



**OXFORD 2020:**  
Meeting the  
Pandemic Challenge





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# VICE-CHANCELLOR'S FOREWORD

It seems fitting that this year's annual report be devoted to the University's response to the pandemic that has dominated all our lives this past year. In the pages that follow you will get a sense of the scale and the depth of Oxford's contribution to the global battle against COVID-19, from the vaccine to therapeutics, from testing to statistical modelling, from advice on face masks to vaccine hesitancy.

As a result of the work described in these pages, the research profile of the University has never been higher and we have demonstrated, beyond a shadow of doubt, the critical contribution of our research universities to the health and wealth of society. We have demonstrated the importance of international collaborations without which the ChadOx vaccine would never have been developed, nor the trials successfully conducted. We have also shown, through the partnership with AstraZeneca, just how much can be accomplished when universities, the private sector and government come together to work for a common goal. We have also shown how generous philanthropic funding can support us in our perennial quest for excellence.

As the scale of the global catastrophe dawned, our academics downed tools and immediately sought to figure out how they could reorient their work to make a contribution to the national effort. Many worked long nights and every weekend trying to help, all the while managing the difficulties the pandemic posed for all families caring for vulnerable adults and young children. In this instance, our highly devolved structure with lots of local autonomy really helped facilitate creativity and innovation. The talent of our staff was matched only by their commitment.

In addition to assisting the national effort against COVID-19 we committed to protecting the University's educational mission through all the vicissitudes of the pandemic. In Trinity term we had to send almost all our students home and move swiftly to remote teaching and assessment. In Michaelmas term we welcomed our largest student cohort ever. We taught them remotely and in person, organised them by household, established state of the art testing facilities, and mandated social distancing measures. Hilary Term 2021 was different again with most students at home and others gradually allowed back into labs. Again, our structure proved to be an asset. The intimate nature of our colleges ensured that our students are



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known to us and received the support they needed.

For a University with such a deep sense of place at its core, the ingenuity and creativity of our staff ensured that services like counselling and careers advice continued and indeed expanded, online. Our admissions interviews, for the first time ever, were held remotely. Our access initiatives were offered remotely and expanded to many more prospective students. We continued to meet and exceed our targets for diversifying the socioeconomic and ethnic background of our students. The Bodleian Library made millions of books and journal articles available online.

The work of the University continued in other areas too. We launched a new graduate College, Reuben College, our first in several decades. We launched an ambitious Sustainability Strategy with a determination to hit net zero emissions and net biodiversity gain by 2035. Work on major capital projects like the new Humanities Centre and the new Life and Mind building continued throughout the lockdowns. Thanks to a generous gift of £100 million, we also launched the INEOS Oxford Institute to study antimicrobial resistance, another impending threat to global health.

The pandemic, in short, brought out the very best in Oxford University. I hope you enjoy reading this report of just some of our activities during the pandemic.

**Professor Louise Richardson**

Vice-Chancellor

Cover: Associate Professor Katie Ewer, Senior Immunologist at The Jenner Institute and member of the Oxford Vaccine Team (© Oxford University/John Cairns).

Inside front cover: Spring 2020: The University's Sheldonian Theatre displays the rainbow colours of the UK's National Health Service (© Oxford University/Joby Sessions)



## A NEW VACCINE IN LESS THAN A YEAR

**The development of vaccines is a complex and intensive process, usually taking decades to move from laboratory to clinic. The vast majority of new vaccines also fail to provide enough protection to be considered useful, making it difficult to fund them.**

The fact that the Oxford vaccine was able to overcome all these hurdles in just 10 months is a testament to preparations that had been going on for some time at Oxford anticipating the arrival of a virus like COVID-19, as well as to the seamless cooperation of different research groups.

It all began at the Jenner Institute, one of the world's leading vaccine research centres, and part of Oxford's Medical Sciences Division. On 31 December 2019,

China reported a mysterious cluster of pneumonia cases in Wuhan and within a fortnight the Oxford team had already begun work on designing a vaccine for the new illness. China publicly shared the genetic sequence of the virus on the morning of Saturday 11 January, and that very weekend the team around Professor Sarah Gilbert began work on a vaccine candidate.

'Novel pathogens such as nCoV-19 require rapid vaccine development,' said Professor Sarah Gilbert of the Jenner Institute, the lead researcher on the Oxford vaccine. 'By using technology that is known to work

well for another coronavirus vaccine we are able to reduce the time taken to prepare for clinical trials.'

The reason for the quick start was that Professor Gilbert's team had already been working on human trials of a vaccine for a similar coronavirus, which causes Middle East Respiratory Syndrome (MERS).

The team's vaccine model was designed to be adapted for use against other diseases. And indeed the same approach had already been tested clinically by Oxford scientists for eight other vaccines. A new vaccine can be made by inserting a new piece of genetic information that is specific to the disease in question into an existing delivery vehicle, which in this case was an altered virus. The new bit of information required for the COVID-19 vaccine was a series of instructions to tell the human cell to produce a distinctive protein spike on its outer surface, which fools the body's immune system into thinking it is a virus. The body then has time to learn how to attack this new threat, without actually being under assault from thousands of real viruses. The next

END OF 2019

26  
NOV

Oxford University is ranked 1st in the world for medicine, for a 9th consecutive year (THE rankings).



31  
DEC

An unusual outbreak of pneumonia is reported by China, centred in the city of Wuhan, Hubei Province.



time the immune system encounters a virus with this distinctive protein spike, it is prepared for action.

The Oxford vaccine (ChAdOx1 nCoV-19) is made from a weakened version of a common cold virus (adenovirus) that has been genetically changed so that it is safe and cannot spread through the body in humans. It is easily manufactured, transported and stored at domestic fridge temperature, making it easy to administer in existing healthcare settings and allowing rapid deployment.

‘For the past 25 years, staff at the Jenner Institute have worked to develop vaccines using novel technologies to protect people around the world from diseases that claim many lives each year,’ explains Professor Adrian Hill, Director of the Jenner Institute, who developed the original ChAdOx1 model. ‘The work on ChAdOx1 nCoV-19 builds on many years of research by a dedicated team of vaccinologists.’ Professor Hill and Professor Gilbert jointly founded Vaccitech to develop this vaccine platform for new diseases.

After positive early results in animal trials, the team began recruiting volunteers for the first human trial in March, and on 23 April in Oxford, the first participants received their jabs.

Professor Andrew Pollard led the trials, having decades of experience in conducting clinical vaccine trials around the world with the Oxford Vaccine Group, in the Department of Paediatrics, University of Oxford.

This early development was boosted by public donations by individuals following a public appeal, and by government investment on March 24 of £2.6 million towards vaccine development and manufacturing.

At this stage, the vaccines used in the trial were being made at the University’s own small manufacturing facility, as well as by other partner institutions.

However, the scale of the pandemic at this point, both in the UK and around the world, made it obvious that if the vaccine proved effective, millions more doses would be needed in a very short period of time.

In late April, the University announced a partnership with the UK-based global biopharmaceutical company AstraZeneca for the further development, large-scale manufacture and potential distribution of the COVID-19 vaccine candidate. The University’s Regius Professor of Medicine Sir John Bell took a lead role in negotiating the agreement, which included working with many other international partners, with a particular focus on making it available and accessible to low- and medium-income countries. Both Oxford and AstraZeneca agreed to operate on a not-for-profit basis for the duration of the coronavirus pandemic.

When the safety data first started to come in from the human trial, work began to include a broader range of trial participants. Trials also began in other countries. The milestone moment for the vaccine programme came on 20 July, when the result of the Phase I/II trial was published in the scientific journal *The Lancet*, showing that there were no early safety concerns and that the vaccine induced strong immune responses in both parts of the immune system. The vaccine provoked a T cell response within 14 days of vaccination (meaning white blood cells can attack cells infected with the SARS-CoV-2 virus), and an antibody response within 28 days (antibodies are able to neutralise the virus so that it cannot infect cells when initially contracted).

The race was now on to make sure that the vaccine worked as effectively in the most vulnerable age groups, as well as to prepare enough stocks of the vaccine to meet demand if and when it was approved for use in the wider population.

## ‘THERE WERE NO HOSPITALISED OR SEVERE CASES AMONG THOSE WHO RECEIVED THE VACCINE’

In late November, the University and AstraZeneca announced successful interim data from the Phase III trials, showing that the vaccine was effective at preventing COVID-19 (SARS-CoV-2) and offered a high level of protection. There were no hospitalised or severe cases among those who received the vaccine, and over 24,000 volunteers had been drawn from clinical trials in the UK, Brazil and South Africa, providing a large safety base. The Oxford vaccine was noteworthy for being easily stored at ‘fridge temperature’ (2–8 °C) and distributed using existing logistics, while large-scale manufacturing was already ongoing in more than 10 countries to support equitable global access at cost price.

The peer-reviewed results of Phase 3 human trials confirmed 100% protection against hospitalisation, with an overall efficacy of 70.4%. It was later shown that extending the interval between the first and second doses to 3 months resulted in an efficacy greater than 80%.

On 30 December the UK Government accepted the recommendation from the Medicines and Healthcare products Regulatory Agency (MHRA) to authorise the emergency use of the ChAdOx1 nCoV-19 coronavirus vaccine in the UK, making history as the fastest development of a vaccine in the UK, with stocks already built up to begin the rollout to the most vulnerable in the New Year.

## 2020 BEGINS

03  
JAN

Oxford’s vaccine team go straight to work to understand the nature of the virus and what could be done to address it.

11  
JAN

China shares the genetic sequence of the virus.

30  
JAN

Oxford’s Medical Sciences Division organises a large-scale information sharing exercise.



## The Jenner Institute

Named after the physician, scientist and vaccination pioneer Edward Jenner, the Jenner Institute's researchers are actively involved in the development of vaccines and clinical trials for diseases including malaria, tuberculosis, Ebola and the MERS coronavirus.

The Institute is based within Oxford University's Nuffield Department of Medicine in the Old Road Campus Research Building in Headington, but also supports senior vaccine scientists, known as Jenner Investigators, in many other departments across the University, as well as externally at The Pirbright Institute and the Animal and Plant Health Agency.



**31  
JAN**

A global federation of health bodies sponsored by Oxford (ISARIC) activates its Clinical Characterisation Protocol to recruit patients with a view to testing treatments.  
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**11  
FEB**

The World Health Organisation names the new coronavirus COVID-19.

**11  
MAR**

The World Health Organisation officially declares a pandemic.





(© Oxford University/John Cairns)

**15**  
**MAR**

A public appeal is set up and raises £150,000 from 700 individuals in six weeks, towards priority Oxford COVID projects.



**17**  
**MAR**

Oxford shares the idea of a contact tracing app and briefs European governments. The work is led by Professor Christophe Fraser from Oxford University's Big Data Institute, who notes that 'mathematical modelling suggests that traditional public health contact tracing methods are too slow to keep up with this virus.'





Professor Sarah Gilbert (© Oxford University/John Cairns)

### **Professor Sarah Gilbert, Saïd Professor of Vaccinology, Jenner Institute and Nuffield Department of Clinical Medicine**

Professor Gilbert has been making and testing vaccines designed to induce T cell responses for over 25 years, chiefly using viral vectored vaccines. She has also been involved in work to develop a universal flu vaccine. Several of the vaccines developed in her laboratory have progressed into clinical trials, including two clinical trials in the UK and the Kingdom of Saudi Arabia for a vaccine against the Middle East Respiratory Syndrome Coronavirus (MERS-CoV). Other vaccines against a number of pathogens that cause outbreaks are in preclinical development.

**18**  
**MAR**

Scientists from the University of Oxford's Engineering Science Department and the Oxford Suzhou Centre for Advanced Research (OSCAR) develop a rapid testing technology for COVID-19. The team, led by Professor Zhanfeng Cui and Professor Wei Huang, reduce the result time from 2 hours to 30 minutes.

**24**  
**MAR**

The University receives £4.7 million in government funding for vaccine discovery, clinical trials and manufacturing processes for vaccines, the last aiming at a million-dose scale.



## Professor Andrew Pollard, Director of the Oxford Vaccine Group and Chief Investigator of the Oxford Vaccine Trial

Professor Pollard is the chief investigator of the global clinical trials of the Oxford COVID-19 vaccine sponsored by the University of Oxford. He has been Director of the Oxford Vaccine Group in the Department of Paediatrics at the University since 2001 and leads the paediatric infectious disease clinical team at Oxford Children's Hospital. The Oxford Vaccine Group was established in 1994. Professor Pollard's research involves the design, development, clinical testing and laboratory evaluation of vaccines, with the aim of preventing serious infectious disease and improving child health. He trained in paediatric infectious diseases in the UK and Canada and his research has supported global policy on typhoid, pneumonia and meningitis, as well as the use of many vaccines in the NHS.



Professor Andrew Pollard (© Oxford University/John Cairns)



## Professor Adrian Hill, Director of the Jenner Institute, Lakshmi Mittal and Family Professor of Vaccinology and Professor of Human Genetics

Professor Hill has been involved in the development of a range of different types of vaccines for illnesses including malaria, tuberculosis, Ebola and malaria. Since 1999 he has led over 50 clinical trials, mainly of Oxford-designed vaccines, while assessing a range of new vaccine technologies. This has included many for outbreak pathogens such as Zika and Chikungunya, and in 2014 his group led the first clinical trial of a vaccine targeting the outbreak of Ebola in West Africa.

He is a passionate believer in the power of molecular medicine to design and deliver new health care interventions that will improve the lives of the poorest billion in sub-Saharan Africa and elsewhere. His main vaccine programme has developed a particularly promising potential vaccine for malaria, which in a recent trial in children in sub-Saharan Africa proved to be 77% effective.

Professor Adrian Hill (© Oxford University/John Cairns)



**25  
MAR**

Reuters Institute for the Study of Journalism Director Rasmus Nielsen predicts the commercial vulnerability of media to COVID-19, in a wide-ranging thought piece.

**30  
MAR**

Professor Cathy Creswell and colleagues launch a major research study (Co-Space) that would investigate the mental health of children throughout the rest of the pandemic.

**30  
MAR**

The University's Department of Education issues advice to help parents faced with the difficult task of home schooling.

# THE RECOVERY TRIAL

**Could existing drugs usually used for other conditions have benefits as potential treatments for patients admitted to hospital with COVID-19? Oxford researchers set out to answer this question in March 2020, with the world's largest clinical trial of COVID-19 treatments.**

In March 2020, no one knew whether existing drugs used to treat other conditions might also benefit COVID-19 patients.

Researchers from the University of Oxford launched The Randomised Evaluation of COVID-19 therapy (RECOVERY) Trial, under the Chief Investigators Professors Martin Landray and Peter Horby, to test the effects of potential drug treatments for patients admitted to hospital with the virus.

The treatments initially included in the study were recommended by an expert panel that advises the Chief Medical Officer in England. They were Lopinavir-Ritonavir, normally used to treat HIV, and the steroid dexamethasone, which is used in a wide range of conditions to reduce inflammation.

One of these drugs would go on to be the first treatment demonstrated to reduce mortality in COVID-19, saving an estimated 1 million lives worldwide by March 2021.

By the beginning of April 2020, almost 1,000 patients from 132 different hospitals had been recruited in just 15 days, the trial boosted by government funding of £2.1 million a week earlier. The RECOVERY Trial added thousands more patients in weeks, becoming the largest randomised controlled trial of potential COVID-19 treatments in the world.

In June 2020 the first breakthrough was announced. The low-cost steroid dexamethasone was reducing death by up to one third in hospitalised patients with severe respiratory complications caused by COVID-19. By then more than 11,500 patients had been enrolled in RECOVERY, from over 175 NHS hospitals in the UK.

Speaking at the time, Martin Landray, Professor of Medicine and Epidemiology at the Nuffield Department of Population Health, University of Oxford, said: 'Since the appearance of COVID-19 six months ago, the search has been on for treatments that can improve survival rates, particularly for the sickest patients.

'These preliminary results from the RECOVERY trial are very clear – dexamethasone reduces the risk of death among patients with severe respiratory complications. COVID-19 is a global disease – it is fantastic that the first treatment demonstrated to reduce mortality is one

that is instantly available and affordable worldwide.'

A UK government estimate published in March 2021 concluded that dexamethasone use had saved 22,000 lives in the UK and an estimated 1 million lives worldwide.

In June 2020, RECOVERY was also able to demonstrate that another potential drug being tested for COVID-19, hydroxychloroquine, showed no clinical benefit.

**'ONE OF THESE DRUGS WOULD GO ON TO SAVE AN ESTIMATED 1 MILLION LIVES WORLDWIDE BY MARCH 2021...'**

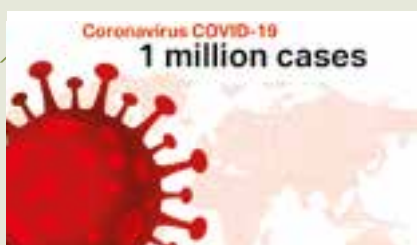
In a statement at the time, Peter Horby, Professor of Emerging Infectious Diseases and Global Health in the Nuffield Department of Medicine, University of Oxford, said: 'Although it is disappointing that this treatment [hydroxychloroquine] has been shown to be ineffective, it does allow us to focus care and research on more promising drugs.'

In September 2020, Regeneron Pharmaceuticals, Inc. and the University of Oxford revealed that RECOVERY would evaluate Regeneron's anti-viral antibody cocktail, REGN-COV2.

REGN-COV2 became the first specifically designed COVID-19 therapy to be evaluated by RECOVERY. It comprises two monoclonal antibodies and is designed to block infectivity of SARS-CoV-2, the virus that causes COVID-19.

By this point the RECOVERY trial was also studying the impact of convalescent plasma (plasma taken from patients who have recovered from COVID-19), tocilizumab (a drug which targets a specific part of the immune system), and azithromycin (usually used as an antibiotic).

In February 2021 it was announced RECOVERY had demonstrated that the anti-inflammatory treatment, tocilizumab, reduces the risk of death when given to hospitalised patients with severe COVID-19. The study also showed that tocilizumab shortens the time until patients are successfully discharged from hospital and reduces the need for a mechanical



**02**  
APR

The total number of COVID-19 cases globally hits the 1 million mark.



**06**  
APR

Dr Stuart Lee leads Lockdown2020, crowdsourcing students and staff for lockdown testimony, often submitted via Twitter.  
(© Oxford University)





Professor Martin Landray (left) and Professor Peter Horby (© Oxford University/John Cairns)

ventilator. Tocilizumab, an intravenous drug used to treat rheumatoid arthritis, was added to the trial in April 2020. Recruitment to the tocilizumab arm stopped on 24 January 2021 since, in the view of the trial Steering Committee, sufficient patients had been enrolled to establish whether or not the drug had a meaningful benefit.

Speaking about the announcement, Professor Landray said: 'The results from the RECOVERY trial clearly show the benefits of tocilizumab and dexamethasone in tackling the worst consequences of COVID-19 – improving survival rates, shortening hospital stay

and reducing the need for mechanical ventilators.

Used in combination, the impact is substantial. This is good news for patients and good news for the health services that care for them in the UK and around the world.'

**'USED IN COMBINATION, THE IMPACT IS SUBSTANTIAL. THIS IS GOOD NEWS FOR PATIENTS AND GOOD NEWS FOR THE HEALTH SERVICES THAT CARE FOR THEM..'**



**07  
APR**

Deputy Director of the Reuters Institute for the Study of Journalism Meera Selva spells out the significant threat to press freedoms represented by the COVID-19 crisis – a theme that the institute would pursue vigorously all year. (© Meera Selva)



**14  
APR**

The Oxford Foundry (OXFO), Oxford's entrepreneurship centre, launches a COVID-19 action plan, supporting 13 ventures accelerating solutions to the problems caused by the pandemic.

By February 2021, more than 35,000 patients had been enrolled in RECOVERY from 177 NHS hospitals in the UK, underlining the scale and benefits of a unified, national healthcare system.

**‘IN THE SAME MONTH RECOVERY, ALREADY THE WORLD’S LARGEST CLINICAL TRIAL, ANNOUNCED AN INTERNATIONAL EXPANSION...’**

In the same month RECOVERY, already the world’s largest clinical trial, announced an international expansion, with Indonesia and Nepal among the first countries to join, and the first patients already recruited to RECOVERY International.

The trial had also already shared further results showing that lopinavir-ritonavir, azithromycin

and convalescent plasma have no benefits for patients hospitalised with COVID-19.

The RECOVERY trial is continuing to investigate the following treatments:

- aspirin (commonly used to thin the blood)
- baricitinib (an anti-inflammatory used to treat rheumatoid arthritis)
- colchicine (a commonly used anti-inflammatory drug)
- Regeneron’s antibody cocktail (a combination of monoclonal antibodies directed against coronavirus)

The RECOVERY trial is conducted by the registered clinical trials units with the Nuffield Department of Population Health in partnership with the Nuffield Department of Medicine, which are both part of the University of Oxford.

## Martin Landray, Professor of Medicine and Epidemiology, Nuffield Department of Population Health



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John Cairns)

Professor Landray’s work seeks to further understanding of the determinants of common diseases through the design, conduct and analysis of efficient, large-scale clinical trials and prospective cohort studies. He has led a series of major clinical trials assessing treatments for cardiovascular and kidney disease. These have enrolled over 65,000 individuals, producing results that have modified regulatory drug approvals, influenced clinical guidelines and changed prescribing practice to the benefit of patients. He is heavily involved in efforts to streamline clinical trials, working with regulatory agencies to facilitate efficient and cost-effective trials. Professor Landray also continues to practise clinical medicine as an Honorary Consultant Physician in the Cardiology, Cardiac and Thoracic Surgery Directorate at Oxford University Hospitals NHS Trust.

## Peter Horby, Professor of Emerging Infectious Diseases and Global Health, Nuffield Department of Medicine

Professor Horby established the Epidemic disease Research Group Oxford (ERGO) in 2014. ERGO is engaged in an international programme of clinical and epidemiological research to prepare for and respond to emerging infections that may develop into epidemics or pandemics. The group is conducting research on a range of epidemic diseases including Ebola, bird flu (H5N1 and H7N9), MERS-CoV and Enterovirus 71. Previously, Professor Horby was the former, and founding, director of the Oxford University Clinical Research Unit in Hanoi, Vietnam. The unit conducts research on infectious diseases which crosses the disciplines of basic science, medical science and public health.



(© Oxford University/  
John Cairns)

**15  
APR**

An Oxford-developed COVID-19 Impact Monitor utilising mobile phone data reveals that travel in the UK had fallen by 98% in the preceding month.



**15  
APR**

A ‘Ten-Minute Book Club’ is set up, later achieving international traction as far afield as India. It was led by Dr Alexandra Paddock, Professor Kirsten Shepherd-Barr and Dr Erica Lombard, and featured book snippets readable in 10 minutes. (Pictured: Elizabeth Keckley, 1861 © Moorland-Spangarn Research Center)



# THE UK REVOLUTION IN PRIMARY HEALTHCARE



While the clinical trials for COVID-19 treatments progressed at unprecedented speed in the background, the UK's National Health Service (NHS) underwent radical surgery. The cornerstone of patient care has always been general practice, and general practice has always been relational: patients visit their doctor in a surgery.

Within three weeks of the first COVID-19 death in the UK, 93% of GP-patient consultations were taking place by telephone or video. This rapid change to remote-by-default consulting was 'the fastest and most extensive introduction of a radical service innovation since the NHS was founded in 1948,' suggests Oxford's Professor of Primary Care Health Sciences Trish Greenhalgh.

It was the full intention that some elements of this immense change would be retained for the longer term – a silver lining of the pandemic.

Left: Trish Greenhalgh

## Sir John Bell, Regius Professor of Medicine at the University of Oxford

Professor Bell has played a key role in many aspects of the University's response to the pandemic, as well as advising at a national level. In particular, he took a lead role in negotiating the agreement between the University and AstraZeneca on vaccine production and distribution, to ensure that there would sufficient capacity to meet the anticipated global demand at low cost.

He was also involved in advising on Covid Diagnostics, helping to set up the Lighthouse labs and leading the Oxford/Porton Down team that established the utility and validation of lateral flow tests - now the backbone of the national strategy.

Professor Bell has a long history of leading biomedical research at Oxford, and he also plays a major role in external relations, including with major research funding agencies, charities and industry. An immunologist and geneticist, he succeeded David Weatherall as the Nuffield Professor of Clinical Medicine at the Institute of Molecular Medicine in 1992, and in 1994 was one of the founders of the Wellcome Trust Centre for Human Genetics at Oxford University.

He has been the founding director of several biotechnology companies, holds board positions on a number of charity and research bodies, sat on the Council of the Medical Research Council, and is a government adviser on industrial life sciences strategy.



(© Oxford University/  
John Cairns)

17  
APR

Oxford is among the first institutions in the world to identify the relation between patient age and mortality risk from COVID-19. The research, by Dr Jennifer Beam Dowd, Professor Melinda Mills and other Oxford colleagues, emphasises the potential for dramatically higher fatality rates in countries and localities with older populations.

17  
APR

State-sponsored COVID-19 misinformation is laid bare by a team within the Oxford Internet Institute. English-language state-backed media in Russia, China, Iran and Turkey is shown to be pushing messages to millions of potential followers containing misleading content, conspiracy theories and propaganda.



Professor Chris Butler (left) and Professor Richard Hobbs (© Oxford University/Loby Sessions)

## THE PRINCIPLE TRIAL

**A major trial launched in 2020 focuses on a range of potential treatments for COVID-19 suitable for use in the community, to help people recover more quickly and prevent the need for hospital admission.**

Oxford launched PRINCIPLE, a major national treatment trial in April 2020. Unlike RECOVERY, which focused on hospitalised patients, this study focused on at-risk COVID-19 patients in the community.

Led by Professors Chris Butler and Richard Hobbs, PRINCIPLE tests the effectiveness of treatments that could be rapidly scaled up, to speed recovery and reduce the need for hospital admission. A major benefit is that drugs shown by the trial to have a clinical benefit can be rapidly introduced into routine primary care in the NHS and elsewhere.

The Platform Randomised trial of Interventions against COVID-19 In older peOPLE (PRINCIPLE) was initially conducted through GP surgeries. It recruited participants most at risk of serious COVID-19 illness due to their age, symptoms or an underlying health condition.

While general practice remains critical to delivery

of the trial, everyone across the UK, regardless of where they are registered to receive their health care, can now sign up independently if they are eligible.

To date, more than 4,900 patients have volunteered to join PRINCIPLE, making it the world's largest platform trial of COVID-19 treatments to take place in community settings.

PRINCIPLE has pioneered an innovative methodology for community-based research that allows for many treatments to be efficiently and rapidly assessed in a single trial, resulting in a world-first finding of an effective community-based treatment during the course of a pandemic, in the form of the asthma treatment budesonide.

In April 2021, PRINCIPLE reported inhaled budesonide as the first widely available, inexpensive drug found to shorten recovery times in COVID-19 patients aged over 50 who are treated at home and in other community settings.

**20**  
APR

An international study begins to consider the experience of social distancing, coordinated by Dr Bahar Tuncgenc.

**23**  
APR

Human trials of Oxford's vaccine candidate begin – the first of its kind in Europe.

**23**  
APR

A new study led by researchers at Oxford and Guangdong Centre for Diseases Control and Prevention describes the epidemiology and genetic make-up of the COVID-19 outbreak in China's most populous region, showing how early and intensive testing and tracing helped to interrupt local transmission of the virus.



In January 2021, interim analyses of commonly used antibiotics investigated as separate treatments in the PRINCIPLE trial also resulted in two important findings.

The trial demonstrated that azithromycin and doxycycline are not effective treatments for COVID-19 in the early stages of the illness, changing clinical practice in the UK and internationally.

PRINCIPLE investigations are ongoing with colchicine, a commonly used anti-inflammatory, and favipiravir, an antiviral used in Japan to treat influenza. For the colchicine arm, it was also announced in March

2021 that the trial would include participants either aged 18–64 with shortness of breath from COVID-19 or certain underlying health conditions that put them at risk of severe illness, or those aged over 65.

PRINCIPLE is funded by a grant to the University of Oxford from UK Research and Innovation and the Department of Health and Social Care through the National Institute for Health Research as part of the UK Government's rapid research response fund. PRINCIPLE is led from the Primary Care Clinical Trials Unit at the University of Oxford's Nuffield Department of Primary Care Health Sciences.

### Professor Chris Butler, Professor of Primary Care and Salaried GP

Professor Butler's research focuses on common infections (especially the appropriate use of antibiotics, antibiotic resistance, point of care testing and treatments for viral infections), and health care communication and behaviour change. He has led or helped lead more than 20 randomised clinical trials, and in the space of 12 months published first-author trials in the world's top 3 general medical journals. He leads the Infections and Acute Care Research Group, and is Clinical Director of the University of Oxford Primary Care Clinical Trials Unit and a Fellow of the Academy of Medical Sciences.



(© Oxford University/Joby Sessions)



(© Oxford University/Joby Sessions)

### Professor Richard Hobbs, Head of the Nuffield Department of Primary Care Sciences and Professor of Primary Care Health Sciences

Professor Hobbs's research interests are in cardiovascular epidemiology and clinical trials, especially those relating to vascular and stroke risk, heart failure and digital health. Currently, he runs all 4 of the primary care 'national priority urgent COVID-19 research programmes'. He is Director of the NIHR English School for Primary Care Research and of the NIHR Applied Research Collaboration (NIHR ARC) Oxford. He is the president of the International Primary Care Cardiovascular Society (IPCCS) and currently chairs the European Primary Care Cardiovascular Society (EPCCS), a World Organization of National Colleges, Academies and Academic Associations of General Practitioners/Family Physicians (WONCA) Special Interest Group.

23  
APR

A team from the Nuffield Department of Medicine's Big Data Institute shares an epidemiological model to help configure a contact tracing app for COVID-19.



28  
APR

A collaborative report identifies the plight of 50 million gig workers globally – typically those who deliver goods for internet platforms and cannot avoid social proximity in order to perform their jobs.

(© Shutterstock)

# INTERPRETING A PANDEMIC

Oxford's humanities researchers gathered context for the current pandemic from historical and literary sources, as well as providing critical policy insights into misinformation surrounding the spread of COVID-19 and then the safety of vaccination. There were also practical contributions, such as the donation of PPE. One project sought out narratives from staff, students and the wider Oxford community as a record of the peculiar moment of Spring 2020; a small selection of these stories are told here.



**01**  
MAY

The month begins with the launch of an international mental health survey of adolescents, the Oxford ARC Study, led by Professor Elaine Fox and designed to determine factors that promote or hinder resilience.



**06**  
MAY

An interim report is published on a family mental wellbeing survey, Co-SPACE, which is co-led by Professor Cathy Creswell and Dr Polly Waite. The report highlights the enormous pressure lockdown placed on the parents of children, particularly children with special education needs and/or neurodevelopmental differences, and those from lower-income households. (© Shutterstock)



# THE HISTORY OF PANDEMICS

**Oxford's History Faculty provided invaluable historical context from the earliest moments of the pandemic, which was widely shared online.**



Professor Lyndal Roper (pictured left), whilst quarantining in Australia, came to re-examine her assumptions about Early Modern society taking plague in its stride. A Martin Luther and Reformation specialist, Professor Roper published an essay in the *London Review of Books* about events when the plague came to Wittenberg,

Germany, in 1527. Luther himself published a pamphlet on the subject and urged pastors to stay and minister to the sick and dying – as he himself did – rather than running away to safety. Some of his other views are theologically a long way from most modern views, yet for these same reasons hold significant comparative value. The role of pastors advocated by Luther contrasted with the closing of places of worship in some countries, including the UK. Roper wrote, ‘This struck me with particular force, because it is not happening now, as people die without friends and family around them’. In fact, when the pandemic started to dwindle in the UK in 2021 there would be a greater resumption of discussion about cultural values around death and dying, in particular concerning family access to patients at the end of their lives.

Across April and May 2020, Dr Erica Charters and Koen Vermeir co-edited a spotlight issue (May 2020) of the journal *Centauros* on the history of epidemics and the history of science and medicine in the context of COVID-19. The freely available result provided a range of approaches (methodological as well as geographic) to the historical context of the pandemic. As the Introduction, co-authored by Erica Charters and Richard McKay, explains, ‘Knowing the history of something – whether of numbers, narratives, or disease – enables us to see a broader range of trajectories available to us. These varied histories also remind us that we are currently in the midst of a chaotic drama of uncertainty, within our own unstable and unfolding narrative.’ Contributors include the University of Oxford’s Margaret Pelling, who makes use of her career-long expertise in Early Modern and 19th-century disease to provide a long-term perspective

on epidemic disease and its histories. As Erica Charters explains, ‘historians and academic publishing do not usually work with such speed, but it was clear many scholars felt the urgency of articulating and sharing their expertise as a way of making sense of and contextualising the COVID-19 pandemic. It has been energizing to work with others on this project, and I hope the freely-available special issue will be useful to students and researchers alike.’

22 May saw Mark Harrison, Professor of the History of Medicine and Co-Director of the Wellcome Centre for Ethics and Humanities, publish the online essay ‘COVID-19, the aftermath: insights from history’, in which he noted that all previous pandemics have resulted in racial and class-based divisions, economic strife, extreme politics and prolonged civil unrest, as suffering populations and authorities sought answers and scapegoats for their plight. This was a particularly useful long-wave analysis that helped inform some of the other tensions that made headlines in 2020 – whether concerning bitter political division, race or other inequalities, including access to health care and later vaccine distribution.



Civil unrest followed the police shooting of George Floyd in the USA on May 25, 2020 (© Shutterstock)

06  
MAY

Professor Mike Bonsall publishes alternative models of ending lockdown, arguing that a gradual approach is much less risky than a sudden release.



07  
MAY

Oxford publishes the largest COVID-19 risk survey yet seen, considering 17.4 million UK adults between 1 February and 25 April 2020. The survey shows that ethnicity is a factor in COVID-19 risk, as well as social deprivation.

(COVID-19 Field Hospital set up in a former industrial plant © Shutterstock)

Professor Paul Slack wrote in the *London Review of Books* about the advanced state of Italian ideas of quarantine in the 17th century, and how similar ideas were proposed to Charles I in England against the plague, but not enacted; yet the king's president of the Council in the North, Thomas Wentworth, assumed authority over the city of York and rigidly enforced a quarantine to good effect.

Professor of Economics Jane Humphries hosted a Royal Economic Society webinar on the long economic consequences of pandemics, seen historically, while Professor

of International History Patricia Clavin wrote in the *London Review of Books* about the common comparison made by media and governments between the pandemic and national solidarity in the Second World War. She argued instead that the best recent war for comparison was the First World War.

In November, Professor of Philosophy Peter Millican hosted a multi-episode Future Makers podcast for the University, as he took a journey through 10 historical outbreaks of disease in search of meaning and lessons for today.

## RECORDING AN INSTITUTIONAL HISTORY

Dr Stuart Lee of Oxford's IT Services and the Faculty of English led Lockdown2020, crowdsourcing students and staff for lockdown testimony, often submitted via Twitter. Word analysis revealed the popularity of 'exercise', 'nature', 'Zoom', 'breathe', 'nature' and 'family'. A mirror project ran in the community with the Museum of Oxford.

## THE TEN-MINUTE BOOK CLUB



On 15 April a 'Ten-Minute Book Club' was set up, later achieving international traction as far afield as India. It was led by Dr Alexandra Paddock, Professor Kirsten Shepherd-Barr and Dr Erica Lombard, and featured book snippets readable in 10 minutes.

## THE MUSEUMS DONATE THEIR PPE TO HEALTHCARE WORKERS

By early April the pandemic was a health care emergency, with over 1 million cases of COVID-19 declared globally. The Bodleian Libraries, Ashmolean Museum, History of Science Museum and Museum of Natural History all answered a call to donate their Personal Protection Equipment (PPE) to key workers and frontline health care professionals. Conservators often use hazardous substances in their work, meaning that they had boxes of nitrile gloves, disposable aprons, sleeve protectors, protective masks and antibacterial wipes that could all be given to the NHS. The initial donation was made directly to the London Ambulance Service.

Right: Personal Protective Equipment waiting to be delivered to the London Ambulance Service (© GLAM)



13  
MAY

An Oxford-developed rapid COVID-19 test is commercialised; the resulting company is called Oxsed Limited. Its RaVid Direct test was used in Heathrow Airport in November.

18  
MAY

Research fellows Victoria Nash and Rebecca Eynon report that home schooling 1.3 billion children has resulted in exaggerated inequalities, mostly concerning digital access favouring the affluent.



21  
MAY

Professor Mary Daly explores the causes of the policy response to the pandemic's devastating impact on care homes, considering the task of social scientists in future responses to the treatment of care homes and caring in general.





(© Shutterstock)

## TACKLING THE INFODEMIC

Oxford's Reuters Institute for the Study of Journalism was extremely active throughout the pandemic, researching how the news media was in huge demand as a source of accurate information during the pandemic, but was also commercially prone to complete and catastrophic failure as different national economies contracted and advertising evaporated.

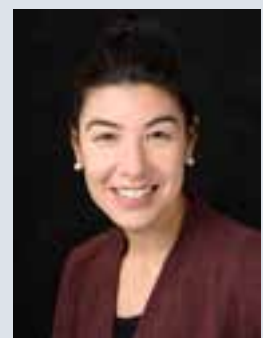
The Institute surveyed misinformation in 6 countries covering March–April 2020, and found that misinformation consisted of 87% manipulation of true stories and 13% pure fabrication, typically on social media. The term 'infodemic' provided a powerful framing tool for health authorities. The full report followed in October, once more data had been acquired. It shared 3 key findings: that most people were relatively informed but a large minority did not feel news media or the government explained what they could do in response to the pandemic; that information inequality grew as the crisis continued; and that the 'infodemically vulnerable' are a small but significant and growing part of the UK public.\*

\*See story on state-sponsored misinformation on page 24.

## THE BEGINNING OF THE END?

Before any vaccine's effectiveness was declared, historian Dr Erica Charters looked ahead to the successful containment of COVID-19 and sought an interdisciplinary framework for the 'end' of the pandemic, informed by history. 'Epidemics end once the diseases become accepted into people's daily lives and routines, becoming endemic – domesticated – and accepted.' But, she noted in the co-authored paper 'How Epidemics End', while the formal end signals a return to normality it is typically an uneven process, proceeding at different speeds in different places. Pandemics are socially, politically and economically negotiated, not just bio-medical events.

Right: Dr Erica Charters



27  
MAY

Professor Luciano Floridi and DPhil student Jess Morley publish a video considering the ethics around COVID-19 tracking apps.



29  
MAY

Hugh Grosvenor, the Duke of Westminster, donates £1 million towards the University's COVID-19 mental health research programmes.

## ADAPTING THE UNIVERSITY

**Mirroring the rest of society, the University faced an immense shock to the system as the pandemic struck. A huge number of changes took place to make sure that teaching and research continued as much as possible throughout the rest of the year.**

On 23 March the UK Prime Minister instructed the British public to 'stay at home', except for 'shopping for basic necessities', and when travelling to and from work was 'absolutely necessary'. The University had anticipated the lockdown. The winter (Hilary) term had ended on 14 March. The day before, students had been instructed to go home and most staff to work from home. The Easter vacation provided an opportunity to assess options and make big changes.

The first substantial change was to library services. As early as 17 March the University's Bodleian Library put many of its services online, and just a fortnight later over 1,000 reading lists were available to students alongside millions of books and journals.

The summer (Trinity) term began on April 20 and did so unlike any previous term in the 800-year history of the University. All in-person teaching and exams were replaced by online learning, assessment and support. Teaching and professional support staff worked tirelessly to move tutorials, seminars and lectures to online formats. Tens of thousands of exams were delivered online. Student support also moved to online delivery, from counselling to careers. It was a challenging time, but according to a survey two thirds of both staff and students said they

were satisfied overall, paying testimony to the collegiate University's response to the difficulties it faced.

**'THE SUMMER TERM WAS UNLIKE ANY OTHER IN THE HISTORY OF THE UNIVERSITY...'**

Lockdown ended in the UK on 4 July and initially in the autumn (Michaelmas) term a semblance of normality returned, but with very strict government guidance as to social distancing and mask wearing at all times inside buildings, in particular during tutorials.

Then the second wave of the pandemic precipitated a return to the deserted Oxford previously experienced in the spring.

Come the start of 2021, a few courses, including medicine, reopened their laboratories, but the city continued to be largely empty of students. Only in late April 2021 did the bulk of students return to the University to resume in-person studying, at a time when over half of the UK population had been vaccinated and cases of COVID-19 had plunged to a low enough level for the pandemic to be downgraded by Oxford's Professor Sarah Walker to 'endemic' status.

Tutorial in Oxford, 2020 (© Oxford University/John Cairns)



04  
JUN

More than 120 international lawyers sign the Oxford Statement on the International Law Protections Against Cyber Operations Targeting the Health Care Sector – led by Professor Dapo Akande. The document seeks legal consensus and political clarity about existing laws, and suggests counter-measures such as freezing the assets of states sponsoring criminal activities.

04  
JUN

*Gender inequalities: changes in income, time use and well-being before and during the UK COVID-19 lockdown* is published. This major report, led by Professor Man-Yee Kan, showed how women had suffered doubly in lockdown, with gender inequality continuing at home and disproportionate exposure to COVID-19 risk in the workplace, as 80% of frontline health workers are women.






## ACCESS AND OUTREACH

Oxford's programme of outreach to potential new students is a vital part of its mission. The usual presentations were made into videos so that the greatest number of individuals could be reached. The University's flagship free residential access programme for UK state school students, UNIQ, ran online for the first time, as did its graduate counterpart UNIQ+.

The annual University-wide undergraduate Open Days became virtual, and the launch of Opportunity Oxford, the University's major new access initiative, went to plan. All participants completed an online study module and 100 went on to attend a September residential stay in Oxford, which was carefully designed to conform to social distancing regulations.



## TESTING FOR COVID

The University has a large population of staff and students for whom COVID-19 testing might allow work to continue in laboratories and libraries. A joint venture with life science company Thermo Fisher Scientific, announced on 10 November, meant a steep increase in the University's capacity to 50,000 tests a day. The ELISA (enzyme-linked immunosorbent assay) quantifies antibodies in blood serum, making it a serologic test that could also provide critical feedback on vaccine effectiveness. This was a major step towards ending lockdowns, not just locally in Oxford but globally too.

Oxford Vaccine Group, serum processing  
(© Oxford University/John Cairns)

05  
JUN

The RECOVERY trial, which since March had enrolled over 11,000 patients from 175 NHS hospitals in the UK, reports no beneficial effect of hydroxychloroquine in patients hospitalised with COVID-19.

05  
JUN

A paper co-authored by Emeritus Professor Robin Dunbar studies the neurobiology for loneliness in light of COVID-19-induced social isolation, pointing to evidence showing that strong interpersonal relationships are critical for survival across the entire lifespan of humans.

# HOW OXFORD RESPONDED TO THE PANDEMIC

**Dr Stephen Conway, Director of Research Services, tells the story of Oxford's response from his perspective.**

In March 2020 all buildings not undertaking COVID-19 research were closed. Buildings, laboratories and libraries were reconfigured for social distancing. All buildings, including libraries and collections, required for research that could not be performed remotely have been open since September 2020, but with restrictions.

Our priority throughout the pandemic has been the safety and wellbeing of staff, students and our local community. One example was the early set-up of walk-in "pods" for staff and students to access rapid PCR-based COVID-19 testing to manage and suppress outbreaks, quickly and effectively.

Many of our principal investigators were fully involved in the pandemic response, including in frontline clinical roles in hospitals. Other research was redirected towards COVID-19 initiatives of global urgency. Partner NHS Trusts had to pause all non-COVID-19 research. We received £15m in donations for express COVID-19 research, and we established a rapid peer-review process, deploying funds in four rounds over three months. The University supported the national response by

shipping equipment, including our own PCR testing machines, to a national centre in Milton Keynes.

We launched a COVID-19 Scholarships Extensions Fund for postgraduate students holding Oxford-managed scholarships; we deployed Wellcome, UKRI and other COVID-19 support funds for researchers strictly according to need. We significantly increased hardship funds for self-funded or externally-funded students. We developed guidance for examiners of doctoral theses to account for pandemic effects; we modified probation and initial period of office processes for research staff and Associate Professors respectively, taking care to account for differential impacts of the pandemic on protected characteristics and other groups.

We surveyed research staff to identify major impacts of the pandemic. Following survey responses, we created the COVID-19 Rebuilding Research Momentum Fund. The Fund has provided grants to support re-starting research activities, based on prioritised need, including childcare provision, home IT provision and training, and buy-outs from teaching for research.

## GARDENS, LIBRARIES AND MUSEUMS GO ONLINE



Oxford's Gardens, Libraries and Museums (GLAM) adapted to stay connected, respond to need and continue to deliver learning and engagement activity. Most programmes moved online. Outside venues continued with some on-site activities. Thousands have now taken part in online public programmes of talks, workshops and short courses. New live-streamed taught sessions for schools and colleges have been created. Following the launch of the virtual classroom programme at the Ashmolean, over 2,000 primary and secondary students have taken part. Partner and community programmes continue online with connections, discussions and conversations taking place virtually. New content has been created including podcasts, films and home learning packages for families.

*Left: Dionne Freeman's Young Rembrandt-inspired image. Art resources were created in direct response to the needs of community partners.*



**11  
JUN**

The Reuben Foundation makes a transformational gift of £80 million, endowing the University's 39th college, founded in May 2019. Reuben College's focus is interdisciplinary research addressing global challenges including cellular and vaccine studies, environmental change and AI. (© Reuben College)

**29  
JUN**

Global COVID-19 cases pass the 10-million mark.



## HEALTH MEASURES AND TESTING

When the University re-opened in August 2020, its priority was the health and wellbeing of students, staff and the local community. A number of safety measures were introduced including careful planning of building access, hand and surface sanitation, ventilation, use of Perspex screens, use of face coverings and actions to ensure social distancing.

The Early Alert Service was launched to minimise the impact of COVID-19-positive students and staff arriving in Oxford in October 2020. Early infection identification enabled fast isolation of cases within the University. As well as keeping all members of the collegiate University as safe as possible through easy access to symptomatic testing, a major success was avoiding disruption to local health services, protecting the local Oxford community and preventing student-to-staff transmission.

From mid-August a total of 5,842 tests were undertaken before the testing centres closed for Christmas. EAS enabled comprehensive containment of COVID-19 among students. It not only prepared the University to contain and manage a spike that arose within college communities, but also left over half of the colleges with zero active cases by early December. There was an extremely low number of staff cases – much lower than rates in the general population – with no evidence of transmission from students.

Since November 2020 the pod-based symptomatic testing has been augmented with asymptomatic, rapid lateral flow testing. 7,319 students took these tests in the run up to the Christmas vacation, followed by



Staff member taking a COVID-19 test at the Early Alert Service pod at the Radcliffe Observatory Quarter. The University's in-house COVID-19 testing service was opened to all staff and students of the University and colleges, providing rapid access to free testing. (© Angel Sharp Media)

6,904 students and staff in the first 4 months of 2021. Assisted lateral flow testing centres were operated by the University's Estates Services from early April, with 2,617 staff and students taking part by 10 May.

## THE BODLEIAN KEPT THE UNIVERSITY READING



(© Dawnyoung)

The Bodleian Libraries closed their doors on 17 March but were determined to keep the University reading by continuing and expanding their digital services, as well as extending all loans, removing the cost for scanning and cancelling fines for late book returns. Students and staff received online inductions and the Bodleian iSkills training programme also moved online, giving a large group of students and researchers access to information and research training and workshops. Throughout 2020, the Bodleian expanded the hours of its Live Chat service, which had over 6,000 enquiries; increased the number of online reading lists (ORLO) to over 1,000; and delivered around 5,000 document scans through the expanded Scan and Deliver service. Additionally, the Bodleian became the first UK member of the HathiTrust partnership, a major digital repository giving access to around 14 million titles, with an additional 1.5 million copyrighted titles through the Emergency Temporary Access Scheme. New services delivered by the Bodleian included mediated scanning for Special Collections and the low-contact Click and Collect service for loaned items.

07  
JUL

PHOSP-COVID, a large-scale national study on the long-term effects of COVID-19, is launched. Oxford's particular excellence in medical imaging and mental health gives it a key role, coordinating two trusts, two biomedical research centres and its own research, with over 50 doctors and researchers seeking to get the nation back on its feet again.

10  
JUL

A gift of £3.5 million from Lakshmi Mittal and his family secures the future of Professor Adrian Hill's chair, henceforth to be known as the Lakshmi Mittal and Family Professorship of Vaccinology.

# KEEPING TRACK OF GLOBAL COVID-19 POLICY

## Policy trackers and later supertrackers helped governments keep abreast of COVID-19 policies around the world.

As early as 3 February, before COVID-19 was seen as a crisis in most of the West, Dr Moritz Kraemer led a large collaboration to map its spread, launching an interactive global map backed by open access epidemiological data. This was a moment when any meaningful public policy hinged on accurate data concerning the spread of the virus.

This project was quickly followed by more focused regional work concerning the spread, for example on 20 February when the Oxford Martin Programme on Pandemic Genomics published collaborative research on the risk to Africa of importing COVID-19 from China via passenger travel, highlighting the gateways of Egypt, South Africa and Algeria.

The need for accurate data never went away and another Oxford Martin School programme, Our World in Data, came into its own as a powerful, accurate data source for media, policy makers and public alike.

One of the largest Oxford contributions came a month later in the form of a Government Response Tracker that brought transparency to COVID-19 public policy all over the world.

Spearheaded by Associate Professor Thomas Hale, the tracker systematically recorded different government responses to COVID-19 across 11 key indicators such as workplace closure and transport restriction, aggregating

the scores into a common Stringency Index. In June it was expanded to include information about testing, contact tracing and income support.

Many other tracker initiatives sprang up globally, so Oxford invented a Supertracker. Launched formally in late July, it had begun as a Twitter thread by DPhil student Lukas Lehner, which evolved into a new global directory compiling over 100 data sources.

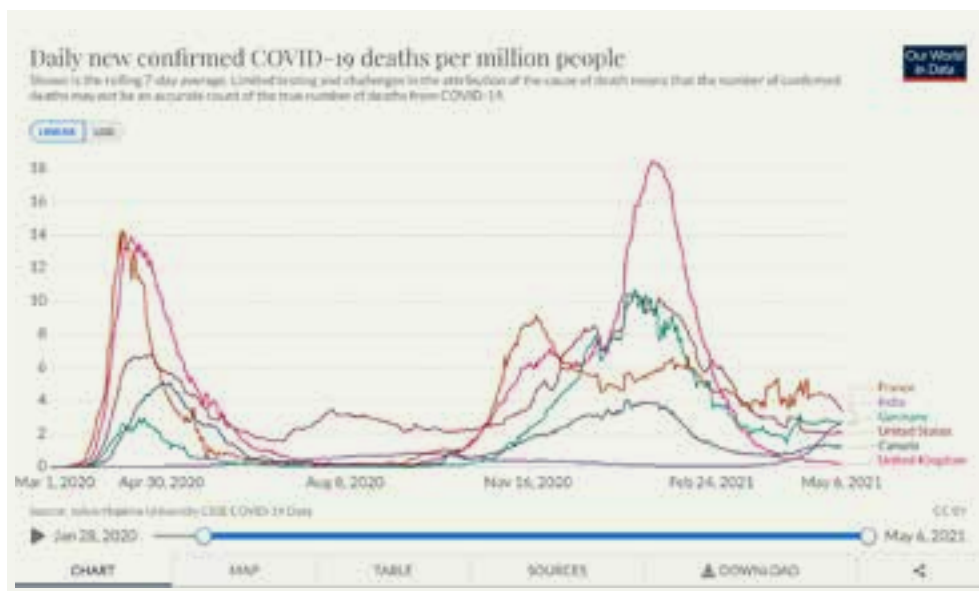
### '...THE TRACKER SYSTEMATICALLY RECORDED DIFFERENT GOVERNMENT RESPONSES TO COVID-19'

The project was led by Dr Marek Naczyk, with the involvement of Professor Mary Daly, Professor Bernhard Ebbinghaus, Lukas Lehner and Dr Tim Vlandas.

Ugo Gentilini, Global Lead for Social Assistance at the World Bank, said: 'The Oxford Supertracker offers a precious compass to help policy makers, practitioners and researchers to navigate the rich and evolving set of trackers available globally.'

At the end of the year, on 3 December, Oxford's Blavatnik School of Government joined forces with other institutions for a £2m project that bridged research and policy to mitigate the impacts of COVID-19 and accelerate the UK's recovery.

There were numerous other large-scale, collaborative research projects in the sphere of public policy and COVID-19, from Oxford's collaboration with the International Public Policy Observatory (IPPO) to work by Oxford's Migration Observatory highlighting how the COVID-19 crisis has affected migration to and from the UK, migrants themselves, data collection and other aspects of the UK's migration debate.



Our World In Data produced invaluable graphs tracking the global pandemic

14  
JUL

A £3.5 million donation secures the University's Chair of Vaccinology, currently filled by Professor Adrian Hill. Henceforth it will be called the Lakshmi Mittal and Family Professor of Vaccinology.

14  
JUL

Lead author of a collaborative journal paper Dr Marion Mafham, a Clinical Research Fellow at Oxford's Nuffield Department of Population Health, notes the shocking fact that as many as 5,000 patients who had suffered serious heart attacks during the initial wave of the pandemic in the UK had not attended hospital, in many cases with serious consequences.

16  
JUL

An Oxford study points to a notable decline in COVID-19 cases and R rate on the Isle of Wight after the launch of a test and trace programme.





(© Shutterstock)

Social anthropologist Professor Biao Xiang set up a mobility forum in March, realising that how society moves and travels would be a focal point for how COVID-19 was spread. The central insight was that mobilities are not only basic human practices; they also frame how global society is organised and disrupted. They are managed by national and international policies and regulations. The blog was so successful that it grew into 6 different themes over time, with global engagement.

## THE CALL FOR FACE COVERINGS

On 7 July, Professor Melinda Mills published a major study, 'Face masks and coverings for the general public: behavioural knowledge, effectiveness of cloth coverings and public messaging', saying, 'The evidence is clear that people should wear face coverings to reduce virus transmission and protect themselves, with most countries recommending the public wear them. Yet policies on wearing face coverings have been unclear and inconsistent in some countries, such as England.' Until this point there had been marked reluctance to wear face coverings in some countries – including the UK – but the debate shifted following the publication of this study and they quickly became standard practice, something that was unthinkable even a few weeks before.

Melinda Mills (MBE, FBA) is the Nuffield Professor of Sociology and Director of the Leverhulme Centre for Demographic Science, University of Oxford. Her research spans multiple topics in demography, empirical sociology, statistics and genetics. Her recent work focuses on sociogenomics, combining a social science and molecular genetic approach to the study of behavioural outcomes. In relation to the pandemic she has investigated behavioural approaches to health interventions, including behavioural and policy responses to face coverings and vaccine deployment.



Professor Melinda Mills (© Marcel Bakker)



19  
AUG

Professor Rachel Condry leads research revealing that the 'hidden problem' of child- and adolescent-to-parent violence (C/APV) saw a significant increase in lockdown.

24  
AUG

Professor Rachel Kerr and Dr Lennard Lee publish a study showing for the first time which cancer patients are at particular risk from COVID-19. Blood cancer patients were particularly at risk, with 57% higher odds of severe disease if they contracted the disease. Breast cancer was associated with the lowest risk overall.



Professor Dapo Akande

## THE IMPORTANCE OF TRUST IN AN ERA OF MISCHIEF

**Many departments and institutes spoke truth to power in a period of fear and panic that gave rise to both misinformation and mischief.**

The Oxford Internet Institute issued a series of data memos, having discovered that state-backed media from China, Iran, Russia and Turkey were targeting French-, German- and Spanish-speaking social media users around the world with news about COVID-19. Professor Philip Howard, Director of the Institute, and research assistant Katarina Rebello noted that the state-backed outlets blended fact with editorial, or deliberate falsehood.

Russian outlets consistently emphasised weak democratic institutions and civil disorder in Europe, while Chinese and Turkish outlets producing Spanish content promoted their own countries' global leadership in combating the pandemic. Russian and Iranian outlets generated polarising content targeted at Latin America and Spanish-speaking social media users in the United States.

The Reuters Institute for the Study of Journalism conducted valuable research on the 'Infodemic', to determine where people were obtaining news and advice about the pandemic, at the very moment when advertising revenues were plunging, existentially threatening newspapers (see page 17).

Early in June, more than 120 international lawyers signed the Oxford Statement on the International Law Protections Against Cyber Operations Targeting the Health Care Sector

– initiated by Professor Dapo Akande, Co-Director of the Oxford Institute for Ethics, Law and Armed Conflict. Once again the focus was on state-sponsored cyber attacks, what existing laws could offer, and possible remedies.

### **'ONCE AGAIN THE FOCUS WAS ON STATE-SPONSORED CYBER ATTACKS...'**

New analysis from researchers at the Oxford Martin School, published in October, found that from March to July 2020, Europe had a 28 percent lower rate of excess deaths than the US. This was contrary to claims by then President Donald Trump that Europe experienced greater excess mortality than the US.

In a broader comment on political systems and the pandemic, democracies beat autocracies in their handling of COVID-19, argued the Martin School's Dr Carl Benedikt Frey in a working paper published in May. He added that this did not hold true in the highly individualistic countries of the US, the UK and Sweden. He said: 'People are more willing to follow the rules if they trust their government, which they are more likely to do if the government is accountable. That is my interpretation of our findings.'

**03  
SEP**

Professors Cécile Fabre and Jonathan Wolff are part of a multi-author paper modelling an ethical framework for distributing the vaccine, which subsequently forms the basis of a WHO policy briefing.



**07  
SEP**

The Oxford ARC study, launched in May, revealed that teenagers consistently reported higher levels of anxiety and depression than their parents.  
(© Shutterstock)



# SCALING UP AND STARTING UP TO DEFEAT THE VIRUS

**Oxford has been a hotbed of innovation for centuries, but the pandemic acted as an immediate spur to creativity.**

The Oxford Foundry (OXFO) was established in 2017 by the University of Oxford's Saïd Business School, for the benefit of all students and alumni of the University of Oxford. Its mission is to embed entrepreneurial values, build a new generation of ventures that better society, and nurture ethical leaders who put people and planet first.

Based at Oxford Foundry and led by Dr Alexander Finlayson, digital health care start-up Nye Health's remote health consulting tool was scaled up dramatically early in March, allowing 10 million patients to consult with doctors and raising an additional £3.8 million during the early stages of the pandemic.

In another example of many, OxWash's founder Dr Kyle Grant pivoted towards the health sector, applying a revolutionary green laundry solution to NHS needs across several cities, all collected and returned by electric cargo bike.

Oxford Foundry Executive Director Ana Bakshi raced to draw in new support for COVID-19-relevant ventures, raising a £120,000 Start-up Grant Runway Fund that was distributed to 20 ventures.

Some recipients repurposed an existing activity in light of COVID-19, such as Smash Medicine, Nye Health and OxWash, while others built specific products, such as Vatic, Crowdless, Oblivious AI and Devie, a parenting app.

Elsewhere in the University, the engineers came into their own. Professors Lionel Tarassenko and Peter Watkinson had already pioneered a system for recording nurse observations, but now they rapidly deployed a Coronavirus Health Monitor consisting of wearable technology for hospitalised COVID-19 patients – a pulse oximeter and a chest patch connected wirelessly to a bedside tablet, which sent information to nursing staff and a display monitor on a nearby ward.

Used on patients on the main COVID-19 isolation ward in Oxford from April 2020 the wearable technology reduced staff exposure to viral infection while allowing patients to walk around, such mobility being critical in fighting a respiratory infection. By the end of the year it had been used for



Above: OxWash refocused a sustainable laundry business on the needs of the health service (© OxWash)

the real-time monitoring of 164 patients for 8,000 hours during the first 2 waves of the pandemic.

There was a flurry of initiatives across the University as the crisis intensified in March. Ideas for a contact tracing app, a rapid coronavirus test and a rapid ventilator all gained traction.

The rapid ventilator was a collaboration among Engineering Science, Anaesthetics and King's College London. Within two weeks, a small group of academics and students led by Professor Mark Thompson had built a working prototype and won a place on the UK Government's Ventilator Challenge. The idea behind the concept was that ventilators would be in short supply in hospitals, a large subsequent theme of the pandemic outside the UK. This particular ventilator could be made quickly and easily from cheaply procured parts. OxVent subsequently became a social venture supporting deployment of innovative low-cost ventilators across the world.



**14  
SEP**

Led by Associate Professor Thomas Hale, Oxford's COVID-19 Government Response Tracker publishes *The Risk of Openness Index*, which sought to provide information on the risk that a country faced if the government were to adopt an 'open' policy stance – meaning no policy measures aimed at containing the virus through reducing physical interaction.

**16  
SEP**

The University's Bodleian Library hosts a landmark conference – online of course – to celebrate its 700th Anniversary. It was useful to recognise that the University had seen many previous pandemics come and go, including the Black Death.



Above (left): Professor David Eyre. Centre: Dr Andrew Soltan. Right: Professor David Clifton (© Oxford University/Joby Sessions)

## TESTING TIMES

### Oxford contributed three rapid test technologies for COVID-19.

Oxford has long championed collaborative work across departmental boundaries. Take the leading clinician Dr Andrew Soltan and the two professors, respectively of Artificial Intelligence and Big Data, David Clifton and David Eyre. Out of their discussions came an algorithm to detect COVID-19, 'trained' on the real data of 115,000 emergency hospital visits by patients. The astonishing result was a tool that had over 90% accuracy in screening patients for COVID-19. It was also fast and cheap, showcasing what AI might be able to do for health care in the future.

Further development of the AI test since 2020 has created a 'lab-free' screening solution, collecting all the data needed to screen a patient for COVID-19 in minutes, at the bedside. With faster results, better triage at the front door of hospitals can help curb the spread and reduce delays to care. Looking to the future, the researchers are investigating how these AI-driven approaches can improve early diagnostics and triage for other conditions.

Meanwhile in a multi-party collaboration between Oxford University, government agencies, other universities and the company Oxford Nanopore, a big test programme yielded a big result, namely that Oxford Nanopore's sequencing technology offers diagnostic sensitivity of 99.1% in analysing COVID-19 samples from suspected patients, and the potential for thousands of tests a day, hugely

speeding up the process. Led by Professor Derrick Crook, Oxford's expertise in clinical microbiology and pathogen sequencing was once again evident in this project, but so too is its broader ability to collaborate with industry.



Scientist inserting a flow cell into MinION Mk1C (© Oxford Nanopore)

A rapid COVID-19 test developed at Oxford University was the basis of a spinout company named Oxsed Ltd. By November its rapid test was being used in both London Heathrow Airport and

Hong Kong International Airport. It was duly acquired by DNAFit Life Sciences, part of Hong Kong-based genetics and diagnostic health testing company Prenetics. The acquisition was expected to accelerate Oxsed's ambition to provide rapid COVID-19 testing globally, prioritising low- and middle- income countries. A rapid, accurate and affordable point-of-care test deployed globally could herald a significant development in reducing the spread of the virus between countries.

23  
SEP

Oxford's Nuffield Department of Medicine publishes a mathematical model, OpenABM-Covid19, providing public health decision-makers with the ability to review the potential progression and outcome of the coronavirus, including fluctuations in infected individuals, hospitalisations, intensive care unit (ICU) admissions and deaths, and assess the impact of test and trace programmes.

01  
OCT

New analysis from researchers at the Oxford Martin School finds that from March to July 2020, Europe had a 28 percent lower rate of excess deaths than the U.S. - contrary to claims by President Donald Trump that Europe experienced greater excess mortality than the U.S.



# THE SPOTLIGHT FALLS ON LONG COVID

**Recovering from COVID-19 could be a long process, as three different Oxford studies had made plain by late 2020.**

The term 'Long Covid' was first seen in a Tweet in May, but it got its clinical validation first in Oxford when in early August alumnus and Consultant Physician with Oxford University Hospitals NHS Foundation Trust Dr Rajarshi Banerjee sat down with his team at the company Perspectum Diagnostics to study scan data from former COVID-19 patients. What they saw greatly troubled them: multi-organ damage in as many as a quarter of patients, which tallied with a rich stream of anecdotal evidence suggesting that for many patients the initial end of symptoms definitely didn't mean the end of COVID-19.

Elsewhere in the University, large-scale studies concerning long-term COVID-19 recovery had begun too. Led by Dr Betty Raman and Professor Stefan Neubauer, the C-MORE study found in October that three months after the onset of COVID-19, 64% of hospitalised patients experienced persistent breathlessness and 55% complained of significant fatigue. Whole-body MRI scans indicated abnormalities in the lungs of patients (60%), as well as their kidneys (29%), hearts (26%) and livers (10%).

Shortly before these results were published, the International Severe Acute Respiratory and emerging Infection Consortium (ISARIC), based at Oxford University, launched a large study to measure prevalence and risk factors of long-term health and psychosocial consequences of COVID-19. Oxford is now the leading authority on Long Covid, partly because of a deep-rooted, pre-existing excellence in medical scanning technology.



In the last academic term of 2020, historian Professor Lyndal Roper pioneered the unthinkable, group exercise via Zoom, ahead of a class. Initial hesitation turned into praise and admiration from students, many of whom came to look forward to it. The underlying purpose was structured as a real experiment, collaborating with scientists, to measure the impact of exercise on creativity.

*Below (left): Dr Rajarshi Banerjee (© Perspectum Diagnostics). Centre: Professor Stefan Neubauer. Right: Dr Betty Raman*

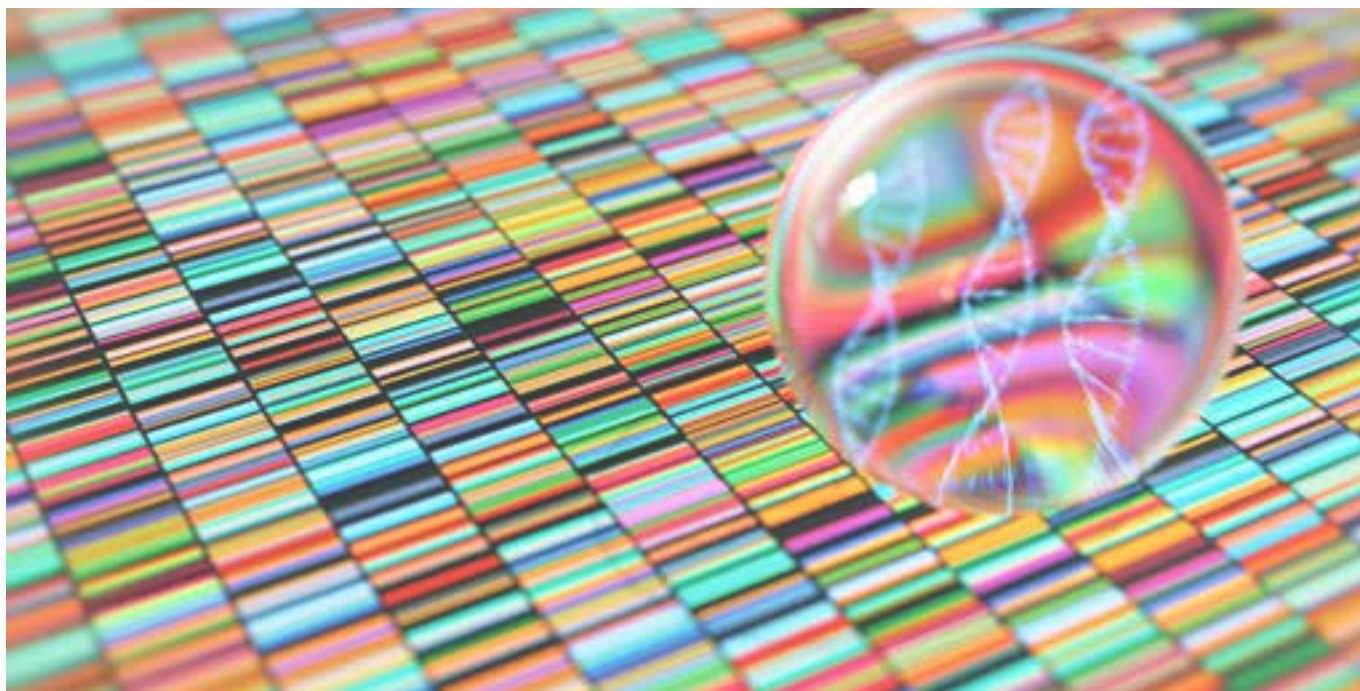


**09  
OCT**

Oxford's Saïd Business School launches a cross-departmental exercise to re-imagine the social sciences in light of the pandemic.

**09  
OCT**

The chief investigator and academic lead for the National COVID-19 Infection Survey, Professor Sarah Walker, is appointed an OBE.



3D illustration of a method of coloured DNA sequencing (© Shutterstock)

## THE IMPORTANCE OF GENOME SEQUENCING

**The true value of this area of UK and Oxford expertise became increasingly evident throughout 2020.**

Beginning in March, Professor Oliver Pybus led analysis for a 'virus genome sequencing alliance' to unlock the secrets of the disease.

The UK Government's Chief Scientific Adviser, Sir Patrick Vallance, repeatedly noted the importance of genomic sequencing, since applying this technique to a virus allows different strains to be accurately identified.

The refinement of this approach would lead to so-called surge testing of local populations by the end of the year in the UK, allowing the identification of new variants and quick action to contain it by public health authorities.

A coronavirus such as COVID-19 constantly mutates as it proliferates through a population. While most lineages fall away, a few multiply and become 'variants of concern'.

By early 2021 Professor Pybus, Professor of Evolution and Infectious Disease, was with his team tracking over a thousand known lineages, but they had also contributed to the discovery of both the B.1.1.7 ('Kent') and P.1 ('Brazil') variants of concern, and worked with WHO to establish a public-facing

naming system in addition to the letter and number system (Pango) aimed at the scientific community.

Such is the accuracy of the sequencing that once the data from the first wave in the UK was logged, it could be interrogated for pathway transmission.

Shared in preliminary form in June 2020 and then published early in 2021, a paper led by Professor Pybus, working with teams in Oxford and Edinburgh, offered the most fine-scaled and comprehensive genomic analysis of COVID-19 transmission in the UK of any epidemic to date, showing exactly how the first wave was introduced via international travel.

The analysis drew on 50,000 virus genome sequences – 26,000 of which were gathered through the COVID-19 Genomics UK (COG-UK) consortium – offering a never-before-seen level of insight into the origins and behaviour of transmission chains since the start of the pandemic.

Published in *Science*, the study showed that the virus was introduced to the UK well over a thousand times in early 2020 and that the rate and source of introduction changed very quickly. During this time



**23  
OCT**

The first two Bvlgari Scholars begin vaccine immunology doctoral programmes at Oxford, Rebecca Makinson (*far left*) and Cameron Bissett (*left*).  
(© Jenner Institute)

**28  
OCT**

Oxford University is ranked 1st in the world for medicine, for a 10th consecutive year (THE rankings).

**30  
OCT**

Oxford's vaccine team begin a trial in Kenya.



the highest numbers of transmission chains were introduced from Spain (33%), France (29%) and then Italy (12%) – with China accounting for only 0.4% of imports. The study also showed how the UK national lockdown affected individual transmission chains.

Professor Pybus said that frequent sampling would allow ‘genomic tracking to become a key component of public health surveillance,’ but it also had implications for policy concerning international travel. The roughly 1,000 identifiable UK transmission lineages jointly contributed to accelerated epidemic growth that quickly exceeded national contact tracing capacity.

Professor Pybus says: ‘By reconstructing where and when COVID-19 was introduced to the UK we can see that earlier travel and quarantine interventions could have helped to reduce the acceleration and intensity of the UK’s first wave of cases.’

The team believed that similar trends occurred in other countries with comparably large epidemics and high volumes of international travel, a belief that turned out to be true both for the virus generally and for the dynamics of variants of concern.

The degree to which the surviving lineages contributed to the UK’s second and third spikes in the autumn and winter of 2020–21 is still being investigated.

Co-lead author Louis du Plessis, from Oxford’s Department of Zoology, said: ‘Our work offers unparalleled views into what’s happening in an individual epidemic. The UK shares large volumes of virus genetic data publicly on a weekly basis and if you don’t have this level of surveillance you won’t know the real situation of virus evolution and transmission.’

Co-lead author Verity Hill, a PhD student based at Edinburgh University, said: ‘This kind of continuous, nationally coordinated genomic sequencing not only allows the high-resolution analysis we present, but also helps other countries to place their genomic data into context and assists the global pandemic response.’

The ability to ramp up genomic surveillance to a large scale built on decades of blue-sky basic research into virus evolution, led by Oxford and Edinburgh universities, which developed the theory that meant scientists had these tools at their disposal.

By spring 2021 the big question was how the UK might share genomic sequencing techniques globally to aid the international community in the broader fight against COVID-19.

In May, it was announced that the University had formed a partnership with Oracle to offer an international Genomic Surveillance System combining Oxford’s Scalable Pathogen Platform (SP3) with the

computing power of Oracle Cloud Infrastructure.

The offering will securely unify and analyse data from around the globe to provide better intelligence on variants of concern and their potential for spread. The next step will be to extend this service to all pathogens.

‘This powerful new tool will enable public health scientists in research establishments, public health agencies, health care service and diagnostic companies around the world to help further understanding of infectious diseases. The first pathogen we will be working on is the coronavirus,’ said Derrick Crook, Professor of Microbiology in the Nuffield Department of Medicine at the University of Oxford.

‘The opportunity to apply systematic surveillance of genetic variants of a range of pathogens will have major benefits for global public health. This programme, with Oracle as a partner, takes us a step closer to this goal,’ said Sir John Bell, Regius Professor of Medicine at the University of Oxford.



**Professor Oliver Pybus, Director of the Oxford Martin School Programme on Pandemic Genomics, Professor of Evolution & Infectious Disease and a Professorial Fellow of New College.**

A British biologist, his research concerns the evolutionary and ecological dynamics of infectious disease. Genome sequencing and other technologies are allowing him and others to investigate these processes in unprecedented detail, using the insights gained to tackle global challenges such as biodiversity loss, food production, and emerging epidemics. He notes that it is a very exciting time in the history of biology.

**10**  
NOV

A large, multidisciplinary team of Oxford researchers reveals that almost 20% of COVID-19 patients receive a psychiatric diagnosis within three months of falling ill.

**11**  
NOV

Completing a collaborative research programme with Public Health England, Oxford professors led by Richard Hobbs report that lateral flow tests could greatly reduce COVID infections rates. Within weeks lateral flow test kits became common across the UK.

**12**  
NOV

Wafic Saïd donates £3.33 million, achieving the permanent endowment of Professor Sarah Gilbert’s post, now the Saïd Professorship of Vaccinology

# ANIMAL WELFARE IS HUMAN SELF-INTEREST

To avoid further pandemics we should rebalance our relationship with nature, a group of Oxford academics argues.



Intensive poultry farm with poor welfare standards (© Shutterstock)

Oxford has several programmes in conservation science. Early in 2020 Professor E J Milner-Gulland and several members of her research group issued a powerful statement on the need for humanity to rebalance its relationship with nature, even though the suspected zoonotic (animal-to-human) source of COVID-19 was not proven.

The group called for an evidence-based approach to risk management within global food systems, and scrutiny of both intensive livestock rearing and the trade, hunting and consumption of wildlife. This includes prioritising better welfare standards for domestic and wild animals, recognising that this approach also reduces human risk of disease.

Historically, over two thirds of zoonotic viruses have originated in wild animals, most frequently rodents, bats

and primates. The transmission of zoonotic diseases primarily occurs when there is close contact between humans and animals. In the case of Wuhan there was an early, very well-publicised theory of transmission involving bats via pangolins to humans. This was debunked, but not before images were circulated of caged pangolins and other wildlife in markets.

These stories resulted in outrage among some wildlife and animal welfare groups, and calls for a complete ban on so-called 'wet markets' and other wildlife hunting and trading.

'Unfortunately it's not so simple. I spent most of 2020 trying to untangle many knots of misunderstanding around these issues,' says Professor Milner-Gulland.

One misconception is that the issue rests solely with wild rather than domestic animals. In fact, since 1940 almost half of the zoonotic diseases that have emerged in humans have come from domestic livestock, even if they originated in wild animals. This evidence of transmission puts a spotlight on Western farming methods, whether heavily industrialised livestock farming or land use practices.

Recent precedent in banning the commercial uses of wildlife to control human disease is not encouraging. Following the 2013–16 Ebola outbreak, a ban was imposed on wild meat markets across West Africa. This pushed wild meat markets underground, rendering regulation less effective and potentially worsening food hygiene conditions.

**'THE EVIDENCE PUTS A SPOTLIGHT ON WESTERN FARMING METHODS, WHETHER HEAVILY INDUSTRIALISED LIVESTOCK FARMING OR LAND USE PRACTICES...'**

When cattle replace wild meat consumption, it is often at the expense of the ecosystems supporting the wildlife in the first place. The research team estimate that replacing all wild meat in the Congo Basin with cattle would require converting 25 million hectares of forest to pasture. Furthermore, there is the broader issue of customary practices among indigenous populations, and the real meaning of sustainability seen in that light.



**16  
NOV**

More than 12,300 parents had now taken part in the Co-SPACE (COVID-19 Supporting Parents, Adolescents and Children in Epidemics) survey co-led by Professor Cathy Creswell and Dr Polly Waite. The findings showed attending school had a significant mental health benefit. (© Shutterstock)

**20  
NOV**

Researchers find that previous COVID-19 infection appears to create antibodies lasting as long as 6 months.



Professor Milner-Gulland says, 'Understanding the root causes of zoonotic diseases and how they transmit to humans is one vital line of inquiry, but I would prefer to cast the net much, much further and call for a wholesale rebalancing of our relationship with nature.'

'We need to clamp down on illegal and high-stress trade in animals, whether wild or domestic. We need to support well-regulated, cruelty-free trade in wildlife on condition that there is evidence that it is helping to protect wildlife and habitats against threats whilst sustaining livelihoods and meeting food security needs. We also need to limit the destruction of natural habitats and restore nature. It's a tall order but there is no alternative.'



Professor E J Milner-Gulland (© E J Milner-Gulland)

## A GREEN RECOVERY FROM COVID-19?

Hopes fade as governments fail to do the right thing.



Professor Cameron Hepburn (© Oxford University/Loby Sessions)

On 6 May, 2020, a special Oxford report was published, *Will COVID-19 fiscal recovery packages accelerate or retard progress on climate change?* Professor Cameron Hepburn led a global survey of over 700 economic stimulus policies, sent to 231 global experts, and they concluded on average that a 'green' route out of the

COVID-19 crisis would be highly effective economically.

Co-authored by Professor Joseph Stiglitz and Professor Lord Nicholas Stern, the report highlighted the economic and green benefits of renewable energy; building retrofit, clean infrastructure; and natural capital investment for ecosystem resilience and biodiversity.

Fossil fuel subsidies and airline bailouts were, by contrast, the worst sort of stimulus.

**'UNFORTUNATELY, GOVERNMENTS DID NOT LISTEN...'**

Unfortunately, governments did not listen. A year later, the Oxford-UNEP Global Recovery Observatory report was released on 10 March, 2021, noting that the much-discussed green recovery was not on track, and that many governments had instead subsidised familiar sectors such as aviation rather than use the crisis as an opportunity to pivot towards greener alternatives such as low carbon energy, green Research and Development (R&D), and Nature-based Solutions (NbS).

Just 18% of rebuilding and recovery funding, across 50 leading economies, could be considered 'green' in any meaningful sense, representing \$368bn of \$14.6tn COVID-19-induced spending.

23  
NOV

Oxford announces successful interim trial data from its Phase III vaccine trials, showing that the 'Oxford Vaccine', ChAdOx1 nCoV-2019, is effective at preventing COVID-19 while offering a high level of protection. There were no hospitalised or severe cases among over 24,000 volunteers drawn from the UK, Brazil and South Africa.



07  
DEC

Associate Professor Dr Jennifer Beam Dowd, a demographer of health and society, joined a group of female experts commenting on the pandemic as 'The Nerdy Girls'. She specialises in the social determinants of infectious diseases.

# AIR QUALITY AND COVID-19

## How did travel restrictions benefit air quality?

By July 2020, the world had registered 10 million cases of COVID-19. Because the virus was believed to be airborne, it reignited discussions about air quality and pollution.

Broader questions were now asked about atmospheric conditions, viral load, transmission between humans and accumulating evidence that heavily polluted areas correlated with worse suffering among COVID-19 patients, as well as higher mortality rates.

There were also well-publicised stories about the improvements in air quality in otherwise heavily polluted cities all over the world, including Oxford, Delhi and Beijing, the direct result of government-sanctioned stay-at-home orders.

Air quality had improved by some measures where there had been a lockdown, with traffic volumes down 60% in Oxford in April, for example.

Early July saw Oxford researchers led by Professor Felix Leach, of the Department of Engineering Science, win funding to extend the existing air quality sensor network in Oxford to 16 city locations, taking measurements every 10 seconds.

The resulting OxAria (Air Quality in Oxford City) programme also includes noise measurement. It accelerated into 2021, and is an excellent example of how the University works directly in the community around it.

**‘BECAUSE THE VIRUS WAS ALSO AIRBORNE, IT REIGNITED DISCUSSIONS ABOUT AIR QUALITY’**

The sensors measure key pollutants such as particulate matter (PM1, 2.5, 10) and nitrogen dioxide, as well as weather parameters (temperature and humidity). Some of the units picked for the study also measure carbon monoxide, nitric oxide and ozone.

The broader purpose of the study was to measure the effectiveness of public health measures implemented in the light of the COVID-19 pandemic on air quality.

The relation between a disease with respiratory symptoms and air pollution is a broader and more complex one than any single study can address, but it is manifestly a cause of concern.



Above (left): Air Quality Monitor in Oxford in 2020 (© Felix Leach). Right: Professor Felix Leach (© Oxford University/Richard Lofthouse)

**11  
DEC**

Oxford researchers publish the first longitudinal study of the pandemic.

**14  
DEC**

The RECOVERY trial shows the drug azithromycin has no benefit for COVID-19 patients.



**18  
DEC**

Oxford's School of Geography Transport Studies Unit notes that the much-vaunted 'Green Recovery' is badly off track.





Dr Lindsay Turnbull (© Oxford University/Joby Sessions)

## BIOLOGY IN YOUR BACK GARDEN

**One of Oxford's leading ecologists responded imaginatively to the lockdown, helping parents, children and students alike.**

As soon as the UK lockdown began in late March 2020, ecologist Dr Lindsay Turnbull, from the University's Department of Plant Sciences, decided to act. She acquired a camera and tripod and began to shoot a series of videos in her own back garden in north Oxford.

While officially aimed at children faced with home schooling, the videos turned out to be of great interest to parents, students and the public generally.

In the very first episode, 'Sex and the Single Primrose,' she spoke eloquently about how many plants have smarter sex lives than humans and other mammals. The primrose is hermaphrodite – so carries both male and female sexual parts – but to avoid inbreeding, the flowers come in 2 different types, encouraging cross-pollination.

In a string of rapidly produced episodes that ultimately carried over into 2021, Dr Turnbull addressed a vast range of topics ranging from the difference between bugs and beetles, to why evergreen conifer trees do better in northern climes, and how woodpigeons make fantastic parents.

Dr Turnbull's main research concerns the diversity of plant communities, including their interactions with insects. She has also organised efforts to tackle plastic pollution in the oceans and is engaged in active conservation work around Oxfordshire.

'During the pandemic, people have really started to notice plants and understand how vital they are to our daily lives,' she tells me. 'I really hope it continues.'



**31  
DEC**

From early 2020, under the leadership of Professor Dave Stuart, the University, Diamond Light Source and the Rosalind Franklin Institute coordinated to produce and distribute the proteins and host factors of the virus, screening them for therapies. They led the work using protein crystallography. Professor Stuart's knighthood was announced on 31 December.

2021 BEGINS...

**25  
JAN**

The total number of global COVID-19 cases exceeds 100 million.



Tulips outside the Radcliffe Humanities building, Radcliffe Observatory Quarter, 14 April, 2021 (© Oxford University/Richard Lofthouse)

## 2021 AND BEYOND

**As the pandemic extended into 2021, major breakthroughs and new projects continued at Oxford.**

### TREATMENTS FOR COVID-19

One of the most striking Oxford-specific outcomes of the pandemic was the success of the RECOVERY trial.

The world's largest trial for COVID-19 treatments was praised for its speed, its simplicity and its scope, all of which were made possible by the UK's unified healthcare system, the NHS.

In a single year, the trial examined nine repurposed drugs, a convalescent plasma and a newly developed antibody cocktail.

As expected, some of these failed and were withdrawn from the trial, but two drugs were found to significantly reduce mortality for seriously ill COVID-19 patients: dexamethasone and tocilizumab.

A UK government estimate published in March 2021 concluded that dexamethasone use had so far saved 22,000 lives in the UK and an estimated 1 million lives worldwide. The tocilizumab discovery was announced in February.

The PRINCIPLE trial also generated a significant finding when in April it published results showing that early administration of inhaled budesonide, an asthma treatment, reduced the likelihood of needing urgent medical care and reduced time to recovery after early COVID-19.

The Oxford-AstraZeneca vaccine garnered a welcome headline as the year began, with the first dose administered on 4 January. Of course, this did not herald the end of the pandemic either in the UK or elsewhere. But as the vaccination programme caught hold, it began to yield strong results, in conjunction

with further restrictions on social movement.

Between the second wave's peak in the UK (8,965 deaths in the week ending 22 January) and the week ending 9 April, in which 266 deaths were recorded, COVID-19 deaths in the UK fell 97%.

Later in April Oxford's Sarah Walker, Professor of Medical Statistics and Epidemiology, publicly noted that thanks to the vaccine rollout Britain no longer had a pandemic so much as an endemic situation, whereby the virus is present but at a low enough level to be largely controllable.

However, the ever-present threat of new variants of the virus meant that the future trajectory of the pandemic, locally and globally, remained uncertain.

Dr Erica Charters, Associate Professor of Global History and the History of Medicine, had sought to draw up an interdisciplinary framework for the 'end' of the pandemic, informed by history.

In a co-authored paper, 'How Epidemics End', she noted that in practice no pandemic ends neatly, but is an uncertain process, proceeding at different speeds in different places. Pandemics are socially, politically and economically negotiated, not just bio-medical events.

The global situation underlined just how devastating the pandemic was and still is, with total deaths passing 3 million in late April, the true figure believed to be far higher, and several variants of the virus spreading rapidly.



## THE OXFORD-ASTRAZENECA VACCINE

The success of the Oxford-AstraZeneca vaccine ChAdOx1 nCoV-19, now approved for use in many countries around the world, was a critical advance and particularly so in light of a study showing it to be effective against the B.1.1.7 'Kent' variant, which spread rapidly around the world in 2021.

The Oxford-AstraZeneca vaccine will enable broad, equitable access, with 3 billion doses being manufactured for worldwide distribution. It is expected to reach about one fifth of the world's population.

The vaccine can be produced at low cost, and stored and shipped using current infrastructure, furthering access in low- and middle-income settings.

Professor Sarah Gilbert, the project leader for the Oxford vaccine, was awarded the RSA Albert Medal in March, a prestigious UK award dating back to 1964 that honours 'services to collaborative innovation for the global common good'.

She was naturally delighted to receive the award, but noted that the work was far from over – the objective now being to find new developments of the vaccine to address new variants of the virus, alongside the ongoing global distribution of the vaccine, at cost, to all citizens.

Another critical area of Oxford research had by the spring turned to the broader question of whether multiple doses of vaccines might mix different vaccines entirely.

## ENVIRONMENT

The Oxford-UNEP Global Recovery Observatory report was released on 10 March. It noted that the much-discussed green recovery was not on track, and that many governments had instead subsidised familiar sectors such as aviation rather than use the crisis as an opportunity to pivot towards greener alternatives.



## THE UNIVERSITY

Within Oxford University, the success of lateral flow tests within closely followed government safety guidance allowed certain students to return early in the year – typically where they were future key workers in health care and medicine – and by April more students were back in Oxford, with the promise of in-person teaching and even some small-scale face-to-face events, within prevailing rules, by the summer term.

## GENOME SEQUENCING

A genomic sequencing study published in January revealed with extraordinary detail how COVID-19 had entered the UK early in 2020, a breakthrough led by Professor Oliver Pybus from Oxford's Department of Zoology and the Oxford Martin School.

Professor Pybus said: 'This study shows that it's possible to trace individual virus transmission lineages accurately through time and space. Undertaking analyses on a weekly basis means that genomic tracking can become a key component of public health surveillance.'

The task was now to share these findings more widely and to encourage more governments to practice genomic sequencing, the only way to detect and isolate new variants of COVID-19.

The University developed and executed a plan for exactly this. On May 17, it announced that it would help governments and medical communities identify and act on these variants faster, with a Global Pathogen Analysis System (GPAS) developed jointly with Oracle. The System combines Oxford's Scalable Pathogen Pipeline Platform (SP3) with the power of Oracle Cloud Infrastructure (OCI).

Derrick Crook, Professor of Microbiology in the Nuffield Department of Medicine at the University of Oxford, noted, "This powerful new tool will enable public health scientists in research establishments, public health agencies, healthcare services, and diagnostic companies around the world to help further understanding of infectious diseases, starting with the coronavirus".

The outcome was based on previous expertise. First used for tuberculosis, Oxford's SP3 has been repurposed to work on SARS-CoV-2, yielding annotated genomic sequences and identifying new variants and those of concern. The SP3 system will now deliver comprehensive and standardised results of COVID-19 analyses within minutes of submission on an international scale. The results will be shared with countries around the globe in a secure environment.

## TREATMENT FOR LONG COVID

The UK's Medicines and Healthcare products Regulatory Agency (MHRA) approved the use of CoverScan MD on 20 January, an MRI-based technology that maps the effects of COVID-19 on several of the body's key organs, developed by Oxford-based Perspectum Diagnostics.

The original intellectual basis for the company came out of doctoral work undertaken at Oxford by Dr Rajarshi Banerjee, the company's founder and CEO, along with its chairman, Emeritus Professor in Oncology Professor Sir Mike Brady.

The company concluded a major scanning trial in Oxford and London and by spring 2021 estimated that as many as 1 million former COVID-19 patients in the UK were still suffering from Long Covid.

## REBUILDING ECONOMICS

In the arena of economics, the pandemic constitutes a further turning point in rebuilding a subject shaken by the Global Financial Crash of 2008–9.

A landmark issue of the *Oxford Review of Economic Policy* collected the work of renowned global economists including Joseph Stiglitz and Oxford's David Vines, Director of the Ethics and Economics Programme at INET Oxford and Emeritus Professor of Economics, and Samuel Wills, an external research associate at the Oxford Centre or the Analysis of Resource-Rich Economies.

Vines said that the COVID-19 pandemic was simply the next shock that traditional economic theory could not explain, calling for a return to empiricism and real data: 'The old model of macroeconomics was built for a stable world free from large economic shocks. If we ever lived in such a world, we no longer do.'

## TACKLING ANTIMICROBIAL RESISTANCE

The creation of the Ineos Oxford Institute to fight antimicrobial resistance was announced in January, following a donation of £100 million by one of the world's largest manufacturing companies, Ineos. The Institute will directly tackle an urgent threat to human life and wellbeing, and will benefit from Oxford's expertise in this field, which played the key role in the origin of antibiotics following Fleming and Oxford's discovery and development of penicillin in the last century.

Tim Walsh, Professor of Medical Microbiology at Oxford, says: 'Just as the discovery of penicillin and subsequent antibiotics transformed modern medicine, the rapid and relentless growth of antimicrobial resistance poses one of the most serious threats to human life worldwide. Modern agriculture and healthcare are both heavily reliant on antibiotics, which is why it is vital to address this issue as a humanitarian emergency and to bring together national and international expertise across scientific disciplines to develop new drugs and policies to tackle this global problem.'

## A MALARIA VACCINE

Oxford's pre-existing strength in medical research formed the basis of its approach to solving COVID-19. 23 April, 2021 saw yet more remarkable headlines, this time concerning malaria.

Working with partners in Burkina Faso, Oxford researchers reported from a Phase IIb trial of a candidate malaria vaccine, R21/Matrix-M, which demonstrated high-level efficacy of 77% over 12 months of follow-up. In their findings (posted on SSRN/Preprints with *The Lancet*) they note that they are the first to meet the World Health Organization's Malaria Vaccine Technology Roadmap goal of a vaccine with at least 75% efficacy.

Trialled in 450 children, the vaccine showed a favourable safety profile and was well tolerated, as well as offering excellent potential for large-scale manufacturing and low-cost supply.

The significance of this announcement can be seen in the fact that over 100 malaria vaccine candidates have entered clinical trials over recent decades but none has

reached the WHO-targeted efficacy of more than 75%. 229 million cases of clinical malaria were reported in 2019, leading to an estimated 400,000 deaths.











April 2021: Bodleian Library, Radcliffe Square. Students were welcomed back to the University for Trinity term (© Oxford University/Joby Sessions)

This document can also be found online here:

**[OX.AC.UK/ANNUAL-REVIEW](https://ox.ac.uk/annual-review)**

The University has also developed an imaginative digital timeline sequencing the major events of 2020:

**[OX.AC.UK/PANDEMIC-REVIEW](https://ox.ac.uk/pandemic-review)**

For further information on Oxford University COVID-19 research visit:

**[WWW.RESEARCH.OX.AC.UK/AREA/CORONAVIRUS-RESEARCH](https://www.research.ox.ac.uk/area/coronavirus-research)**