings in Germany, Australia and the UK. Claudia is part of the leadership team for the university’s Digital Futures Health and Care theme, and the Early Career Researcher Lead for the Christabel Pankhurst Institute for Health Technology Research and Innovation. She works with clinicians from various NHS trusts and is a member of the steering committee of the World COACH Consortium (www.worldcoachconsortium.com), an international collaboration of experts studying osteoarthritis and morphological data of the hip.

Claudia has won several national and international awards. She was Highly Commended at the 2019 L’Oréal-UNESCO UK & Ireland Fellowships for Women in Science programme, and received the Wellcome-Beit Prize for outstanding biomedical researchers in 2021.

The HDR UK fellowship enabled Claudia to secure a Sir Henry Dale Fellowship to establish a multidisciplinary research group with a focus on combining medical image computing, data science and implementation science to deliver clinical impact.

“The HDR UK fellowship provided a fantastic opportunity to start establishing myself and to independently develop the direction of my research. Its flexibility and standing opened doors that may have remained closed to me for years without it.”



Dr Yang Long

Rutherford Fellow – MRC Innovation Fellow
Assistant Professor, Durham University

Yang Long is an Assistant Professor in the Department of Computer Science, Durham University. He is also an MRC Innovation Fellow aiming to design scalable AI solutions for large-scale healthcare applications. His research focuses on the highly interdisciplinary field of computer vision and machine learning. He is the director and founded Perception Lab in the Department of Computer Science, Durham University. International PhD students and visiting scholars share expertise and develop cutting-edge AI models and hardware in a hybrid human-centric and data-centric way.

Yang is passionate about exploring zero/few-shot data solutions by integrating large-scale models, datasets, and human knowledge into unified scalable, interactable, interpretable, and sustainable solutions for other disciplinary research, e.g. continuous human activity understanding, biomedical image analysis, design of robotic healthcare aid. He has authored/co-authored 50+ top-tier papers in refereed journals/conferences such as IEEE TPAMI, TIP, CVPR, AAAI, and ACM MM.

“The fellowship provided me the valuable opportunity to apply AI, machine learning, and computer vision technologies in a wide range of healthcare applications and establish research foundations and teams for an independent and sustained career.”



Dr Tom Lumbers

HDR UK Fellow at University College London

Dr Lumbers is an HDR UK Fellow and Consultant Cardiologist at University College London. He trained in molecular biology and genetic epidemiology at Imperial and UCL. He leads the Genomics Group at the UCL Insitute of Health Informatics and is a Visiting Scientist at the Broad Insitute of MIT and Harvard. His research focuses on defining the genetic architecture of heart failure and left ventricular dysfunction to generate insights into causal factors and molecular disease mechanisms. He founded the global HERMES consortium to study the genomics of heart failure and cardiomyopathy.

The main focus of Dr Lumbers’ HDR UK Fellowship was to develop tools to define phenotypes of heart failure and cardiomyopathy in multi-modal health data in datasets linked to genomic biobanks in order to define the genetic architecture of these disorders. During the award, he coordinated the assembly of a unique data platform for heart failure genomic research and helped to generate new genomic datasets which have been used for the discovery of new genes and pathways, for the prioritisation of drug targets, and as the basis of new genomic tools for prediction. Dr Lumbers led a Cochrane Review on the pharmacologic treatment of heart failure with preserved ejection fraction highlighting the need for new therapeutic approaches. As a member of the ClinGen Hereditary Cardiovascular Gene Curation Expert Panel he has contributed to the curation of dilated cardiomyopathy genes for clinical testing. The fellowship has enabled Dr Lumbers to develop skills and experience in working with health record data. His future aims are to translate the findings from genomic studies of cardiovascular disease into the clinic to develop, implement, and validate new genomic tools for diagnosis and prediction for routine clinical care.

“The fellowship enabled me to develop health records research skills that will be foundational for my future. I look forward to addressing fundamental questions about the causes of heart failure and cardiomyopathy through analysing health records and genomics, and to the translation of these insights into improved diagnosis and treatment.”



Dr Caroline Minassian

UKRI Innovation Fellow at London School of Hygiene and Tropical Medicine (LSHTM)

Caroline Minassian initially studied experimental psychology, graduating from Oxford University with a BA (Hons) in 2001. She joined LSHTM after completing the MSc in Epidemiology at the Electronic Health Records Research Group in 2007. Since then, much of her research has focused on investigating the role of acute infections and inflammation in vascular disease, using a variety of large electronic health datasets: UK primary care databases (including the Clinical Practice Research Database (CPRD) and linked hospital episode statistics data) and US administrative claims databases (Medicaid and Medicare).

In 2014, Caroline completed her PhD in this area. She has a particular interest in the application of case-only approaches to study design. Recent work includes a self-controlled case series study of acute cardiovascular events after herpes zoster in vaccinated and unvaccinated older individuals in the US. She is also especially interested in how to maximise the use of available information within electronic health records to improve identification of clinical outcomes and phenotypes. Caroline is currently co-leading a joint LSHTM-CPRD collaboration to develop an algorithm to identify and date pregnancies and their outcomes within the CPRD, part of the programme of work of the NIHR Health Protection Research Unit in Immunisation at LSHTM.



The HDR UK NPIF Fellowship programme has demonstrated impact in advancing knowledge through high quality research, guiding policy, engaging a wide audience, and recognition beyond HDR UK.



CITED >9,000 TIMES

Fellows publications have been **cited >9,000 times** – the most cited publication, *Early dynamics of transmission and control of COVID-19: a mathematical modelling study*, has been cited >1,100 times.

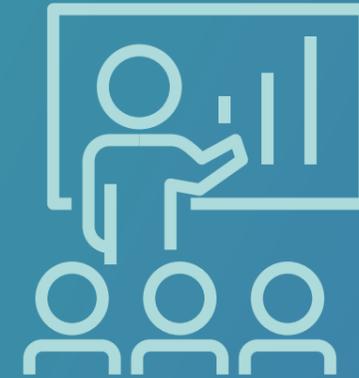
CITED ~5× MORE

Fellows are **cited ~5 times more** than other publications in same field.



INFLUENCED POLICY

Fellows **influenced policy** 31 times, both nationally and internationally, including membership of key advisory committees such as SAGE and SPI-M.



143 ENGAGEMENTS

Fellows report **143 engagements** including presentations, working groups and press releases, of which 44% were international. Fellows engaged most with practitioners and patient, carers and/or patient groups.

RECOGNISED ACHIEVEMENTS

Fellows have been recognised for their achievements 39 times through invitations as **keynote speakers, honorary positions, research prizes** and more – including prestigious honours such as L’Oreal UNESCO Women in Science fellowship.



£3.6 FURTHER FUNDING

Fellows leveraged **£3.6 in further funding** for every £1 invested– including sources across sectors and internationally.





Professor Krishnarajah Nirantharakumar

HDR UK UKRI Innovation Clinical Fellowship, University of Birmingham
 Professor of Health Data Science and Public Health, University of Birmingham

Prof Nirantharakumar completed his medical degree in 2002 and came to the UK and worked in the NHS, becoming a Specialty Registrar in Public Health Medicine before moving to the University of Birmingham as a senior clinical lecturer.

Since then he has focussed on research and have particular interests in developing novel digital tools that enable effective/efficient healthcare systems and expedite healthcare research. He co-innovated the Automated Clinical Epidemiology Studies tool which led to a number of high impact publications and to the HDR UK fellowship. He is the co-theme lead for health informatics within the Institute of Applied Health Research, and oversees a team of 19. Prof Nirantharakumar’s research spans five domains:

- Automated Clinical Epidemiology Studies (ACES), Informatics Consult and Data Driven Clinical Trials.
- Real World Evidence Research (THIN-KING research group)
- Epidemiology of diabetes, endocrinology and metabolic disorders
- Research into abuse and health outcomes
- Global health.

The HDR UK fellowship proved critical in opening the door to around £5 million in research funding. It also allowed Prof Nirantharakumar to make vital connections with researchers and organisations across the UK and beyond – including through the annual HDR UK summer school. One of the biggest benefits was that it gave him much more time to pursue his own research – which included creating a tool called DExtER (data extraction for epidemiological research).

One of the projects he is now pursuing, and which has received a grant of £2.5m, will apply AI to the understanding of multimorbidity. Another, for £2.9m, will help advance the work of MuMPreDiCT – a collaboration of eight universities, across the four home nations, to improve care for pregnant women with two or more health conditions.

Prof Nirantharakumar’s greatest desire is to use his expertise in health data science, public health and chronic disease epidemiology/management to help improve health worldwide. To date he has worked with two particular countries, Sri Lanka and China. His long-term mission is to lead a global health informatics team to improve the health and wellbeing of the disadvantaged communities in low and middle income countries.

“One key benefit of the fellowship was the opportunity for networking, finding the right people to work with – like-minded people with similar interest across all four nations. And before the fellowship I had a great many teaching commitments. The fellowship meant that was no longer the case – it gave me time. That was tremendously important, having the time to focus and to achieve the research results that I hoped were possible.”



Dr Bartlomiej Papiez

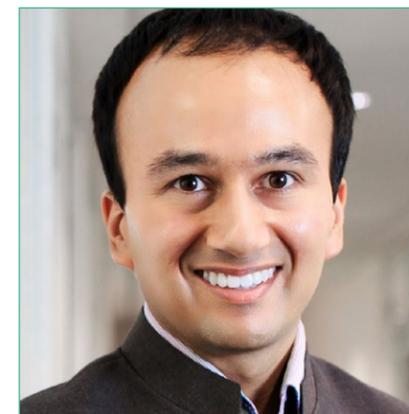
HDR UK Rutherford Fellow, University of Oxford
 Senior Research Fellow, University of Oxford

Dr Papiez’ research interests always aim to identify unmet needs in clinical, patient and preclinical pathways, and to devise biomedical image analysis solutions with the goal of bringing these inventions forward into patient care. His application for a fellowship in health data research offered by HDR UK was a natural next step in pursuit of research excellence and to address key challenges in data-driven scientific research.

Dr Papiez’ research is centred on the development of new medical image analysis techniques that could be applied to biomedical imaging to advance both our understanding of the causes of diseases and to develop diagnosis and personalised treatment to them. To date, the developed image analysis framework helps to: monitor changes of lung tumours during treatment, analyse dynamic contrast-enhanced imaging sequences and reduce artifacts for in vivo microscopy techniques.

The fellowship supported the creation of Dr Papiez’ research group at the Oxford Big Data Institute. Furthermore, with the support of this fellowship he could establish new collaborative research projects that merge machine learning and biomedical image analysis, which will lead to the discovery of new imaging-based biomarkers and their translation to clinical practice and to inform population health studies.

“It has been a great opportunity to create a new research group working multi-modal health data analysis.”



Dr Rashmi Patel

MRC UKRI Health Data Research UK Fellow, King’s College London

Dr Patel is an academic psychiatrist at the Institute of Psychiatry, Psychology & Neuroscience, King’s College London. He has a particular interest in mental healthcare analytics and applied for an HDR UK fellowship to develop natural language processing (NLP) tools to analyse clinical data from free text electronic health records (EHRs) to better understand and optimise treatments for mental disorders.

During Dr Patel’s fellowship he worked with computer scientists and informaticians in the NIHR Maudsley Biomedical Research Centre to conduct large scale epidemiological studies evaluating treatment outcomes in serious mental disorders and he developed novel approaches to use NLP-derived electronic health record (EHR) data to predict clinical outcomes. Following the onset of the pandemic Dr Patel turned his attention to evaluating the impact of COVID-19 on mental health services. He analysed EHR data that indicated the pandemic was associated with a rapid adoption of remote mental healthcare. Dr Patel developed a data visualisation tool (<http://rpatel.co.uk/TelepsychiatryDashboard>) to provide insights into the delivery of remote mental healthcare in South London. Further details of his publications are available at <http://doctor.rpatel.co.uk/publications>.

Dr Patel has recently been awarded an NIHR Advanced Fellowship to evaluate and implement data visualisation tools to support mental healthcare delivery. He is passionate about the potential for actionable analytics to support people with mental disorders and hope this work will help to improve clinical outcomes and reduce delays to receiving treatment.

“Healthcare data are complex. The only way we will be able to solve complex problems is for clinicians and data scientists to work together in the same team. This is exactly the opportunity I have benefitted from during my fellowship.”





Dr James Peters

UKRI Innovation Fellow at HDR UK
Reader in Immunology and Inflammation, Imperial College London and
Honorary Consultant in Rheumatology, Hammersmith Hospital

Dr Peters’ research combines his clinical expertise in inflammatory diseases (consultant rheumatologist) with data science and computational biology. He has a fascination with the heterogeneity of clinical course and treatment response within patients with the “same” disease. Identifying the molecular and cellular basis underpinning this variability is a key driver of his research.

Dr Peters believes that addressing these questions requires research at scale. He is also passionate about the unique strengths of genomic data in understanding the basis of disease in humans, since genomic information is much less vulnerable to the confounding and reverse causation that plagues most observational studies in humans.

The research carried out during the fellowship lies at the interface of molecular epidemiology, computational biology and clinical medicine. Its focus is understanding the molecular and cellular basis of immune-mediated inflammatory diseases using a combination of genomics, transcriptomics and proteomics. The group he has set up employs a wide range of techniques including longitudinal molecular profiling, polygenic risk scores, and Mendelian randomisation, leveraging both its own in-house datasets and also publicly available resources (such as GWAS summary statistics, UK Biobank).

Dr Peters (in collaboration with others) published a series of papers as a result of the research conducted during his fellowship. These included *Longitudinal proteomic profiling of dialysis patients with COVID-19 reveals markers of severity and predictors of death* (eLife), *Genomic atlas of the human plasma proteome* (Nature) and *Genome-wide association study of eosinophilic granulomatosis with polyangiitis reveals genomic loci stratified by ANCA status* (Nature Communications).

Dr Peters says that the fellowship was a vital springboard in his career that helped him establish his own independent research group.

“My HDR UK fellowship provided me with dedicated research time that enabled me to bridge the gap between PhD and starting my own independent group. It allowed me to build a valuable network of peers and collaborators in the emerging new field of quantitative medical research.”



Dr Joram Posma

HDR UK Rutherford Fellow, Imperial College London
Lecturer in Cancer Informatics, Imperial College London

During his chemistry undergraduate studies Joram realised that he enjoyed analysing the data more than generating it. For his MSc he sought a course that allowed him to perform research in biomedical data science while still being in close contact with those that generate the data to make an impact by developing the computational tools they need to solve the problems they have. Since that time, his enthusiasm to work in the overlapping area between biomedicine and data science has only grown stronger.

The main theme of the fellowship focussed on discovery of biomarkers and patterns (e.g. dietary) associated with blood pressure and integrating different data sources for more effective statistical modelling. The fellowship has enabled Dr Posma to continue his transition to becoming an independent researcher. He is now Lecturer in Cancer Informatics at Imperial College London and co-leads the Data Science stream (with 18 students in the 2020/2021 academic year) of the MRes in Biomedical Research. The fellowship also enabled him to open several new research lines as a result of the funding, as well as discover new future directions inspired by meetings with other fellows and HDR UK associated researchers. The established connections are continuing to shape Dr Posma’s research going forward, including being co-investigator on an MRC Programme Grant (MR/V012452/1) to develop new strategies to tackle child malnutrition in Africa, and an ELIXIR Data Platform Implementation Study grant (2022-Humangenphen) with Dr Tim Beck (UKRI Innovation Fellow) for an idea they originally conceived during one of the Fellows’ meetings at the Wellcome building.

“Being given the support to pursue my own research and have access to training opportunities to continue to learn and grow was invaluable. One of my highlights was helping to organise the second HDR UK Summer School.”



Dr Kristiina Rannikmäe

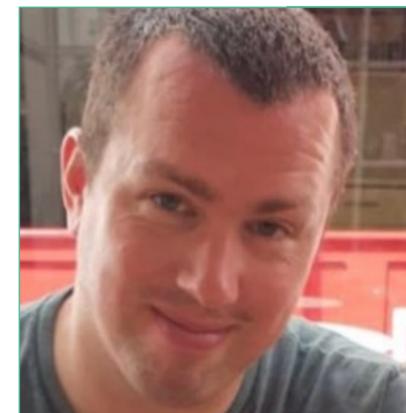
HDR UK Rutherford Fellow, University of Edinburgh
HDR UK Rutherford Senior Clinical Research Fellow, Centre for Medical Informatics, Usher Institute, University of Edinburgh and Consultant Neurologist, NHS Forth Valley.

Dr Rannikmäe studied medicine in the University of Tartu, Estonia. Part way through her neurology residency she moved to the UK, where she completed her specialty training. She undertook a PhD at the University of Edinburgh researching stroke genetics. Then she continued a clinical-academic role, working for the NHS and for the UK Biobank as a clinical research fellow. These experiences inspired Dr Rannikmäe’s interest in using routinely collected health data for genetics research and her applying for the fellowship.

Dr Rannikmäe’s fellowship aim was to develop methods for identifying clinical phenotypes from routinely collected health data with applications to stroke genetics. Over the last three years she has led several methodological research projects, which have improved our understanding of how to best identify stroke and its subtypes from structured and unstructured administrative health data. She has applied this knowledge to gain insights into the genetic associations with stroke and to understand the role of rare variations in cerebral small vessel disease genes in a population-based setting. This has been possible thanks to collaborations with a wide range of researchers, including other HDR UK fellows. Outputs from this to date include 18 publications in peer reviewed journals, with four further manuscripts in progress, as well as presentations at national and international conferences.

The fellowship enabled Dr Rannikmäe to apply for additional project-specific funding to progress her transition to independence. Furthermore, it has allowed her to become an ISGC steering committee member, developing her leadership skills. Finally it has equipped Dr Rannikmäe with invaluable experience and expertise to continue her clinical academic career.

“The HDR UK fellowship has given me the time and space to develop my research interests, as well as the contacts and opportunities for collaboration, which will underpin my future clinical-academic career.”



Dr Tom Richardson

UKRI Innovation Fellow, University of Bristol
Specialist in Genetics at Novo Nordisk

After a PhD in statistical genetics, Dr Richardson chose a career in health research to help improve our understanding of how genetics and lifestyle factors influence risk of disease.

His fellowship concerned using genetic and molecular data to investigate the mechanisms by which genes and lifestyle risk factors can influence disease risk. Using gene expression data derived from 48 different tissue types he constructed a web atlas of genetically predicted effects for disease-associated genes which allows their tissue-specificity to be investigated (*Richardson et al (2020), Nature Communications*). This work was awarded the best oral presentation in statistical genetics at Europe’s largest genetics conference in 2019, the European Society of Human Genetics.

Dr Richardson also built an atlas of polygenic risk scores to evaluate how genetic predisposition can increase risk of disease over the lifecourse (*Richardson et al (2019), eLife*). This was awarded a plenary session at the American Society of Human Genetics 2018.

He is also interested in understanding how early life risk factors may influence later life disease. His research suggests that children who are overweight are typically at higher risk of heart disease and type 2 diabetes in later life due to a persistent effect of adiposity attributed to individuals remaining overweight into adulthood (*Richardson et al (2020), BMJ*). However, children with a larger body size may be at lower risk of breast cancer in later life. Dr Richardson has extended this work to demonstrate that childhood adiposity is a risk factor for type 1 diabetes and has a potentially long-term influence on cardiac structure.

The fellowship allowed Dr Richardson to begin building a reputation for high-quality research in the field of genetic epidemiology and he hopes to establish his own research group.

“The fellowship opportunity provided by HDR-UK was the perfect springboard for my personal development and has given me the space to be creative and experiment with my own research ideas.”



Fellows by location



1 Belfast

Dr Matthew Alderdice [p32](#)
Dr David Wright [p31](#)

2 Vienna

Dr Adriano Barbosa da Silva
[p32](#)

3 Leicester

Dr Chiara Batini [p8](#)
Dr Tim Beck [p9](#)

4 London

Dr Daniel Bean [p8](#)
Dr Ruth Blackburn [p9](#)
Dr Nick Dand [p13](#)
Dr Rosalind Eggo [p33](#)
Dr Deepti Gurdasani [p33](#)
Dr Gill Harper [p15](#)
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Dr Tom Lumbers [p18](#)
Dr Caroline Minassian [p19](#)
Dr Rashmi Patel [p23](#)
Dr James Peters [p23](#)
Dr Joram Posma [p24](#)
Dr Esra Suel [p29](#)
Dr Abu Dayem Ullah [p30](#)
Dr Honghan Wu [p32](#)

5 Newcastle

Dr Mwenza Blell [p10](#)
Dr Yang Long [p18](#)
Dr Rebecca Wilson [p31](#)

6 Scotland

Dr Marco Caminati [p33](#)

7 Leeds

Mr Chris Carrigan [p10](#)

8 Swansea

Dr Jason Carson [p11](#)
Dr Jonathan Kennedy [p33](#)

9 Dublin

Dr Derek Corrigan [p11](#)
Dr Alistair Droop [p13](#)

10 California

Dr Kit Curtius [p12](#)

11 Glasgow

Dr Michael Fleming [p14](#)
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12 Bristol

Dr Harriet Forbes [p33](#)
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13 Cambridge

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Dr Bartłomiej Papież [p19](#)

17 Edinburgh

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Dr Andy Skinner

UKRI Innovation Fellow, University of Bristol
 Research Fellow, School of Psychological Science, University of Bristol

After a BEng at the University of Essex and a BSc at Bristol, Dr Skinner took his doctorate at the University of Bristol. His research interests are around the use of wearable technology for capturing health related data. He is part of the MRC Integrative Epidemiology Unit (IEU) at the university.

Smartphones have been used for some time to capture health research data as people go about their normal lives. Often, data are captured many times a day. However, research has identified a number of factors that have a negative impact on the use of smartphones as research tools. One is that they are, on average, only in reach ~50% of the time. This means participants frequently need to stop what they are doing to respond. Also, audible rather than less distracting haptic prompts are needed. Together, these factors can reduce participant engagement in health research. Dr Skinner’s fellowship was designed to address these issues by exploring the use of smartwatches for the longitudinal capture of different types of health data. As these devices are worn on the wrist they are never beyond reach, and less intrusive haptic prompts can be used. His research aimed to examine how these methods perform over longer periods, whether specific groups are more likely to find them acceptable, and the feasibility of combining multiple health data collection approaches in a single smartwatch. The research also explored how best to analyse the data captured with these methods in order to improve our understanding of health and disease, and how to use these same devices to deliver interventions for improving health.



Dr Keith M Smith

UKRI Innovation Fellow, University of Edinburgh
 Lecturer in Mathematics, Nottingham Trent University

After a degree in pure mathematics at Glasgow University, Dr Smith took a master’s in financial mathematics. A long-standing interest in the mind and the biology of the brain led him to take a PhD in electronic engineering at the University of Edinburgh, analysing the EEG signals of Alzheimer’s disease patients.

Research independence gave Dr Smith the freedom to explore whether network analyses developed during his PhD would prove as successful in structural MRI brain networks as they did in functional EEG networks. Within a year he had a first-author paper in *Neuroimage* describing the *Hierarchical complexity of the adult human structural connectome*. This was followed by applications to lupus (published in *Lupus*) and preterm-born neonates, leading to his first senior author publication in *Cerebral Cortex*. Dr Smith then obtained main responsibility for a PhD student from a Data Science and Mental Health DTP. Hon Wah Yeung has now published his first paper in the *European Journal of Neuroscience* on spectral clustering approaches to structural MRI measurements. Attending the Complex Systems Summer School at the Santa Fe Institute led to an international collaboration on the evolvability of protein interaction networks which was recently accepted for publication in *Communications Biology*. A collaboration with other HDR UK Fellows at Edinburgh led to another work on protein interaction networks, published in *Briefings in Bioinformatics*.

Dr Smith’s fellowship work allowed him to secure a permanent position as a lecturer and to make contacts in many fields that he hopes will contribute towards developing a research group in biological networks.

“My HDR UK fellowship allowed me the time and space to fully develop my own research approach and interests and, through collaborative and training opportunities, elevated me to a higher level of skill and ability in my work.”



Dr Rona J. Strawbridge

HDR-UKRI Fellow, University of Glasgow
 Lord Kelvin/Adam Smith Fellow, University of Glasgow

After a BSc in Biochemistry with Medical Biochemistry, Dr Strawbridge completed her PhD at Karolinska Institute, and continued there as a Post-Doctoral Fellow working with international genetics consortia for cardiovascular and metabolic traits. Moving to the University of Glasgow to investigate genetics of severe mental illness, she was struck by the immense disparity in life expectancy for those with and without severe mental illness. Dr Strawbridge applied for the HDR UK fellowship with the aim of applying her expertise to investigate the biology of this important concern.

The fellowship allowed Dr Strawbridge to combine her areas of interest and expertise to start to use genetics to investigate why individuals with severe mental illness have increased risk of cardiometabolic diseases. She has been able to: demonstrate proof of principle that the genetic overlap of schizophrenia and cardiometabolic disease could identify different groups of people with different metabolic profiles (PMID:33436761); identify genetic risk markers for traits of relevance to severe mental illness, such as suicidal and risk-taking behaviours (30745170) and 2018 (30181555, 29391395); continued to explore adipose tissue phenotypes (32180562; 32349335) systematically examine candidate loci for common biology contributing to mental and physical illness (PMIDs 3109183, 33182605, 34440368). Dr Strawbridge’s research has been published in scientific journals and *The Conversation* (that was reprinted in traditional media) and presented at conferences with a wide audience (lay population, clinicians, policy-makers and scientists). She has enjoyed the opportunities made available by this fellowship, both within and outside HDR UK, for example, contributing to the One Institute meetings and the summer school, and being invited to speak at the Frontiers in Genomics meetings. Her continued collaborations have been enabled by having independent funding, which has also enabled additional methods training and access to additional data. She has so far been unable to attract additional funding (despite progressing to advanced stages), but more applications are being prepared. The fellowship was an excellent way to demonstrate Dr Strawbridge’s ability to plan and conduct a research programme, whilst also meeting others across the UK with related interests, to share ideas and experiences and provide peer support.

Dr Strawbridge hopes that by demonstrating that she is able to successfully complete the work initiated in her Fellowship, she will be able to attract funding to enable the follow-up work required to assess the clinical utility of the findings discovered to date.

“The fellowship was an excellent way to demonstrate my ability to plan and conduct a research programme.”





Dr Esra Suel

Rutherford Fellow at Imperial College London
Health Data Research Fellow, Imperial College London,
Senior Assistant, ETH Zurich

PhD training in transport planning and urban systems focused Dr Suel’s interest on models of individual choice behaviour. During her first postdoctoral year her research expanded into applications of deep learning methods to urban and environmental health domain as part of the Wellcome Trust funded Pathways to Equitable Healthy Cities.

The fellowship enabled Dr Suel’s postdoctoral training in a new interdisciplinary field and the application of deep learning methods focused on the use of street-level and satellite images for measurement of urban inequalities. It also supported her role as Senior Data Scientist at the Swiss Data Science Center ETH Zurich, further facilitating her training in machine learning (focusing both on supervised and unsupervised methods) in which she primarily used GPS tracking data and electronic health records. Dr Suel’s research visit to Harvard T.H. Chan School of Public Health in 2019 (a key part of the training plan for the fellowship) allowed her to form collaborations with international experts in epidemiology on multiple ongoing projects where she provided expertise in deep learning applications to images. She has close international collaborations with UBC Vancouver and NASA Ames Research Center. Dr Suel was involved in successful grant application to US NIH (as co-investigator), ESRC LISS DTP’s Collaborative (CASE) Studentship (as co-supervisor), and Swiss Data Science Center (as co-investigator). Dr Suel has co-led the Big Data Working Group as part of the Wellcome Trust funded Pathways to Equitable Healthy Cities project since 2018.

“I don’t come from a health background and had limited experience with ‘big data’ and machine learning methods. My fellowship helped me to start establishing myself in an interdisciplinary field and advance my skills in deep learning.”



Dr Abu Dayem Ullah

HDR UK UKRI/Rutherford Fellow, Barts Cancer Institute, Queen Mary University of London
Senior CAP-AI Digital Fellow, Barts Life Science, Queen Mary University of London

Dr Dayem Ullah became interested in computational biology during his PhD at King’s College London and in 2011 he joined Barts Cancer Institute as a postdoctoral research assistant. His work as the founding data manager in the Pancreatic Cancer Research Fund Tissue Bank allowed him to realise the potential of health informatics in advancing translational medical research, which formed the basis of his fellowship research proposal.

Dr Dayem Ullah’s fellowship focused on an exploratory investigation of risk and prognosis factors associated with pancreatic cancer, using the longitudinal linked primary and secondary care EHR data from East London. Several factors were identified which are, independently or via interactions, associated with a higher incidence of pancreatic cancer. It was also observed that some well-known risk factors of pancreatic cancer in fact have similar risk measures of developing non-cancerous pancreatic diseases. The continuation of the work will see the development of a machine learning based prediction tool with high discriminatory ability of identifying a high-risk group of individuals for pancreatic cancer screening and surveillance programmes from routine EHR data. Dr Dayem Ullah has secured funding to do this through a Barts Life Sciences CAP-AI Fellowship award.

Another successful outcome was using the data to identify the impact of COVID-19 on the study cohort, which consisted of patients with pre-existing hepatobiliary and pancreatic diseases.

“The fellowship provided me with the opportunity of making the transition to becoming an independent investigator. There were hard obstacles to realising the proposed research, but they were as valuable lessons for the future.”



Dr Praveen Surendran

Rutherford Fellow at University of Cambridge
Associate Director, Applied and Statistical Genetics, Human Genetics and Computational Biology GlaxoSmithKline

Following undergraduate and post-graduate education in biotechnology/bioinformatics at India’s Bangalore University and a year training as a Junior Research Fellow at the Indian Institute of Science, Praveen completed a PhD in Computation Biology and Bioinformatics at University College Dublin along with a visiting fellowship at Massachusetts General Hospital and Harvard Medical School.

After doctoral research, Dr Surendran joined the Cardiovascular Epidemiology Unit (CEU), Department of Public Health and Primary Care, University of Cambridge as a Research Associate (Genetic Statistician). He then obtained Rutherford Fund Fellowship in 2018 and a promotion in 2020 as Senior Research Associate at University of Cambridge. In 2016, Dr Surendran co-led the largest genetic study of blood pressure involving ~ 1.3 million individuals where he and colleagues identified novel pressure or hypertension-associated genetic regions in a trans-ancestry meta-analyses. Later, during the HDR-UK fellowship, Praveen’s research focused on discovering novel bimolecular pathways associated with cardiometabolic diseases (CMDs) through genetic studies of endophenotypes including metabolites, glycans and proteins. During this term, Dr Surendran led various genetic studies in UKBiobank, collaborative research with academia and industry, and co-led, what was currently the world’s largest genetic study of non-targeted metabolomics in a collaboration between CEU and the MRC Epidemiology Unit at Cambridge. During the fellowship, he was also the scientific coordinator of the HDR UK Cambridge seminar series and data manager for the CHD Exome+ consortium hosted at the CEU. In 2021, Dr. Surendran joined GlaxoSmithKline’s Human Genetics and Computational Biology department and continue his research at CEU as a honorary research fellow with an aim to improve drug and biomarker discovery through the integration of genomics, multiomics and disease data in population based studies.

“The fellowship provided me with the time and support to conduct research, initiate collaborations and most importantly build trust among researchers while I aspired to be an independent investigator.”



Dr Rebecca Wilson

HDR UK UKRI Innovation Fellow, University of Liverpool
(formerly Newcastle University)
UKRI Innovation Fellow with HDR UK

The achievements during Dr Wilson’s innovation fellowship have led her to secure a faculty Tenure Track Fellowship at University of Liverpool to continue independent research on DataSHIELD (www.datashield.org) for privacy preserving, distributed analysis within both an academic setting and in commercial applications.

During her fellowship she contributed to new methodologies for privacy preserving data visualisation, and had the opportunity to run her first participant study intersecting behaviour science and human computer interaction. In addition to securing a tenure track fellowship, she is a co-applicant on the EU Horizon 2020 project ATHLETE project (www.athlete.eu) utilising DataSHIELD for analysis of human exposome data, (€12M awarded, Jan 2020 – Dec 2024). She also holds a leading role in exploring the commercialisation prospects of DataSHIELD as PI of an Innovate UK NxNW ICURe grant (~£45,000 awarded, Sep 2021 – Mar 2022).

Dr Wilson’s fellowship has enabled her to take on leadership roles through membership of three advisory boards for DataSHIELD, OKRE (a Wellcome Trust incubated organisation) and the R Forwards Taskforce (established by the R Foundation to support diversity in the R Community). She has also taken the opportunity to engage in policy work - as a named contributor to the All-Party Parliamentary Group for Diversity in STEM enquiry into Equity in the STEM workforce (published July 2021). She has additionally made contributions to the Knowledge Exchange Unit at UK Parliament exploring the diversity of researchers engaging with parliament – outcomes included the development of two policy documents – one for researchers engaging with UK Parliament and the second an internal policy for increasing diversity in engagement with UK Parliament.

In 2020 Dr Wilson featured on the Shaw Trust Disability Power 100 list of the most influential disabled people in Britain, one of just four scientists.

“This fellowship has given me the flexibility to explore research strands across data privacy and visualisation – allowing me to shape my independent research. Alongside this I have taken opportunities to participate in policy work, research commercialisation and leadership activities.”





Dr David Wright

HDR UK Innovation Fellow, Queen’s University Belfast
Lecturer in Ophthalmic Data Science, Queen’s University Belfast

Dr Wright specialises in secondary analysis of existing datasets. He had an informal interest in eye health for several years and the fellowship gave him the opportunity to link up with the active ophthalmology group at Queen’s, putting his analytical skills to use in data-heavy eye health research projects.

The fellowship focused on age-related macular degeneration (AMD), diabetic eye disease and glaucoma. Dr Wright used data from the large cohort NICOLA study, developing analysis pipelines to find biomarkers that give earlier indication of AMD progression. He combined machine learning algorithms for prediction with techniques from the developing field of interpretable machine learning to make the best possible prediction and to indicate why a prediction was made. This research has contributed towards two new externally funded projects, the first extending the NICOLA analysis to include genetic and multi-modal imaging data (Macular Society). Dr Wright also designed a study to use machine learning to mine anonymised electronic medical records and identify factors associated with long term response to AMD treatment (British Council). For diabetic eye disease, Dr Wright has analysed data from a large screening programme for diabetic retinopathy, quantifying risk factors for referable disease and assessing the performance of existing risk prediction models, with outputs published in Diabetic Medicine and The British Journal of Ophthalmology.

The highest profile output has been on glaucoma where Dr Wright led a secondary analysis of data from LIGHT, a landmark trial comparing laser treatment effectiveness against conventional eye drops. The fellowship helped open the door to his current academic position at Queen’s University Belfast.

“My HDR UK fellowship gave me the opportunity to build networks with leading research groups and has opened the door to an academic position in health data science.”



Dr Honghan Wu

Rutherford Fellowship, University of Edinburgh (originally awarded) and University College London (Now)
Associate Professor in Health Informatics, University College London

Dr Wu was a software engineer and a semi-professional gamer, who decided to pursue a computing science PhD. He first encountered health data as a postdoc at King’s College London. He was fascinated by how behind the uptake of informatics technologies was at hospitals and how big the potential could be to do health data science. This made him see AI in medicine as his lifelong career.

Dr Wu’s fellowship aimed to tackle the challenge of “incompleteness” of patient data at hospitals. For example, a lot of patients’ conditions were either not coded in the structured EHRs, or only coded as unspecified conditions (e.g. unspecified stroke). His research was to use AI technologies to interrogate both structured and unstructured health records for deriving comprehensive patient profiles. Dr Wu applied text analytics and knowledge graph technologies on EHRs to enable AI driven decision making for tailored care, trial recruitment and research. The fellowship broadened his research network and boosted his research. He has secured six grants since 2018 and published more than 50 peer-reviewed publications in health informatics and computing science. His research has produced >10 open-source tools for improving healthcare. The flagship toolkit – CogStack-SemEHR (an AI driven health data science framework) – has been deployed in NHS Trusts across the UK. Its key exemplars include serving as the Natural Language Processing infrastructure of Scottish National Medical Imaging repository that makes available >38m structured reports for research.

Since Dr Wu’s fellowship he has secured a tenured position as an Associate Professor at the Institute of Health Informatics of UCL, become an Alan Turing Fellow and established his own research lab – KnowLab.

“The HDR UK fellowship started with a light touch on the personal research programme design, leaving it as a continuous, flexible, and agile process. Ideas, collaborations and resources are continuously provided via close links with national research themes and projects.”



Dr Matthew Alderdice

UKRI Innovation Fellow at Queens University Belfast

Dr Matthew Alderdice’s research focuses on advancing patient stratification strategies in the colorectal cancer paradigm. Matthew has a particular interest in developing user-friendly applications for the analysis and interpretation of high throughput multiomic data.



Dr Adriano Barbosa da Silva

Rutherford Fellow at Queen Mary University London

Dr Adriano Barbosa da Silva’s project aimed to develop new tools for the integrated analysis of electronic health records, genetic, genomic and cardiac magnetic resonance imaging using a translational data warehouse platform (tranSMART). These tools will be used to investigate data collected from two major studies: UK Biobank and Barts Bioresources cardiovascular collections.



Dr Harriet Forbes

UKRI Innovation Fellow at London School of Hygiene and Tropical Medicine (LSHTM)

Dr Harriet Forbes did an undergraduate degree in Human Sciences, followed by a Masters in Epidemiology at LSHTM. She was a Research Assistant at the King’s Centre for Military Health Research, exploring the mental health of military personnel returning from Iraq and Afghanistan, before joining the London School of Hygiene and Tropical Medicine in 2011. She has experience working with large datasets, namely the CPRD and HES. Harriet is currently working on her PhD looking at risk factors for zoster and postherpetic neuralgia, using UK electronic healthcare records.



Dr Deepti Gurdasani

UKRI Innovation Fellow at Wellcome Trust Sanger Institute

Dr Deepti Gurdasani is a post-doctoral fellow in the Sandhu Group. Her current research focuses on characterising the genetic diversity among African populations and understanding their population history. Deepti trained as a clinician in internal medicine at Christian Medical College Vellore, India, following which she completed a PhD in genetic epidemiology at the University of Cambridge. She joined the Sanger Institute as a post-doctoral fellow in 2013. Deepti’s research focuses on characterising the genetic diversity among African populations, and understanding how this influences susceptibility to disease. She has a key interest in understanding the historical movements and mixing of populations that influenced the current genetic structure of these populations. Deepti’s work involves analysis of dense genotype and whole genome sequences from diverse ethno-linguistic groups in Africa, including examination of ancient DNA from these regions. She is also interested in the development and application of new statistical methods to answer some of these questions.

HDR UK fellowships were also awarded to **Dr Marco Caminati**, a Rutherford Fellow at University of St Andrews, and to **Dr Jonathan Kennedy** of the University of Swansea.



Fellows' ORCID numbers

Name	ORCID number
Dr Jason Carson	0000-0001-6634-9123
Dr Adriano Barbosa da Silva	0000-0002-5260-2607
Dr Andreas Karwath	0000-0002-6942-3760
Dr Andy Skinner	0000-0001-7019-163X
Dr Bartłomiej Papież	0000-0002-8432-2511
Dr Rebecca Wilson	0000-0003-2294-593X
Mr Chris Carrigan	Not Available
Dr Caroline Minassian	0000-0001-9406-1928
Dr Chiara Batini	0000-0002-7140-2985
Dr Claudia Lindner	0000-0001-9396-3436
Dr Abu Dayem Ullah	0000-0002-2567-4648
Dr David Wright	0000-0001-8948-3691
Dr Daniel Bean	0000-0002-8594-7804
Dr Deepti Gurdasani	0000-0001-9996-6929
Dr Ewan Harrison	0000-0003-2720-0507
Dr Esra Suel	0000-0001-9246-3966
Dr Harriet Forbes	0000-0001-6888-2212
Dr Honghan Wu	0000-0002-0213-5668
Dr Jonathan Kennedy	Not available
Dr Joram Posma	0000-0002-4971-9003
Professor Krishnarajah Nirantharakumar	0000-0002-6816-1279
Dr Keith Smith	0000-0002-4615-9020
Dr Kit Curtius	0000-0002-2678-0960
Dr Kristiina Rannikmäe	0000-0002-2384-7568
Dr Lamiece Hassan	0000-0002-5888-422X
Dr Matthew Alderdice	0000-0002-6440-0260
Dr Marco Caminati	0000-0002-4529-5442
Dr Michael Fleming	0000-0002-2185-4502
Dr Mwenza Blell	0000-0002-6794-3826
Dr Nick Dand	0000-0002-1805-6278
Dr Praveen Surendran	0000-0002-4911-6077
Dr Ruth Blackburn	0000-0002-3491-7381
Rosalind Eggo	0000-0002-0362-6717
Dr Rashmi Patel	0000-0002-9259-8788
Dr Rona Strawbridge	0000-0001-8506-3585
Dr Tim Beck	0000-0002-0292-7972
Dr Thomas Richardson	0000-0002-7918-2040
Dr Tom Lumbers	0000-0002-9077-4741
Dr Watjana Lilaonitkul	0000-0002-1742-7583
Dr Yang Long	0000-0002-2445-6112
Dr Alistair Droop	0000-0001-7695-7480
Dr Derek Corrigan	0000-0001-7632-6013
Dr Gill Harper	0000-0002-3492-2076
Dr James Peters	Not available



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