

Imperial College
London

Jameel
Institute

Combating disease
threats worldwide

Jameel
Institute

Annual report

<https://www.imperial.ac.uk/jameel-institute/>

2023

Foreword



The Jameel Institute's core mission is to combat disease threats worldwide. Since its inception in October 2019, the Institute has been focused on supporting decision makers in governments and national and international organisations in the response to the COVID-19 pandemic. As we now find ourselves on the other side of the pandemic, we've been able to look forward, review our strategic direction and ensure our continued growth and expansion, well into the future.

I am pleased to report it has been another year of productivity, multi-disciplinary collaboration and outstanding research findings for the Jameel Institute team. From our first in-person event exploring the impact of climate change on health; our extensive international collaborations, continued partnerships within Imperial College London to convening our strategic advisory committee, and hosting our inaugural committee meeting, the year has indeed proved fruitful.

Our Economics of Pandemic Preparedness Initiative (EPPI), under the leadership of Jameel Institute Deputy Director, Professor Katharina Hauck, has progressed impressively. The team are currently producing a multi-country dashboard to project the return-on-investment of pandemic preparedness. Using integrated economic-epidemiological modelling to provide critical data and analysis to inform public health decisions related to pandemic preparedness and disease outbreaks around the world, initial work is focusing on modelling the societal costs of potential future pandemics under various preparedness and response scenarios. Such work is crucial in supporting countries and organisations to better prepare for future inevitable outbreaks.

Professor Nimalan Arinaminpathy has contributed greatly to supporting tuberculosis (TB) programmes, both via his work with the Indian government to develop a user-friendly modelling interface that can be used to guide the TB response, and for his invaluable contributions to the World Health Organisation (WHO) Guideline Development Group as part of an expert panel on targeted, next-generation sequencing for TB. Professor Arinaminpathy has recently taken a secondment to join the World Health Organisation Global Tuberculosis Programme and I would like to take this opportunity to thank him for his invaluable work in strengthening global health systems and wish him the very best for the next four years with the World Health Organisation. They are indeed most privileged to have his expertise.

Dr Anne Cori resumed a multi-pathogen review project initially put on hold due to the pandemic. The pathogen epidemiology review group is building a catalogue of mathematical modelling parameters to facilitate rapid response to potential outbreaks of nine WHO priority pathogens. As part of this project, Dr Anne Cori collaborated with Jameel Institute colleague, Dr Patrick Doohan, and other Imperial colleagues, to produce a paper published in *The Lancet Infectious Diseases*, featuring a systematic review of articles reporting any outbreaks, transmission models or epidemiological parameters for the Marburg virus.

Beyond this, Dr Cori was awarded this year's 'Adams Prize' for her contribution to mathematical and statistical epidemiology. Only open to researchers under 40 years of age, this prize has previously been awarded to prominent figures including Professor Stephen Hawking, and it must be noted that Dr Cori is just the sixth woman to win this prestigious award in its almost 175-year history. A remarkable achievement.

I must also commend Professors Hauck and Hallett on their work as [co-chairs of the health economics group for the Infected Blood Inquiry in the UK](#). The group's final report was published in June 2023, and quantifies the long-term economic and health costs of infected blood and blood products in the 1970s and 1980s.

The work of Jameel Institute is so vast that sometimes it can be hard to capture it all, however, Research Associate, Dr Thomas Rawson, has done an exceptional job with the production of our new '[JameelCast](#)' podcast series. This series takes the listener behind the scenes of public health, spotlighting the latest research developments, and the work being done right here, at the Jameel Institute. I highly encourage you to listen and be inspired by the passion and innovation behind improving global health outcomes and combatting disease threats.

My sincere thanks to the dedication and perseverance shown by my Jameel Institute colleagues during the course of 2023. They are a wonderfully enthusiastic, engaged and passionate group generating real change through their work. I would also like to take this opportunity to sincerely thank Community Jameel and Kenneth C. Griffin. Without your generosity and belief in our work, such an undertaking would not be possible. We look forward to continuing our growth, but more importantly, making a positive impact on fighting disease threats in 2024.

Professor Neil Ferguson
Director of the Jameel Institute



The first episode in the new JameelCast podcast series featured Professor Neil Ferguson. In this episode, he looked back at the last 30 years of disease outbreak response, discussing how the field has grown and developed, and what lessons have been learned.

Executive summary

While the world continued to adjust to the endemic phase of SARS-CoV-2 in 2023, it proved to be a busy, fulfilling and exciting year for the Jameel Institute as the team progressed with research themes and projects. New partnerships were forged, prizes were awarded, papers were published, collaborative events were held and attended, and our strategic direction set the scene for substantial growth opportunities.

The Jameel Institute – Kenneth C Griffin Initiative for the Economics of Pandemic Preparedness Initiative is now well and truly underway and has proved to be invaluable in our capacity-building with partners in both Singapore and Sweden. Additionally, several collaborative multidisciplinary research projects have been launched to strengthen the team’s research in low- and middle-income countries. Led by Jameel Institute Deputy Director, Professor Katharina Hauck, EPPI continues to grow from strength-to-strength.

Professor Ferguson has continued his work leading a Wellcome Trust funded research programme which aims to improve understanding of how environmental conditions affect the transmission of five key diseases (malaria, dengue, yellow fever, cholera and meningitis A), and examine the implications of climate change for the health burden caused by those diseases and implications for control policies.

Additionally, Professor Ferguson, who played a key role in the government’s advisory committee throughout the COVID-19 pandemic, contributed to the UK COVID-19 Inquiry, which provided the opportunity to reflect on the close policy engagement the Jameel Institute undertook throughout the pandemic and the key learnings taken from this.

Professor Nimalan Arinaminpathy continues advancing Indian tuberculosis (TB) programmes, with some of his most notable achievements including his role in supporting the Indian government to create their own TB estimates, being the first country to ever undertake this colossal work. He also contributed to the global TB report by the World Health Organization, highlighting a worrying increase in TB incidence for the first time in decades following COVID-19 disruptions.

Dr Cori’s work on COVID-19 and pandemic preparedness continues. Ongoing work includes a major review on priority pathogens that may cause outbreaks in future (with a [first paper on the Marburg virus recently published in the Lancet Infectious Diseases](#)), research on optimal stockpile sizes of the Ebola vaccine, and continued development of software tools for outbreak analytics. Alongside this, she has featured in guest editorials and opinion pieces, and organised and delivered workshops. We congratulate Dr Cori for winning this year’s [Adams Prize for her contribution to mathematical and statistical epidemiology](#). Named after John Couch Adams, to commemorate his role in the discovery of the planet Neptune, this prize is open to researchers under 40 years of age. Dr Cori was also awarded the [Imperial College President’s Award for Excellence in Research Supervision](#) and was invited to give a [plenary lecture at the biannual Epidemics conference](#) in Bologna in December 2023, where she highlighted issues faced by scientists and showed how privilege underpins career trajectories.



Dr Anne Cori receiving a President’s Award for Excellence in Research Supervision from Professor Hugh Brady

Dr Bin Zhou and Professor Majid Ezzati, in collaboration with the Chinese CDC and Fuwai Hospital Chinese Academy of Medical Sciences, have produced groundbreaking research investigating the prevalence and distribution of hypertension in the general adult population in China. In addition, the NCD Risk Factor Collaboration (NCD-RisC), led by Professor Ezzati, brought together researchers from 18 countries to discuss achievements and the future of the collaboration.

Professor Timothy Hallett continues his work as chair of the modelling guidance group at The Global Fund and leading the '[Thanzi La Mawa](#)' project, which aims to integrate epidemiological and health economics research to inform resource allocation decisions in low- and middle-income countries.



Participants in the Thanzi La Mawa project

In November 2023, we celebrated four years of the Jameel Institute with our annual symposium. This year, bringing experts together from across the world, we looked to share our findings on how to reduce the impact of climate change on health. Looking forward to 2024, the Institute hopes to conduct more in-person symposiums, generating further cross-disciplinary and commercial sector collaboration. We continue to invest in a broad range of human health issues and strengthened capacity building activities internationally. Fostering close collaborations with partners around the world, we are gaining first-hand insights into current issues in global health policy making to better understand which interventions work and which do not. By systematically engaging with our partners, we actively look to evolve and pivot the Institute's research and adapt to the challenges of the post-pandemic world.

We continue to seek new strategies that effectively address some of the most important challenges to human health in the post-pandemic world. We are exceptionally grateful for the wonderful relationships with our donors, Community Jameel and Kenneth C Griffin, which continue to grow and develop. In 2024, we will strive to execute a successful communications and engagement strategy as we build capacity, awareness and support for the Institute's important research.

Research overview

Emerging threats

Professor Neil Ferguson and Dr Anne Cori supported national and international public health agencies including WHO in assessing the threat to human health of recent outbreaks of mpox and Bird Flu among wild birds. They used modelling to assess what would happen if the current bird flu pandemic evolved into a disease that could be spread from human-to-human.

Dr Anne Cori resumed a multi-pathogen review project initially put on hold due to the pandemic. The pathogen epidemiology review group is building a catalogue of mathematical modelling parameters facilitating rapid response to potential outbreaks of nine WHO priority pathogens. Further information about the project can be found by viewing this [‘Science in Context’](#) video. As part of this project, Dr Cori collaborated with Jameel Institute colleague, Dr Patrick Doohan, and other Imperial College London colleagues, to produce a paper, published in [The Lancet Infectious Diseases](#), containing a systematic review of articles reporting any outbreaks, transmission models or epidemiological parameters for the Marburg virus. This review identified large knowledge gaps in Marburg epidemiology and estimated that it has a case fatality ratio of 61.9%, highlighting the urgent need for better understanding of this virus, for which there is no treatment or vaccine.

Dr Cori has continued her work developing and using software for real-time outbreak analytics. Her team recently [extended their popular R package for epidemic monitoring, EpiEstim](#), to make it applicable to contexts where epidemic data is not collected daily.

Climate and health

Professor Ferguson has continued his work leading a Wellcome Trust funded research programme which aims to improve understanding of how environmental conditions affect the transmission of five key diseases (malaria, dengue, yellow fever, cholera and meningitis A), and examine the implications of climate change for the health burden caused by those diseases and implications for control policies. Recruitment to the programme is complete, and subcontracts with several partners in low- and middle-income countries in Africa and Latin America are close to being signed. Initial research has focused on developing high performance parallelised simulation and inference algorithms, with pilot application to dengue fever.

Dr Thomas Rawson began 2023 with publication of a paper adapted from contributions Dr Rawson submitted for Community Jameel’s collaboration with Aeon Partnership: [Climate change and communicable diseases in the Gulf Cooperation Council \(GCC\) countries](#). This paper showed that the extent to which communicable diseases spread will be significantly impacted by climate change. In addition, the paper outlines the need for significant investment in public health research and disease surveillance to address current data gaps and better forecast threats in the epidemiological landscape.

Learning from the COVID-19 pandemic

Dr Anne Cori guest edited a special issue of [Epidemics on Data needs for better surveillance and response to infectious disease threats](#), which illustrates a wide scope of innovation in data collection, processing and analysis of data, spotlighting accomplishments in three themes: surveillance, contextual understanding, and data analytics.

Dr Cori has also contributed to the opinion piece [Lessons from COVID-19 for rescalable data collection](#) published in The Lancet Infectious Diseases. An enormous amount of data was collected during the pandemic to better understand its spread and impact. As we exit the acute pandemic phase and prepare for the next epidemic threat, the temptation is to simply stop collecting this data. In this piece Dr Cori highlights the need to make sure epidemic surveillance remains ready to be rapidly scaled-up and adapted when needed. She also argues that designing effective surveillance systems requires a better understanding of the pathway between data collected and decisions made. Retracing this pathway should be on the research agenda to improve preparedness for future epidemic threats.

Also, investigating the spread of infectious diseases and the effective targeting of control measures, Dr Cori’s paper, [Gaps in mobility data and implications for modelling epidemic spread: A scoping review and simulation study](#), highlights the importance of human mobility data at an appropriate temporal or spatial resolution and

how its unavailability leads to use of mobility proxies. However, results from this study demonstrate that using mobility proxies can have a substantial impact on the predicted [epidemic dynamics](#), with complex and non-intuitive biases.

A paper co-led by Dr Thomas Rawson and Dr Anne Cori, titled [Quantifying the effect of delaying the second COVID-19 vaccine dose in England: a mathematical modelling study](#), was published in the Lancet Public Health. This study explored the effect of delaying the interval between COVID-19 vaccine doses to 12 weeks in England between 8 December 2020 and 13 September 2021. Using a previously described model of SARS-CoV-2 transmission, calibrated to COVID-19 surveillance data from England, this paper estimated and compared the resulting numbers of daily infections, hospital admissions, and deaths. The main findings of this paper suggest that delaying the interval between the first and second COVID-19 doses from 3 to 12 weeks averted a median 58,000 hospitalisations in England by 13 September 2021, and averted between 39,000 and 211,000 total hospitalisations across all sensitivity analyses.

This year saw publication of the completed special edition topic in the journal Frontiers in Public Health: [Coronavirus Disease \(COVID-19\): Pathophysiology, Epidemiology, Clinical Management and Public Health Response, Volume II](#), for which Dr Thomas Rawson was the guest editor. The topic has received over 1.5 million article views to date.

Dr Rawson also contributed to the Imperial real-time modelling team's paper investigating the intrinsic severity of the prominent COVID-19 variants of concern, published in [Nature Communications](#).

Dr Rawson has been independently working on two research projects. The first analyses the impact of health inequity on COVID-19 incidence, to help inform future modelling and surveillance priorities. The second highlights how non-pharmaceutical interventions (NPIs) broke identifiable spatial patterns of COVID-19 spread, having significant implications for common modelling assumptions in the field. The first article is currently under consideration for publication, and the second is being written up for submission in January 2024.

Tristan Naidoo, one of two PhD students at the Jameel Institute, is investigating the relationship between Twitter/X and COVID-19 outcomes. The purpose of this investigation is to use Twitter/X to quantify adherence to protective behaviours during the COVID-19 pandemic. In his first year, Tristan explored Twitter/X usage and its relationship to the outcomes of interest. He presented this work in his Early-Stage Assessment, which he successfully passed, allowing him to proceed into the second year of his PhD. The second year of Tristan's PhD has been spent creating a dataset of tweets relating to the COVID-19 pandemic. Using a subset of this dataset, Tristan extracted sentiment and investigated how it relates to COVID-19 outcomes of interest (cases, hospitalisations, and deaths).

How much vaccine to stockpile for outbreaks?

In a 2023 collaboration, Dr Anne Cori, Professor Katharina Hauck and Professor Neil Ferguson have been instructed by a global consortium of donors (including WHO, GAVI and the Centres for Disease Control USA) to advise on the optimal stockpile size of the Ervebo vaccine held by the international agencies. The team is using modelling to project the potential outcomes of future Ebola outbreaks under different stockpile sizes and mitigation strategies, including contact tracing, ring-, geographical, and preventative vaccinations.

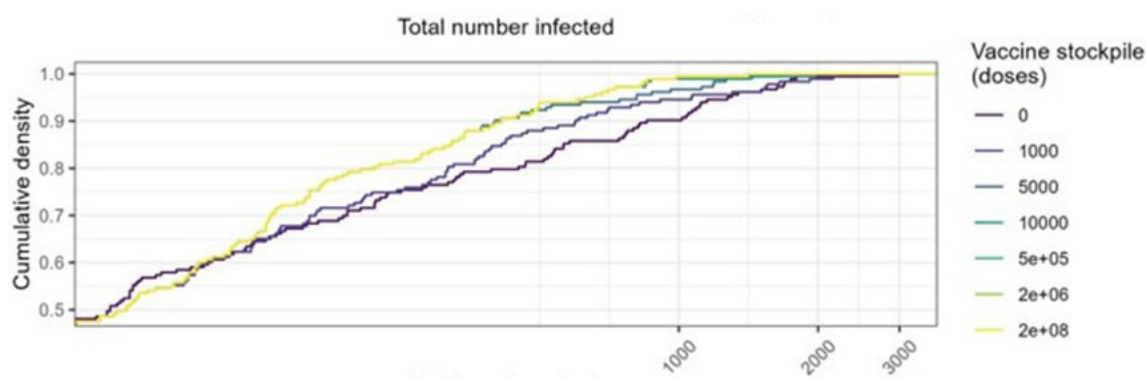


Figure 2: Ebola infections for 300 projected Ebola outbreaks, assuming stockpile sizes of the Ervebo vaccine vary between 0 doses (no vaccinations) to 200 million doses.

The economics of pandemic preparedness

The Jameel Institute-Kenneth C. Griffin Initiative for the Economics of Pandemic Preparedness Initiative (EPPI) was founded in October 2022. It will use pioneering integrated economic-epidemiological modelling to provide critical data and analysis to inform public health decisions related to pandemic preparedness and disease outbreaks around the world. The initiative is a collaboration between the School of Public Health, Imperial College Business School, the World Health Organisation, Singapore’s Programme for Research in Epidemic Preparedness And Response (PREPARE), Singapore’s National Centre for Infectious Diseases (NCID), and Umeå University in Sweden.

The collaborative research has begun, providing leadership in combining economic and epidemiological models to give decision makers in governments, international organizations, and businesses, coordinated and evidenced-based real-time advice. The EPPI team was joined by two behavioural economists, based at Imperial College Business School, who will integrate behavioural aspects into the models developed by EPPI on the costs of a pandemic, and the ROI of P2.

Work on the P2 online dashboard is progressing well. This is an innovative multi-country dashboard to estimate the societal costs of future pandemics in up to 150 countries worldwide. Driven by the need for substantial investments in pandemic prevention, preparedness, and response (PPPR) measures, the monitor projects the societal costs of potential future pandemics under various preparedness and response scenarios. In initial work, the costs related to deaths, business and school closures have been estimated for 56 countries and seven pathogens that vary in transmissibility and severity.

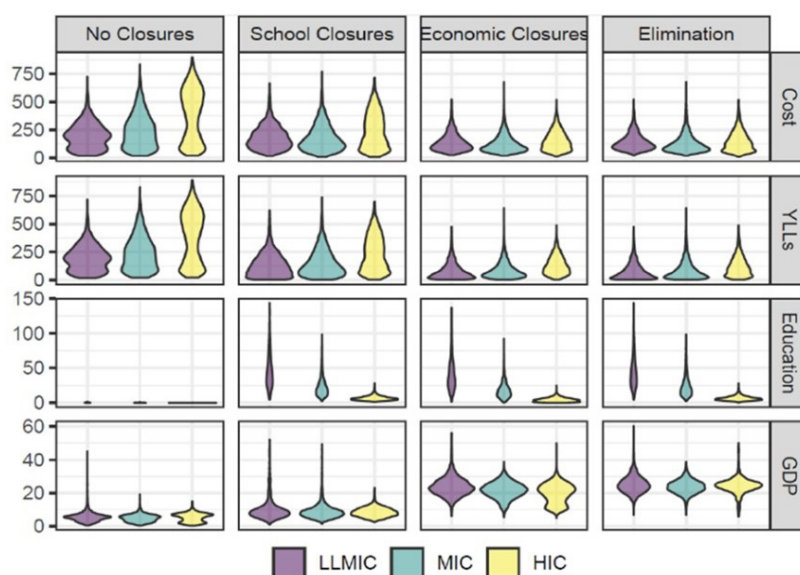


Figure 3: First results for the P2 online dashboard. Projected overall costs, years-of-life-lost (YLLs), education and GDP loss of the delta variant of SARS-CoV-2 under four alternative mitigation strategies for LLMIC (low and lower-middle income countries), MIC (middle-income countries), and HIC (high-income countries). The violin plots show the distribution and magnitude of projected costs across all countries within an income class.

The EPPI team has also focused on optimising pandemic mitigation strategies which protect lives and livelihoods, using the Philippines as a case study. Collaborating with experts from the Ateneo de Manila University, the team is exploring how lockdown measures can be designed at the onset of an epidemic to minimise both pandemic deaths and poverty risk factors. The study aims to determine the most effective strategies to reduce transmission while also protecting vulnerable households from catastrophic income loss.

The team is in advanced discussions on a research project that navigates the trade-off between economic and public health outcomes in pandemic mitigation under an elimination strategy within the Singaporean context. In May, Professor Katharina Hauck and EPPI researcher, Dr Patrick Doohan, met with Singaporean project partners from PREPARE and senior Singaporean policy makers to map out this collaborative research on pandemic mitigation strategies for Singapore.

Strengthening health systems

Professor Timothy Hallett is leading the [‘Thanzi La Mawa’](#) project, a major collaboration which aims to develop the use of epidemiology and health economics to create a step-change in the way that health priorities are addressed through policy interventions in low-income countries, particularly so in Africa. The team intends to achieve this by developing a model that represents the generation of health gains in a population, which can be used to examine the effect of resource allocation, management and clinical practice, in order to contribute to informing decision-making.

Within the pillar of epidemiology, the Thanzi la Mawa project has developed a novel health system model (a holistic representation of the Malawi health system’s processes and mechanisms), to better understand how to most effectively allocate resources to tackle public health challenges and improve population health. In the future, it is hoped that this model can be used by policy makers in Malawi and other African countries to help inform how health priorities are addressed through policy interventions. From 28 February to 2 March, Professor Timothy Hallett and colleagues led a workshop convening senior African leaders from the African Union Commission, Southern African Development Community, East African Community, and the West African Health Organisation; representatives from national ministries of health and national public universities in Ghana, Malawi, Senegal and Uganda; members of the Thanzi Programme; and international donors and development non-governmental organisations. During the workshop, the team delivered presentations on research, capability-building and research-policy engagement from the Thanzi Programme, with the aim of guiding health resource allocation decisions.

Professor Nimalan (Nim) Arinaminpathy has continued his vital work in supporting the global response to tuberculosis (TB). Making modelling accessible for India’s TB programme: The TB programme in India has been making large strides in recent years, fuelled by high-level political commitment. Professor Arinaminpathy’s team has been working with the team in India to develop a user-friendly modelling interface, that can be used by State-level planners to guide the TB response in individual States. He will be taking a sabbatical for the next four years as he joins the WHO Global Tuberculosis Programme.

Professor Majid Ezzati and Dr Bin Zhou have continued their collaboration with China CDC and Fuwai Hospital Chinese Academy of Medical Sciences. The latest outcome is the research paper [Prevalence, awareness, treatment, and control of hypertension in China](#), which highlights the gaps in hypertension treatment in China.



Dr Bin Zhou and colleagues published work in Nature Medicine on research into the global variation of diabetes diagnosis and prevalence, featuring on the cover of the November 2023 edition.

Professor Ezzati continues to lead the NCD Risk Factor Collaboration (NCD-RisC). The NCD Risk Factor Collaboration (NCD-RisC) is a network of health scientists around the world with the core group of researchers based at Imperial. On 1-2 March 2023, NCD-RisC hosted a regional collaborators meeting in London, which was co-funded by the Jameel Institute. The aim of this meeting was to engage with the wider network of NCD-RisC collaborators, involve regional NCD experts in discussions around the main burdens associated with NCDs both regionally and globally, and plan the production of regional focused papers followed by region specific analyses.

In total, 32 collaborators attended the meeting, with regional representatives from across the globe. Over the course of the two days a number of key topics were discussed, including;

- The importance of data and analytics in understanding the burden of NCDs.
- How regional NCD health issues vary across the globe, and the importance of regional specific analyses in

understanding and tackling these issues.

- The impact policy makers can have on the health of a population, and how vital it is to engage policy makers in our work.
- Limitations in the reach of our results when solely disseminating in academic journals, followed by suggestions for the best platforms to achieve a wider and more diverse audience.
- How reduced data access negatively impacts research, medical advancements, and policy change, followed by suggestions on how to engage with researchers around the globe to enable greater data sharing.

The outcome of the meeting was an agenda for major change in each region, along with strengthening connections with key regional NCD experts and policy and implementation partners. NCD-RisC regional collaborators have been actively pursuing funding opportunities to take this work further within their regions, and to translate results to regional and national policy impact.

One of the latest outputs of the NCD-RisC is the paper [Diminishing benefits of urban living for children and adolescents' growth and development](#), which has attracted much media attention. Using data from 2,325 population-based studies with measurements of height and weight from 71 million participants, this study reports the mean height and BMI of school-aged children and adolescents residing in rural and urban areas of 200 countries and territories from 1990 to 2020.

Building partnerships and capacity

Partnerships and policy engagements

The team has continued to strengthen existing relationships and build new ones by collaborating with a wide range of international partners from national and international organizations, governments and academia, and by engaging with high level policy makers in a variety of advisory roles.

Some examples of our successful and much valued collaborations:

- Research on how to preserve lives and livelihoods during lockdowns, undertaken jointly with Ateneo University in the Philippines. The outcome of this partnership is a manuscript which is being prepared for submission to a journal.
- Our partnership with the Public Health Institute Mexico has resulted in a paper investigating the association between obesity and COVID-19 mortality in Mexico.
- In collaboration with WHO, we have worked on a project for the G20 Joint and Finance Health Task Force (JFHTF) on economic vulnerabilities due to pandemics.
- The EPPI team is working with CEPI to determine the ROI in terms of health, economic gain, and educational gains of the 100-day mission. CEPI's commitment to instigate advance investments in vaccine capacity that will allow the world to develop a vaccine within 100 days of a new pandemic emerging.
- For the Ervebo stockpiling project, led by Dr Anne Cori, we were invited to apply for additional funding from GAVI, extending this project to the end of 2025.
- Professor Hauck co-chaired the health economics group for the Infected Blood Inquiry in the UK. The final report was published in June 2023, and quantifies the long-term economic and health costs of infected blood and blood products in the 1970s and 1980s.
- In January 2023 we presented findings on case studies on Mexico and Philippines during an internal meeting with WHO.
- Professor Arinaminpathy participated in a WHO Guideline Development Group as part of the expert panel on targeted next-generation sequencing for tuberculosis.
- Professor Hauck was invited to join the Technical Advisory Group of the Coalition for Epidemic Preparedness Innovations (CEPI).

Capacity building

The work of Professor Arinaminpathy on strengthening health systems is strongly sustained by principles of capacity building. As part of the new 'National Disease Modelling Consortium', chaired by ICMR India, Professor Arinaminpathy is working with IIT Bombay to help train a new generation of modellers in the country. He will be delivering the first of a series of modelling workshops in the coming months. These workshops aim to culminate in participants developing their own independent modelling studies. Participants come from government public health institutions across the country and will work on problems directly relevant to their own disease areas.

The Jameel Institute proudly sponsored the ‘Machine Learning and Global Health’ workshop organized by the Machine Learning and Global Health Network. The workshop was organized as part of the International Conference of Learning Representation (ICLR 2023) hosted in Kigali, Rwanda from 1-5 May 2023 (Figure 4). ICLR is recognised as one of the top conferences in deep learning and its applications. The workshop included talks and posters on applied topics such as epidemiology and public health, non-communicable disease burden, semi-mechanistic modelling of infectious disease dynamics, as well as methodological research in disease transmission modelling, phylogenetics, Bayesian statistics, computational statistics and machine learning.



Researchers at the Machine Learning and Global Health workshop.



This is the first time ICLR has been hosted in Africa and it presented a unique opportunity for knowledge exchange and co-production with a truly international group of researchers. The goal of the workshop was to further strengthen research partnerships amongst our participants and their institutions, spotlight research excellence through accepted papers, and provide our sponsored guests with access to world class deep learning talent at the wider ICLR conference. The workshop featured invited talks from established international researchers. To finish the day, we hosted a panel with several influential researchers in the field from diverse backgrounds, including: Chris Fourie (SisonkeBiotik), Girmaw Tadesse Abebe (Microsoft Research), Mercy Asiedu (Google), Joëlle Barral (Google) and Oliver Bent (InstaDeep). Thanks to our sponsors, we were able to fund 31 registrations to ICLR for local Rwandan students and four contributing speakers and poster talks from LMICs, so they could play a part in the machine learning research community and contribute to the conversation.

Dr Anne Cori co-organised a workshop at the WHO Hub for Pandemic and Epidemics Intelligence in Berlin (Germany) titled '[Advanced Analytics to Inform Decision Making in Public Health Emergencies](#)' on 9-10 May 2023.



Participants of the WHO workshop on advanced analytics to inform decision making in public health emergencies.

The workshop gathered approximately 30 participants (modellers and policy makers) from all continents. Participants reflected on the pathway from data to decision making during the COVID-19 pandemic, discussing differences between countries, enablers and inhibitors of using analytics for decision making during the pandemic, and proposing ways to improve this process in the future.



In October 2023, Professor Katharina Hauck contributed to a panel for the 'Future Resilience Forum' to discuss building resilient food and health systems. Joined by the High Commissioner to Bangladesh, CEO of the Clean Air Fund and others, Professor Hauck shared why it is crucial there is cooperation when responding to global crises.

In November 2023, Dr Cori [presented at the Epidemics conference](#) in Bologna, Italy, speaking to the 'Privilege in epidemic modelling careers' and highlighting the vast under-representation of various minorities, Dr Cori's [compelling plenary session](#) demonstrated the importance of diversity and encouraged inclusion and advocacy within the epidemiological community.

Additionally, the priority pathogen review group, who operate under Dr Cori's leadership, presented their work at the Epidemics Conference as follows:

- Rebecca Nash, PhD student – [Estimating the epidemic reproduction number from temporarily aggregated incidence data: a statistical modelling approach and software tool.](#)
- Dr Pablo Perez Guzman – 'SARS-CoV-2 transmission dynamics in Kabwe, Zambia during the pre-vaccination era (2020-2021)'
- Julia Michalow, PhD student – 'Aetiology of vaginal discharge, urethral discharge and genital ulcer in sub-Saharan Africa: systematic review and meta-regression.'
- Cyril Geismar, PhD student – [Bayesian reconstruction of SARS-CoV-2 transmissions highlights substantial proportion of negative serial intervals.](#)
- Dr Edward Knock – 'A multi-region, Bayesian hierarchical approach applied to modelling SARS-CoV-2 in England.'
- Gina Cuomo-Dannenburg, PhD candidate – 'Systematic review of historical outbreaks, mathematical models and disease parameters for the World Health Organisation blueprint priority pathogens.'

- Paula Christen, PhD student – ‘Exploring gender equality and ethnic diversity in publications in a university public health department’ and ‘Advanced analytics for public health policy decision making – knowledge translation during the COVID-19 pandemic.’
- Christian Morgenstern, Research Associate – [Systematic review of Marburg virus disease outbreaks, mathematical models and disease parameters.](#)



Dr Paula Christen and Sabine Van Elsland at the Epidemics Conference

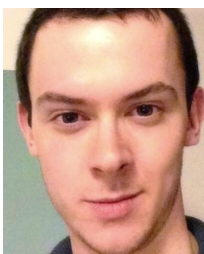
Spotlight Institute profiles

Dr Bin Zhou | Research Fellow



In 2023, Dr Bin Zhou published three papers as first and co-first author in the British Medical Journal, Nature and Nature Medicine. In February, Dr Zhou took part in a collaborator meeting with NCD Risk Factor Collaboration in London. In March, Dr Zhou joined a panel in World Congress of Cardiology/American College of Cardiology 2023 Meeting in New Orleans to discuss the use of data to improve cardiovascular health. In October, Dr Zhou was selected in the 2023 cohort of the World Heart Federation Emerging Leaders and attended a five day think tank on digital health and cardiovascular diseases in the University of Sydney, Australia.

Dr Patrick Doohan | Research Associate



2023 was a busy year for Dr Patrick Doohan with the ‘Cost of Pandemics’ project, now in its final stages, to be submitted in early 2024. Additionally, the ‘Pandemic Preparedness Costing’ project is now in progress with a prototype dashboard to be completed by mid-2024. Dr Doohan’s literature review of integrated models is now in its final stages to be submitted in early-mid 2024 and his systematic review of Lassa Fever write-up will be submitted at the end of 2023.

In addition to this, Dr Doohan conducted a research visit to Singapore in May 2023, meeting with researchers at the National University of Singapore School of Public Health, partners at PREPARE and Ministry of Health. Dr Doohan also presented on his ‘Cost of Pandemics’ work at the IHEA Conference in South African and the Epidemics Conference in Italy. Dr Doohan also completed ‘Policy Evaluation Methods’ training organised by CEMMAP.

Dr Thomas Rawson | Research Associate



Dr Rawson and colleagues in the Jameel Institute have been supporting Imperial's Lancet commission identifying key priority pathogen epidemiological parameters, and in November they began co-leading the SARS-CoV-1 article.

Dr Rawson has also been assisting colleagues in Canada at the Canadian Integrated Program for Antimicrobial Resistance Surveillance (CIPARS), in relation to models of antimicrobial resistance in Canadian livestock chains. He also mentored a PhD student at the University of Calgary in work on this topic, with a publication currently being drafted.

Outside of research, Dr Rawson independently produced the Jameel Institute podcast '[JameelCast](#)' – a 10-episode series spotlighting the work of the Institute, available through all podcast provider applications. The series has been well received, with 600 listens to date and new listeners subscribing each week.

Chairing the panel at the Jameel Institute's fourth annual symposium and attending the Epidemics conference in Italy, enabled Dr Rawson to form new international collaborations and initiated programs on the topics of cross-species pandemic risk from a One Health perspective.

Dr Rob Johnson | Research Associate



Dr Rob Johnson has had a busy 2023 with his paper on the [societal value of SARS-CoV-2 booster vaccination in Indonesia](#) being published. Dr Johnson later presented on this work at the IHEA Conference in South Africa. Dr Johnson's work exploring what the impact of reduced population BMI might have had on the COVID-19 epidemic in Mexico was submitted. Dr Johnson and colleagues are beginning the next phase of this project with joint grant proposals.

In collaboration with Jameel Institute colleague, Dr Patrick Doohan, Dr Johnson and Dr Doohan have made two applications for Dr Doohan's ongoing P2 work with WHO and CEPI.

The latter is an ongoing project in conjunction with modelling colleagues from the Department of Infectious Diseases and Epidemiology at Imperial and two US based groups.

In the Philippines, Dr Johnson and colleagues explored how lockdowns could be designed at the onset of an epidemic to maximise social welfare and lower poverty risk factors. This work will be submitted in early 2024.

Dr Johnson also attended the second 'WHO global technical consultation on public health and social measures during emergencies' summit at WHO Headquarters.

Tristan Naidoo | PhD student



The second year of Tristan's PhD has been spent creating a dataset of tweets relating to the COVID-19 pandemic. Using a subset of this dataset, Tristan extracted sentiment and investigated how it relates to COVID-19 outcomes of interest (cases, hospitalisations, and deaths). This builds on the first year of Tristan's PhD, where he conducted a similar analysis with X (formerly Twitter) usage. Furthermore, Tristan has attended two summer schools related to machine learning and health and the infodemic and presented a seminar to the Cardiff NLP group. Tristan ends a productive year saying: *"The supervision and mentorship I receive from the Jameel Institute members has been invaluable, and I am looking forward to my continued participation in the group in 2024."*

Institute wide activities

Media coverage

The Jameel Institute has continued to communicate and raise awareness about our work via social media, print media, events, webinars and much more. We have continued to be an important voice in the public media nationally and internationally. Professor Neil Ferguson has been interviewed by a range of media outlets, and contributed to the UK COVID-19 Inquiry.

Events and public engagements

Jameel Institute Symposium

The fourth annual Jameel Institute Symposium showcased our collaborative and interdisciplinary research approach and was held at Imperial's White City Campus.

This year, focusing on the theme of 'Climate and Health', Professor Neil Ferguson, Director of the School of Public Health and Jameel Institute, opened the event saying the symposium was striving to move beyond an analysis of the problem, towards finding interventions that work in protecting population health from the adverse impacts of climate change. The symposium's aim was to demonstrate any gaps in the current evidence on effective interventions and help design multidisciplinary research projects that address those gaps.



Colleagues across Imperial including [Professor Frank Kelly](#), [Professor Ralf Toumi](#), [Dr Laure de Preux](#), [Dr Ilaria Dorigatti](#) and [Dr Kristine Belesova](#), joined external experts from the commercial sector including the Commercial Director from AXA Health UK, Head of Investor Relations and Group Planning from Origin Enterprises, and Head of Impacts and Adaptation from the Wellcome Trust, for a series of talks, panel discussions and moderated breakout sessions on specific topic areas.

Attended by over 100 guests, the event received positive engagement and feedback and we look forward to conducting more in-person events going forward.

Advisory Committee

The Jameel Institute's core mission is to combat disease threats worldwide. Since its inception in October 2019, the Institute has been focused on supporting decision makers in governments and national and international organisations in the response to the COVID-19 pandemic. As we look forward, the Institute is reviewing its strategic direction and growth. To support the Institute in 2023, we convened an Advisory Committee to provide input on the strategic direction and philanthropic goals, as well as provide connections to stakeholders in global health organisations, governments, philanthropies, and the private sector, to support future collaborations. With the first meeting having taken place in November 2023, we are excited to implement some of the discussion points and further expand the work of Jameel Institute.

With special thanks to our Jameel Institute SAG Committee members:

- [George Richards | Director, Community Jameel](#)
- [Gunther Kraut | Global Head of Epidemic Risk Solutions, Munich Re; Ludwig Maximilian University of Munich \(LMU\) - Munich Risk and Insurance Center \(MRIC\).](#)
- [Humphrey Battcock | Philanthropist](#)
- [Anna Hakobyan | Chief Impact Officer, Children's Investment Fund Foundation \(CIFF\)](#)
- [Chikwe Ihekweazu | Assistant Director General of the World Health Organization - Nigerian epidemiologist, public health physician](#)

School of Public Health building

We look forward with great anticipation to the completion of the new School of Public Health building at our White City Campus. In early 2024, this cutting-edge facility will be ready for occupation and our team will establish its headquarters. The new School of Public Health building has been meticulously designed to foster collaboration and interaction among team members and visitors.



Recent images from the site of the School of Public Health

Publications

- Alli AS, Clark SN, Wang J, Bennett J, Hughes AF, Ezzati M, Brauer M, Nimo J, Bedford-Moses J, Baah S, Cavanaugh A, Agyei-Mensah S, Owusu G, Baumgartner J, Arku RE. [High-resolution patterns and inequalities in ambient fine particle mass \(PM_{2.5}\) and black carbon \(BC\) in the Greater Accra Metropolis, Ghana](#). *Sci Total Environ*. 2023 Jun 1;875:162582. doi: 10.1016/j.scitotenv.2023.162582. Epub 2023 Mar PMID: 36870487
- Arinaminpathy N, Mukadi YD, Bloom A, Vincent C, Ahmedov S. [Meeting the 2030 END TB goals in the wake of COVID-19: A modelling study of countries in the USAID TB portfolio](#). *PLOS Glob Public Health*. 2023 Oct 23;3(10):e0001271. doi: 10.1371/journal.pgph.0001271. eCollection 2023 PMID: 37870997
- Arinaminpathy N, Rade K, Kumar R, Joshi RP, Rao R. [The potential impact of vaccination on tuberculosis burden in India: A modelling analysis](#). *Indian J Med Res*. 2023 Feb-Mar;157(2&3):119-126. doi: 10.4103/ijmr.ijmr_328_23. PMID: 37202930
- Baumgartner J, Rodriguez J, Berkhout F, Doyle Y, Ezzati M, Owusu G, Quayyum Z, Solomon B, Winters M, Adamkiewicz G, Robinson BE. [Synthesizing the links between secure housing tenure and health for more equitable cities](#). *Wellcome Open Res*. 2023 Mar 13;7:18. doi: 10.12688/wellcomeopenres.17244.2. eCollection 2022. PMID: 37654603
- Bennett JE, Rashid T, Zolfaghari A, Doyle Y, Suel E, Pearson-Stuttard J, Davies B, Fecht D, Muller ES, Nathvani RS, Sportiche N, Daby HI, Johnson E, Li G, Flaxman S, Toledano MB, Asaria M, Ezzati M. [Changes in life expectancy and house prices in London from 2002 to 2019: hyper-resolution spatiotemporal analysis of death registration and real estate data](#). *Lancet Reg Health Eur*. 2023 Jan 19;27:100580. doi: 10.1016/j.lanepe.2022.100580. eCollection 2023 Apr. PMID: 37069855
- Bhatia S, Imai N, Watson OJ, Abbood A, Abdelmalik P, Cornelissen T, Ghazzi S, Lassmann B, Nagesh R, Ragonnet-Cronin ML, Schnitzler JC, Kraemer MU, Cauchemez S, Nouvellet P, Cori A. [Lessons from COVID-19 for rescalable data collection](#). *Lancet Infect Dis*. 2023 Sep;23(9):e383-e388. doi: 10.1016/S1473-3099(23)00121-4. Epub 2023 May 4. Erratum in: *Lancet Infect Dis*. 2023 Jul;23(7):e227. PMID: 37150186; PMCID: PMC10159580.
- Bhatia S, Parag KV, Wardle J, Nash RK, Imai N, Elsland SLV, Lassmann B, Brownstein JS, Desai A, Herring M, Sewalk K, Loeb SC, Ramatowski J, Cuomo-Dannenburg G, Jauneikaite E, Unwin HJT, Riley S, Ferguson N, Donnelly CA, Cori A, Nouvellet P. [Retrospective evaluation of real-time estimates of global COVID-19 transmission trends and mortality forecasts](#). *PLoS One*. 2023 Oct 18;18(10):e0286199. doi: 10.1371/journal.pone.0286199. PMID: 37851661; PMCID: PMC10584190.
- Bhatia S, Wardle J, Nash RK, Nouvellet P, Cori A. [Extending EpiEstim to estimate the transmission advantage of pathogen variants in real-time: SARS-CoV-2 as a case study](#). *Epidemics*. 2023 Sep;44:100692. doi: 10.1016/j.epidem.2023.100692. Epub 2023 Jun 21. PMID: 37399634; PMCID: PMC10284428.
- Bhatia V, Rijal S, Sharma M, Islam A, Vassall A, Bhargava A, Thida A, Basri C, Onozaki I, Pai M, Rezwani MK, Arinaminpathy N, Chandrashekar P, Sarin R, Mandal S, Raviglione M. [Ending TB in South-East Asia: flagship priority and response transformation](#). *Lancet Reg Health Southeast Asia*. 2023 Oct 29;18:100301. doi: 10.1016/j.lansea.2023.100301. eCollection 2023 Nov. PMID: 38028166
- Bosse NI, Abbott S, Cori A, van Leeuwen E, Bracher J, Funk S. [Scoring epidemiological forecasts on transformed scales](#). *PLoS Comput Biol*. 2023 Aug 29;19(8):e1011393. doi: 10.1371/journal.pcbi.1011393. PMID: 37643178; PMCID: PMC10495027.
- Cavanaugh AC, Baumgartner JC, Bixby H, Schmidt AM, Agyei-Mensah S, Anim SK, Anum J, Arku R, Bennett J, Berkhout F, Ezzati M, Mintah SE, Owusu G, Tetteh JD, Robinson BE. [Strangers in a strange land: mapping household and neighbourhood associations with improved wellbeing outcomes in Accra, Ghana](#). *Cities*. 2023 Dec;143:104584. doi: 10.1016/j.cities.2023.104584. Epub 2023 Sep 28. PMID: 37829151
- Cori A, Lassmann B, Nouvellet P. [Data needs for better surveillance and response to infectious disease threats](#). *Epidemics*. 2023 Jun;43:100685. doi: 10.1016/j.epidem.2023.100685. Epub 2023 Apr 13. PMID: 37076350; PMCID: PMC10101508.
- Cui F, Blach S, Manzeno Mingiedi C, Gonzalez MA, Sabry Alaama A, Mozalevskis A, Séguy N, Rewari BB, Chan PL, Le LV, Doherty M, Luhmann N, Easterbrook P, Dirac M, de Martel C, Nayagam S, Hallett TB, Vickerman P, Razavi H, Lesi O, Low-Beer D. [Global reporting of progress towards elimination of hepatitis B and hepatitis C](#). *Lancet Gastroenterol Hepatol*. 2023 Apr;8(4):332-342. doi: 10.1016/S2468-1253(22)00386-7. Epub 2023 Feb 8. PMID: 36764320
- Cuomo-Dannenburg G, McCain K, McCabe R, Unwin HJT, Doohan P, Nash RK, Hicks JT, Charniga K, Geismar C, Lambert B, Nikitin D, Skarp J, Wardle J, Kont M, Bhatia S, Imai N, van Elsland S, Cori A, Morgenstern C; Pathogen Epidemiology Review Group. [Marburg virus disease outbreaks, mathematical models, and disease parameters: a systematic review](#). *Lancet Infect Dis*. 2023 Nov 28;S1473-3099(23)00515-7. doi: 10.1016/S1473-3099(23)00515-7. Epub ahead of print. PMID: 38040006.
- Davis K, Pickles M, Gregson S, Hargreaves JR, Ayles H, Bock P, Pliakas T, Thomas R, Ohrnberger J, Bwalya J, Bell-Mandla N, Shanaube K, Probert W, Hoddinott G, Bond V, Hayes R, Fidler S, Hauck K; HPTN 071 (PopART) Study Team. [The effect of universal testing and treatment for HIV on health-related quality of life - An analysis of data](#)

- [from the HPTN 071 \(PopART\) cluster randomised trial](#). *SSM Popul Health*. 2023 Jul 22;23:101473. doi: 10.1016/j.ssmph.2023.101473. PMID: 37575363; PMCID: PMC10413193.
- Derelle R, Lees J, Phelan J, Lalvani A, Arinaminpathy N, Chindelevitch L. [Fastlin: an ultra-fast program for Mycobacterium tuberculosis complex lineage typing](#). *Bioinformatics*. 2023 Nov 1;39(11):btad648. doi: 10.1093/bioinformatics/btad648. PMID: 37871178
 - Derqui N, Koycheva A, Zhou J, Pillay TD, Crone MA, Hakki S, Fenn J, Kundu R, Varro R, Conibear E, Madon KJ, Barnett JL, Houston H, Singanayagam A, Narean JS, Tolosa-Wright MR, Mosscrop L, Rosadas C, Watber P, Anderson C, Parker E, Freemont PS, Ferguson NM, Zambon M, McClure MO, Tedder R, Barclay WS, Dunning J, Taylor GP, Lalvani A; INSTINCT and ATACCC study group. [Risk factors and vectors for SARS-CoV-2 household transmission: a prospective, longitudinal cohort study](#). *Lancet Microbe*. 2023 Jun;4(6):e397-e408. doi: 10.1016/S2666-5247(23)00069-1. Epub 2023 Apr 6. PMID: 37031689; PMCID: PMC10132910.
 - Di Fusco M, Mendes D, Steuten L, Bloom DE, Drummond M, Hauck K, Pearson-Stuttard J, Power R, Salisbury D, Towse A, Roiz J, Szabo G, Yang J, Marczell K. [The Societal Value of Vaccines: Expert-Based Conceptual Framework and Methods Using COVID-19 Vaccines as a Case Study](#). *Vaccines (Basel)*. 2023 Jan 20;11(2):234. doi: 10.3390/vaccines11020234. PMID: 36851112; PMCID: PMC9961127.
 - Dodd PJ, McQuaid CF, Rao P, Abubakar I, Arinaminpathy N, Carnegie A, Cobelens F, Dowdy D, Fiekert K, Grant AD, Wu J, Nfii FN, Shaikh N, Houben RMGJ, White RG. [Improving the quality of the Global Burden of Disease tuberculosis estimates from the Institute for Health Metrics and Evaluation](#). *Int J Epidemiol*. 2023 Sep 27:dyad128. doi: 10.1093/ije/dyad128. Online ahead of print. PMID: 37759341
 - Gaythorpe KAM, FitzJohn RG, Hinsley W, Imai N, Knock ES, Perez Guzman PN, Djaafara B, Fraser K, Baguelin M, Ferguson NM. [Data pipelines in a public health emergency: The human in the machine](#). *Epidemics*. 2023 Jun;43:100676. doi: 10.1016/j.epidem.2023.100676. Epub 2023 Mar 8. PMID: 36913804.
 - Geismar C, Nguyen V, Fragaszy E, Shrotri M, Navaratnam AMD, Beale S, Byrne TE, Fong WLE, Yavlinsky A, Kovar J, Hoskins S, Braithwaite I, Aldridge RW, Hayward AC, White PJ, Jombart T, Cori A. [Bayesian reconstruction of SARS-CoV-2 transmissions highlights substantial proportion of negative serial intervals](#). *Epidemics*. 2023 Sep;44:100713. doi: 10.1016/j.epidem.2023.100713. Epub 2023 Aug 7. PMID: 37579586.
 - Guzauskas GF, Hallett TB. [The long-term impact and value of curative therapy for HIV: a modelling analysis](#). *J Int AIDS Soc*. 2023 Sep;26(9):e26170. doi: 10.1002/jia2.26170. PMID: 37749063
 - Hall M, Golubchik T, Bonsall D, Abeler-Dörner L, Limbada M, Kosloff B, Schaap A, de Cesare M, MacIntyre-Cockett G, Otecko N, Probert W, Ratmann O, Bulas Cruz A, Piwowar-Manning E, Burns DN, Cohen MS, Donnell DJ, Eshleman SH, Simwanga M, Fidler S, Hayes R, Ayles H, Fraser C; HPTN 071 (PopART) Phylogenetics protocol team; PANGEA consortium. [Demographics of sources of HIV-1 transmission in Zambia: a molecular epidemiology analysis in the HPTN 071 PopART study](#). *Lancet Microbe*. 2023 Dec 8:S2666-5247(23)00220-3. doi: 10.1016/S2666-5247(23)00220-3. Epub ahead of print. PMID: 38081203.
 - Haw DJ, Biggerstaff M, Prasad P, Walker J, Grenfell B, Arinaminpathy N. [Using real-time data to guide decision-making during an influenza pandemic: A modelling analysis](#). *PLoS Comput Biol*. 2023 Feb 27;19(2):e1010893. doi: 10.1371/journal.pcbi.1010893. eCollection 2023 Feb. PMID: 36848387
 - Hogan AB, Doohan P, Wu SL, Mesa DO, Toor J, Watson OJ, Winskill P, Charles G, Barnsley G, Riley EM, Khoury DS, Ferguson NM, Ghani AC. [Estimating long-term vaccine effectiveness against SARS-CoV-2 variants: a model-based approach](#). *Nat Commun*. 2023 Jul 19;14(1):4325. doi: 10.1038/s41467-023-39736-3. PMID: 37468463; PMCID: PMC10356855.
 - Hogan AB, Wu SL, Toor J, Olivera Mesa D, Doohan P, Watson OJ, Winskill P, Charles G, Barnsley G, Riley EM, Khoury DS, Ferguson NM, Ghani AC. [Long-term vaccination strategies to mitigate the impact of SARS-CoV-2 transmission: A modelling study](#). *PLoS Med*. 2023 Nov 28;20(11):e1004195. doi: 10.1371/journal.pmed.1004195. PMID: 38016000; PMCID: PMC10715640.
 - Imai N, Rawson T, Knock ES, Sonabend R, Elmaci Y, Perez-Guzman PN, Whittles LK, Kanapram DT, Gaythorpe KAM, Hinsley W, Djaafara BA, Wang H, Fraser K, FitzJohn RG, Hogan AB, Doohan P, Ghani AC, Ferguson NM, Baguelin M, Cori A. [Quantifying the effect of delaying the second COVID-19 vaccine dose in England: a mathematical modelling study](#). *Lancet Public Health*. 2023 Mar;8(3):e174-e183. doi: 10.1016/S2468-2667(22)00337-1. Epub 2023 Feb 9. PMID: 36774945; PMCID: PMC9910835.
 - Johnson R, Djaafara B, Haw D, Doohan P, Forchini G, Pianella M, Ferguson N, Smith PC, Hauck KD. [The societal value of SARS-CoV-2 booster vaccination in Indonesia](#). *Vaccine*. 2023 Mar 10;41(11):1885-1891. doi: 10.1016/j.vaccine.2023.01.068. Epub 2023 Feb 1. PMID: 36781331; PMCID: PMC9889258.
 - Jose K, Ferguson N, Bhaskar A. [Branched flows of flexural elastic waves in non-uniform cylindrical shells](#). *PLoS One*. 2023 May 26;18(5):e0286420. doi: 10.1371/journal.pone.0286420. PMID: 37235628; PMCID: PMC10218726.
 - Kanagasabai T, Carter E, Yan L, Chan Q, Elliott P, Ezzati M, Kelly F, Xie G, Yang X, Zhao L, Guo D, Daskalopoulou SS, Wu Y, Baumgartner J. [Cross-sectional study of household solid fuel use and renal function in older adults in China](#). *Environ Res*. 2023 Feb 15;219:115117. doi: 10.1016/j.envres.2022.115117. Epub 2022 Dec 20. PMID: 36549492

- Laydon DJ, Cauchemez S, Hinsley WR, Bhatt S, Ferguson NM. [Impact of proactive and reactive vaccination strategies for health-care workers against MERS-CoV: a mathematical modelling study](#). Lancet Glob Health. 2023 May;11(5):e759-e769. doi: 10.1016/S2214-109X(23)00117-1. PMID: 37061313; PMCID: PMC10101755.
- Lison A, Banholzer N, Sharma M, Mindermann S, Unwin HJT, Mishra S, Stadler T, Bhatt S, Ferguson NM, Brauner J, Vach W. [Effectiveness assessment of non-pharmaceutical interventions: lessons learned from the COVID-19 pandemic](#). Lancet Public Health. 2023 Apr;8(4):e311-e317. doi: 10.1016/S2468-2667(23)00046-4. PMID: 36965985; PMCID: PMC10036127.
- MacTavish R, Bixby H, Cavanaugh A, Agyei-Mensah S, Bawah A, Owusu G, Ezzati M, Arku R, Robinson B, Schmidt AM, Baumgartner J. [Identifying deprived “slum” neighbourhoods in the Greater Accra Metropolitan Area of Ghana using census and remote sensing data](#). World Dev. 2023 Jul;167:106253. doi: 10.1016/j.worlddev.2023.106253. PMID: 37767357
- Martoma RA, Washam M, Martoma JC, Cori A, Majumder MS. [Modelling vaccination coverage during the 2022 central Ohio measles outbreak: a cross-sectional study](#). Lancet Reg Health Am. 2023 Jun 27;23:100533. doi: 10.1016/j.lana.2023.100533. PMID: 37497395; PMCID: PMC10366459.
- McCormack CP, Goethals O, Goeyvaerts N, Woot de Trixhe XD, Geluykens P, Borrenberghs D, Ferguson NM, Ackaert O, Dorigatti I. [Modelling the impact of JNJ-1802, a first-in-class dengue inhibitor blocking the NS3-NS4B interaction, on in-vitro DENV-2 dynamics](#). PLoS Comput Biol. 2023 Dec 6;19(12):e1011662. doi: 10.1371/journal.pcbi.1011662. PMID: 38055683; PMCID: PMC10699615.
- Metzler AB, Nathvani R, Sharmanska V, Bai W, Muller E, Moulds S, Agyei-Asabere C, Adjei-Boadi D, Kyere-Gyeabour E, Tetteh JD, Owusu G, Agyei-Mensah S, Baumgartner J, Robinson BE, Arku RE, Ezzati M. [Phenotyping urban built and natural environments with high-resolution satellite images and unsupervised deep learning](#). Sci Total Environ. 2023 Oct 1;893:164794. doi: 10.1016/j.scitotenv.2023.164794. Epub 2023 Jun 13. PMID: 37315611
- Nash RK, Bhatt S, Cori A, Nouvellet P. [Estimating the epidemic reproduction number from temporally aggregated incidence data: A statistical modelling approach and software tool](#). PLoS Comput Biol. 2023 Aug 28;19(8):e1011439. doi: 10.1371/journal.pcbi.1011439. PMID: 37639484; PMCID: PMC10491397.
- Nathvani R, D V, Clark SN, Alli AS, Muller E, Coste H, Bennett JE, Nimo J, Moses JB, Baah S, Hughes A, Suel E, Metzler AB, Rashid T, Brauer M, Baumgartner J, Owusu G, Agyei-Mensah S, Arku RE, Ezzati M. [Beyond here and now: Evaluating pollution estimation across space and time from street view images with deep learning](#). Sci Total Environ. 2023 Dec 10;903:166168. doi: 10.1016/j.scitotenv.2023.166168. Epub 2023 Aug 14. PMID: 37586538
- Nayagam S, de Villiers MJ, Shimakawa Y, Lemoine M, Thursz MR, Walsh N, Hallett TB. [Impact and cost-effectiveness of hepatitis B virus prophylaxis in pregnancy: a dynamic simulation modelling study](#). Lancet Gastroenterol Hepatol. 2023 Jul;8(7):635-645. doi: 10.1016/S2468-1253(23)00074-2. Epub 2023 May 5. PMID: 37150181
- NCD Risk Factor Collaboration (NCD-RisC). [Diminishing benefits of urban living for children and adolescents’ growth and development](#). Nature. 2023 Mar;615(7954):874-883. doi: 10.1038/s41586-023-05772-8. Epub 2023 Mar 29. PMID: 36991188
- NCD Risk Factor Collaboration (NCD-RisC). [Global variation in diabetes diagnosis and prevalence based on fasting glucose and hemoglobin A1c](#). Nat Med. 2023 Nov;29(11):2885-2901. doi: 10.1038/s41591-023-02610-2. Epub 2023 Nov 9. PMID: 37946056
- Olivera Mesa D, Winskill P, Ghani AC, Hauck K. [The societal cost of vaccine refusal: A modelling study using measles vaccination as a case study](#). Vaccine. 2023 Jun 23;41(28):4129-4137. doi: 10.1016/j.vaccine.2023.05.039. Epub 2023 May 30. PMID: 37263873.
- Parks RM, Kontis V, Anderson GB, Baldwin JW, Danaei G, Toumi R, Dominici F, Ezzati M, Kioumourtzoglou MA. [Short-term excess mortality following tropical cyclones in the United States](#). Sci Adv. 2023 Aug 18;9(33):eadg6633. doi: 10.1126/sciadv.adg6633. Epub 2023 Aug 16. PMID: 37585525
- Perez-Guzman PN, Knock E, Imai N, Rawson T, Elmaci Y, Alcada J, Whittles LK, Thekke Kanapram D, Sonabend R, Gaythorpe KAM, Hinsley W, FitzJohn RG, Volz E, Verity R, Ferguson NM, Cori A, Baguelin M. [Epidemiological drivers of transmissibility and severity of SARS-CoV-2 in England](#). Nat Commun. 2023 Jul 17;14(1):4279. doi: 10.1038/s41467-023-39661-5. Erratum in: Nat Commun. 2023 Dec 7;14(1):8099. PMID: 37460537; PMCID: PMC10352350.
- Perez-Guzman PN, Knock E, Imai N, Rawson T, Elmaci Y, Alcada J, Whittles LK, Thekke Kanapram D, Sonabend R, Gaythorpe KAM, Hinsley W, FitzJohn RG, Volz E, Verity R, Ferguson NM, Cori A, Baguelin M. [Author Correction: Epidemiological drivers of transmissibility and severity of SARS-CoV-2 in England](#). Nat Commun. 2023 Dec 7;14(1):8099. doi: 10.1038/s41467-023-44062-9. Erratum for: Nat Commun. 2023 Jul 17;14(1):4279. PMID: 38062038; PMCID: PMC10703916.
- Pickles M, Gregson S, Moorhouse L, Dadirai T, Dzamatira F, Mandizvidza P, Maswera R, Museka T, Schaefer R, Skovdal M, Thomas R, Tsenesa B, Mugurungi O, Nyamukapa C, Hallett TB. [Strengthening the HIV prevention cascade to maximise epidemiological impact in eastern Zimbabwe: a modelling study](#). Lancet Glob Health.

2023 Jul;11(7):e1105-e1113. doi: 10.1016/S2214-109X(23)00206-1.PMID: 37349036

- Prasad PV, Steele MK, Reed C, Meyers LA, Du Z, Pasco R, Alfaro-Murillo JA, Lewis B, Venkatramanan S, Schlitt J, Chen J, Orr M, Wilson ML, Eubank S, Wang L, Chinazzi M, Pastore Y Piontti A, Davis JT, Halloran ME, Longini I, Vespignani A, Pei S, Galanti M, Kandula S, Shaman J, Haw DJ, Arinaminpathy N, Biggerstaff M. [Multimodeling approach to evaluating the efficacy of layering pharmaceutical and nonpharmaceutical interventions for influenza pandemics](#). Proc Natl Acad Sci U S A. 2023 Jul 11;120(28):e2300590120. doi: 10.1073/pnas.2300590120. Epub 2023 Jul 3.PMID: 37399393
- Rawson T, Doohan P, Hauck K, Murray KA, Ferguson N. [Climate change and communicable diseases in the Gulf Cooperation Council \(GCC\) countries](#). Epidemics. 2023 Mar;42:100667. doi: 10.1016/j.epidem.2023.100667. Epub 2023 Jan 13. PMID: 36652872.
- Reid M, Agbassi YJP, Arinaminpathy N, Bercasio A, Bhargava A, Bhargava M, Bloom A, Cattamanchi A, Chaisson R, Chin D, Churchyard G, Cox H, Denkinger CM, Ditiu L, Dowdy D, Dybul M, Fauci A, Fedaku E, Gidado M, Harrington M, Hauser J, Heitkamp P, Herbert N, Herna Sari A, Hopewell P, Kendall E, Khan A, Kim A, Koek I, Kondratyuk S, Krishnan N, Ku CC, Lessem E, McConnell EV, Nahid P, Oliver M, Pai M, Raviglione M, Ryckman T, Schäferhoff M, Silva S, Small P, Stallworthy G, Temesgen Z, van Weezenbeek K, Vassall A, Velásquez GE, Venkatesan N, Yamey G, Zimmerman A, Jamison D, Swaminathan S, Goosby E. [Scientific advances and the end of tuberculosis: a report from the Lancet Commission on Tuberculosis](#). Lancet. 2023 Oct 21;402(10411):1473-1498. doi: 10.1016/S0140-6736(23)01379-X. Epub 2023 Sep 13.PMID: 37716363
- Salami RK, Valente de Almeida S, Gheorghe A, Njenga S, Silva W, Hauck K. [Health, Economic, and Social Impacts of Substandard and Falsified Medicines in Low- and Middle-Income Countries: A Systematic Review of Methodological Approaches](#). Am J Trop Med Hyg. 2023 Jun 20;109(2):228-240. doi: 10.4269/ajtmh.22-0525. PMID: 37339762; PMCID: PMC10397424.
- Schmit N, Nayagam S, Lemoine M, Ndow G, Shimakawa Y, Thursz MR, Hallett TB. [Cost-effectiveness of different monitoring strategies in a screening and treatment programme for hepatitis B in The Gambia](#). J Glob Health. 2023 Jan 20;13:04004. doi: 10.7189/jogh.13.04004. PMID: 36655869
- Suel E, Muller E, Bennett JE, Blakely T, Doyle Y, Lynch J, Mackenbach JD, Middel A, Mizdrak A, Nathvani R, Brauer M, Ezzati M. [Do poverty and wealth look the same the world over? A comparative study of 12 cities from five high-income countries using street images](#). EPJ Data Sci. 2023;12(1):19. doi: 10.1140/epjds/s13688-023-00394-6. Epub 2023 Jun 7. PMID: 37293269
- Wardle J, Bhatia S, Kraemer MUG, Nouvellet P, Cori A. [Gaps in mobility data and implications for modelling epidemic spread: A scoping review and simulation study](#). Epidemics. 2023 Mar;42:100666. doi: 10.1016/j.epidem.2023.100666. Epub 2023 Jan 12. PMID: 36689876.
- Yadav N, Sorek-Hamer M, Von Pohle M, Asanjan AA, Sahasrabhojane A, Suel E, E Arku R, Lingenfelter V, Brauer M, Ezzati M, Oza N, Ganguly AR. [Using deep transfer learning and satellite imagery to estimate urban air quality in data-poor regions](#). Environ Pollut. 2023 Nov 22;342:122914. doi: 10.1016/j.envpol.2023.122914. Online ahead of print. PMID: 38000726
- Zhang M, Shi Y, Zhou B, Huang Z, Zhao Z, Li C, Zhang X, Han G, Peng K, Li X, Wang Y, Ezzati M, Wang L, Li Y. [Prevalence, awareness, treatment, and control of hypertension in China, 2004-18: findings from six rounds of a national survey](#). BMJ. 2023 Jan 11;380:e071952. doi: 10.1136/bmj-2022-071952. PMID: 36631148
- Zhou J, Singanayagam A, Goonawardane N, Moshe M, Sweeney FP, Sukhova K, Killingley B, Kalinova M, Mann AJ, Catchpole AP, Barer MR, Ferguson NM, Chiu C, Barclay WS. [Viral emissions into the air and environment after SARS-CoV-2 human challenge: a phase 1, open label, first-in-human study](#). Lancet Microbe. 2023 Aug;4(8):e579-e590. doi: 10.1016/S2666-5247(23)00101-5. Epub 2023 Jun 9. Erratum in: Lancet Microbe. 2023 Aug;4(8):e576. PMID: 37307844; PMCID: PMC10256269.