

Mobilising Research Excellence in the Midlands to Tackle COVID-19

Showcasing the dedicated work of academics, healthcare professionals and industrial partners from across the Midlands

Foreword

by Sir John Peace, Chairman of Midlands Engine

For those of us who call the Midlands home, we are rightly proud of our region - a region that has undergone huge growth but that has massive potential for more. COVID-19 does not change this. In fact, it deepens our resolve to see this unprecedented global health crisis through – and rebuild, ever-stronger. As this report shows, the Midlands has more than risen to the challenge of fighting the pandemic. This has been made possible with our huge strength in Health, Medical Technologies and Life Sciences and we are now excellently positioned to recover, grow and further unlock the potential of our region.



COVID-19 continues to have a profound effect on the lives of millions of people globally. Imposed restrictions to daily life have forced us to quickly adopt different ways of working, learning and connecting with each other. The research response has been faster and more globalised than ever before, and the Midlands has played a significant part in this.

In recent years, the Midlands has become a real focus in the UK for Health, Medical Technologies and Life Sciences. Over 1,200 businesses in the sector are based here, including the country's highest number of medical technologies companies and supporting over 33,000 high-skilled jobs. The region is also driving the sector internationally – not least because our world-class Midlands universities – seven of which have medical schools, are all working to promote strong collaboration between academia, industry and health. A prime example of this collaboration is soon to be seen through a vaccine to combat COVID-19. Following an agreement between Cobra Biologics and AstraZeneca UK, this vaccine is set to be manufactured on Keele University's Science and Innovation Park as part of a programme with the University of Oxford.

As this report demonstrates, the Midlands has moved swiftly to apply our wealth of capability in our hospitals, universities and businesses to support the global effort to develop treatments for COVID-19. The volume of research projects and clinical trials that our region is not just involved in, but in many cases is leading, is exceptional. Designing, recruiting and supporting clinical trials that have recruited over 50,000 patients represents a nationally significant effort over a very short space of time.

“The Midlands has moved swiftly to apply the wealth of capability in its hospitals, universities and businesses to support the global effort to tackle COVID-19”

Recognising the absolute connection between health and economy, the Midlands Engine partnership – together with partners from industry, academia, the health sector and public sector partners – has focused efforts to establish Midlands Engine Health. This important collaboration will look to champion the vast capabilities we have right here in the Midlands. Working together, we will showcase our strengths, bring forward new opportunities, accelerate sector-wide growth and maintain a powerful spotlight on the phenomenal capabilities and facilities our region has to offer in this field.

The achievements celebrated in this powerful publication – reflecting work in partnership across our region – offer some insight into the hugely valuable rewards our shared endeavours will reap through our Midlands Engine Health partnership in the coming months and years.

Executive Summary

Through the dedicated work of the region's academics, healthcare professionals and industrial partners, in addition to high levels of our workforce supporting frontline care, the Midlands is:

Driving UK COVID-19 Research

- MI partners received £45 million to lead over £90 million of research excellence programmes directly targeting COVID-19.
- Midlands-led priority national programmes:
 - **UK-CIC:** Led by the University of Birmingham, the £6.5 million project is studying immune responses that could provide targets for new COVID-19 treatments and inform vaccine development.
 - **CO-CONNECT:** The University of Nottingham co-led £4 million project will help scientists access data to develop potential COVID-19 therapies and treatments.
 - **UK-REACH:** The £2.1 million trial, led by the University of Leicester, will work with more than 30,000 healthcare staff across the UK to assess their risk of COVID-19, based on the analysis of 2 million healthcare records.

Leading COVID-19 Trials Patient Recruitment (Data accurate on 23/12/2020)

- Delivering over 15% of all UK patients recruited to COVID-19 trials (50,038 patients).
- The region has achieved nationally significant recruitment for the following clinical trials:
 - **ISARIC-4C:** collecting COVID-19 clinical data and samples – the Midlands has recruited over 20% of all UK patients (24,383).
 - **RECOVERY:** testing 6 existing medicines as potential COVID-19 treatments – the Midlands alone recruited almost 20% of UK patients (4,019).
 - **RECOVERY-RS:** comparing the effectiveness of 3 ventilation methods – the Midlands recruited nearly 40% of all UK patients (219).
 - **NHS CHECK:** health and experience of NHS staff – the Midlands has recruited 26% of UK patients (3,597).
- Midlands-led priority programmes:
 - **PHOSP:** The £8.4 million Leicester-led national consortium aims to understand and improve long-term health outcomes of hospitalised COVID-19 patients.
 - **REGAIN:** A University Hospitals Coventry & Warwickshire NHS Trust-led £1.2 million trial to assess the impact of online and at home physical and mental health support.

Supporting the Region and the Nation

Whether through supporting staff and students to volunteer within frontline care, reallocating expertise and resources to fight the pandemic (e.g. Birmingham's role as the first academic lab partner for NHS Test & Trace, Leicester University's screening programme and Keele University's PPE drive), or donating and mobilising tens of millions of pounds worth of equipment (e.g. Nottingham's 16 PCR machines, worth £1 million), the Midlands has held nothing back in its determination to support, inform and protect patients and the public. This includes delivery of a wealth of online services (e.g. Leicester's groundbreaking 'Your COVID Recovery' service) and evidence-based policy and practice expertise (e.g. Loughborough University's numerous studies of social impact and Aston University's review of the important role of pharmacists).

Authors



Midlands Innovation Health (MIH) is a research and innovation partnership that coordinates and combines the collective excellence of seven Midlands universities to deliver improved health and regional growth. Driving disruptive translational interventions and influencing nationally, MIH draws together a critical mass of innovative regional stakeholders to impact national and global health challenges using local training strengths, expertise, networks, best practice and facilities. MIH also links the Midlands-based universities within a joint academic-NHS-industry innovation environment, to push forward

research, collaboration and skills in the Midlands medical sector.

MIH partners are the Universities of Aston, Birmingham, Keele, Leicester, Loughborough, Nottingham and Warwick. MIH acts as the Health branch of Midlands Innovation, a world-class multi-disciplinary collaboration that unites the power of university research with the unique strengths of Midlands industry to drive cutting-edge research, innovation and skills development.



Midlands Health Alliance (MHA) is an alliance between NIHR infrastructure across the Midlands including Biomedical Research Centres, Clinical Research Facilities, Clinical Research Networks and Applied Research Collaborations plus the Academic Health Science Networks.

Together, the MHA will develop: a common strategy to maximise the impact of our research, tools and approaches to clinical patient recruitment and study setup, and a clear infrastructure for seamlessly signposting our capabilities to industry. We intend to increase our voice in national and international funding opportunities and secure regional investment to the Midlands. To this end, we work alongside the Midlands Engine and Midlands Innovation Health. We will develop a shared strategy for maximising the impact of NIHR funding for clinical experimental research through agreeing priority areas that we can address collectively and put the Midlands at the heart of UK biomedical research excellence. We aim to ensure a seamless offer to make it easier and quicker for industry to work with the leading expert investigators within the NHS to harness the exciting and wide ranging opportunities in this area.



Medilink Midlands is the Midlands Life Sciences industry association, whose aim is to help companies establish, develop and grow. Its network of more than 8,000 contacts in over 1,700 organisations represents all aspects of the sector; from multi-nationals to high potential start-up companies, as well as the NHS and universities.

Working alongside the Midlands Engine and other strategic alliances, Medilink Midlands' helps stimulate additional and value-added growth of the Midlands as a prosperous community for Life Sciences.

With offices in Birmingham and Nottingham, Medilink Midlands provides specialist support to boost the region's economic output from Life Sciences.

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Institutional Glossary

ABHI	– Association of British HealthTech Industries	NUH	– Nottingham University Hospitals Trust
ABPI	– Association of the British Pharmaceutical Industry	ONS	– Office for National Statistics
ARC	– Applied Research Collaboration	PRH	– Princess Royal Hospital
AU	– Aston University	RJAH	– Robert Jones and Agnes Hunt Orthopaedic Hospital
AUH	– Aintree University Hospital	ROH	– Royal Orthopaedic Hospital
BCH	– Birmingham Community Healthcare NHS Foundation Trust	RW	– Royal Wolverhampton NHS Trust
BCP	– Black Country Partnership NHS Foundation Trust	SFH	– Sherwood Forest Hospitals
BWCH	– Birmingham Women’s and Children’s NHS Foundation Trust	SGUH	– St Georges University Hospitals
CRH	– Chesterfield Royal Hospital	STH	– Shrewsbury and Telford Hospital
CRNs	– Clinical Research Networks	SW	– South Warwickshire NHS Foundation Trust
EMA	– European Medicines Agency	SWBH	– Sandwell and West Birmingham Hospitals
FDA	– The United States Food and Drug Administration	TDG	– The Dudley Group NHS Foundation Trust
GE	– George Eliot Hospital	UHB	– University Hospitals Birmingham NHS Foundation Trust
HDR UK	– Health Data Research UK	UHCW	– University Hospitals Coventry and Warwickshire NHS Trust
KGH	– Kettering General Hospital	UHDB	– University Hospitals of Derby and Burton
KU	– Keele University	UHL	– University Hospitals of Leicester NHS Trust
LH	– Lincolnshire Hospitals	UHNM	– University Hospital of North Midlands
LP	– Lincolnshire Partnership NHS Foundation Trust	UKRI	– UK Research and Innovation
LPT	– Leicestershire Partnership NHS Trust	ULH	– United Lincolnshire Hospitals
LU	– Loughborough University	UoB	– University of Birmingham
MHRA	– Medicines and Healthcare products Regulatory Agency	UoL	– University of Leicester
MPFT	– Midlands Partnership NHS Foundation Trust	UoN	– University of Nottingham
MRC	– Medical Research Council	UoW	– University of Warwick
NIHR	– National Institute for Health Research	WAH	– Worcestershire Acute Hospitals
NGH	– Northampton General Hospital	WH	– Walsall Healthcare NHS Trust
NHB	– Nightingale Hospital Birmingham	WV	– Wye Valley NHS Trust
NSCH	– North Staffordshire Combined Healthcare		

Meeting The Challenge

Building on excellence to tackle COVID-19

In response to the COVID-19 pandemic, the UK has overcome considerable challenges. It is vital that we recognise the lessons the virus has taught us as well as the core assets enabling us to meet these challenges both locally and nationally. Despite the Midlands Life Science sector's historic under-representation in national Life Sciences investment, the region has not only delivered, but thrived in the new environment. It is clear that the Midlands is:

A world-leading COVID-19 clinical research environment:

“The Midlands is a distinctive UK centre for clinical trials, and research and development, having a wealth of experience across a wide range of diseases, conditions and clinical settings, all of which need specific trial designs to test and evaluate them accurately and sufficiently.”

Driving Life Sciences Business In the UK Midlands Region (DIT, 2020)

The region has a proven reputation for design and delivery of world-class adaptive clinical trials at a national and international scale, and hosts Europe's second largest clinical trials cluster. The Midlands delivers innovation for patients and drives accelerated translational excellence in specialist areas including trial design, usability, testing and innovative engagement of patients and industry. We have a wide range of clinical specialisms, including respiratory disease, BAME health, and diabetes, and have led the global effort in the methodologies used to evaluate and accredit diagnostic tests for COVID-19.

The Midlands is delivering world-leading, life changing clinical research in response to COVID-19. Working together across the region, the NHS, universities and industry are meeting the challenge, driving lifesaving treatments for COVID-19 and improving outcomes.

During the pandemic, the Midlands' outstanding clinical trials investigators and infrastructure have worked with national organisations to streamline processes and have delivered complex and adaptive clinical trial designs, exceptional recruitment levels and high-quality execution at speeds that were previously thought to be impossible. By combining this with the ability to leverage expertise, integrated with local infrastructure and community engagement, the region now hosts a world-class COVID-19 clinical trials environment, delivering nationally-leading patient recruitment.

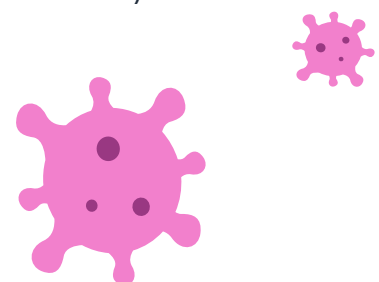
The voice for communities within science and policy:

A core strength of the Midlands' academic excellence and knowledge economy is data-driven healthcare. We host a rapidly-growing cluster of digital health companies (including more digital start-ups than any UK area outside of London), as well as world-leading academic and clinical expertise (such as the Centre for BME Health and the Health Data Research UK Midlands Substantive Site).

Utilising the close partnership between our cluster of excellence and large, diverse population, the region has led the UK's study and reporting of the impact of the COVID-19 virus on different socioeconomic and ethnic groups. Advising the Government, independent SAGE, local authorities and the global scientific community, regional partners have ensured that the UK's policies and interventions take into account the considerable difference in clinical outcomes identified by the Midlands academic expertise. We have also created near-real-time clinical dashboards for the NHS able to show geographical clustering and ethnicity impact before wider national capability. Inclusivity and participation are at the heart of the academic and clinical ambitions for the future the Midlands Health and Life Science sector.

Delivering excellence in genetics, immunology and cell biology:

The Midlands has considerable strength in fundamental Life Science research, culminating in the award of highly successful projects (such as the joint £6 million Cryo-EM facility which has been supporting remote collaborative research during lockdown) and delivery towards a number of national programmes e.g. the Midlands led the largest Genomic Medicine Centre taking part in the 100,000 Genomes Project (comprising a consortium of 17 trusts from across the region, coordinated by Birmingham Health Partners).



Regional partners have a variety of successful programmes: the Birmingham-led £6.5 million UK Coronavirus Immunology Consortium (UK-CIC) programme brings together UK immunology centres of excellence to research how the immune system interacts with SARS-CoV-2 to help develop better diagnostics, treatments and vaccines. We are a core partner of the £20 million UK COVID-19 Genomics UK Consortium (COG-UK), delivering large-scale and rapid whole-genome virus sequencing to local NHS centres and the UK government, with major contributions from the Universities of Birmingham, Nottingham and Warwick as well as several regional NHS Trusts. Midlands' partners are also playing a significant role in vaccine development, for example the Universities of Nottingham and Nottingham Trent are collaborating with Scancell Holdings plc to adapt its existing cancer vaccine platform for the development of a new vaccine.

The heart of UK manufacturing and medical technologies:

"The Midlands is the epicentre of advanced manufacturing and engineering in the UK, including innovative leaders in digital and collaborative production processes. Its extensive supply chain is reshaping chemicals, base and fabricated metals, electrical items, prefabrication and subcontracting including machinery for Life Sciences as well as other sectors."

Driving Life Sciences Business In the UK Midlands Region (DIT, 2020)

The Midlands has a substantial legacy in advanced manufacturing and engineering with over 20% of the UK's manufacturing employment (over 614,000 jobs) located in the region. Combined with our Life Science excellence, this allows the Midlands strength in medical technologies to provide an agile response to emerging challenges. In medical technology, the region boasts the highest number of UK companies and is the second-largest UK employer.

It is thanks to the diversity of this SME-driven landscape, its high-level skills and the supply chain that supports it, that the Midlands has been able to provide both sustainability and innovation during the pandemic, including the development of novel tests, optimising and testing of ventilators and their components, and delivery of PPE. Universities are supporting this work, for example, through world-leading facilities and expertise at the Medical Devices Testing & Evaluation Centre (MD-TEC) and integrated partnerships at Aston that have developed the SNAP device.

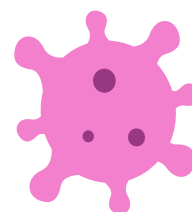
A vital point of support for to the national COVID-19 response:

In addition to leading and contributing to critical national programmes enabling the Government's core initiatives to fight COVID-19, the Midlands is also providing added value in a number of ways:

A collaborative cluster delivering scale and tackling challenges: The Midlands' strong academic-NHS ecosystem, cutting-edge facilities and innovative industry has rapidly delivered excellence across its clinical and research infrastructure. This has prepared the region to respond at scale to national/international requests and laid the foundations for successful UK partnerships, using our trusted relationships to apply creative new approaches, processes and attitudes, and overcome even the biggest challenges.

Supporting NHS frontline care and testing capabilities: All Midlands partners have dedicated staff, facilities and resources to support national NHS services, including the donation of tens of millions of pounds worth of PPE and equipment, the reallocation of hundreds of research personnel to support frontline care, dedication of world-leading facilities to testing/sequence both local and national samples, and the creation of the UK 'Your COVID Recovery' service. Additionally: Charnwood Campus, in Loughborough, has been announced as the UK's seventh "Lighthouse Lab", supplementing existing NHS labs working on the Government's National COVID-19 Testing Programme; while Birmingham Health Partners opened the first Pillar 2 Turnkey laboratory in the country at their medical school, as well as a collaborative Pathfinder lab with NHS partners; and the University of Warwick is supporting the new testing Mega Lab in Leamington Spa.

Mobilising supply chains and resource to create resilience: Thanks to innovative procurement practices and collation of industry efforts, the Midlands has been able to not only supply the region itself with in-demand products (such as PPE and reagents) but create additional resource for the rest of the UK, e.g. the Medilink Midlands Big Ask (supported the region's Academic Health Science Networks (AHSNs) and the PPE initiative driven by the Midlands Engine.



Lessons Learnt

As the scientific and clinical community approaches a more complete understanding of the COVID-19 virus, it is important to consider the lessons that have been learnt and build them into a plan for the future.

Speed, flexibility and partnerships are key:

Without any one of these, neither the Midlands nor the UK would have been able to respond to the pandemic in the way that has been achieved. A significant reduction in bureaucracy, a real-time rolling review of applications and clinical data, and a focus upon coproduction, have demonstrated what can be achieved by taking a flexible, multi-discipline and cross-organisation approach to rapid innovation. Our capacity to transform practice and produce resilience-focused strategies has delivered speed without compromising patient safety and product quality. Supporting this is the ability to develop and maintain virtual environments, better and more open data sources, new ways of working and a shift to patient-focused outcomes.

Partnership is the most important factor in the Midlands' leading role in driving the UK's COVID-19 response. In addition to the unprecedented collaboration between academic, clinical and industrial organisations enabling rapid translation of novel science into leading clinical trials and product development, partners have demonstrated their ability to disseminate knowledge across the globe, extending networks and expanding the available evidence base. Acting as anchor institutions, Midlands' partners are achieving their full potential to deliver real-world impact for their local populations and to spread translational impacts across a much wider geography than previously achieved.

Ignoring societal factors is a recipe for disaster:

The COVID-19 response has necessitated a seismic shift from acute late-stage treatment to early-stage preventative medicine. For this to be fully realised and embedded in the UK health service, it is vital that the roles of socioeconomic, ethnicity, mobility, geography, culture and education be fully understood. Additionally, while it may be practical to group patients with underlying conditions, it does not address the root cause of the variations in clinical outcomes. Throughout the pandemic, Midlands' partners have stood side by side with the region's citizens, championing this message and prioritising the continuing need for both preventative and rehabilitative interventions.

The Place Agenda has never been more important:

Understanding the importance of Place and how best to 'level up' regions is not just a priority for national economic growth, it also has major implications for health outcomes, especially for COVID-19. Societal factors that impact on clinical outcomes often have a geographic element and so must be included in both local and national government policy and ambitions for growth. Co-design with and for communities has been a vital process throughout the pandemic. This strength has shown itself in the Midlands' high levels of recruitment to clinical trials, as well as practical translation of research and measures to take care into the community.

The virus has shone a light on the Government's devolution plans and highlighted the role of local organisations. The benefits of devolved responsibilities and a local-national shared agenda have been very apparent during the pandemic, particularly within local lockdown. Balancing national agendas with local need has enabled evidence-based policy approaches and increased understanding of how local practice can support and inform national policy. Moving forwards, coordinated data gathering and communication at a local, national and international level is vital to prevent future national lockdowns, further damaging the economy. It is also necessary to identify where decisions need to be made locally or nationally (e.g. employment) to achieve interventions. It is only through the activation of Place within the Political landscape that these can be achieved.

It is also important to consider the role of anchor institutions and how these can work together to create local, regional and national impact. Utilising anchor institutions and their local and international connections will create a pipeline to drive forward skills, education, research and innovation agendas.

It is through this mechanism that Place can play its most powerful and timely role, allowing investment to deliver benefit to left behind industries and communities.



Procurement strategies can significantly impact future resilience:

An area of particular importance is the role and collective responsibility for local public bodies to practice sustainable, locally-focused procurement practices. Procurement is key in the delivery of positive impacts, creating opportunities for training, jobs and local resilience. Through creative and collaborative approaches, we can not only deliver against the social value act, but also create

Building towards a better future

With these lessons in mind, the Midlands has been developing assets and specialist clusters to support the regions' health and wealth, for example:

The National Rehabilitation Centre:

Construction is planned to begin next year, led by Nottingham University Hospitals NHS Trust with lead academic partners Universities of Nottingham and Loughborough. As part of getting young people with illness and injury back to work, the NRC will address the long-term implications of the respiratory trauma associated with COVID-19 and the need for targeted rehabilitation. Working with the University of Leicester-led 'Your COVID Recovery' programme and PHOSP clinical trials platform, as well as other national schemes, the NRC is ideally placed to deliver clinical, R&D and educational innovation in this space.

A UK Centre of Excellence for Regulatory Innovation & Delivery:

It is vital that the UK maintains its position as a global thought-leader in a post-coronavirus market, embracing opportunities for regulatory flexibility whilst robustly understanding risks and challenges. Linking to the joint academic-NHS Centre for Regulatory Science and Innovation in Birmingham, leveraging significant ongoing work with bodies such as MHRA, ABPI, ABHI, NHSX, EMA and FDA, as well as patient groups and the new Regulatory Horizons Council, the Midlands aims to cement

long term foundations from which local businesses can build. The Midlands Engine, with support from Midlands Innovation Health and Midlands Health Alliance, has been supporting local authorities with their discussion of a regional-level Dynamic Purchasing Systems for PPE provision. This would enable the creation of a sustainable domestic market in the Midlands, prevent reliance on overseas supply and give back to the private sector that has taken on enormous risk in their efforts to meet local and national PPE requirements.

its status as the leading UK region for Regulatory Science. The first step in this ambition is to create a unified UK Centre for Regulatory Innovation & Delivery, which will showcase the Midlands as a focal point for this activity and leverage a regional legacy of manufacturing expertise.

Birmingham Health Innovation Campus:

Due to open in 2023, this innovative healthcare technology campus will deliver cutting-edge facilities in healthcare data, genomics medicine and diagnostics, medical technologies and clinical trials. It will expand the region's ability to work with industry and the NHS to rapidly develop prototypes and deliver translation. The campus's potential has been demonstrated through the Birmingham Health Partners collaboration with Binding Site to produce COVID-19 antibody tests.

Midlands Engine Health:

ME Health will support and promote these new opportunities and the region's innovation-delivering strengths. By continuing to embed organisations such as Midlands Innovation Health and Midlands Health Alliance at the heart of this partnership (as well as industry, local Government and other regional partners), Midlands Engine Health will emphasise what the region can offer and what is needed at the most appropriate time. (see page 66 for further details).

Summary

The Midlands has considerably outperformed traditional expectations and firmly established its position in the UK Health and Life Sciences sector. Reinforced by recent studies highlighting the considerable underinvestment of public funding into the region despite its achievements in private research and development spend (The Missing £4 Billion, NESTA, 2020), it is clear to see what the Midlands is capable of achieving when supported at a national level. With the independent analysis run by the Midlands Engine Economic Observatory showing that the Midlands has the deepest economic exposure of any UK region, now is the time for the region to be recognised as a true Life Science Powerhouse.

Research Excellence

Combining world-leading academic excellence in genetics, immunology, health data analytics and ethnic health with a long-standing reputation for manufacturing strengths, it is no surprise that the Midlands has more than excelled in its translational research response to the COVID-19 outbreak. Having already achieved significant funding into these areas through priority programmes, such as the three Biomedical Research Centres, the Midlands HDR UK Substantive Site, PathLAKE and the Midlands and Wales Advanced Therapy Treatment Centre, the Midlands is ideally placed to support the Government, NHS and UK industry to meet their ambitions to fight the COVID-19 pandemic.

Working alongside these Medical and Life Science-focused activities are the region's award-winning business, law, social science

and humanities schools. In a coordinated effort to support policy makers, the police, and local, national and international Governments, experts in the region are empowering these bodies to deliver efficient and timely responses to this complex and ever-changing situation.

Be it through increased waste or reduced air pollution, even our environment has been impacted by the international measures taken to tackle COVID-19. It is, therefore, more important than ever that the scientific community works collaboratively, both between institutions and across disciplines. By utilising our existing networks, we have ensured that the Midlands is doing just that.

This chapter outlines the considerable uplift in targeted research and innovation that has been delivered by Midlands' universities and their regional partners since the lockdown began:

A. Diagnostics, genomics, immunology and testing

The region's expertise is being mobilised nationally to facilitate genome sequencing, molecular biology and antibody testing. We have also mobilised staff and resources to help increase regional testing capacity.

UK Coronavirus Immunology Consortium (UK-CIC)

Led by Professor Moss from the University of Birmingham, the UK-CIC will receive £6.5 million to bring together leading immunologists from 17 research institutions. The project will use samples and data from major UK COVID-19 projects already underway, including ISARIC-4C, the COVID-19 Genomics UK Consortium and GenOMICC. Better understanding of these immune responses, particularly the T-cell response, could provide targets for new COVID-19 therapies and inform the efforts to develop a vaccine. uk-cic.org

COVID-19 Genomics UK Consortium (COG-UK)

The Universities of Birmingham, Nottingham and Warwick are members of an alliance of the UK's leading clinicians and scientists to map how COVID-19 spreads and evolves, using whole-genome sequencing. The COVID-19 Genomics UK Consortium – comprised of the NHS, Public Health Agencies, Wellcome Sanger Institute, and academic institutions – is delivering large scale, rapid sequencing of the cause of the disease and sharing intelligence with

local hospitals, regional NHS centres and the Government. Through this £20 million investment, the consortium is looking for breakthroughs that help the UK respond to this and future pandemics, and to save lives. cogconsortium.uk/about

The University of Warwick, working with University Hospitals of Coventry and Warwickshire NHS Trust, is supporting COG-UK with virus genome sequencing data, while also studying the evolution of the SARS-CoV-2 genome (including post mortem samples).

The University of Birmingham, led by Professor Loman, has been using techniques developed to track mutations in the Ebola virus during the epidemic in Africa to track the SARS CoV2 virus as COVID-19 spreads throughout the UK. Their work has elucidated how the virus originally entered the UK; and is now demonstrating that the virus is not mutating particularly rapidly and does not appear to be becoming more or less aggressive. <https://www.birmingham.ac.uk/news/latest/2020/03/birmingham-joins-covid-19-genome-sequencing-alliance-to-map-spread-of-coronavirus.aspx>

Assisting the development of a potential DNA vaccine

The Universities of Nottingham and Nottingham Trent are contributing essential virology expertise to help develop a safe and effective preventative vaccine. Experts from both universities will assist Scancell Holdings plc to

adapt its existing cancer vaccine platform for the development of a new vaccine. The UoN's Centre for Research on Global Virus Infections has identified parts of the virus that they hope will generate an immune response to prevent future infection, while NTU's John van Geest Cancer Research Centre will screen the vaccine for its capacity to trigger this response. <https://www.nottingham.ac.uk/alumni/newseventsandfeatures/news/news-items/alt/were-helping-to-develop-a-covid-19-vaccine.aspx#>

Immune response

Our bodies' own natural immune response could offer a new hope in fighting the COVID-19 pandemic and help underpin the success of future vaccines, a team of scientists have said. In an editorial to the British Medical Journal (BMJ), the researchers, led by Emeritus Professor Sewell at the University of Nottingham, highlight that a section of the population appears to have some natural cellular immune responses to the coronavirus. If enough of the public were to take up vaccines, then herd immunity, which effectively protects all of society against the disease, could become possible. nottingham.ac.uk/news/immune-response-finding-offers-new-hope-in-fight-against-covid-19

Dr Russo (Keele University) is developing a cellular and in vitro assay with potential to use saliva to detect the individual effective immune protection and level of infectivity in the population. This assay, based on the functional binding of the virus to the ACE2 receptor, aims to enable the development of a paper-based diagnostic for general public use and also to support vaccine clinical trials and drug screenings.

Testing

Development of an antibody test that determines whether an individual has had the infection, has become immune and is safe to return to the community/workplace is of critical importance. The University of Birmingham's Clinical Immunology Service and Birmingham Health Partners in collaboration with the University of Oxford, Binding Site and Abingdon Health have developed a sensitive test in use across multiple projects; the test provided evidence to confirm COVID-19 as the cause of a multi-system inflammatory syndrome in children who tested negative for the virus by PCR, which directly detects the presence of an antigen rather than antibodies. In addition, it detected antibodies in people who only suffered from a mild form of COVID-19 infection and displayed very few or no symptoms, but who generated an immune response to the virus. bindingsite.com/en/news-and-events/news/2020/04/covid-19-collaboration?disclaimer=1

The University of Warwick (led by Professor Gibson) and its partner Icen Diagnostics are also developing a new diagnostic tool for rapid detection of coronavirus. The diagnostic tool will function without any need for training or complex infrastructure, looking like a 'pregnancy test'. The tool uses sugars, not antibodies or general material, to identify the virus. warwick.ac.uk/newsandevents/pressreleases/new_diagnostic_tool

Initial findings from a new study led by Loughborough University, in partnership with the IMSPEX Group (Ion Mobility Spectrometry (IMS) specialists), the Royal Infirmary of Edinburgh and Germany's Klinikum Dortmund Hospital, have shown how Covid-19 can be detected via a non-invasive breath test, providing almost instant results. lboro.ac.uk/news-events/news/2020/october/covid-breath-test/

A novel approach to testing for COVID-19 is currently being trialled by a team led by Professor Barer at the University of Leicester, which could determine how infectious an individual is – even before symptoms are present. The approach could greatly simplify large scale screening for the virus and curb the spread of the disease. Professor Barer's team use simple, low-cost face masks, which are adapted using 3D printed strips that can trap exhaled microbes whilst the mask is worn for 30 minutes.

Testing evaluation

The University of Birmingham (Professor Deeks) is leading an international collaboration (with WHO and the Foundation for Innovative New Diagnostics [FIND] in Geneva) to create and maintain a suite of seven living systematic reviews on the accuracy of tests and patient characteristics in the diagnosis of COVID-19. This work has demonstrated that the timing of testing is critical. Professor Deeks' internationally-leading Diagnostic Test Evaluation centre has been closely involved in assessing the validity of the claims being made for the many emerging antibody and virus antigen tests; their careful, informed analysis is crucial in bringing rigour to the process. Professor Deeks is an advisor on the accreditation of diagnostic tests for WHO, MHRA and the House of Lords Science and Technology Committee, has been a regular BBC news contributor, and featured extensively in the newspapers. He was also the main scientist behind two in-depth programmes on the problems of diagnostic COVID-19 tests for BBC Newsnight and Panorama, with resulting media coverage reaching an audience of 868 million. birmingham.ac.uk/research/applied-health/test-evaluation-research-group-terg.aspx

Preclinical drug development and repurposing

Using pioneering techniques, the University of Leicester (Professor Brindle) and the MRC Laboratory of Molecular Biology, are working on the creation of a new soluble protein that binds to the SARS-CoV-2 virus, thereby preventing it from being able to bind to and infect our cells. As the virus normally binds to an ACE2 receptor, the decoy is engineered to be more attractive to the virus, so it will bind to the decoy instead, preventing the virus from 'hijacking' and reproducing within our cells. le.ac.uk/news/2020/april/17-decoy-protein-covid-19

Dr Russo at Keele University is also working on ACE2-like decoys which will not interfere with the natural function of the ACE2.

Aston University is focusing upon two preclinical drug developments:

- the development and characterisation of a lyophilised COVID-19 subunit vaccine delivery system to permit manufacture at scale, overcome cold chain instabilities and deliver global access (led by Dr Russell) covidpipeline.acmedsci.ac.uk/projects/development-and-characterisation-of-a-lyophilised-covid-19-subunit-vaccine-delivery-system-to-permit-manufacture-at-scale-overcome-cold-chain-instabilities-and-deliver-global-access-46
- interrogation of the role of inflammatory cytokines on microvascular stability (led by Dr Johnson) covidpipeline.acmedsci.ac.uk/projects/interrogating-the-role-of-inflammatory-cytokines-on-microvascular-stability-54

Dr Richardson (Keele University) is developing tests to repurpose existing drugs to identify which can inhibit viral entry into human cells. Other researchers at Keele are developing cell lines to enable COVID-19 drug studies.



Pathology and molecular characterisation

The Innovate UK-funded PathLAKE digital pathology initiative led by University Hospitals Coventry and Warwickshire (Professor Snead and Rajpoot) working with University of Warwick, is examining the viral and immunological pathology of COVID-19. This initiative is also interacting with other Innovate UK Centres of Excellence, NIHR and HDR UK to collate radiological data from chest X-rays. pathlake.org

Research led by Professor Covington at the University of Warwick are utilising their novel, breath-based systems for molecular pathology to see if it is possible to detect COVID-19 infection in breath. warwick.ac.uk/research/priorities/health/covid

A computational model of a human lung cell has been used to understand how SARS-CoV-2 draws on human host cell metabolism to reproduce by researchers at the University of Warwick (led by Professor Soyer). This study helps understand how the virus uses the host to survive, and enables drug predictions to be made for treating the virus. warwick.ac.uk/newsandevents/pressreleases/warwick_scientists_design

Researchers led by Professor Gooptu at the University of Leicester are integrating structural biology with cell and tissue studies to understand mechanisms of disease and develop new treatments. The group is focusing on molecular mechanisms that drive acute lung inflammation, how this can lead to long-term scarring, and defining drug targets to treat these steps. These same pathways may be hijacked by the coronavirus and can play an important role in the acute lung inflammation which may be fatal to patients with severe COVID-19 pneumonitis. This pathway is amenable to targeting by drugs, including some already in clinical trials for other conditions. le.ac.uk/research/coronavirus/professor-bibek-gooptu

University of Nottingham research is hoping to provide a better understanding of how COVID-19 works and could enable more efficient, tailor-made treatments. Hundreds of frontline NHS workers who've been exposed to coronavirus are donating blood samples so that the researchers can look into why some people contract COVID-19 and others do not. bbc.co.uk/news/av/health-52536661/coronavirus-nhs-staff-to-help-find-out-why-people-get-sick

Professor Siddiqui at the University of Leicester specialises in precision medicine and phenotyping. He is applying these approaches to COVID-19 in both UK and EU consortia to provide treatments that are tailored for patients, and to ensure the best diagnostic and prognostic markers are implemented rapidly into clinical care pathways. le.ac.uk/research/coronavirus/professor-salman-siddiqui

Professor Wain (University of Leicester) is researching how genetic variation contributes to the long-term effects of COVID-19, in order to help identify who needs to receive treatment, and which type of treatment patients will respond to best. le.ac.uk/research/coronavirus/professor-louise-wain

Keele University has published a new report that provides insights into how mutations in the SARS-CoV-2 genome sequences may have led to the current COVID-19 pandemic, using comparative analysis to highlight the structural changes in one of the key proteins that increases the binding of the virus to human receptors. keele.ac.uk/discover/news/2020/may/computing-report-coronavirus/comparative-analysis-coronavirus.php

Professor Jenkins leads the Nottingham Covid Research Group, which is investigating how the SARS-CoV-2 virus infects lung cells to cause severe pneumonia and assessing novel strategies to limit viral cell entry and replication, in order to reduce the risk of SARS-CoV-2 infection leading to severe COVID-19. nottinghamcrg.info

A major cause of breathlessness is pulmonary fibrosis and Professor Jenkins is also leading the Post COVID Lung Fibrosis Working Group of the PHOSP-COVID study, looking at the fibrogenic potential of SARS-CoV-2 infection; the mechanisms through which it may promote the development of lung fibrosis; and the effect of COVID-19 on underlying fibrotic lung disease. nottingham.ac.uk/news/long-term-health-impacts-of-coronavirus

Early cases missed

The early spread of COVID-19 could have been prevented if initial case definitions had been less stringent and extensive community testing had been in place sooner, according to new research from the University of Nottingham. Experts from the University's School of Life Sciences retrospectively tested routine respiratory samples taken from patients at a Nottingham teaching hospital dating back to early January 2020. The results provide evidence that COVID-19 was already circulating widely in local communities in the UK in early February and into March, and was undetected because of restrictive case definitions that informed testing policy at the time. nottingham.ac.uk/news/missed-covid-cases

Antiviral drug

Molecular microbiologists at the University of Nottingham are working with biotech firm Cyanetics and Public Health England to discover a novel antiviral medication to effectively treat COVID-19. The Innovate UK-funded project will rapidly screen strains of a harmless bacteria called *Streptomyces*, found in abundance in soil. The microbe has the ability to produce natural compounds (secondary metabolites) with potent therapeutic benefits. There is an urgent need to discover new and effective antivirals against SARS-CoV-2. *Streptomyces* are an untapped resource for new antiviral medications. Large-scale screening, such as the one being undertaken, increases the likelihood of identifying such antivirals.



CASE STUDY 1: Delivering and ensuring transformational testing

Led by the University of Birmingham, University Hospitals Birmingham NHS Foundation Trust and enabled by Birmingham Health Partners, our clinical and academic teams have utilised their extensive genomic, virology and immunology expertise, in combination with their world-leading facilities, to drive the UK's response to COVID-19 testing:

- Category 3 laboratories at the University have been re-purposed to enable the testing of 10,000 samples within 24 hours.
- The University is delivering same-day testing for staff at UHB, the West Midlands Ambulance Service and Birmingham Women's and Children's Hospital.
- The University (alongside the University of Nottingham) are partners within COG-UK, which aims to put the UK at the forefront of the genomics effort for SARS-CoV-2. This programme has sequenced well over 50% of the entire UK effort.
- Within 10 weeks, the partnership between the University and its spin-out company Binding Site has produced a world-leading antibody test that can detect even a mild form of COVID-19 infection (usually presenting weaker antibodies responses) and will soon be available to the NHS.
- This has culminated in the University being named as the first academic lab partner for NHS Test & Trace, increasing sample processing capacity by ~3,000 tests per day. They have now opened the first Pillar 2 Turnkey laboratory in the country at the medical school, which will provide testing for the local population including the campus. UHB are also opening a Pathfinder lab in collaboration with the University at Heartlands Hospital.

The NIHR Birmingham BRC are also leading an international collaboration (with WHO and the Foundation for Innovative New Diagnostics in Geneva) to create and maintain a suite of living systematic reviews of the evidence of the accuracy of tests and patient characteristics in the diagnosis of COVID-19. The Birmingham BRC Diagnostics and Biomarker team, having screened >25,000 COVID-19 publications/pre-prints and >2000 full text reports, are coordinating activity and leading reviews, including:

1. **Antibody tests for identification of current and past infection with SARS-CoV-2 (published):** Antibody tests are not sensitive enough to diagnose current infection in the first 2 weeks of symptoms, but may complement other testing in individuals presenting later (with negative or no RT-PCR test result). Antibody tests are likely to be useful for detecting previous SARS-CoV-2 infection 15 or more days after the onset of symptoms, but the duration of antibody rises is unknown.
2. **Rapid point-of-care antigen and molecular-based tests for the diagnosis of SARS-CoV-2 infection (submitted):** Point-of-care antigen and molecular tests could allow earlier detection and isolation of confirmed cases compared to laboratory-based diagnostic methods, with the aim of reducing household and community transmission. Rapid tests have the potential to inform triage of RT-PCR use, but the evidence currently is not strong enough to recommend their use in clinical practice.



B. Health data analytics

Our nationally recognised strengths in health data, analytics and design have allowed us to play a leading role in the UK response to the epidemic.

COVID-19 monitoring

A team of oncologists, including those from the University of Nottingham and Birmingham Health Partners, have joined forces to launch the first cancer coronavirus registry in the world to track how cancer patients who have tested positive for COVID-19 will be impacted. 10 national cancer centres have now signed up to the scheme, with 70 pending. There is also international interest in how to emulate this scheme. ukcoronaviruscancermonitoring.com

This project is also developing an open source, international database that undertakes three functions: i) a database of all ongoing research projects (basic sciences, reviews, clinical trials) to facilitate coordination and collaboration, and to avoid duplication, ii) a depository of existing published literature and guidelines to facilitate dissemination and education, and iii) a gap analysis of current literature (including suggestions from clinicians and scientists) to help direct future research.

Successful management of COVID-19 by Governments and other international agencies will require statistical tools for real-time monitoring of the pandemic's evolution over space and time, e.g. how COVID-19 spreads across an urban area over time, clusters, growth, and efficiency of localised lockdowns. The University of Birmingham aims to adapt statistical methods for this purpose and develop software for their implementation. birmingham.ac.uk/research/city-redi/wm-redi/economic-social-impacts-of-covid19-on-the-west-midlands.aspx

AI diagnostic to predict COVID-19 likelihood without a test

The University of Nottingham (led by Dr Valdes) has collaborated with London and Harvard on the analysis of data from a COVID-19 symptom tracker app. The researchers created a mathematical model that predicted, with nearly 80% accuracy, whether an individual is likely to have COVID-19 based on their age, sex and a combination of four key symptoms: loss of smell or taste, severe or persistent cough, fatigue and skipping meals. nottingham.ac.uk/news/covid19-ai-diagnostic

Analysis of patient data

PIONEER, the HDR UK Health Data Research Hub for Acute Care (led by Professor Sapey, Birmingham Health Partners), is supporting partners with a granular, real-time extraction of hospital data on COVID-19 cases including Intensive Therapy Unit data. This has enabled the creation of clinical 'dashboards' supporting decision-making and analysis across multiple NHS sites – including monitoring geographic clustering prior to national capability to deliver this, and in-depth analysis of ethnicity data with relation to outcomes, used to inform SAGE. PIONEER continues to analyse detailed, near-real-time data from hospitals across the region as the pandemic unfolds, providing clinicians and researchers with insight that can lead to more effective clinical treatment strategies. hdruk.ac.uk/pioneer

Keele University's Professor Chew-Graham looked at the experiences of patients after contracting the virus and found that some people who experienced a 'mild' infection of COVID-19 are suffering long-lasting symptoms months after. This is known as 'long Covid'. The research has informed a new Royal College of General Practitioners e-learning training module as part of their 'Recovery from COVID-19' course to help GPs understand the long-term effects of COVID-19 on patients. bjgpopen.org/content/early/2020/10/12/bjgpopen20X101143

There are many unknowns in the long-term recovery of COVID-19 survivors. Dr Evans (University of Leicester) is using a holistic approach to quickly identify symptoms and problems experienced after COVID-19 in the short, medium and long term. The aim is to understand the underlying pathology and develop and test interventions to improve outcomes. le.ac.uk/research/coronavirus/dr-rachael-evans

Initial clinical guidelines for mechanical ventilation of COVID-19 patients suggested following standard approaches used in the treatment of acute respiratory distress syndrome. However, emerging clinical experience suggests that patients with COVID-19 pneumonia may present an atypical form. Clinicians require insights into the possible underlying disease pathophysiology of COVID-19 in order to develop appropriate strategies for ventilating patients. Engineers (led by Professor Bates) from the University of Warwick propose adapting a state-of-the-art computational simulator to investigate a range of issues that are specific to mechanical ventilation of COVID-19 patients. warwick.ac.uk/newsandevents/pressreleases/warwick_researchers_investigate



The HDR UK Hub for respiratory health, which includes the University of Leicester (Professor Tobin), the University of Birmingham (Dr Filer and Dr Richter) and Nottingham University Hospitals NHS Trust (Professor Hall), is focusing all resources on COVID-19. BREATHE will help navigate respiratory health datasets from across the UK, creating a digital resource where trained, approved experts can access data safely and responsibly, on an unprecedented scale. hdruk.ac.uk/infrastructure/the-hubs/breathe/



Dr Haldar (University of Leicester) is leading the data management group of the local research network and researching the blood biomarkers that can predict people with COVID-19 who are at a higher risk of developing severe disease. le.ac.uk/research/coronavirus/dr-pranabashis-haldar

The PatientTracker™ was developed by University Hospitals of Coventry and Warwickshire NHS Trust R&D and rolled out across the West Midlands region to support the transfer of patients participating in the RECOVERY Trial between hospitals. This enabled research staff working at individual Trusts to safely transfer patients and continue to carry out the research protocol in a seamless manner, ensuring compliance and patient safety. uhcw.nhs.uk/leading-research/for-industry

Those diagnosed with obstructive sleep apnoea could be at increased risk of adverse outcomes from COVID-19 according to a new study from the University of Warwick. Led by Dr Miller, the review highlights the need to further investigate the impact of the virus on those with the sleep condition and to better identify those currently undiagnosed with it. uhcw.nhs.uk/leading-research/for-industry

Patient care

Professor Quinlan (University of Nottingham) is co-leading a £4 million research project (COVid - Curated and Open aNalysis aNd rEsearCh platform) that will help UK scientists to access the data needed to develop potential COVID-19 therapies and treatments. Experts at the Universities of Nottingham, Dundee and Edinburgh, and Public Health England, will build the CO-CONNECT infrastructure to support research into antibody response, by connecting COVID-19 data derived from patient blood samples. nottingham.ac.uk/news/co-connect-funding

An extension of the original NIHR Health Informatics Collaborative cardiovascular dataset has been designed, with the aim of informing research on the treatment of patients who present with respiratory or viral complications. University Hospitals of Leicester NHS Trust, Nottingham University Hospitals NHS Trust and University Hospitals Birmingham NHS Foundation Trust are collating and sharing information for this dataset for every patient for whom a COVID-19 test is ordered. hic.nihr.ac.uk

Birmingham Health Partners (led by Professors Adab, Sapey and Richter) is leading a new programme named COPE-West Midlands, examining the contribution of occupational exposures to risk of COVID-19 and approaches to control among healthcare workers. The aim is to examine the relative contribution of occupational, sociodemographic and clinical risk factors for SARS-CoV-2 infection among healthcare workers – who are known to be at higher risk of being infected – in University Hospitals Birmingham NHS Foundation Trust, Birmingham Women's and Children's NHS Foundation Trust and the West Midlands Ambulance Service NHS Foundation Trust, and how to minimise these risks. birmingham.ac.uk/research/applied-health/research/cope-study.aspx

The University of Nottingham, in collaboration with the Nottingham University Hospitals NHS Trust, are also working to optimise resource allocation via prediction of outcomes for suspected and proven COVID-19. Researchers have set up processes to automatically process, extract, and analyse all clinical and laboratory values across the full duration of each patient's illness with a twice daily update from the live data sources.

Professors Jenkins and Bolton are investigating the long-term consequences of COVID-19 and have established a post-COVID clinic at Nottingham University Hospitals NHS Trust. They are leading on a number of projects following COVID-19 infection, with long-term breathlessness being a major symptom at follow up.

Professor Draper (University of Leicester) is leading several projects that monitor and provide insight into the effect of COVID-19 on pregnancy outcomes, neonatal and paediatric intensive care. These include:

- the national perinatal surveillance and enquiries for MBRRACE-UK (Mothers and Babies: Reducing Risk through Audits and Confidential Enquiries across the UK), which is monitoring COVID-19 perinatal outcomes for the UK. npeu.ox.ac.uk/mbrrace-uk
- the national paediatric intensive care audit network, PICANet, which carries out daily reporting to the NHS of newly confirmed cases of children with COVID-19 admitted to paediatric intensive care. The network has developed a customised audit evaluating the symptoms, testing and treatment for paediatric cases. picanet.org.uk/covid-19
- a study which seeks to understand and inform neonatal care in COVID-19 for the British Paediatric Surveillance Unit. rcpch.ac.uk/work-we-do/bpsu

Keele University, and institutions from across Europe, have published a study examining the quality of prediction models that are being proposed to inform the diagnosis and prognosis of suspected COVID-19 patients. Research found that the data and methods used in these studies were potentially at high risk of bias. Consequently, doctors may be making decisions based on weak and over-optimistic evidence. keele.ac.uk/coronavirus/response/ourresearch/researchers-warn-doctors/flawed-decisions.php

Keele University is also running the FOREUM-funded SNIPE study (MuSculoskeletal pain during the COVID-19 PandEmic), observing UK primary care electronic health records. Dr Welsh and Dr Burton aim to describe how pandemic practice has impacted on the consulting patterns and management of patients with musculoskeletal pain in a primary care setting, including if referral for and diagnosis of inflammatory arthropathies has changed. cprd.com/protocol/musculoskeletal-pain-during-covid-19-pandemic-observational-study-uk-national-primary-care

Birmingham Health Partners has launched the CovidSurg Collaborative, capturing real-world data and sharing international experience to inform the management of patients undergoing surgery during the pandemic. This has been developed by The NIHR Global Health Unit on Global Surgery, led by Professors Morton and Brocklehurst. globalsurg.org/covidsurg

The importance of fitness

The University of Nottingham is urging those on surgical waiting lists to use high-intensity interval training (HIIT) to boost their heart and lung fitness during the pandemic. New research proves the benefit of HIIT in patients having surgery for urological cancer. nottingham.ac.uk/news/covid-surgery-fitness

Professor Yates (University of Leicester) is working to better understand how lifestyle behaviours act as risk factors for COVID-19, and the extent to which they explain differences in the risk of COVID-19 between different populations and ethnicities.



Prognostic tool

The virus is new and affects patients differently; doctors are finding that their clinical experience is not enough to help them predict which patients are most likely to develop severe symptoms or die, and there is no tool which can help them to do this. This Birmingham Health Partners study (led by Dr Adderley) will develop tools to help healthcare professionals in identifying patients at high risk of needing intensive care treatment, as well as patients at low risk who can be safely discharged from hospital.

CASE STUDY 2: Tracking Transmission and Immunity in Healthcare Workers

Beginning in April, the University of Nottingham has been tracking a cohort of Nottingham University Hospitals NHS Trust frontline nurses and doctors and assessing changes in anti SARS-CoV-2 antibodies over at least 6 months via Pandemic Tracking of Healthcare Workers (PANTHER). Professors Valdes and Ollivere lead the UKRI COVID-19 Rapid Response-funded nationwide project (£719,500 awarded) to assess weekly changes in antibody titres in 1320 healthcare workers, in particular neutralizing antibodies which are the kind that determine immunity against the virus. Using the same assays that are being used to assess seropositivity for the Oxford vaccine trial, the study is already generating data on links between mobility and transmission, how different antibody levels change over time and seropositivity and ethnicity. pantherstudy.org.uk

In collaboration with the Nottingham BRC Patient and Public Involvement group, the Nottingham team (led by Professor Aithal) have set up priorities for BAME doctors and nurses and the serological and genetic data being generated is being used to dissect the biological from the socioeconomic factors underlying ethnic differences in COVID-19 susceptibility. The work has been communicated through national TV interviews (channel4.com/news/study-aims-to-find-why-some-people-with-coronavirus-are-more-susceptible-to-serious-illness), articles in The Conversation (theconversation.com/coronavirus-bame-deaths-urgently-need-to-be-understood-including-any-potential-genetic-component-138400) and at a recent internationally-disseminated presentation at the Royal College of Physicians by Professor Aithal.

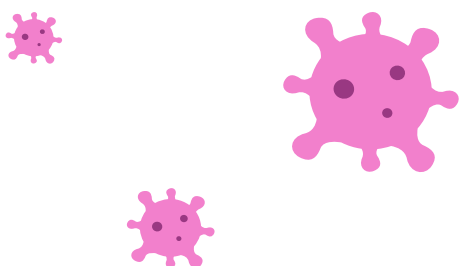
C. Innovative design, manufacturing and engineering

Building upon the Midlands' longstanding manufacturing history, our partners are utilising their world-leading engineering expertise, facilities and laboratories to drive forward innovative processes and remove supply chain barriers.

Development of a new ventilator

WMG researchers at the University of Warwick are helping a consortium of medical clinicians, academics, manufacturers and engineers to develop an alternative model of ventilator. Supporting the Government's drive to equip the NHS, the new model (the exovent) is a cutting-edge reinvention of the archetypal iron lung, which saved the lives of countless polio victims during the last century. warwick.ac.uk/newsandevents/pressreleases/ventilators_visors_volunteers

A consortium of UK technology and engineering businesses, from the aerospace, automotive and medical sectors, came together in response to the COVID-19 outbreak to address the national ventilator shortage. In collaboration with the Cabinet Office, the MHRA and industrial partners, Birmingham Health Partners' NIHR Trauma MIC and MD-TEC (Medical Devices Testing & Evaluation Centre) contributed to the investigation of novel ventilator designs to meet a high-level specification for a Rapidly Manufactured Ventilator System (RMVS). Led by Professor Clutton-Brock, over a four-month period 50 prototypes of 12 novel ventilators, CPAP systems and non-invasive ventilation systems were examined and underwent multiple rounds of safety, performance and usability testing. The team also established a real-time remote communication system with ventilator manufacturers to help them with design and safety issues. The team are now in discussion with the WHO on device use in low- and middle-income countries. Without their tireless work, unsafe ventilators would have entered the health care system and harmed already critically ill patients. Professor Clutton-Brock's contribution has been recognised with a personal letter of thanks from the Prime Minister. birmingham.ac.uk/staff/profiles/clinical-sciences/Clutton-Brock-Tom.aspx



Personal Protective Equipment (PPE), clinical setting, hand sanitiser and 3D printing

The University of Birmingham Colleges of Medical & Dental Sciences and Engineering & Physical Sciences, led by Mr Campbell-Hill, have co-developed an innovative 'pop-up tent', which forms a protective barrier between patients with COVID-19 and healthcare professionals. This development could be the latest line of defence for frontline NHS workers. This was identified by The Times as one of the top ten COVID-19 innovations internationally in a Raconteur Report. raconteur.net/healthcare/healthcare-innovation-covid

The SNAP device – the brainchild of two Midlands surgeons, Mr George and Mr Coulson and developed by Dr Prince – has been developed in a matter of months, thanks to a collaboration with engineers at Aston University and specialist UK-based manufacturing firms. The innovative device is designed to stop patients accidentally spreading coronavirus to ear, nose and throat surgeons, and is being rolled out free to NHS clinics across the UK. aston.ac.uk/latest-news/british-made-surgical-ppe-device-rolls-out-free-nhs



Scientists (led by Dr Cox) at the Healthcare Technologies Institute (Birmingham Health Partners) and King's College London are working on a solution to improve the seal and fit of facemasks used in hospitals during the COVID-19 crisis. The silicone interface, designed by researchers from the Centre for Custom Medical Devices, will help to improve the mask seal, thereby reducing exposure risk. In tandem, personalisation has the advantage of reducing fitting time and improving comfort while reducing skin abrasions for NHS users. birminghamhealthpartners.co.uk/improving-

[facemasks-for-frontline-covid-19-staff](#)

Critical conversations are often difficult, but the use of respirator masks make this almost impossible, particularly for patients with hearing loss or communication difficulties. Professor Coates (University of Leicester) is working with industry partners to design and build a new communications system that overcomes these problems caused by masks and respirators.

Colleagues (led by Dr Zhang) from the University of Birmingham School of Chemical Engineering have been awarded funding to work on mitigating the transmission of COVID-19 between humans by developing antiviral formulated products. SURfaCe Characteristics Enabled Strategies against virus transmission (SUCCESS) will deliver additives in domestic formulated products, e.g. spray or aerosol, or integrated with current manufacturing processes, forming an invisible and long-lasting film of sub-micron thickness. Unlike disinfectants, formulations both capture the aerosol droplets and inactivate the virus. gtr.ukri.org/projects?ref=EP%2FV029762%2F1

The University of Nottingham (led by Professor Hague) designed a PPE face shield with expedited CE approval, 3D printed at scale, for healthcare workers to use in the fight against COVID-19. Within a month, thousands of devices were being used by local doctors and hospitals. The Centre for Additive Manufacturing, working with external collaborators, delivered 5,000 face shields to Nottingham's NHS and community healthcare workers, thanks to the extraordinary efforts of local manufacturing partners Matsuura Machinery UK and BSI. nottingham.ac.uk/news/nottingham-engineers-produce-certified-3d-printed-face-shields-for-nhs

A novel PPE solution has been specifically developed for cochlear implantation procedures, thanks to a team of researchers and clinicians from Nottingham. The project was driven by Professor Hartley, research lead for objective measures at the Nottingham BRC Hearing Theme and consultant ENT at Nottingham University Hospitals NHS Trust. nottinghampost.com/news/nottingham-news/i-can-hear-birds-sing-4303923

The European Commission has invested €40 million to design the hospital of the future, financing four projects in this area. Dr Pecchia (University of Warwick) will lead a Work Package within one of these four projects, the ODIN project (€13 million for 21 partners from 11 countries). 11 hospital critical challenges have been identified for which ODIN will be combining robotics, Internet of Things and Artificial Intelligence to tackle. warwick.ac.uk/newsandevents/pressreleases/robots_and_ai

Tackling challenges

Professor Ogrodnik, a biomedical engineer from Keele University, is leading a new project to unite engineers from across the world to help solve challenges deriving from the COVID-19 pandemic. These could include creating a device to enable a frail person to accept a food parcel, the mass production of ventilators, or testing surgical masks after they have been sterilised. keele.ac.uk/discover/news/2020/april/calls-for-engineers/to-unite-together.php

Using “bump” devices to support social distancing

University Hospitals Coventry and Warwickshire NHS Trust are taking part in a project to evaluate an electronic device worn by staff members which alerts the user when they come within two metres of another user (tharsus.co.uk/about/bump). The devices will initially be implemented for staff use on the “Green Pathways”, where it is vital to reduce/eliminate any COVID-19 spread.

CASE STUDY 3: Keele Deal - Recovery

Keele University will be shortly launching **Keele Deal | Recovery** which will build on its strong and diverse history of local collaborations, setting out significant commitments that will aid and strengthen local recovery following COVID-19.

Staff, students and businesses at Keele have been involved in an impressive range of efforts to address the impacts of the pandemic since its early stages. The initial emergency response included the early release of clinical graduates into the NHS and return of clinical staff to the NHS frontline, the donation of all stocks of PPE, student and staff volunteering, the manufacturing of 100,000 litres of sanitiser for the NHS and the provision of online legal advice to vulnerable households.

The second phase included efforts around campus usage for respite accommodation, joining a national antigen testing research programme, and offering support for Science and Innovation Park companies and the 600 businesses in their networks.

Keele Deal Recovery will be launched in October 2020 and will build on some of the major areas of the University's existing engagement to form a powerful and wide-ranging programme of contributions for the benefit of local communities and economies.

The Deal will encompass eight interrelated themes – Innovation and Enterprise, Cultural Regeneration, Digital Futures, Employment and Skills, Food Security, Health and Wellbeing, Inclusion and Sustainability.

The aim is to identify significant project and programme opportunities capable of achieving a major impact on local recovery and resilience. The themes are intentionally selective for the purpose of the Deal – for a locally engaged university such as Keele, other local collaborations will continue to flourish around them.

Simplifying standards for COVID-19 PPE

Professor D. McNally, Head of the University of Nottingham Bioengineering Research Group

Very early on in the COVID-19 pandemic, the EU Commission recognised that there was a strong possibility that there would be shortages of PPE. To this end, they issued a Recommendation 2020/403 on the 13th March 2020, with the objective of ensuring the availability of PPE and medical devices for adequate protection. This recommendation was aimed at all economic operators throughout the supply chain, as well as notified bodies and market surveillance authorities. One of the provisions of this document was to permit the manufacture of PPE to 'technical solutions' rather than harmonised standards. These technical solutions were simplified forms of the normal standards that retained all the provision required for COVID-19 protection and which maintained the applicable essential health and safety requirements laid down in Regulation (EU) 2016/425.

An example of one such technical solution was published by BSI for COVID-19 face shields. Normally, such face shields need to comply with EN 166:2001 'Personal eye-protection - Specifications'. This is an extensive and comprehensive document that covers everything from safety glasses to welding masks. Most of the scope of EN 166 is not relevant to COVID-19 protection, where a face shield simply needs to fit comfortably without causing irritation, be easy to see through without distortion, and provide sufficient coverage to protect from droplet splashes. The BSI technical solution pulled out these essential requirements.

By really simplifying both the manufacturing and regulatory testing requirements, these technical solutions allowed very rapid product development cycles. For example, the COVID-19 face shield designed and manufactured by the University of Nottingham took just over a week from initial design to CE marking. This simplification of regulation facilitated an agile solution to PPE manufacture that undoubtedly was responsible for saving many lives.

D. Impact on diverse populations

The Midlands globally representative population, international research links and local research expertise allow us to contribute to the international research effort:

The diverse UK population

Professor Khunti (University of Leicester) is working with the South Asian Health Foundation to collect hospital data on patients admitted with COVID-19, specifically ethnicity data from ONS. He also sits on a Global Panel for GAPIO (South Asian organisation) looking at the effects of COVID-19 in South Asians globally, and the UK's Independent SAGE group, which provides the Government with evidence-based policies to tackle COVID-19. sahf.org.uk

Work by Birmingham Health Partners, utilising the PIONEER Health Data Research Hub, led by Professor Sapey, was one of the first to identify that South Asian patients are 42% more likely to die from COVID-19 than White people; twice as likely to develop severe symptoms; and 2.5 times more likely to require treatment on intensive care wards. [itv.com/news/central/2020-05-27/south-asian-patients-42-more-likely-to-die-with-coronavirus-than-white-patients](https://www.itv.com/news/central/2020-05-27/south-asian-patients-42-more-likely-to-die-with-coronavirus-than-white-patients)

The Centre for Black and Minority Ethnic Health (supported by the University of Leicester, Leicester Real World Evidence Unit, NIHR's ARC-EM and Leicester Biomedical Research Centre) has also provided the South Asian Health Foundation with an overview of the current evidence on ethnic inequalities in the impact of COVID-19, and potential explanatory factors for these observations. Critically, it makes much needed recommendations to protect Black, Asian and Minority Ethnic (BAME) individuals, both in the general population and in key worker roles. The Centre is also studying social isolation within the UK's mixed ethnicity population. static1.squarespace.com/static/5944e54ab3db2b94bb077ceb/t/5f059972f6680542c546897f/1594202487799/Covid19_SAHF_Final+for+Release.pdf

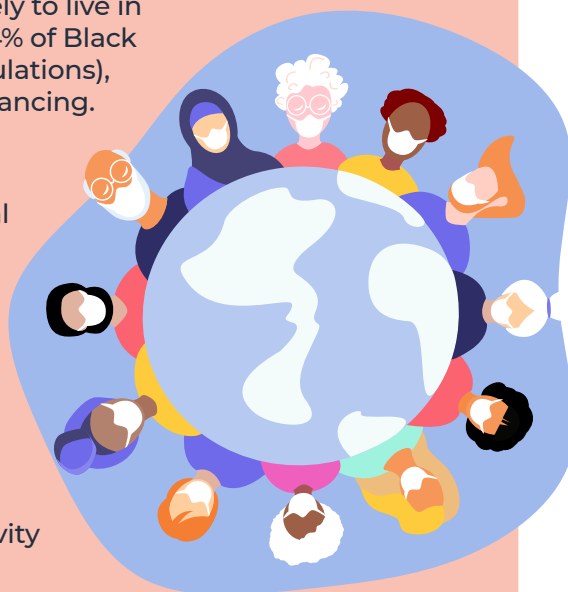


Why COVID-19 has exposed and exacerbated health inequalities based on ethnicity

Dr Paton, Aston University

COVID-19 disproportionately affects Black, Asian, and Minority Ethnic (BAME) people, who are more likely to become critically ill and die. Discussion of this relationship has centred on the greater prevalence of certain underlying health conditions among people from BAME communities e.g. diabetes, heart and circulatory diseases (common among people dying from COVID-19). However, this focus obscures the real reasons behind the BAME population's increased risk that, in fact, reflects fundamental socio-economic inequalities. The relationship between poor health, mortality and social inequalities is well understood. In the present case, it arises from a complex interaction between ethnicity, living conditions, occupations, ambient air quality, area deprivation, underlying health conditions, relative economic disadvantage and poverty. Consequently, to address disproportionate deaths for the BAME population due to COVID-19, we need to go beyond clinical concerns.

- People from BAME backgrounds are more likely to live in densely populated urban areas (98.1% and 97.4% of Black and Asian minority groups vs 79.1% white populations), where it is more difficult to practice social distancing.
- Household composition also makes social isolation more difficult. For example, Asian households make up 21% of multi-generational family households.
- BAME communities are more likely to live in areas with poor air quality, which contributes to the development of high-risk underlying conditions e.g. asthma.
- >50% of frontline staff/key workers and 40% of health professionals are from BAME backgrounds. BAME workers are also over-represented in jobs requiring face-to-face activity such as transport, distribution and essential retailers.



Further consideration of both the impact of the virus and the measures employed is needed. To mitigate these effects, I have recommended to Parliament that the following actions are taken over the next 12 months.

- Companies with high rates of agency/zero hours contracts should be required to offer workers PPE, with regular testing for workers in higher risk occupations.
- Guidance should be produced on shielding and PPE provision that addresses the increased COVID-19 risk for BAME frontline/keyworkers across all sectors.
- The impact of COVID-19 on the BAME community must feature prominently as part of the Government's plan to scale back pandemic measures.
- Research is needed to determine the most essential needs of people from ethnic minority backgrounds, so they can remain safe over the longer term from the disproportionate effect COVID-19 is having on BAME communities in Britain.
- Finally, it is essential that the Government reviews how best to implement strategies to support and safeguard this group from unnecessary exposure and risk of infection.

CASE STUDY 4: West Midlands Black, Asian and Minority Ethnic (BAME) Group

The West Midlands BAME Group is a partnership of local research and academic organisations, which focuses on tackling health inequalities and seeks to reduce the disproportionate impact of COVID-19 on local BAME communities. It is led by the Clinical Research Network West Midlands (CRN WM) closely supported by the Network's Equality, Diversity and Inclusion Research Champions Group. The Group is planning to deliver a number of research projects and studies, some of which include undertaking an observational study to better understand the local BAME ageing population and exploring cancer tumour surveillance in BAME groups. In addition, they have recently undertaken the COVID-19 vaccination survey. The aim of this survey was to help better understand the views of people in the West Midlands and from across the country in relation to vaccines and vaccine research studies. The results of this are planned to be shared in October 2020 across the NIHR and NHS Partner Organisations. Partners are the CRN WM, the University of Birmingham, the University of Wolverhampton and the Royal Wolverhampton NHS Trust.

Global Health

Through the NIHR Global Research Unit on Improving Health in Slums, Professor Lilford (University of Birmingham) is discussing COVID-19 with international partners and policy makers, for example, the use of poorly validated treatments, such as the wide use of hydroxychloroquine in India.

The University of Warwick (led by Professor Nokes) is studying COVID-19 intervention modelling for East Africa (CIMEA). The rapid global spread poses a threat to all, but particularly in countries with the weakest health systems. East Africa requires an epidemic response that optimally mitigates COVID-19. Colleagues are assisting this effort by forecasting the impact of different interventions that support policy decisions. bit.ly/3ajaEKH

An international team (led by Professor Griffiths, University of Warwick) has worked with health workers and residents in slums in Bangladesh, Kenya, Nigeria and Pakistan to understand the challenges they face and the deepening of existing inequalities seen. warwick.ac.uk/newsandevents/pressreleases/covid-19_measures_deepening

Professor Porto de Albuquerque is leading a research project, originally aiming to protect poor urban neighbourhoods in Colombia and Brazil from landslides, which has adapted to instead strengthen communities' resilience to the COVID-19 pandemic. warwick.ac.uk/newsandevents/pressreleases/favela_communities_made

Dr Ray-Bennett from the University of Leicester is working at research locations in India, Bangladesh, and Uganda to guide authorities tackling COVID-19 on the impact of lockdown on vulnerable populations, and the challenges of social distancing in low-and middle-income countries. le.ac.uk/departments/business/people/academic/nibedita-s-ray-bennett

University of Birmingham coldchain experts (led by Professor Peters) are working on how to get a COVID-19 vaccine to rural African communities, where electricity supply and cooling infrastructure can be unreliable. birminghamhealthpartners.co.uk/coldchain-experts-explore-how-covid-19-vaccine-could-be-distributed-in-africa

Dr Eccleston-Turner, a specialist in Global Health Law from Keele University, is leading research to investigate the equitable distribution of any potential COVID-19 vaccine in the context of international law. keele.ac.uk/discover/news/2020/june/law-research/covid19-vaccine-accessible.php

Displaced people living in temporary settlements in Zimbabwe are to get help to protect themselves against COVID-19 in a new project led by education and sociology experts at the University of Nottingham. Low-cost sanitisers and face masks developed at Zimbabwe Ezekiel Guti University will be rolled out in these areas, along with a toolkit and training for households to make their own protective products. The project will also create a public health education programme to be disseminated through a variety of interactive communication channels. nottingham.ac.uk/news/zimbabwe-fight-covid-19

Researchers from the University of Nottingham have also been working closely with Indonesian authorities to support their management of COVID-19. The Nottingham-Indonesia Collaboration for Clinical Research and Training (NICCRAT) consortium, led by Professor Ilyas, has been tasked with offering insight into the situation and to help formulate the national research, innovation and capacity-building stream, thus becoming an integral part of Indonesia's COVID-19 management system. www.nottingham.ac.uk/news/nottingham-and-indonesia-unite-in-battling-covid-19

How do we stop the pandemic taking away a child's right to survive and thrive in African settings?

Dr Mutisya, Dr Kimani-Murage, Dr Wekulo and Dr Margaret Nampijja (the African Population and Health Research Centre, Nairobi, Kenya), and Professor Griffiths (Loughborough University, UK)

Globally, as many as 67% of children do not achieve their developmental potential due to high levels of child malnutrition, poor growth before and after birth, poor caregiving, poverty, and food insecurity. In Kenya, despite a decrease in the proportion of children stunted at the age of five years, the rates remain unacceptably high, with children born in urban poor households, rural, and nomadic communities hugely affected.

The current COVID-19 pandemic threatens to erode the gains made so far in improving the nutritional status and development of young children. Indeed, stakeholders working in the field of early childhood development agree that COVID-19 has created complexities that may have long-term effects on children. The situation has even been difficult for community health volunteers (CHVs), who are unable to reach out to their communities. There is an urgent need to ensure that CHVs are equipped with the personal protective equipment and information to reassure their communities that their services are safe to receive so that infants and children can be signposted into the correct support services.

The economic impact of the pandemic has hugely affected the poor and the marginalised. For instance, disrupted livelihoods for many urban poor populations, who rely on menial and casual employment, which has been impacted by social distancing and movement restrictions. Official movement restrictions due to the pandemic have also negatively affected the market for livestock, threatening food and nutrition security to the detriment of children. Evidence has shown that urban poor populations spend more than half of their income on food; thus lost incomes could only mean households and children going hungry.

While the government has extended safety nets to cushion poor populations from the effects of the pandemic, the efforts are said to be too little for many households that live on the margins.

Despite growing efforts from movements, such as the right-to-food in Kenya (which seeks to promote low-cost solutions for improved food and nutrition security such as innovative and regenerative urban agriculture), there is an urgent need to continue to understand and generate the evidence on:

- the status of early childhood development
- effects of interventions such as agroecological urban agriculture for food and nutrition security
- the role of urban daycare centres and caregiving to promote holistic development and promote positive early childhood experiences
- to ensure the most vulnerable populations continue to be served with basic health and social security systems, as well as support for caregiving, even in the face of the global pandemic.

This is key if all our children are to survive and thrive. Without these considerations, infants and young children, who are relatively less affected by COVID-19 symptoms than adults and the elderly, will become the biggest losers in life because of the indirect consequences of the pandemic.

E. Economic impact

It is irrefutable that COVID-19 has caused one of the most significant global economic impacts of recent times. Specialists from across the Midlands are working to provide critical insights and practical support both locally and internationally.

The pressure of COVID-19 on working class women

Working class women are carrying the extra burden (physical and emotional) generated by COVID-19. The Women's Budget Group (WBG) found that 2.5 million of the 3.2 million UK workers employed in the highest risk roles during the pandemic are women, many low-paid. The collaboration between the WBG, the University of Warwick and the University of Nottingham (led by Professors Warren and Lyonette) will look to discover how working-class women are responding to these pressures. nottingham.ac.uk/news/UK-study-will-evaluate-pressure-COVID-working-class-women

Enhancing the use of Resilience Direct by Local Resilience Forums

Dr Sage (Loughborough University) will explore and enhance how the Resilience Direct (RD) digital collaboration platform is used by multi-agency Local Resilience Forums (LRFs) to remotely plan and respond to the pandemic. The research aims to produce the first independent evidence base for LRF practitioners, national policymakers, and scholars, to understand how RD is being used to facilitate LRF collaboration and to then rapidly circulate best practices through RD to enhance the UK's planning and response. midlandsengine.org/loughborough-university-research-supports-resiliencedirect

Evaluating the effects of COVID-19 and policy responses on the economy

Professor Stewart (University of Warwick) will create a new real-time economic characterisation of consumer and firm behaviour from mass transaction data. Specifically, the work will evaluate impact on consumer finances (reduced incomes, non-payment of debts, patterns of saving and expenditure) and small business finances (turnover and business continuity).



Warwick's Professor Draca is working to identify the impact of COVID-19 and consequent lockdown measures on labour demand, using unique real-time data on UK online job postings, combined with text analysis and causal econometric research designs. <https://www.coronavirusandtheeconomy.com/ongoing-research/rescuing-sick-labour-market-using-online-vacancy-data-track-covid-19s-economic>

The University of Nottingham (led by Professor Mizen) is rapidly gathering critical data on the business response to COVID-19 for immediate policy and future research use, with the aim of measuring the effects of COVID-19 on businesses and the UK economy. <https://www.coronavirusandtheeconomy.com/ongoing-research/covid-19-measuring-effects-covid-19-businesses-and-uk-economy>

Loughborough University's Professor Milne has examined ways of minimising the economic impact of the pandemic (estimated to be equivalent to a 10% fall in global GDP). lboro.ac.uk/departments/sbe/executive-education/news/2020/retrospective-insurance-could-save-uk-businesses.html

Colleagues at Aston University are studying how to use technologies such as Artificial Intelligence, 3D Printing and blockchain to manage supply chains in a crisis. theconversation.com/coronavirus-how-ai-3d-printing-and-blockchain-can-help-overcome-supply-problems-in-a-crisis-133826

The potential for COVID-19 to significantly exacerbate regional economic inequalities raises the necessity to develop more cost-effective and targeted support measures to firms. The University of Warwick (led by Professor Fetzner) are producing a novel data product (jointly with the ONS) to bring together detailed information on the population of the UK's business premises, in order to identify social distancing policies that may be effective in both reducing economic impact while maintaining disease containment objectives. warwick.ac.uk/fac/soc/economics/staff/ftfetzner

University of Nottingham research (led by Professor Mizen) shows that 81% of UK businesses currently reporting COVID-19 as one of the top three sources of uncertainty for their business. By comparison, firms reporting that Brexit was an important source of uncertainty for their business fell from 44% in February to 36% in March. These findings are based on interviews with over 8,000 CEOs and CFOs who participate in the Decision Maker Panel, a collaboration with the Bank of England and Stanford University, to assess the impact of Brexit on businesses with ten or more employees. nottingham.ac.uk/news/covid-19-business-survey



The pandemic has also transformed household waste into a potential biohazard and poses new risks to workers who collect, sort and dispose of waste materials. A team of experts led by Dr Balayannis from the University of Nottingham is investigating how COVID-19 has affected the UK waste sector and its workforce. nottingham.ac.uk/news/new-study-assess-covid-impact-waste-sector-workforce

COVID-19: Optimal Lockdown

Using cutting edge epidemiological models, the University of Warwick is investigating how efficient lockdown has been and how reduced social distancing measures could eventually go back to normal. An optimal mitigation strategy will be designed, which will be adapted frequently in response to daily data.

Financial vulnerability and risk in UK charities and care homes during COVID-19

The University of Birmingham aims to provide an analysis of the variegated impacts and very severe financial constraints on charities, due to the immediate and longer-term economic effects of the COVID-19 crisis. Building on extensive prior research on the finances, distribution and exposure to risk of charities, this research will assess financial vulnerability across UK charities. birmingham.ac.uk/research/tsrc/research/assessing-financial-vulnerability-and-risk-in-the-uks-charities-during-and-beyond-the-covid-19-crisis.aspx

Professor Fotaki is investigating the impact of COVID-19 on the care home sector, including the consequence for the workforce and users while assessing its financial viability, as well as requirements for recovery and resilience. This new research, conducted by the team at the University of Warwick, will address the need for policy makers to understand and address the financial impact of COVID-19 on staff experiences and efforts to retain staff in care homes.

Professor Godsell from WMG at the University of Warwick has surveyed 249 manufacturers to investigate the impact of the COVID-19 pandemic on their supply chains. It was found that the lessons manufacturers have learnt in developing supply chain resilience practices in response to the COVID-19 pandemic are helping them to prepare for Brexit as well. warwick.ac.uk/newsandevents/pressreleases/manufacturers_leverage_supply



CASE STUDY 5: Working with industry at speed and scale to tackle COVID-19

The University of Warwick's efforts to understand, diagnose, and treat COVID-19 was initiated early in March 2020 and spans a large spectrum of activities, ranging from the production of reagents for testing, and the development of a new assay based on sugar chemistry for diagnosis, to a large clinical trial evaluating alternatives to ventilators when treating critically ill patients. Remarkably, these were achieved and/or enacted within just a few weeks of initiation of the work, many in collaboration with industry.

In one of the major projects, Professor Gibson (Departments of Chemistry and Medicine) and colleagues discovered that a sugar, N-acetyl neuraminic acid (NAN), has high affinity for the SARS-CoV-2 spike protein, which is used by the virus to enter host cells. The work was done in collaboration with Dr Straube, whose group provided expertise in the scaling up and production of the spike protein. Professor Gibson's team linked the NAN to nanoparticles and have used the interaction between NAN-particle and the purified spike protein as a rapid means (under 30 minutes) to detect SARS-CoV-2 with remarkable specificity. The reaction is so specific that it discriminates SARS-CoV-2 from the highly related SARS-CoV-1. This test can be easily administered at the point-of-care and does not require any special training for healthcare workers. The work is being pursued in collaboration with Icen Diagnostics, which is developing the test for clinical trials, and also has the potential to be developed to detect other viral diseases, including zoonotic diseases.

F. Societal impact

Partners in the Midlands has achieved success through close relationships with both local and global communities. This deep understanding and connection have allowed them to assess, and take measures to mitigate, the impact of COVID-19 on society.

Impact of COVID-19 on physical, mental health and wellbeing

The pandemic presents a real threat to Small and Medium-sized Enterprises' (SME's) workforce mental health and wellbeing. Professor Dey at Aston University (in partnership with the Universities of Birmingham, Keele and York) will develop a multi-disciplinary perspective on best strategies, interventions and policies informing SME's regarding how to support staff and enhance their productivity. midlandsinnovation.org.uk/News/midlands-innovation-universities-awarded-over-20m-of-covid-19-research-funding

Dr Moore (University of Leicester) is an internationally respected expert on technology and work. Her expertise in online work and digitalisation is providing an invaluable insight into home working during COVID-19, the impact of changing working expectations on employees and the psychosocial pressures people are experiencing as a result of online work expectations. le.ac.uk/research/coronavirus/dr-phoebe-moore

The University of Leicester (led by Professors Khunti and Davies) has also conducted a global social media survey on the impact the virus is having on care for individuals living with chronic diseases. Targeting healthcare professionals, the study found that diabetes, chronic obstructive pulmonary disease and hypertension were the most impacted conditions due to reduction in access to care. 80% reported the mental health of their patients worsened during COVID-19. ncbi.nlm.nih.gov/pmc/articles/PMC7308780

The ICON study, led by the Royal College of Nursing Research Society steering group in a consortium including the University of Warwick and the University of Nottingham, highlights the concerns nurses and midwives in the UK have about COVID-19 and the risks it poses to their physical and mental health, as well as the health of their families. nottingham.ac.uk/news/survey-of-uk-nurses-and-midwives



Professor Hastings (University of Warwick) is co-leading a study to examine the lives of people with learning disabilities in the UK throughout the pandemic. The collaboration is conducting an inclusive survey to ask about their wellbeing, health, living circumstances, the support they are getting, and the impact of COVID-19 on their lives.

Keele University (led by Professor Mamas), alongside Oxford University, found that hospital admissions due to heart attacks in England fell by 35% from mid-February to the end of March 2020 when compared with the same period in 2019. These findings suggest patients may have been suffering from heart attacks at home and not seeking potentially life-saving medical attention because of COVID-19 worries. keele.ac.uk/coronavirus/response/ourresearch/heart-attack-research/during-covid-pandemic.php

The University of Nottingham Wellbeing of the Workforce study (led by Dr Thomson and delivered in partnership with Nottingham Trent University) aims to understand how different experiences have affected people's wellbeing, their feelings about their work and their future employment, and whether certain sources of support or resilience help to protect people from some of the possible negative experiences. nottingham.ac.uk/news/wow-study

Professor Hollis from the University of Nottingham is leading research into how digital technology can be used to help support young people with mental health problems, including those emerging during the COVID-19 pandemic. nottingham.ac.uk/news/youth-mental-health-crisis

The University of Nottingham (led by Dr D'Angelo) is also working with a team of experts in national social networks investigating how the coronavirus lockdown has impacted people's relationships and routines. nottingham.ac.uk/news/nottingham-researchers-want-to-know-how-lockdown-is-affecting-your-relationships

A new study of how COVID-19 has affected people with hearing loss has found that, although there are many negative effects, there are also unexpected positive ones. The survey (carried out at the University of Nottingham's Hearing Sciences Scottish Section at the Glasgow Royal Infirmary) confirmed some suspected consequences (e.g. the challenges of conversing with people in face masks), but also raised positive aspects (i.e. heightened rumination about one's hearing loss and relief of not having to face the challenges of social gatherings). blogs.nottingham.ac.uk/newsroom/2020/08/07/study-reveals-how-people-with-hearing-loss-are-affected-by-covid-19-lockdown

Criminal behaviour

The University of Nottingham is studying the accrued risks and mitigating responses of COVID-19 for victims and survivors of slavery. Victims and survivors of modern slavery are at greater risk of ongoing exploitation and re-exploitation due to COVID-19. Traffickers will increase recruitment and seek to maintain revenue during economic crisis, while victim identification has become even more challenging as States shift protection resources towards combatting the pandemic. The complexity of the risk environment may impede anti-slavery mitigation unless risks can be assessed in an efficient way. nottingham.ac.uk/sociology/research/research-projects/index.aspx

Loughborough University (led by Dr Armstrong) is studying NGOs' perceptions of the intersections between modern slavery, labour exploitation and decent work in the gig economy during COVID-19. This project is working with NGOs and trade unions who advocate for gig economy workers to protect them from labour exploitation and modern slavery, to show how COVID-19 has exacerbated or created situations that give rise to exploitative practices.

Keele University (led by Professor Obokata) is sharing good practices in protection of workers and victims of modern slavery during the COVID-19 pandemic. The aim is to conduct evidence-based research on the key impacts of COVID-19 and identify/share good practices in order to facilitate a victim-centred approach. This will be formed into a report "Guiding Principles on Actions against Modern Slavery during the State of Emergency".

Keele's Professor Stott is leading research on tackling the huge societal challenges in how nations respond to situations like the COVID-19 pandemic and how people respond collectively to a perceived state of emergency, even when this turns out to be a false alarm. Keele is working with colleagues from the Universities of Sussex, St Andrews, Oxford, Edinburgh, Canterbury Christ Church, and Lund, as well as the Cabinet Office, Public Health England, West Yorkshire Police, Staffordshire Civil Contingency Unit, Staffordshire Fire and Rescue Service, and the College of Policing among others. keele.ac.uk/discover/news/2020/june/research-announcement/mass-emergencies-research.php

The University of Nottingham (led by Dr Brewster) is also assessing changes and continuities in criminal behaviour against children resulting from social distancing, showing whether criminal business models are likely to change due to a changing risk and/or profitability profile. This work details the impact of social distancing measures on offenders' ability to groom, methods for mobilising

'county lines' operations, and the prevention, detection and safeguarding abilities of police and other organisations.

The University of Birmingham (led by Professor Ferguson) is working to improve the capacity of social workers to keep children safe during the pandemic. The research explores the impact of COVID-19 on child protection, social workers and service users, with specific reference to the novel use of digital technologies in a period of institutionalised social distancing. birmingham.ac.uk/schools/social-policy/departments/social-work-social-care/research/child-protection-and-social-distancing.aspx

Managing dual responsibilities

For busy mother entrepreneurs, the challenge of navigating their business safely through the pandemic is compounded by a parallel challenge of coping with unexpected family responsibilities. Researchers at the University of Nottingham (led by Dr Spedale) are studying how they are managing these dual responsibilities, and are aiming to develop tailored support. nottingham.ac.uk/news/nottingham-researchers-entrepreneurs-mothers-lockdown-experiences

Children's Health Literacy

Dr Protheroe (Keele University) is involved in a study led by Professor Bray, Edge Hill University, on children's health literacy to determine the best way to communicate the pandemic to children.



Behavioural Response

Individual personality traits make people up to a third more likely to adopt guidelines aimed at preventing the spread of COVID-19, a new study has found. Researchers at the University of Warwick (led by Professor Lee) said the results suggested that governments could use different messages to target different personality groups to improve compliance with coronavirus rules. wbs.ac.uk/news/how-personality-impacts-on-compliance-with-covid-19-rules

Case Study 6: The impact of COVID-19 on Britain's roads

Criminology experts from Keele University helped Highways England, the National Police Chiefs' Council and UK police forces to understand the impact of the coronavirus lockdown on Britain's road network, and to mitigate the negative effects of a return to more normal traffic volumes as lockdown eased.

In the early weeks of lockdown, traffic levels dropped by around 70% while people worked at home and avoided all but 'essential' journeys. Dr Wells (an expert on roads policing and speed enforcement particularly) and Craig Arnold (an ESRC CASE student and serving police officer) were asked to work alongside data analytics company Tonic Analytics to explore data from Highways England and police reports, in order to understand the impact of the lockdown on traffic volumes and road users' behaviour.



Media reporting in March and April focused on some truly excessive speeding offences, but the data also showed an increase in speeds being chosen by the majority. This demonstrates the speed choices of 'normal' drivers when they are unobstructed by heavy traffic and less inclined to believe that police resources are being used for speed monitoring. Combined with cheaper fuel (something that was not a factor during the last major reduction in traffic volumes in the last recession) data suggests that quieter roads and faster speed choices led to an increase in more serious collisions.

In response, the Keele team acted as advisors in the design and implementation of a series of interventions by the police and Highways England, looking at the effects of variable message signs, mobile and static police patrols on drivers' speed choices. Dr Wells also advised National Roads Policing Operations, Intelligence and Investigation on the tone and approach of communications for the national speed enforcement campaign in summer 2020, and gave a webinar briefing to police forces involved in the initiative.

Research also focused on the period when lockdown restrictions were lifted, as many drove for the first time in weeks, or even months. The work highlighted both practical and behavioural issues associated with such an unprecedented pause. Whilst drivers would have noticed a flat battery, they may not think to check tyre pressures or fluid levels, their insurance, tax or MOT status, and they may not realise how out of practice they are. This fed into the Ready for the Road campaign and app launched by Driving for Better Business (the Government-backed Highways England programme).

G. Environmental impact

There have been many unexpected side effects that have resulted either directly or indirectly from COVID-19. Perhaps the most unexpected is a change in the global environmental conditions due to emergency public health measures.

Environmental impacts of COVID-19

UK emergency public health measures implemented to suppress COVID-19 transmission have had major implications for ambient air quality. Satellite data have indicated associated reductions in air pollutant concentrations with potential benefits for human health; however, ground-based measurements suggest more complex trends. The University of Birmingham (led by Dr Bartington) is performing a longitudinal study, focusing upon Oxford City, looking to better understand environmental consequences arising from these measures and to apply this learning to future air quality intervention scenarios. [birmingham.ac.uk/news/latest/2020/07/air-and-noise-quality-study-oxford.aspx](https://www.birmingham.ac.uk/news/latest/2020/07/air-and-noise-quality-study-oxford.aspx)

The University of Leicester is investigating links between air pollution and COVID-19 mortality rates. Areas of the world with high air pollution levels have had worse mortality rates than those with lower levels. Professor Hansell is investigating whether this is because air pollution increases the risk of diseases that make people more susceptible to COVID-19 or whether air pollution has an additional impact on COVID-19 infection. Dissemination of this work has included a number of interviews and presentations including the Work Bank 'Air Pollution Exposure and COVID-19' seminar and as a witness at the House of Commons Environment, Food and Rural Affairs Select Committee on Air Quality.

In addition, Professor Gulliver is using AURN monitoring station data to provide insights on the impact of transport changes on future air quality. This has been submitted to the AQEG call for evidence on 'Estimation of changes in air pollution emissions, concentrations and exposure during the COVID-19 outbreak in the UK'. [uk-air.defra.gov.uk/assets/documents/reports/cat09/2007010844_Estimation_of_Changes_in_Air_Pollution_During_COVID-19_outbreak_in_the_UK.pdf](https://www.uk-air.defra.gov.uk/assets/documents/reports/cat09/2007010844_Estimation_of_Changes_in_Air_Pollution_During_COVID-19_outbreak_in_the_UK.pdf)

Linking the environment and COVID-19: the need for further study

Professor Hansell - Director of the Centre for Environmental Health and Sustainability at the University of Leicester

It is likely there is an association between air pollution and COVID-19 severity, as there is with many other diseases affecting heart, lungs and other parts of the body. Long-term exposure to air pollution increases the risk of cardiovascular, respiratory and metabolic disease – and we know that these chronic diseases increase the risk of severe COVID-19. However, some researchers have suggested that air pollution may additionally interact with SARS-CoV-2 infection with various mechanisms proposed, e.g. the pro-inflammatory effects of air pollution, air pollution up-regulation of ACE-2 receptors and adverse effects of air pollution on the surfactant system. While a number of epidemiological studies are now available in both preprint or published to date, almost all are group-level (ecological) studies or correlations that do not fully account for confounding factors. Further, most of the studies relate to long-term (cumulative) exposures to air pollution so it is difficult to know whether action to reduce air pollution in the short-term will reduce severity of and mortality from COVID-19. The scientific consensus among air pollution researchers is that detailed individual level studies are now needed to provide high quality evidence sufficient to inform policy.

To help begin to address this uncertainty, and as a member of the Committee on the Medical Effects of Air Pollution (COMEAP) subgroup on COVID-19, I am working with the Office for National Statistics to conduct an individual-level study of epidemiological analysis of air pollution and COVID-19 mortality. I am also developing plans with the PHOSP-COVID programme to conduct follow-up studies of air pollution susceptibility in COVID-19 survivors.

H. Policy, practice and review

Since the beginning of the pandemic, experts from the Midlands have been delivering insight into the Government's think tanks and advisory boards, as well as through the wider scientific and clinical communities.

Advisory Boards and UK Testing Centres

Professor Van Tam, a Professor of Health Protection at the University of Nottingham, is currently on secondment to the Department of Health and Social Care in the role of Deputy Chief Medical Officer. He is helping to lead the Government's response to the coronavirus outbreak and has regularly represented the DHSC at the daily briefings with the media throughout the COVID-19 crisis.

Midlands' experts are also well represented across the Government's Advisory Boards:

- **Scientific Advisory Group for Emergencies (SAGE)** - providing scientific and technical advice to support government decision-makers during emergencies:
 - Professors Lord and Moss (University of Birmingham)
 - Professor Van Tam (University of Nottingham)
- **Scientific Pandemic Influenza Group on Behaviours (SPI-B)** - providing advice aimed at anticipating and helping people adhere to interventions that are recommended by medical or epidemiological experts.
 - Professor Stott (Keele University)
- **Scientific Pandemic Influenza Group on Modelling (SPI-M)** - advises DHSC and wider UK government on scientific matters relating to the UK's response to an influenza pandemic (or other emerging human infectious disease threats) based on infectious disease modelling and epidemiology.
 - Professor Keeling, Dr Dyson, Dr Hill and Dr Tildesley (University of Warwick)
 - Professor Van Tam (University of Nottingham)
- **COVID-19 Clinical Information Network (CO-CIN)** - helping to collate clinical information from healthcare records of people admitted to hospital in the UK to characterise the clinical features of patients with severe COVID-19 in the UK:
 - Dr Green (University of Birmingham)
 - Professors Van Tam and Lim (University of Nottingham)

- **Children's Task and Finish Working Group** - advises the government on the transmission of COVID-19 in children and within schools, ensuring research questions are fed into relevant studies and UKRI/funders for new funding.
 - Professor Keeling and Dr Tildesley (University of Warwick)

Colleagues from across the Midlands Innovation partnership have also contributed to an analysis by the **Parliamentary Office of Science and Technology's Knowledge Exchange Unit** on the implications of the pandemic over the next two to five years. It raised a number of concerns including security of home working, mental health, school closures, health inequalities, economic impacts and future preparedness.

Additional membership on independent UK advisory boards includes:

- Professor Hall, Director of the Nottingham Biomedical Research Centre, is a member of the **UK COVID-19 Therapeutics Advisory Panel (UK-CTAP)**.
- Professor Khunti, Professor of Primary Care Diabetes & Vascular Medicine at the University of Leicester, is a member of the **Independent SAGE committee**.
- Professor Stokoe, Professor of Social Interaction at Loughborough University, is a member of the **Independent SAGE Behavioural Advisory Group**.
- Professor Vlaev, Professor of Behavioural Science in Warwick Business School is also working with the **COVID-19 Behavioural Change Unit for NHS England**.

Professor Deeks (University of Birmingham) is a member of the World Health Organisation's Strategic Advisory Group of Experts on In Vitro Diagnostics (SAGE IVD) which provides technical advice on global policies and strategies, ranging from development, assessment, use of IVDs and their linkages with other health interventions. [who.int/medical_devices/diagnostics/SAGE_IVD_2018_members/en/index6.html](https://www.who.int/medical_devices/diagnostics/SAGE_IVD_2018_members/en/index6.html)

Professor A. McNally, Director of the University of Birmingham's Institute of Microbiology and Infection (one of the UK's highest performing infection and microbiology institutes), is helping to shape the national testing strategy. He is in constant dialogue with the Department of Health and Social Care and, having advised them on set up and testing criteria for national testing centres in Milton Keynes and Belfast, was Infectious Disease Lead at the Milton Keynes Lighthouse Lab.

birmingham.ac.uk/news/latest/2020/04/university-professor-part-of-team-leading-national-covid-19-testing-effort.aspx

Impact of Government Policy

Mobile phone applications (apps) have emerged as a key part of the response to COVID-19 around the world and are a feature of UK Government plans to manage 'phase two'. The University of Warwick is delivering an analysis of emerging ecologies of COVID-19 apps and their governance through app stores, and the data flows of prevalent apps within this domain. This will provide an assessment of the governance risks and challenges posed to the public by COVID-19 apps. warwick.ac.uk/fac/cross_fac/cim/research/covid-19-app-store-and-data-flow-ecologies/

Dr Lincoln (University of Leicester) is researching the urban governance response to the coronavirus in East Asia, specifically how municipal governments manage the impact of the pandemic on their populations and the public's response to these policies.

Dr Varuna and his team (Loughborough University, London) have been working on the analysis of real-time COVID-19 data. They have collected a vast dataset to probabilistically quantify the effects of different governmental policies on the variation of infected numbers, and are looking at how we can learn from the countries that are ahead of us in the curve, and their management of the virus.

This work is complemented by research from across Loughborough, aiming to understand:

- how people's attitudes and behaviours around COVID-19 are impacted by official Government actions and advice: [survey](#) (Dr Paine and Professor Griffiths).
- the impact of COVID-19 internationally on carers through qualitative interviews with unpaid carers. (Professor Aldridge, working with the University of Exeter).
- work-life balance during the COVID-19 outbreak (Dr Travers, alongside colleagues from the Universities of Leicester, Coventry and Birkbeck).
- the impact on eating habits, sleep, physical activity and wellbeing of adults and children in the UK (Dr Witcomb).
- the social implications of COVID-19 across Europe, including views and behaviours: [study](#) (Dr Michaelidou, working with the University of Vienna, IESEG Paris and Copenhagen Business School).

Professors Mallen and Dikomitis (Keele University) and researchers from the School of Primary and Social Care are leading a community focused study (Q-COVID-19) which uses a series of interviews to better understand the impact of this pandemic on specific professional groups, and under researched and/or marginalised groups. keele.ac.uk/discover/news/2020/may/social-professional-research/coronavirus-professional-research.php

Professor Wood (University of Leicester) and colleagues at University of East Anglia are also examining wellbeing and work-life balance during the closure of the university, where many are working at home. The study also aims to examine how technology facilitates working from home and the wellbeing of staff. le.ac.uk/news/2018/january/work-life-balance-supports-can-improve-employee-well-being-research-shows

Working with Child Poverty Action Group, researchers at the Universities of Birmingham and York launched the COVID Realities project to explore the experiences of parents and carers on low incomes. They found that the 'new normal' creates new costs for such families. It was recommended that policy makers increase child benefit and consider difficulties faced in order to avoid the pandemic heightening existing inequalities and creating new ones. birmingham.ac.uk/news/latest/2020/07/families-escape-lockdown-inequality.aspx

A new study at the University of Nottingham is also exploring the effect of social distancing on our lives during the COVID-19 pandemic. The study is being conducted by an international group of researchers led by Dr Tuncgenc (School of Psychology). nottingham.ac.uk/news/new-study-to-explore-the-effect-of-social-distancing

Dr Tildesley (University of Warwick) will use a mathematical model to enhance real-time model fitting, incorporating up-to-date information on cases and outcomes, and use this framework to determine multi-phase adaptive control policies, with a focus upon optimal timing of relaxation and tightening of social distancing measures. The results will be communicated directly to the scientific pandemic influenza modelling group that advises the UK Government. Dr Tildesley has also worked with Professor Keeling and colleagues to examine the impact of a short, two-week period of intense control. warwick.ac.uk/newsandevents/pressreleases/precautionary_breaks_planned



Keele University's Professor Stott has played a key role in contributing to the 'Coronavirus: The Science Explained' website. Launched by UKRI, it provides the most authoritative scientific information available on the constantly evolving COVID-19 outbreak. It allows public access to up-to-date scientific information on the evidence and facts about the virus and its control, compiled by leading scientists. keele.ac.uk/discover/news/2020/june/coronavirus-response/ukri-clifford-stott.php

Healthcare provision, PPE, clinical safety and medical device requirements

Community pharmacy has a key role in the current COVID-19 pandemic; this includes mass vaccination, medication supply and providing advice. Aston University (led by Dr Maidment) is performing a realist review of how community pharmacy can most effectively support the challenges presented by COVID-19. The aim is to understand how and when community pharmacy can best support the public health agenda in during pandemics. aston.ac.uk/latest-news/new-research-key-role-community-pharmacy-covid-19-pandemic

Dr Pecchia (University of Warwick) is helping the World Health Organisation as they set minimum requirements for essential medical devices used to diagnose and treat COVID-19 patients, as well as the PPE employed to protect NHS nurses and doctors. His lab is also supporting manufacturers in the UK and Italy, where four companies have already converted their productions to start manufacturing PPE (including masks, face shields) and medical devices (ventilators, monitors). warwick.ac.uk/newsandevents/pressreleases/ventilators_visors_volunteers

Coventry University, working with University Hospitals of Coventry and Warwickshire NHS Trust, has looked at the perceived levels of heat stress amongst healthcare workers in NHS settings whilst wearing PPE during the COVID-19 pandemic. medrxiv.org/content/10.1101/2020.09.22.20198820v1.full.pdf

Professor Bennett (University of Leicester) has led the development of a pragmatic guide (SPACES) to cut hospital staff exposure to infection while caring for patients. The approach reduced the need for multiple entries into rooms for standard procedures, observations and assessments.

Professor Clutton-Brock (Birmingham Health Partners) is working closely with the MHRA to help evolve the design specification for a Rapid Manufacture Ventilator and the regulatory framework to allow their rapid manufacture and usage.

Professor Khunti (University of Leicester), working with the Centre for Evidence-Based Medicine and the University of Oxford, has published numerous rapid reviews on PPE and diabetes phc.ox.ac.uk/files/covid-19-evidence-service/covid-cat-ppe-masks-7.pdf/view

Also ongoing at the University of Leicester:

- Dr Pareek has had a highlight published in the Lancet 'Ethnicity and COVID-19: an urgent public health research priority'.
- The Real World Evidence Unit has a number of systematic reviews and real-world studies planned. lrwe.org.uk/about
- Dr Haldar is using his clinical expertise to help shape policies and practices that have been successfully implemented in the care of his patients. le.ac.uk/research/coronavirus/dr-pranabashis-haldar
- Professor Armstrong is studying the organisation and delivery of healthcare in the UK to help to inform access to high-quality healthcare throughout the pandemic and beyond. le.ac.uk/research/coronavirus/professor-natalie-armstrong

Researchers from the University of Warwick's Clinical Trials Unit and Warwick Evidence also led a systematic review for the International Liaison Committee on Resuscitation, which has been widely viewed. ilcor.org/covid-19

Professor Williams (University of Nottingham's Centre of Evidence-Based Dermatology) responded to a CMO request for advice on shielding for dermatology patients taking immunosuppressants. With support from the British Association of Dermatologists and the Royal College of Physicians, this resulted in national guidance emerging within one week, along with specialist advice for skin patients. Additionally, he has been working with the Nottingham Eczema Support Group for carers of children with eczema to provide expert advice on the impact handwashing and glove wearing is having on the nation's skin. nottingham.ac.uk/news/covid19-skin-care

Dr Grindlay and Professor Williams have also set up a unique, international resource on COVID-19 and the skin that includes journal articles, guidelines, evidence summaries and guidance for patients and the public. nottingham.ac.uk/research/groups/cebdr/resources/coronavirus-resource/coronavirushome.aspx

The importance of regulatory innovation for and beyond COVID-19

Professor Calvert, Professor Denniston and Dr Marston, Birmingham Health Partners - Centre for Regulatory Science and Innovation

COVID-19 has highlighted both the complexities and opportunities in bringing new diagnostics, medicines, medical devices and vaccines to market at pace, showcasing flexibility and rapidity of collaborative responses by academia, industry, health services and, crucially, our regulatory agencies. Our ability to accelerate innovation not only in cutting-edge technologies such as the hoped-for vaccine through to novel AI systems for screening, triage and decision support, but also in low-cost, high-volume products such as PPE, will – to a large extent – determine the long-term toll of the virus, both economically and most importantly in human lives. All of this hinges on our regulatory environment.

Flexible, targeted innovation in regulation is a key priority in a host of recent UK research strategy recommendations, from the R&D Roadmap, Life Sciences Recovery Roadmap, Life Sciences Industrial Strategy and 'Regulation for the Fourth Industrial Revolution'. And yet the UK lacks a clear strategy around regulatory science in healthcare. Our departure from the EU adds a significant, specific national need for adaptation in our regulatory environment, carrying opportunity and risk that must be carefully managed.

Patient safety and trust are central issues. The major public concerns over the global vaccine "race" will no doubt add to existing anti-vaccination beliefs and misinformation. The recent Cumberlege Review is a harrowing but vital reminder of the importance of making patient safety central to regulation – but the UK's current Medicines and Medical Devices Bill focuses on the need for any new regulations to ensure the "attractiveness" of the UK for development of medicines and medical devices post-Transition, rather than prioritising patient safety.

To tackle this, the UK must take a coordinated approach to foster and prioritise advances in regulatory science and innovation and build a workforce to ensure its sustainability and continuing evolution. Making patients and the public central to these efforts – through co-design of research and regulation input – is vital to promote patient safety and trust in our healthcare system and drive uptake and use of innovative medicines and devices. This will require significant cross-sector collaboration, uniting industry, academia, NHS, funders, charities, regulators and citizens, with major investment to realise the profound healthcare, societal and economic benefits of targeted regulatory reforms, standards and flexibilities.

While this must be a national effort, the Midlands is already providing a beacon of leadership for UK regulatory science. The Midlands has around 1,000 medical technology companies operating in the region, the largest such cluster in the UK, delivering around £1.6 billion GVA annually – a sector set to be massively impacted by new regulation, with a "very real and concerning lack of readiness". Birmingham Health Partners hosts the Centre for Regulatory Science and Innovation and led the 'Advancing Regulatory Science and Innovation in Healthcare' report which provided a national call to action earlier this summer, supported by bodies ranging from the Government's new Regulatory Horizons Council, Association of British Pharmaceutical Industries (ABPI) and Association of British HealthTech Industries (ABHI) to patient advocates. Our academic and NHS leaders have just set the first international standards for reporting of clinical trials of AI, publishing their findings and the new guidelines simultaneously in Nature Medicine, The BMJ and The Lancet Digital Health. Experts in our Medical Devices Testing and Evaluation Centre (MD-TEC) have been advising both Cabinet Office and industry throughout the pandemic around issues such as the Government's Ventilator Challenge, and are now pivoting support to PPE production and preparing companies for future uncertainty. Midlands Engine have convened vital industry and policy discussions this summer on enabling our PPE supply chain – with recurrent emphasis on the importance of effective regulation, an issue they are actively championing at a national level.

Regulatory innovation is an urgent opportunity and necessity for the UK, underpinning global market competitiveness and citizen access to timely, safe and effective healthcare innovation – an agenda in which the Midlands continues to play a pivotal enabling role.

Case Study 7: The need for a joined up national approach

Many initiatives have appeared from different Government and research departments, including DHSC, BEIS, UKRI and NIHR. In the haste to respond quickly, there was a serious risk that some initiatives would overlap or compete for scarce clinical research capacity. The introduction of national collaborative oversight groups has been key to ensure that limited resources, such as the CRNs, are deployed in the most efficient ways, and that the various task forces are aware of what each is doing.

A prime example of this exists in the Midlands. Professor Williams (University of Nottingham and Director of the NIHR Health Technology Assessment Programme) has played a key role in several national oversight and funding groups, keeping each informed of what the other is doing on a weekly basis. He is part of the Urgent Public Health oversight group, prioritising which studies are supported by the Clinical Research Networks. Professor Williams was a member of the UKRI/NIHR rolling call for funding COVID-19 research and also helped to set up the NIHR Recovery and Learning call. He is also a key decision maker for the NIHR on the RAPID-19 group, a group dedicated to drastically speeding up the assessment, approval, procurement and delivery of effective treatments for COVID-19 - as was evidenced by the delivery of remdesivir and dexamethasone to NHS patients within 24 hours of results becoming available. Going forward, prophylaxis studies are likely to take place alongside vaccine studies. Professor Williams is also a member of the Prophylaxis oversight group, a role that has been key to ensure learning from RAPID-19 in drug selection and assessment is taken into account.



The Midlands collective research effort

Professor Kumar, Convener of Midlands Innovation Health and Dean of Medicine at the University of Warwick.

“Midlands Innovation Health brings together top talent and excellent research infrastructure available in the 7 research intensive Universities in the Midlands. Whether it is to do with developing novel tests or designing and executing clinical trials at speed, individually and collectively, MIH has shown agility and responsiveness to this major public health emergency, helped by significant reduction of bureaucracy. We can see from the snapshot of exemplar projects in this report, creative new approaches to solving this societal challenge using any method possible drawing from expertise across a wide range of disciplines. What is also positive is the way Universities, NHS and industry are collaborating not only across Midlands, but also across the UK and Internationally, with palpable improvement in the relationship between the institutions despite not being able to meet face to face. We will build on these positive developments from now on.”

Publications

The aforementioned academic strength of the Midlands is reflected, not only in its translation into clinical output and new technologies, but in the delivery of an impressive amount of publications. Since the beginning of the pandemic, the Midlands has produced over 1000 publications, which have been cited thousands of times. Our top publications show how the region has identified the impact of the pandemic on patient care, what risks COVID-19 poses to our patients, effective treatments for COVID-19, the impact of the virus on BAME communities, and many other areas of importance.

1058 Publications

7257 Cited

Valid 23rd December 2020



Top Publications:

- Armitage, R. and Nellums, L.B. (2020) 'COVID-19 and the consequences of isolating the elderly', *The Lancet Public Health*: 5(5), pp. e256. DOI:10.1016/S2468-2667(20)30061-X
- Bangash, M.N., Patel, J. and Parekh, D. (2020) 'COVID-19 and the liver: little cause for concern', *The Lancet Gastroenterology and Hepatology*: 5(6), pp. 529-530. DOI:1016/S2468-1253(20)30084-4
- Ferner, R.E., Aronson, J.K. (2020) 'Chloroquine and hydroxychloroquine in covid-19', *The BMJ*: 369:m1432. DOI:10.1136/bmj.m1432
- Jordan, R.E., Adab, P. and Cheng, K.K. (2020) 'Covid-19: Risk factors for severe disease and death', *The BMJ*: 368:m1198. DOI:10.1136/bmj.m1198
- Khunti, K., Singh, A.K., Pareek, M. and Hanif, W. (2020) 'Is ethnicity linked to incidence or outcomes of covid-19?', *The BMJ*: 369:m1548. DOI:10.1136/bmj.m1548
- Ludvigsson, J.F. (2020) 'Systematic review of COVID-19 in children shows milder cases and a better prognosis than adults', *Acta Paediatr*: 109(6), pp. 1088-1095. DOI:10.1111/apa.15270
- Pareek, M., Bangash, M.N., Pareek, N., Pan, D., Sze, S., Minhas, J.S., Hanif, W., Khunti, K. (2020) 'Ethnicity and COVID-19: an urgent public health research priority', *The Lancet*: 395(10234), pp. 1421-1422. DOI:10.1016/S0140-6736(20)30922-3
- Professor Ghosh in: Mao, R. et al. (2020) 'Implications of COVID-19 for patients with pre-existing digestive diseases', *The Lancet Gastroenterology and Hepatology*: 5(5), pp. 426-428. DOI:10.1016/S2468-1253(20)30076-5
- Dr Green and Professor Van-Tam in: Docherty, A.B. et al. (2020) 'Features of 20 133 UK patients in hospital with covid-19 using the ISARIC WHO Clinical Characterisation Protocol: Prospective observational cohort study', *The BMJ*: 369:m1985. DOI:10.1136/bmj.m1985
- Professor Khunti in: Bornstein S.R. et al. (2020) 'Practical recommendations for the management of diabetes in patients with COVID-19', *The Lancet Diabetes and Endocrinology*: 8(6), pp. 546-550. DOI:10.1016/S2213-8587(20)30152-2
- Professor Riley in: Wynants, L. et al. (2020) 'Prediction models for diagnosis and prognosis of covid-19: Systematic review and critical appraisal', *The BMJ*: 369:m1328. DOI:10.1136/bmj.m1328

Research makes a real difference to patients' lives

Heather Willis, a Research Nurse at Good Hope Hospital (part of UHB)

Heather Willis has been working on the frontline, delivering urgent public health research during the pandemic. Her experience has reinforced her views that research makes a real difference to patients' lives and is best delivered as part of a team.

"COVID-19 has created a workforce that has pulled together. Working in research, you are used to being that extra person a patient needs to see or that extra person the clinical team needs to accommodate. But what the arrival of COVID-19 did was to create a 'COVID-19 workforce'. Suddenly it didn't matter what team, what job role, what band you were. What mattered was that you were helping people to survive COVID-19. A great example of this is when we recruited our first patient into the RECOVERY-RS study.

On 13 April 2020 we were sent the protocol for the trial. Just 12 days later, we recruited our first patient. Pre COVID-19 this would have been impossible to do so quickly.

RECOVERY-RS is an interventional research study that is assessing three methods of ventilation support: oxygen therapy; high flow nasal oxygen; and Continuous Positive Airway Pressure. The primary outcome measurement is the effect of intubation and mortality rates.

We were due to open to recruitment on a Monday but two days before, a patient came in extremely unwell with COVID-19. One of our trial investigators, who is an acute medicine unit consultant, phoned me to ask if we could screen the patient to see if they were suitable to take part in RECOVERY-RS. After checking with our main Principal Investigator and checking the approvals were in place, we decided to screen the patient.

I will never forget entering the ward to see the patient that day, there was such an air of tension mixed with worry and hope. It felt as though everything was hinging on this study.

As a Research Nurse you normally go about your job almost under a cloak of invisibility, but on this Saturday it was not to be. I don't generally get nervous at work anymore and I would say working during this COVID-19 pandemic has boosted my confidence, but I was nervous that day.

We screened the patient, got consent from the patient to take part, checked their eligibility, re-checked eligibility and then it was time to randomise - this would determine which treatment option we would give.

I had to go to another room to do it. Although it is an automated randomised telephone system I have to admit I had my fingers and toes crossed.

Just over a month later, the patient went home. He was clapped along the corridor as he left; thanks to the hard work of the hospital team.

We are currently awaiting preliminary results from the RECOVERY-RS team to see if any of the interventions provide better outcomes for our patients.

The research delivered by NHS teams during COVID-19 shows that it doesn't matter whether the research question is related to a global pandemic, a new cancer treatment or wound dressing. Whatever the topic, research is important, research is a team effort, research answers clinical questions with scientific proof and most importantly research makes a difference."

For further information about the trial please contact the Clinical Research Network West Midlands at crnwestmidlands@nhr.ac.uk

Outstanding Clinical Research

Since the beginning of the COVID-19 pandemic, the Midlands has and continues to deliver world-leading, life-changing clinical research that is improving outcomes for patients. With proven excellence in delivery, the Midlands hosts world-class health research infrastructure in numerous disease areas. The Midlands has outstanding clinical trials investigators and infrastructure that deliver a transformational approach, as well as an exceptional clinical trials environment that combines rapid development and delivery with the ability to leverage expertise which is integrated within local infrastructure. Regional specialities include design of complex and adaptive trials, usability and testing, innovative engagement of patients and industry, and high-quality trial delivery.

The following lists COVID-19 clinical trials that the Midlands is currently recruiting to or has completed recruitment for. Note: This theme is rapidly changing as new studies are completed and commenced.

50,038 participants recruited to COVID-19 research trials – 15% of all recruitment

54,280 people have registered their interest in taking part in vaccine trials



The Midlands has recruited **24,383** out of 120,621 for the ISARIC trial – **20%** of all recruitment

The Midlands has recruited **4019** out of 21,167 for the RECOVERY trial – **19%** of all recruitment

The Midlands has recruited **3597** out of 13,663 for the NHS CHECK trial – **26%** of all recruitment

The Midlands has recruited **5560** out of 29,743 for the SIREN trial – **19%** of all recruitment

The Midlands has recruited **367** out of 1491 for the PHOSP trial – **25%** of all recruitment

The Midlands has recruited **219** out of 557 for the RECOVERY RS trial – **39%** of all recruitment

Data collected 23/12/2020. Total figures account only for NIHR portfolio trials.

A. Drug and treatment trials

Randomised Evaluation Of COVID-19 Therapy (RECOVERY)

UHL UHB NUH UHCW UHNM SFH LH UHDB
ULH KGH CRH NGH SWBH RW WH BWCH
NHB STH TDG WAH SW WV

In this clinical trial, patients with confirmed COVID-19 will be given one of six different medicines that have been used to treat other conditions, such as HIV, to see if they provide any benefits. This will help healthcare professionals decide if these treatments should be given in future. RECOVERY is an adaptive study, which means new therapies can be added to the trial as they become available. www.recoverytrial.net

SARS-CoV-2 Infection - Synairgen Trial (SNG001)

UHB UHL NUH

This was a randomised double-blind placebo-controlled trial to determine the safety and efficacy of inhaled SNG001 (IFN- β 1a for nebulisation) for the treatment of patients with confirmed SARS-CoV-2 infection. Patients who had confirmed COVID-19 and pneumonia were given either a nebulised version of interferon beta (a naturally-occurring protein that supports anti-viral responses in the body) or a placebo. Synairgen has announced positive results from this trial in hospitalised COVID-19 patients. It was found that patients who received SNG001 had a 79% lower risk of developing severe disease compared to placebo and that patients who received SNG001 were more than twice as likely to recover from COVID-19 as those on placebo. synairgen.com/covid-19

The Respiratory Support trial (RECOVERY-RS)

UoW UHB UHL NUH SFH UHDB LP PH ULH

This study compares standard care, intubation and invasive ventilation for critically ill patients, with other non-invasive treatment methods including masks driven by oxygen or high-flow oxygen through the nose. The comparative data produced will provide a better understanding of which methods are most effective in reducing the need for invasive ventilation and for improving patient outcomes. warwick.ac.uk/fac/sci/med/research/ctu/trials/recovery-rs

ImpaCt of bioLogic therAPy on saRs-cov-2 Infection and immunity (CLARITY)

STH RW TDG

The impact of immunosuppressive and immunomodulatory treatment on SARS-CoV-2 infection and disease severity is unknown but is a major concern for patients and clinicians. Inflammatory bowel disease (IBD) affects about 1% of the UK population and is usually treated with immunosuppressive drugs. This study aims to define the impact of immunosuppressive drug therapy and physical distancing strategies on SARS-CoV-2 seroprevalence within this patient group. Although this study will define risk in IBD patients, there are potentially important lessons to be learned for millions of patients across the UK with other immune-mediated diseases treated with similar therapies.

GlyCovid-19 Trials

KU

Led by Keele University, this global consortium is investigating the glycosaminoglycan-mediated mechanisms by which SARS-CoV-2 targets and invades host-cells, leading to the recent COVID-19 disease outbreak. The glycosaminoglycan heparin is a well-tolerated anticoagulant pharmaceutical that also has the ability to prevent viral infection in SARS-CoV-2, as shown for the first time by researchers at Keele and built on within this programme. glycovid.com

Randomised, Embedded, Multifactorial Adaptive Platform trial for Community-Acquired Pneumonia (REMAP-CAP)

UHB UHL NUH UHNM UHDB KGH WAH UHCW
WV SWBH STH TDG RW GE

A platform trial for severely ill patients with COVID-19. This randomised controlled trial is for patients admitted to the intensive care unit with severe Community-Acquired Pneumonia. This trial studies a number of different treatment categories under one platform, with an aim to determine the best package of treatment for patients. remapcap.org



SARS-CoV-2 Immunity and Reinfection Evaluation (SIREN)

UHL SWBH RJAH UHNM WV AUH RW WH TDG GE ROH UHCW

The impact of detectable anti-SARS-CoV-2 antibody on the incidence of COVID-19 in healthcare workers. This study aims to find out whether healthcare workers who have evidence of prior COVID-19, detected by antibody assays (positive antibody tests), are protected from future episodes of infection compared to those who do not have evidence of infection (negative antibody tests).

Superiority Trial Of Protease inhibition in COVID-19 (STOP COVID-19)

UHL

The overall objective of the study is to evaluate the clinical efficacy of Brensocatib (INST007), compared to placebo on top of standard care, as a novel therapy for the treatment of adult patients hospitalised with COVID-19. dundee.ac.uk/stories/drug-trial-aims-treat-severe-outcome-covid-19

IMU838 and Oseltamivir in treatment of Novel Coronavirus (IONIC)

UHCW UoW

This trial tests biopharmaceutical company Immunic's oral DHODH inhibitor (IMU-838) for the treatment of patients with COVID-19. This is the only trial worldwide exploring the effectiveness of IMU-838 in combination with Oseltamivir (Tamiflu) – one of the most widely used flu treatments in the UK - in patients with moderate-to-severe COVID-19 and is being sponsored by University Hospitals Coventry and Warwickshire NHS Trust and managed by their in-house Trial Management Unit. lifearc.org/funding/covid-19-funding-2/ionic-study

Repair of Acute Respiratory Disease Syndrome by Stromal Cell Administration (REALIST)

UHB

An open-label dose escalation Phase 1 trial followed by a randomised, double-blind, placebo-controlled Phase 2 trial. The aim of the study is to conduct a Phase 1 and a Phase 2 clinical trial of human umbilical cord CD362 enriched Mesenchymal Stem Cells (MSC), in patients with Acute Respiratory Disease Syndrome (ARDS). nctu.hscni.net/realist

CANCOVID

UHCW

A Phase 3 multicentre, randomised, double-blind, placebo-controlled study to assess the efficacy and safety of canakinumab on cytokine release syndrome in patients with COVID-19-induced pneumonia. The purpose of this study is to evaluate if canakinumab (investigational medicine) given to patients with COVID-19 pneumonia (lung infection) is effective and safe at three hospital sites in the UK.

Multi-Arm Therapeutic Study in Pre-ICU Patients Admitted with COVID-19 - repurposed drugs (TACTIC-R)

RW

TACTIC-R is recruiting patients at an early stage in the disease course, aiming for a time point where the patient is experiencing infective symptoms and starting to show pulmonary complications. The purpose is to prevent organ damage and reduce the need to transfer to ICU and ventilation.

COPCOV

TDG UHCW

Chloroquine/hydroxychloroquine prevention of coronavirus disease in the healthcare setting; a randomised, placebo-controlled prophylaxis study. A multi-centre, multi-country randomised, double-blind, placebo-controlled assessment of the prophylactic efficacy of chloroquine (Asia) or hydroxychloroquine (Europe) in preventing COVID-19 illness in at-risk healthcare workers and other frontline staff, or other high-risk groups.

Rehabilitation Exercise and psychological support After covid-19 Infection (REGAIN)

UHCW UoW UHB

Funded via the NIHR COVID-19: Recovery and Learning programme and sponsored by UHCW, this multi-centre randomised controlled trial aims to assess the clinical and cost-effectiveness of the REGAIN intervention compared to best-practice usual care (single session of advice) for people recovering from COVID-19. The REGAIN intervention is an intensive online supervised home-based group rehabilitation programme that supports long-term physical and mental health recovery. warwick.ac.uk/fac/sci/med/research/ctu/trials/regain



CASE STUDY 8: Leicester achieves UK's top recruiter to RECOVERY trial

Leicester has received national recognition (including from Number 10) for having achieved both the highest and the fastest recruitment rate to the RECOVERY study – recruiting more than twice the number of patients than the next highest-performing NHS trust. This success has been attributed to the Leicester COVID-19 research team, made up of researchers and clinicians from the University of Leicester and the University Hospitals of Leicester, which brought together those with the key skills and expertise to take on the challenge posed by COVID-19. Following this success, Leicester was asked to support the set-up of research in the NHS Nightingale Hospital London.

Professor Brunskill, Director of the NIHR Leicester Clinical Research Facility and one of the driving forces behind this impressive step change in recruitment, believes this is due to the innovative practices deployed by the UHL team.

“Our success is not because we are a large acute trust within a COVID-19 hotspot, it is due to the proportion of patients with COVID-19 entering research studies. 96% of patients admitted to hospital with suspected or confirmed COVID-19 since the beginning of March were recruited onto at least one study via our 24/7 triage system. Over 50% were enrolled onto interventional studies, compared to a national average of 13%.



Key to our success has been breaking down internal barriers to create an agile, well-informed and motivated team. This has manifested in numerous ways:

- Integrated NIHR infrastructure (principally through the Biomedical Research Centre) working in tandem with the NHS Research and Innovation departments, ensuring that clinical research is supported and communicated effectively.
- Workforce flexibility and rapid triage of potential participants. Staff are quickly mobilised to work in different roles and sites as needed and, crucially, recruiters are on duty in the evenings and at weekends enabling 24/7 recruitment.
- Embedding research as part of the care package for each patient. New patients with suspected COVID-19 meet a research practitioner who will seek to enrol them while causing minimal disruption to clinical care.
- Working closely with Leicester's Centre for BME Health to reach seldom heard groups. Achieved through specialist training, this help researchers understand any cultural barriers that may prevent certain communities from taking part.
- A democratic leadership model. Inclusive weekly meetings involving managers, principal investigators, pharmacy, allied health professionals and administrators.
- We lead by example and volunteer for research trials. Raising awareness of our involvement through social media and local media encourages participation.
- A dedicated member of the governance team monitors study consent and other governance processes to ensure compliance and assurance to the trust board.
- Midlands Health Alliance enables the sharing of best practice and support.

We have built a truly agile model that, if replicated across the UK, could significantly improve the chances of making meaningful breakthroughs on COVID-19 in faster time.”

CASE STUDY 9: An interconnected and collaborative clinical trials infrastructure is key to success

The healthcare community has never faced a more urgent need for new, innovative treatments than the unprecedented situation we currently face with COVID-19. In UHCW, the R&D Department responded to this call by becoming the first site to successfully open recruitment to the IONIC Trial, which is exploring the efficacy of the new investigational medical drug IMU-838 for COVID-19.

The successful set-up and delivery of this Phase IIb trial was possible due to the collective efforts of the multiple departments within R&D; including the NIHR Coventry and Warwickshire Clinical Research Facility (CRF), the Sponsorship Team, the Trial Management Unit (TMU) and Patient and Public Research Advisory Group (PPRAG).

The idea for the IONIC Trial was conceived by Professor Arasaradnam, Consultant Gastroenterologist at UHCW, with support from the drug manufacturer (Immunic). IMU-838 was already under investigation at UHCW in a different study to explore its efficacy in Crohn's disease. The initial in vitro & vivo results from China showed that this drug had beneficial effects in COVID-19 by suppressing the reproductive rate of the virus when used alongside antivirals. The proposal was subsequently developed by Professor Arasaradnam with support from the TMU and was approved by the Trust COVID Committee to be sponsored by UHCW.

The trial was developed with consideration of frontline hospital staff who were working within an overstretched healthcare system during these unprecedented times. To protect the on-site pharmacy service, the decision was made to engage an external pharmacy advisor by the TMU. This provided the support required to deliver a trial of this magnitude within record time while ensuring Good Clinical Practice. The collaborative efforts of different departments ensured that the study was ready for recruitment within 10 weeks from inception of the idea, during which we had managed to secure funding from LifeArc; one of the UK's leading medical research charities.

The trial has, at present, recruited seven participants of which two participants have completed the treatment without any Adverse Events and Serious Adverse Events.

B. Understanding the clinical impact of COVID-19

Broad Studies:

Post-hospitalisation COVID-19 (PHOSP-COVID)

UHL UHB NUH UoN UoB UoL

This Leicester-led national consortium has been awarded £8.4 million to understand and improve long-term health outcomes of hospitalised patients suffering from COVID-19. With 10,000 patients expected to participate, this will be the largest comprehensive study in the world to understand and improve the health of survivors after hospitalisation from COVID-19. PHOSP-COVID will also help to ensure future treatment can be tailored as much as possible to the person. phosp.org

International Severe Acute Respiratory and Emerging Infection Consortium (ISARIC)

UHB UHL NUH UHCW ULH BWCH UHNM BCH CRH KGH STH UHDB WAH RJAH NSCH TDG WV RW WH SWBH ROH NHB GE LP BCP SCH

Clinical Characterisation Protocol for Severe Emerging Infections in the UK. As part of this group, regional partners are collecting clinical data and samples from patients who have confirmed COVID-19. In doing so, we can better understand the disease and use this learning to inform treatment decisions and the wider public health response in our communities. isaric4c.net

Genetics of susceptibility and mortality in critical care (GenOMICC)

UHB UHL NUH UHCW UHNM UHDB ULH CRH TDG GE STH SWBH RW WAH WH WV

Our genes determine how susceptible we are to life-threatening infection. When a patient is already sick, different genetic factors determine how likely they are to survive. The GenOMICC study will identify the specific genes that cause some people to be susceptible to specific infections and consequences of severe injury. genomicc.org

The COVID-Well Study

NUH UoN

This is an evaluation of a workplace intervention to implement supported Wellbeing Centres in a healthcare workplace during and after the pandemic. nottingham.ac.uk/healthsciences/news/the-covid-well-study.aspx

Pandemic Respiratory Infection Emergency System Triage (PRIEST)

NUH UHNM STH RW

This study aims to use patient data from the early phases of a pandemic to test the accuracy of existing triage methods and develop new, potentially more accurate, methods. UOL/UHL chairs the Trial Steering Committee for this study. Previously the PAINTED study: Pandemic Influenza Triage in the Emergency Department. sheffield.ac.uk/scharr/research/centres/cure/priest

COVID-HEART

UHL UoL

Demographic, multi-morbidity and genetic impact on myocardial involvement and its recovery from COVID-19: a UK national study. This study will investigate how heart muscle damage and recovery is affected by age, sex, ethnicity and other medical conditions. This will improve the diagnosis of viral heart damage from a simple ECG, which may save patients having invasive heart tests, which can be uncomfortable, are expensive, carry a small risk of serious complications, and may put healthcare staff at increased risk of exposure to COVID-19.

Platform Randomised trial of interventions against COVID-19 in older people (PRINCIPLE)

The trial is recruiting participants through UK GP practices.

This study aims to identify whether selected treatments given to people at higher risk of becoming more ill when they are infected with COVID-19 can help reduce the need for hospitalisation and the length of stay required. This will help people recover more quickly and with fewer complications. principletrial.org

The effect of COVID-19 on people with Vasculitis: A Whole Populated Study in England

NUH UoN

This study looks at whether having vasculitis can affect a person's risk of severe COVID-19 infection (defined as hospital admission or death) during this pandemic. Amongst people with vasculitis, does current immunosuppressive treatment influence (increase or decrease) their risk of severe COVID-19 infection?

CAPACITY

UHL

While most patients with COVID-19 present with respiratory symptoms, some develop cardiovascular problems, even as the first sign of COVID-19. There is also some evidence that people with a history of cardiovascular disease might be at a higher risk of complications from COVID-19. This study will seek to shed light on how frequently cardiac complications arise in patients with COVID-19 and whether a pre-existing history of heart disease is associated with more complications. capacity-covid.eu

Nottingham Recovery from COVID-19 Research Platform (NoRCoRP)

NUH UoN

NoRCoRP brings together projects that are examining the impacts and lasting effects of COVID-19. It aims to translate findings from patients who are known to have contracted the virus into new approaches to treatment, in order to support their recovery. It also hopes to provide new insights for the NHS and social care, enabling services to be more responsive to the long-term impact of caring for patients, some of whom seem to be at risk of developing longer-term conditions as a consequence of COVID-19. nuh.nhs.uk/norcorp

Extended Cohort for E-Health, Environment and DNA (EXCEED)

UoL

This study looks at the causes of long-term health conditions by collecting information about genes and lifestyle. The aim is to understand why some people develop more severe COVID-19 than others, and the impact of the pandemic on long-term conditions. For example, minority ethnic and migrant communities have had higher rates of COVID-19 hospital admissions. This will help develop new ways to prevent or treat COVID-19 and long-term conditions during and after the pandemic. exceed.org.uk

Real-time Assessment of Community Transmission (REACT-2)

KU

The REACT-2 programme is a series of studies assessing a number of antibody tests to see how accurate they are and how easily people can use them at home. This work is helping scientists find the best home test and estimate how far the virus has spread. imperial.ac.uk/medicine/research-and-impact/groups/react-study

Facilitating Accelerated Clinical evaluation of novel diagnostic tests for COVID-19 (FALCON C-19)

NUH UHDB

The Life Sciences industry has responded to the pandemic by developing multiple new in vitro diagnostic tests (IVDs). To leverage the potential clinical benefit of those tests, we require efficient but robust clinical evaluation. Therefore, to optimise resource utilisation in this global pandemic, we are conducting a platform adaptive diagnostic study on a national level, utilising a national network of expertise in the evaluation of diagnostic technology.

An early phase platform trial in COVID-19 - CATALYST

UHB

A randomised, Phase 2, proof of principle, multi-arm, multi-stage trial designed to guide the selection of interventions for Phase 3 trials in hospitalised patients with COVID-19 infection. CATALYST is a clinical trial where participants will be randomly allocated to one of several possible new treatments for COVID-19. It will enrol patients admitted to hospital with COVID-19 associated pneumonia. The aim is to rapidly assess these new treatments in small numbers of patients, enabling the most promising therapies to be taken forward for evaluation in much larger trials. research.uhb.nhs.uk/major-covid-19-drugs-trial-begins-in-birmingham

Biomarker-guided Duration of Antibiotic treatment in hospitalised Patients with suspected Sepsis (ADAPT-SEPSIS)

UoW

Warwick researchers behind the NIHR-funded study ADAPT-Sepsis are to include seriously ill COVID-19 patients in their work to make antibiotic prescribing for patients with suspected sepsis more effective and targeted. Many patients with COVID-19 who have to be admitted to hospital develop a lung infection (pneumonia). Progression to sepsis often occurs in critically ill patients and is a common cause of COVID-19 related deaths. Outcomes of this study will help to provide guidance to hospital staff on antibiotic treatment decisions. warwick.ac.uk/fac/sci/med/research/ctu/trials/adaptsepsis



CASE STUDY 10: Post-HOSPitalisation COVID-19

PHOSP-COVID is a £8.4 million MRC/NIHR-funded Leicester-led national consortium aiming to understand and improve long-term health outcomes. Involving 10,000 adults who have been discharged after being hospitalised with COVID-19, the study tracks participants' health through one of three methods a) clinic and GP visits b) surveys, brain scans and blood, urine and sputum samples c) additional assessments.

Professor Brightling (University of Leicester) has brought together a multidisciplinary UK team from 26 universities, 44 NHS trusts and over 150 academics in less than 5 months. He, and co-leads Professor Wain and Associate Professor Evans, aim to shed light on: the effects of COVID-19 on the body; biological molecules or genetic differences that may explain why some individuals experience more long-term effects; who is at risk of such problems; and reveal early indicators. This is the biggest long term follow up study of its kind globally. Professor Brightling told CNN:

“What we really want to understand is after they've been discharged from hospital with COVID-19, what's the consequences. The great thing would be that there have been none, but it's highly likely that there would be a number of problems, which could range from chronic fatigue, muscle and headache, poor exercise tolerance, breathlessness, amongst many others. It's trying to understand the scale of that burden, what's the severity of it and what can we do about it”.

The key to implementing PHOSP-COVID so quickly is the step change in the response to the need for research and is due to a truly national effort. Some examples are:



1. **DHSC/NIHR: COVID-19 Urgent Public Health (UPH) research status** enabled PHOSP-COVID to be prioritised to gather the necessary evidence that will inform national policy and enable new pathways to be developed. During the set up phase and early recruitment, this UPH initiative from the NIHR CRN provided invaluable clinical intelligence for the selection, prioritisation, set-up and delivery of PHOSP-COVID including maximise recruitment and minimise over-commitment of resource.
2. **DHSC/NIHR-UKRI/MRC COVID-19 Rapid Response Rolling Call** acknowledged that rapid progress is needed in addressing this epidemic and that it will depend upon a coherent and integrated response from researchers, industry, the healthcare system and the public. By revising the grant submission process and rapidly responding to the study proposal, PHOSP-COVID was awarded in a short timeframe. Furthermore UKRI brought together their most experienced workforce to support the study both pre- and post-award.
3. **National Academic and Academic Institutions Support:** the effects of COVID-19 extend beyond the lungs and it was important to have the support from experts from various fields, not just Respiratory, to truly understand the disease and help patients. PHOSP-COVID is holistic due to the dedication and harmonised research approach by academics across the UK.
4. **Embedding a research platform into clinical care:** at the heart of PHOSP-COVID is the patient. It's extremely important that research is embedded into clinical care as much as possible to reduce the burden on the patient and research staff, many of whom are in the NHS trusts.
5. The dedication, compassion and “can do” attitude of the **NHS and University study teams** at each site to ensure PHOSP-COVID achieves its goals.

For more information visit www.phosp.org and follow @PHOSP_COVID on twitter.

Targeted Studies:

UK Research study into ethnicity and COVID-19 outcomes in Healthcare workers (UK-REACH)

UHL UoL NUH UoN

The £2.1 million, University of Leicester-led study will investigate why people from BAME (black, Asian and minority ethnic) backgrounds have a higher risk of developing severe COVID-19. Working with more than 30,000 clinical and non-clinical members of staff, the study will assess their risk of COVID-19, based on the analysis of two million healthcare records. le.ac.uk/news/2020/july/covid-bame-risk-study

COVID-19-BMT

NUH UHB UoB

A prospective non-interventional study to evaluate the role of immune and inflammatory response in recipients of allogeneic haematopoietic stem cell transplantation affected by severe COVID-19 infection. The study aims to document the clinical and biological characteristics, including immunological profiling, of allogeneic stem cell transplant recipients presenting with severe COVID-19 infection and its impact on survival. This work may provide the scientific basis for targeted therapy with biological agents in this patient group. impactpartnership.org.uk/the-trials/covid19-bmt

MRC East Midlands Breathomics Molecular Pathology Node (EMBER)

UoL LU UHL

The EMBER study recruits patients who have heart or lung conditions or who have been admitted to hospital with acute shortness of breath or a 'flare-up' of symptoms including pneumonia. It aims to identify breath biomarkers for respiratory disease and is being studied in COVID-19 patients. embernode.org

MRC Nottingham Molecular Pathology Node

NUH UoN

The NMPN analyses lung tissue from patient with chronic lung disease and has expanded its tissue collection to include samples from patients with COVID-19. A range of techniques have been used to assess how viral infection in the lung may promote severe COVID-19. nmpn.info

COVID-19 Vascular sERvice (COVER)

UHCW UHB

What is the impact of the COVID-19 pandemic on the provision, practice and outcomes of vascular surgery? This project is a three-tiered study designed to answer this question. We aim to capture global data on vascular practice(s) during the pandemic; how this evolves over time; and to understand the impact on outcomes in the short and medium term. vascular-research.net/projects/cover-study-covid-19-vascular-service-study

National age-stratified COVID-19 population seroprevalence

UHL

This survey is to understand the prevalence of COVID-19 in England among children under 18, over time and by geographic location. It does this by testing anonymised leftover blood or serum samples from routine investigations taking place in participating centres. This information will be used to help predict the impact of coronavirus on health and social care services, as well as accurately monitor exposure and severity of the disease in different age groups.

The impact of COVID-19 on patients with acute myeloid leukaemia undergoing chemotherapy: an epidemiological study (PACE)

NUH UHCW UHB

PACE examines the impact of infections, with a focus on COVID-19, on patients with acute myeloid leukaemia. cureleukaemia.co.uk/page/news/533/pace-study-open-across-uk

Multi-centre European study of Major Infectious Disease Syndromes: Acute Respiratory Infections in Adults (MERMAIDS-ARI)

UHNM

Pathogens causing acute respiratory infections (ARI) are among the most likely candidates to cause the next pandemic. We need to better understand why some people become much more ill than others when they have an ARI. In this study we are recruiting people attending primary and secondary care in order to capture people with mild to severe ARI. We will analyse samples to observe individual gene activity and compare samples from people with different risk factors for more severe diseases.

Recombinant InterLeukin-7 (CYT107) to improve clinical outcomes in lymphopenic patients with COVID-19 infection (ILIAD 7)

UHB SWBH

This study is to trial CYT107 on COVID-19 patients as part of a global effort to treat the disease. We believe IL-7 (CYT107) can prevent patients who are in the hospital for COVID-19 from progressing to having to be treated in the ICU.

Risk Reduction Framework for NHS staff at risk of COVID-19 infection

UoL

During the pandemic, there has been a focus on identifying those at greatest risk of infection or adverse outcomes, including healthcare workers from a black and minority ethnic background. An expert working group, led by Professor Khunti from the University of Leicester, has developed a Risk Reduction Framework for NHS Staff following robust discussion amongst a wide range of specialists in this field. The aim is to better protect the NHS workforce and maximise its ability to deal with current pressures. arc-em.nihr.ac.uk/clahracs-store/risk-reduction-framework-nhs-staff-risk-covid-19-infection

Linking UK Biobank cohorts to national COVID-19 data

UoL

A new UK-wide study will examine why people from BAME backgrounds have a higher risk of developing severe COVID-19, by drawing on datasets from the UK Biobank and using statistical modelling. The study will assess whether greater exposures to risk factors leads to an increased risk of COVID-19 specifically in BAME groups.

Diagnosis and Management of Febrile Illness using RNA Personalised Molecular Signature Diagnosis (DIAMONDS Search)

UHL

This study, taking place in the University Hospitals of Leicester NHS Trust's children's hospital, aims to find RNA signatures in blood from people with severe infectious and/or inflammatory conditions such as COVID-19. The intention is to match RNA signatures to specific diseases and develop accurate new diagnostic tests, allowing rapid identification of the cause of a common symptom such as fever. This could be used in the rare condition paediatric inflammatory multisystem syndrome, believed to be associated with COVID-19. diamonds2020.eu

Vitamin D levels in COVID-19 patients

UHL

We are collecting routine clinical data on vitamin D levels for patients with COVID-19, to see if there is a connection between reduced levels of vitamin D and patient outcomes.

Using medical-detection dogs to identify people with SARS-CoV-2

UHCW

This Phase I, proof-of-concept study, led by the London School of Hygiene & Tropical Medicine, with Medical Detection Dogs and Durham University, aims to assess the potential of training dogs to detect odour changes indicative of COVID-19 infection, and the possibility of using dogs to supplement ongoing COVID-19 testing. lshtm.ac.uk/research/centres-projects-groups/using-dogs-to-detect-covid-19

IMCA₁ – Impact of COVID-19 infection in patients with alpha-1 antitrypsin deficiency

UHCW

This University Hospitals of Coventry and Warwickshire NHS Trust-led study aims to establish the effect and outcome of infection with COVID-19 in patients with alpha-1 antitrypsin deficiency across Europe. The IMCA₁ study aims to collate information on clinician experience of COVID-19 infection in patients with AATD across the EU countries using a pre-existing consortium of AATD researchers (EARCO) that is supported by the European Respiratory Society.

PREPARE-IBD

NUH

This study looks at the impacts of COVID-19 for people living with Inflammatory Bowel Disease to improve the treatment and care for patients in the future.

PROTECT-ASUS

NUH

This study is looking at the treatment and care for patients with acute severe ulcerative colitis during the COVID-19 pandemic.

DISCOVER

NUH

Comparing disability in activities of daily living for adults with advanced lung cancer or respiratory disease during the COVID-19 pandemic.

C. Trials for women, children and babies

Pandemic Influenza in Pregnancy (UKOSS)

UHB NUH UHCW BWCH UHDB UHNM RW STH
NHB PRH SW TDG WAH

This is an NIHR-supported national study of women hospitalised with confirmed COVID-19 in pregnancy. The study will use the UK Obstetric Surveillance System (UKOSS) to collect information about all pregnant women admitted to hospital who are confirmed to have the virus. The information will be analysed on a continuous basis to inform ongoing guidance for women and maternity staff as we respond to the pandemic. npeu.ox.ac.uk/ukoss/current-surveillance/covid-19-in-pregnancy

Coronavirus infection in primary or secondary immunosuppressed children

UHCW NUH PRH RW BWCH WH

This study is designed to allow families of immunosuppressed children and young people to self-record their experiences of COVID-19 and other viral respiratory illnesses during the COVID-19 pandemic.

PANCOVID (Pregnancy and Neonatal outcomes in COVID-19)

NUH UHCW UoL

This is an international study collecting information about women with suspected or confirmed SARS-CoV-2 infection in pregnancy and their neonates. The aim of the study is to better understand the impact of COVID-19 on mothers and their babies. This information will be used to guide future methods of treatment and prevention. pan-covid.org

Neonatal complications of COVID-19

NUH UHCW PRH BWCH WH WAH SWBH WV
GE TDG

Surveillance of the neonatal complications of coronavirus disease (COVID-19) commenced in March 2020. The study aims to find out: how many babies develop coronavirus infection in the first month after birth; how many babies born to women with coronavirus need neonatal care; describe which babies develop COVID-19 infection and what symptoms or signs they have; and describe how COVID-19 in babies is identified and treated. rcpch.ac.uk/work-we-do/bpsu/study-neonatal-complications-coronavirus-disease-covid-19

What's the STORY (Serum Testing of Representative Youngsters)

Sero-epidemiological survey of England

NUH UoN

This research, in collaboration with Public Health England, will use an existing study of infectious disease immunity in children and teenagers (0 to 19 years old) to study the presence of antibodies against COVID-19 (a marker of having had the disease and now having immunity) in approximately 400 children and teenagers per month for the duration of the COVID-19 outbreak, and they will collect information on recent respiratory illnesses and relevant medical history.

COVID-19 in Pregnancy (PregCOV-19 LSR)

UoB

Tracking the global effects of COVID-19 on pregnancy and childbirth. The aim is to undertake living systematic reviews (LSR) involving pregnant and postnatal women at risk of, suspected, or diagnosed to have COVID-19, and synthesise the relevant evidence on prevalence, risk factors, mother-to-child transmission, diagnosis, and treatment of the disease. birmingham.ac.uk/research/who-collaborating-centre/pregcov/index.aspx

Understanding COVID 19 infection in pregnant women and babies (periCOVID)

UHB

This study aims to understand if pregnant women who test positive for the novel coronavirus can transmit the infection to their unborn babies. pericovid.com

Maternal transmission of COVID-19 to baby during pregnancy

UoN

This study was to estimate the risk of the neonate becoming infected with SARS-CoV-2 by mode of delivery, type of infant feeding and mother-infant interaction. nottingham.ac.uk/news/maternal-transmission-of-covid-19



D. Experiences of COVID-19

Covid-19 Stress and Health Study

UoN

This study is being carried out by experts at the University of Nottingham and King's College London, with the support of the stress hormone testing company MyFertile. It will explore the emotional and physical impact of COVID-19 on the health of our nation by taking repeated assessments of emotional wellbeing in a sample of the population, using questionnaires and by collecting samples of hair, which contains stress hormones. [nottingham.ac.uk/news/new-stress-hormone-study](https://www.nottingham.ac.uk/news/new-stress-hormone-study)

Psychological impact of COVID-19

NUH

This international study is aiming to better understand how COVID-19 and restrictions necessary to prevent its spread are impacting on our day-to-day lifestyle.

NHS CHECK

UHL

This study will explore the health and experiences of staff working at NHS trusts and Nightingale hospitals. The aim of this study is to establish a cohort of NHS-affiliated staff to investigate the short, medium, and longer term psychosocial impact of the COVID-19 pandemic on staff performance and wellbeing. NHS staff will be invited to participate, to complete an online survey module and an intervention evaluation module. nhscheck.org

COV-PALL

NUH

This study looks at improving palliative care for people affected by the COVID-19 pandemic by sharing learning nationally and internationally. A rapid evaluation of the COVID-19 pandemic response in palliative and end-of-life care.

COVID-19 Care Home Sectors Study

The trial is recruiting participants through UK care homes.

We are aware that care home staff are finding it very challenging to respond to the pandemic in many ways, including following evidenced-based guidelines and managing their fears in their day-to-day work. This trial will work with a wide range of providers from across the region to understand the different ways in which they have sought up-to-date information, the usefulness of that information and the ways in which they have used it to share their knowledge and expertise with others across the sectors. arc-em.nihr.ac.uk/research/covid-19-care-home-sectors-study

COVID-NURSE

NUH

Evaluating the impact of a combination of nursing innovations on patient experience. Nottingham University Hospitals NHS Trust is part of a consortium of universities and NHS trusts working together to build the evidence that will help nursing teams nationally and internationally to adopt best practice for care during a pandemic.

Patient Connect

UHCW

This is a survey of patients and staff to determine how the 'Patient Connect' project at University Hospitals of Coventry and Warwickshire NHS Trust, where iPads funded by UHCW Charity distributed to the wards, was accepted during the COVID-19 pandemic.



E. Personal protection equipment (PPE) and the clinical setting

New approach (masks) to testing for coronavirus

UoL

A new approach to testing for COVID-19 is to be trialled using low-cost facemasks, which are adapted using 3D printed strips that can trap exhaled microbes whilst the mask is worn for 30 minutes. This study will first target patients with other respiratory virus infections and compare mask with throat swab results, then if successful, move on to trials with COVID-19 infections. The approach could greatly simplify large-scale screening for the virus and curb the spread of the disease.

F. Vaccine trials

Investigating a Vaccine Against COVID-19 (COV002) – The Oxford Vaccine Trial

UoN NUH UHB

A Phase 2/3 study to determine efficacy, safety and immunogenicity of the candidate coronavirus disease (COVID-19) vaccine ChAdOx1 nCoV-19. There are no currently licensed vaccines or specific treatments for COVID-19. This study will enable us to assess how well people of all ages can be protected from COVID-19 with this new vaccine called ChAdOx1 nCoV-19. It will also give us valuable information on the safety aspects of the vaccine and its ability to generate good immune responses against the virus. [covid19vaccinetrial.co.uk](https://www.covid19vaccinetrial.co.uk)

A Trial to Evaluate SARS-COV-2 Recombinant Nanoparticle Vaccine

KU MPF and multiple GP practices

A Phase 3, randomised, observer-blinded, placebo-controlled trial to evaluate the efficacy and safety of a SARS-COV-2 recombinant spike protein nanoparticle vaccine (SARS-COV-2 rS) with Matrix M1 adjuvant (developed by US biotechnology company Novavax) in adult participants 18-84 years of age in the UK. The aim of this study is to demonstrate the efficacy of SARS-COV-2 rS with Matrix M1 adjuvant in the prevention of virologically confirmed symptomatic coronavirus disease 2019 when given as a two-dose vaccination regimen, as compared to placebo in serologically negative adults.

The Clinical Educators in Emergency Departments (CEED)

AU

CEED involves more than 50 emergency departments and +120 emergency medicine consultants across England. The evaluation of the study is led by the Academic Practice Unit at Aston University. The study will identify the potential benefits of providing clinical educator-led training for emergency department staff of all professions, particularly at a time when services, processes, equipment, staffing and patient presentations are all rapidly changing and under significant pressure.

A Randomized, Double-blind, Controlled Phase 3 Study to Assess the Efficacy and Safety of Ad26.COVID.S for the Prevention of SARS-CoV-2-mediated COVID-19 in Adults Aged 18 Years and Older

UHL

The aim of this Phase 3 COVID-19 vaccine study is to evaluate the efficacy, safety, and immunogenicity of Ad26.COVID.S in participants with higher risk for COVID-19 (based on age, gender, race/ethnicity, profession, comorbidity) living in, or going to, locations with high SARS-CoV-2 activity, after administration of two doses of study vaccine.



The Midlands collective clinical effort

Professor Hall, Director of the NIHR Nottingham Biomedical Research Centre and Co-Chair of the Midlands Health Alliance.

“It has been really pleasing to see how the Midlands Health Alliance community have come together regionally to support research and service delivery during the COVID-19 pandemic: this report contains numerous examples of joint working across different parts of the Midlands infrastructure. Nationally, the major part played by Midlands’ centres, particularly in recruitment to clinical trials, has been important. Without recruitment to these trials we would not have identified the drugs which we now know can be used in the treatment of hospitalised patients with COVID-19. The Midlands is also playing a significant role in the vaccine studies which have commenced. There have also been major contributions from individuals based in the Midlands to national planning for COVID-19, including important contributions to Department of Health and Social Care (DHSC), National Institute for Health Research (NIHR), UK COVID-19 Therapeutics Advisory Panel (UK-CTAP) and Scientific Advisory Group for Emergencies (SAGE) working. It is really encouraging to see the close working across the region and beyond which has happened, and I am delighted that MHA has been able to play a role in supporting this”.

Delivering Participant Satisfaction

Experiences of being involved in Midlands' clinical research

'Anything to help our magnificent NHS.'

'I feel honoured to be able to help in some way'

'I have always been keen to put something back into the NHS having taken such a lot out over the years'

'It was the only contact apart from my partner and it gave me purpose.'

'It made me feel good and contributed to my positive mental health.'

'I like being able to support clinical care and learning from the experiences of others.'

'The pandemic was no reason to stop in a digital age'

'I felt that sensible decisions were made regarding the problems posed by COVID-19, NHS resources were being used properly and it was good to be aware of the changes.'

'It was a positive experience. It is encouraging that new research, including non-Covid studies are still going ahead. I also needed to be active in some way.'

'All the online meetings I have attended for Public Patient Involvement and Engagement have been just as good a real meeting'



Mobilising Critical Infrastructure

All Midlands partners have dedicated expertise, facilities and resources to support national NHS services during the pandemic and defend the community against the virus. By applying the region's Powerhouse of Life Science capability, through our existing partnerships, we have been able to mobilise the local response rapidly and effectively. From boosting laboratory testing capacity, coordinating clinical trials of new interventions and providing practical support to NHS workers, to the delivery of community-based support, our community has come together to mitigate the effects of the pandemic.

The region's response has been driven by the expertise of our academics and clinicians. This is facilitated by our extensive NIHR infrastructure partnership working between HEIs and NHS Trusts, and regional access via WM-AHSN and EM-AHSN.

Your COVID Recovery

'Your COVID Recovery' is a rehabilitation service for patients with chronic lung disease and cardiovascular disease, including face-to-face and home-based interventions. It is specifically designed to support people in their post-COVID recovery. University Hospitals of Leicester NHS Trust will be one of the first sites in the world rolled out nationally, seeking to address potential post-COVID symptoms and support people on the road to recovery. [england.nhs.uk/2020/07/nhs-to-launch-ground-breaking-online-covid-19-rehab-service](https://www.england.nhs.uk/2020/07/nhs-to-launch-ground-breaking-online-covid-19-rehab-service)

Patient Recruitment Centre

NHS patients will benefit from easier access to clinical research opportunities following a £7 million Government investment to launch five new regional Patient Recruitment Centres across England. These new centres are purpose-designed to increase the UK's capacity to deliver late-phase commercial clinical research, improving the speed and consistency with which commercial research is delivered. Thanks to its nationally recognised track-record recruiting patients to trials, University Hospitals of Leicester NHS Trust has been awarded one of these centres as an ideal test bed for future innovation. [nihr.ac.uk/news/new-patient-recruitment-centres-to-improve-patient-access-to-commercial-clinical-research-across-england/24906](https://www.nihr.ac.uk/news/new-patient-recruitment-centres-to-improve-patient-access-to-commercial-clinical-research-across-england/24906)

Redeployment of research facilities and staff

Regional partners are repurposing existing R&D excellence and facilities to support the UK testing efforts. Midlands academics have also been working closely with Government experts to identify "resources, equipment and skilled personnel" to support the implementation of COVID-19 testing centres across the UK. They include Professor Mark Lewis, Dean of the School of Sport, Exercise and Health Sciences, at Loughborough University and Professor Lawrence Young, Pro-Dean at Warwick Medical School.

Experts including Professors Beggs and Richter at Birmingham Health Partners are working closely with Public Health England and DHSC to increase capacity for COVID-19 testing in the region and helping to run one of the national testing hubs. This includes category 3 laboratories at the University of Birmingham, that have been transformed to enable their team to deliver up to 10,000 same-day tests of frontline NHS staff per day, supporting local NHS organisations, including University Hospitals Birmingham, Birmingham Women's & Children's Hospital and West Midlands Ambulance Service, to upscale their testing capacity.

Regional clinical academic and research nurse time within NIHR, university and NHS facilities has been redeployed to provide vital assistance on the NHS frontline and support services. Researcher time within the NIHR ARC West Midlands Theme 2 – Acute Care Interfaces has also been redeployed to provide embedded research on Hospital at Home COVID-19 care.

Medical Schools within MI partnership, which includes the Universities of Birmingham, Keele, Leicester and Warwick, have enabled final year medics and student nurses to join NHS frontline services. In addition, the Universities of Nottingham, Birmingham, Leicester and Warwick are freeing their Medical School staff from academic duties to focus upon clinical care within the NHS frontline.

Redesign of services

All regional partners have mobilised and extended their existing digital technologies and innovative remote working solutions, including telemedicine and self-management, to keep their existing patients off-site and ensure they have as much capacity on-site to care for COVID-19 patients.

Leicester Diabetes Centre is continuing to support people living with diabetes, adapting to change and creating innovative ways to engage with patient, utilising virtual clinics, online content, email support and a helpline manned by doctors and specialist nurses. For example, Professors Davies and Khunti have done a number of videos providing COVID-19 advice for people living with diabetes and for healthcare professionals.

The West Midlands NIHR ARC is studying the rapid roll out of virtual outpatient consulting at University Hospitals Birmingham NHS Foundation Trust, enabled by Birmingham Health Partners and building on the MRC guidelines.

Through the WM AHSN, Birmingham's Maternity theme (led by Professor Kenyon) has delivered compressed virtual training on the Birmingham symptom-specific obstetric triage system (BSOTS) to new sites in England, allowing rapid implementation. BSOTS allows for more efficient use of a midwife's time, which is critical due to COVID-19 creating gaps in the workforce through both sickness and redeployment of staff.

The regional Eyes and Vision theme have worked with their patient groups to provide weekly teleconferences and webinars which give guidance around self-care, mental wellbeing, and ongoing research during the COVID-19 pandemic. For example, Professor Wolffsohn (Aston University) ran a webinar for 1,500 practitioners on how to look after patients during COVID-19. academy.coopervision.co.uk/uk/login

Keele University is working with its physiotherapy partners to make available its resources for managing musculoskeletal conditions remotely during the COVID-19 pandemic, including developing 'Top Ten Tips' for patients to self-manage their Musculoskeletal conditions.

The University of Birmingham are providing an explanation of how to access their redesigned services, including remote phlebotomy, telemedical scanning and assessment in local optometrist sites.

Continuation of delivery to support the NHS and patients

Despite closure of campus, Loughborough University's National Centre for Sport and Exercise Medicine (NCSEM) has been supporting the continuation of important NHS activities by keeping their clinics open.

Universities are taking a flexible approach to their estates management to support the NHS and its staff, including free use of laboratory space, hotel rooms, halls of residence, nursery places and onsite parking. For example, Conference Aston is providing 50 free rooms for key workers with family members that are in 'at-risk groups' or self-isolating for COVID-19 related reasons. This is a joint effort between Birmingham Women's and Children's Hospital, Conference Aston and Aston University.

A number of the region's leading researchers and clinicians have joined the DHSC/NIHR 'College of Experts' and other COVID-19 'Expert Peer Review' groups to provide rapid peer assessment.

Midlands Medical schools joined the national effort to work with the General Medical Council in order to bring forward qualification for final year medical students allowing them to work as fully-fledged doctors by the end of April. In addition, student nurses and physiotherapists are supporting the NHS, with many third-year student nurses taking further responsibility through the Nursing and Midwifery Council's provisional register.

Remote access to equipment

The Leicester Institute of Structural and Chemical Biology houses the Regional CryoEM facility, a revolutionary method to visualise what is happening inside cells with atomic-level detail. This facility is being operated remotely by Dr Savva, who is working with a number of academic groups and industry partners from around the world to investigate how SARS-CoV-2 infects and replicates inside cells utilising remote access technology.

Volunteering and donations

Partners across the Midlands are utilising agile approaches to support the Government, NHS, frontline services and communities at this time of crisis. All regional partners have created and donated a vast amount of vital PPE to NHS hospitals and local GP offices. Keele University, for example has donated 93,750 pairs of gloves, 3,200 disposable aprons, 1,200 facemasks (including FFP2 and FFP3), 280 surgical gowns, 200 masks with visors, 150 pairs of protective glasses and 120 sets of disposable scrubs.

The Universities of Nottingham and Leicester have provided PCR testing equipment to the NHS to help them to be able to test more patients who have suspected COVID-19.

Warwick Medical School owns and operates a set of “Clinical Sciences Research Laboratories”, which have now been made available to University Hospitals of Coventry and Warwickshire NHS Trust to help support the hospital’s COVID-19 clinical laboratory work.

Several Midlands universities, including Aston, Birmingham, Keele and Loughborough, have utilised their supplies, facilities and expertise to produce large volumes of hand sanitiser. Based on World Health Organisation protocol, the sanitiser has been delivered to local hospitals, social care workers and essential personnel.

Many regional partners, including the Universities of Birmingham, Loughborough and Warwick, are also utilising their plastic/metal 3D printing and design services to produce visors, masks, ventilators and medical device parts for use in NHS hospitals.

Two online University of Birmingham student groups have been set up to leverage support for the NHS, as part of nationwide initiatives: ‘Birmingham Med Students For Action’ are volunteering their time to join the frontline and ‘Birmingham Medical Students Helping Hands’ are offering support to NHS workers by providing childcare and running errands.

One of the University of Birmingham’s nurseries is supporting key workers, caring for up to 30 children daily. Without this nursery provision, there would be up to 60 key workers unable to carry out critical frontline work.



Testing on university campus

The University of Leicester is leading the way to create a safer campus, having launched a programme to screen staff and students for COVID-19 regularly as part of a drive to keep their staff, students and community safe. This screening programme is different to the NHS-run testing programme as it will screen staff and students who do not have any COVID-19 symptoms. le.ac.uk/news/2020/august/covid-screening

The University of Birmingham, enabled by Birmingham Health Partners, has been announced as one of the first academic sector lab partnerships to come online. The lab, based at the University of Birmingham’s Medical School, will form part of NHS Test and Trace, joining Britain’s largest network of diagnostic testing facilities increasing COVID-19 testing capacity. Birmingham has also opened the first Pillar 2 Turnkey laboratory in the country at the Medical School, which will provide testing for the local population including the campus, and, through Birmingham Health Partners, are also opening a Pathfinder lab in collaboration with the UHB at Heartlands Hospital. birmingham.ac.uk/news/latest/2020/10/government-covid-19-testing-lab-to-open-at-the-university-of-birmingham.aspx

The University of Nottingham testing service has been established to help control outbreaks caused by asymptomatic transmission among staff and students. They are also working with Nottingham Trent University to extend the service to their staff and students. nottingham.ac.uk/coronavirus/asymptomatic-testing-service/asymptomatic-testing-service.aspx

The Universities of Birmingham, Nottingham and Keele are hosting on-campus walk-in community testing sites, while Aston University has agreed to the use of one of its car parks as a COVID-19 drive-through testing centre via pre-booked test appointments for local residents. The University of Warwick are also supporting testing at the new Mega Lab at Leamington Spa.

Supplying reagents

Warwick Medical School researchers are making more reagents required for COVID-19 testing, using supplies from a campus laboratory. They will supply these reagents to University Hospitals Coventry and Warwickshire and regional partners for the testing of patients. warwick.ac.uk/newsandevents/pressreleases/diy_solution_to

CASE STUDY 11: Donating essentials to tackle COVID-19

The University of Nottingham is working with the NHS, Government and local communities to supporting the local and national efforts to fight against COVID-19 by:

1. **Supplying machines to support the national testing effort:** The University of Nottingham and Nottingham Trent University have supplied the UK Government with 16 PCR machines (worth £1 million) that can perform an estimated 20,000 tests a day. [nottingham.ac.uk/news/test-kits-for-c-19](https://www.nottingham.ac.uk/news/test-kits-for-c-19)

The university also provided the Government with essential category 2 cell culture safety cabinets will provide a highly controlled environment to protect skilled scientists. [nottingham.ac.uk/news/enabling-safe-covid-19-testing](https://www.nottingham.ac.uk/news/enabling-safe-covid-19-testing)

Further supply of equipment was also provided to local clinical labs, including the Maxwell RSC 48 Instrument (enabling the Queen's Medical Centre to triple daily testing by processing up to 48 swab samples simultaneously), dry block heaters (for safe sample processing and reagent heating), 96-well plastic plates and adhesive sealing films for PCR machines, spare machine lamps, nitrile gloves and tissues.

2. **Repurposing the university estate:** Unused space within university departments has been given over to NHS colleagues for use as rest areas. The university is working with local partners, including Nottingham University Hospitals Trust, to help provide extra accommodation for key workers (including its hotels, conference centres, and hall accommodation). While approximately 300 free parking spaces have being supplied to Nottingham University Hospitals Trust staff.

3. **Supporting a Midlands food charity:** FareShare Midlands scrambled to set up a Nottingham office due to the sudden demand for services during lockdown. The university was able to help with volunteers and office equipment, as well as offering spare desks, tables, chairs and filing cabinets. [nottingham.ac.uk/news/university-support](https://www.nottingham.ac.uk/news/university-support)

4. **Enabling students' food surplus supermarket to meet the COVID-19 challenge:** Foodprint is an award-winning social enterprise, and Nottingham's first social supermarket run entirely by students and volunteers. It is supported by Enactus Nottingham, a student entrepreneurship body based at the Nottingham University Business School. Foodprint previously supplied food to around 600 households, food banks, homeless shelters and school breakfast clubs but the COVID-19 outbreak and subsequent lockdown has seen demand increase dramatically. [nottingham.ac.uk/news/foodprint-covid-challenge](https://www.nottingham.ac.uk/news/foodprint-covid-challenge)



Supporting The Region

The Midlands' ecosystem is widely known to be a thriving, SME-driven innovation space. Consequently, it is not surprising that the region's industry and business support infrastructure has reacted rapidly with bespoke, locally-focused interventions. These mechanisms have been designed not only to support the national efforts to fight against COVID-19, but also to generate the economic stability our companies need to deliver ground-breaking healthcare to the community.

The Midlands' rich research and innovation community is enabled by a comprehensive support network of clinical and business specialists. It is through this integrated cluster that partners have been able to provide bespoke interventions to support the region.

Midlands Engine PPE series

The Midlands Engine, in conjunction with Midlands Innovation Health and Midlands Health Alliance, hosted a virtual discussion series on 'Enabling the Midlands PPE Supply Chain'. The series comprised three meetings, chaired by the Midlands Engine's Director and with expert speakers to introduce open discussions. These discussions each focused on a different aspect of the PPE Supply Chain and were attended by the relevant representatives from local authorities, businesses and universities.

Combining the actions identified from these meetings with the strengths of the region, the Midlands Engine is seeking recognition from the Department of Health and Social Care for and assistance in enabling the following ambitions:

- To work with Midlands Engine partners to create an internationally-leading cluster of excellence for Regulatory Science.
- To develop the UK's primary centre for the design, development and manufacture of environmentally sustainable PPE and its materials.
- To reframe national PPE procurement objectives to enable domestic PPE supply security and lever regional capabilities in this field.

The 'Midlands Meeting Place'

Midlands Innovation Health, the Midlands Health Alliance, Medilink Midlands and East/West Midlands AHSNs are working together to deliver a central regional platform to support innovation and collaboration. This will feature guidance, support and funding, collaborations, and pitching opportunities created by regional partners. It is hoped that this virtual meeting place will be used by businesses, academics and clinicians. medilinkmidlands.co.uk/midlandsmeeingplace

Assisting businesses in the region

The University of Nottingham is providing fully-funded expertise to SME's in Nottinghamshire and Derbyshire to help prepare for economic recovery following COVID-19. Companies from any sector can receive strategic planning and operational insight in areas such as business continuity, future markets research, product development support, digital technologies and digital marketing strategies. nottingham.ac.uk/news/sme-productivity-programme-re-purposed-to-help-businesses-prepare-for-covid-19-economic-recovery

Guidance and support for clinicians and NHS staff

Professor Parry (Loughborough University) is providing guidance to Public Health England and clinicians who are likely to be having - and training people who will have - difficult conversations with patients suffering from COVID-19 or those closest to them.

The University of Nottingham, in collaboration with the University of Leicester, is supporting the mental health and wellbeing of the nation's NHS colleagues through an e-package of wellbeing tools: 'Psychological Wellbeing in Healthcare Workers'. The e-package that has now been accessed by almost 50,000 health and care workers. nottingham.ac.uk/news/online-resource-for-healthcare-workers

A new guidance framework has been launched by the University of Nottingham to support pharmacists and registered pharmacy technicians faced with making difficult decisions linked to the exceptional impact of COVID-19. nottingham.ac.uk/news/supporting-pharmacists-with-covid-19-decision-making-framework

The NIHR ARC-EM is also working on an app for residential home staff, which is being developed by the University of Nottingham.

Sensibly informing and educating the general public

Dr Forrester-Soto (eminent virologist of Keele University) has been active on both TV and Radio as a voice to discuss people's concerns and questions during the COVID-19 pandemic, including appearing on BBC Newsnight and over 200 radio interviews.

Supporting parents during lockdown

The outreach team from WMG at the University of Warwick are creating fun computer experiments for children stuck at home via interactive games. To encourage children and their parents or carers to explore some of the fun, creative STEM learning opportunities available online, the outreach team (with support from the HVM Catapult) has produced a number of online activities for children of all ages to get involved and learn something new. warwick.ac.uk/about/community/projects/educationresources

The University of Birmingham is offering practical support to parents who are home-schooling (birmingham.ac.uk/schools/biosciences/about/parents-carers.aspx), while the University of Nottingham is highlighting some of the things to bear in mind when home-schooling children and offering resources that can support children's learning. blogs.nottingham.ac.uk/newsroom/2020/03/23/helping-and-homeschooling-children-in-the-time-of-the-coronavirus-pandemic

Live streaming and virtual fitness classes

Supported by evidence across the mental health, immunology, cardiovascular and diabetes fields, Midlands institutions are utilising virtual technologies to ensure their staff, students and patients are able to remain active. With activities ranging from pre-recorded workouts, live sessions, activities and advice, delivered by our expert teams.

Colleagues are also working to support local businesses. For example, Aston business school is running a series of podcasts for SME's to support them through the COVID-19 crisis. aston.ac.uk/aston-business-school/podcast

Professor Lord at the University of Birmingham has created a Youtube video to assist older people to exercise at home and boost their immunity. youtube.com/watch?v=k6_zJtbzMho



How The Life Science Business Community Has Responded

The Midlands Life Science community comprises over 1,200 companies, supporting over 30,000 jobs, and has played a key role in the national effort against COVID-19. The Midlands is ideally placed to tackle coronavirus, with the largest number of Life Science companies outside London and the South East, a research base consisting of 20 world-class universities and clinical research base which performed over 4,100 studies in 2019.

“The Midlands has a unique set of capabilities and offers for Life Science companies. Our tenacity and resilience allows us to weather whatever storms life throws at us. With COVID, as with any problem we are faced with, the Midlands Life Science industry delivered a solution to what seemed at times, an insurmountable obstacle. It's thanks to our companies that we were able to help those most in need at this time and make a significant contribution to addressing this world-wide pandemic.”

Dr Darren Clark, Chief Executive Medilink Midlands.

Medilink Midlands – The Big Ask

Medilink Midlands is working with partners to coordinate the region's response to COVID-19. So far, Medilink Midlands has had over 110 offers of support, from over 100 different Life Science companies across a wide range of areas, including:

- PPE
- Sanitisers
- Infection control
- Testing capabilities
- Ventilation manufacture
- Remote consultation and patient monitoring dressings
- Mental health and fitness
- Medical textiles
- Precision engineering
- Product design
- Critical care equipment

See below for examples of how the Midlands Life Science business community has helped in the fight against COVID-19.

Manufacturing a vaccine

A vaccine to combat COVID-19 is set to be manufactured at Keele University's Science and Innovation Park, following an agreement between Cobra Biologics and AstraZeneca UK. Cobra has signed a supply agreement to manufacture vaccine candidate AZD1222, previously known as ChAdOX1 n-CoV-19. The production agreement is part of a programme with the University of Oxford to ensure broad and equitable supply of the vaccine throughout the world, at no profit during the COVID-19 pandemic. [keele.ac.uk/business/newsandevents/ournews/2020/april/cobra/cobra-bio-leading-the-fight-against-covid-19.php](https://www.keele.ac.uk/business/newsandevents/ournews/2020/april/cobra/cobra-bio-leading-the-fight-against-covid-19.php)

A collaboration to accelerate the development of a lead COVID-19 drug candidate into human clinical trials has been announced by East Midlands-based Quotient Sciences and CytoAgents, Inc. [medilinkem.com/quotient-sciences-and-cytoagents-accelerate-potential-treatment-for-covid-19-cytokine-storm](https://www.medilinkem.com/quotient-sciences-and-cytoagents-accelerate-potential-treatment-for-covid-19-cytokine-storm)

ANA Therapeutics and Quotient Sciences announced a partnership to support the manufacturing of ANA Therapeutics' drug candidate, ANA001 (niclosamide capsules), which they are developing as a potential treatment for COVID-19. Quotient will scale up the capsule formulation, characterise and optimise the manufacturing process and ensure continuity of the drug throughout clinical trials. [medilinkem.com/ana-therapeutics-and-quotient-sciences-announce-partnership-to-manufacture-niclosamide-drug-candidate-as-a-potential-treatment-for-covid-19](https://www.medilinkem.com/ana-therapeutics-and-quotient-sciences-announce-partnership-to-manufacture-niclosamide-drug-candidate-as-a-potential-treatment-for-covid-19)

Developing COVID-19 testing capability

Source BioScience Limited, a highly accredited ISO:15189:2012 international laboratory services provider, has rapidly developed a robust COVID-19 testing capability to help with the Government's requirement to hit 100,000 tests per day. By 1st May, Source was receiving over 1000 samples a day into the laboratory and with more sample capacity needed, the company embarked on an ambitious plan to convert office space at their Nottingham HQ to a Class II laboratory able to supply 9,000+ tests per day. Operating a 24/7 laboratory, Source has continued to recruit in high volume. Currently staff has increased by 35+ with another 35 being employed to meet the national requirement. medilinkem.com/source-bioscience-develops-covid-testing-capability

The Binding Site has launched a new test to detect COVID-19 antibodies in people with recent exposure, who are asymptomatic, or have mild symptoms. With the focus on mild non-hospitalised patient blood samples, the SARS-CoV-2 Antibody ELISA assay was developed in partnership with the Birmingham Health Partners' Clinical Immunology Service with the initial antigen being provided by the University of Southampton. This latest development is a natural progression for The Binding Site, utilising its world-renowned knowledge of 35 years in developing highly precise, accurate blood tests that affect the immune system. The Company already produces over 35 million IVD tests per year for sale globally and expects this UK manufactured product to be in high demand. medilinkwm.co.uk/2020/08/regional-collaboration-delivers-quality-focussed-covid-19-test-kit-record-time



Derby-based SureScreen Diagnostics has developed a test that can detect COVID-19 within 10 minutes and render both self-isolation and incubation unnecessary. The test checks a patient's blood in a simple procedure and identifies the coronavirus between three to seven days after infection – before symptoms begin to appear. medilinkem.com/big-step-forward-in-coronavirus-detection-by-uk-firm

Digital Health interventions

Spirit Digital are directly supporting the delivery of patient care through two projects utilising their digital health and remote clinical monitoring platform - ClinITouch Vie:

1. Community 'Virtual Wards': ClinITouch Vie is being used by clinical teams at LPT with their patients as part of the NHS COVID-19 response to help them release hospital beds and manage vulnerable patients in the safety and comfort of their own homes.
2. Care Home remote monitoring: Manor Care Centre, a care home in Lincolnshire, has been working collaboratively with its local practice (Spilsby GP Practice) to implement ClinITouch Vie to provide continuity of care for its 40 residents in the care home. spirit-digital.co.uk/newsroom/the-covid-19-catalyst-how-the-pandemic-has-optimised-the-opportunity-for-digital-health

Telecare start-up Alcuris from Loughborough University has launched a digital platform that supports people at home by collecting data that provides reassurance to carers and actionable insights for authorities. memohub.co.uk

Meeting the ventilator challenge

Birmingham-based AE Aerospace supplies high-quality, precision-machined components for the aerospace and advanced engineering markets. The business has produced more than 6,000 complex turned/milled parts for the Smiths 'paraPAC plus' ventilator in less than two weeks after receiving a drawing. This is over double the company's monthly average of 2,500 parts per month.

Inspiration Healthcare have been involved in the Ventilator Challenge UK Consortium to help in the battle against COVID-19. This has included their dedicated 24/7 ventilator support helpline and their provision of other essential support. In addition to their involvement in the Ventilator Challenge UK, they also provided life-supporting equipment to the NHS during an extremely uncertain time. inspiration-healthcare.com/news/articles/inspiration-healthcare-ventilator-challenge-uk-involvement-91

PPE development, manufacture and procurement

At the peak of the COVID-19 crisis, in the West Midlands alone, PPE usage skyrocketed to an estimated:



Medilink West Midlands, the industry gateway for the West Midlands Academic Health Science Network, has been busy sourcing local manufacturers to produce high-quality surgical gowns for the region's NHS trusts. With work now underway, the region will benefit from up to 25,000 extra surgical gowns being produced a week. medilinkwm.co.uk/2020/06/medilink-west-midlands-connects-industry-nhs-produce-surgical-gowns

Textile manufacturers Footfalls and Heartbeats were very excited to announce 'Masks for the Masses', an initiative to help supply masks to key workers and organisations in Nottingham and the surrounding area. Several of their masks have now also been added to a permanent collection in The Framework Knitters Museum, which will immortalise them as part of Nottingham's rich history. medilinkem.com/masks-for-the-masses

Nottinghamshire-based JET PRESS is working with Rolls-Royce, Aston Martin, Multimatic, the Manufacturing Technology Centre and the NHS on a revolutionary new Aerosol Generating Procedure Shield. Fir Tree Buttons and Plastic Screw Cover

EVERY WEEK

Clips normally used in furniture manufacture play an important role in the finished product. JET PRESS also supply small plastic fasteners that are used to make PPE visors. Sales to one customer alone were 2.7 million in July. JET PRESS normally supplies around 35,000 a month. medilinkem.com/jet-press-use-furniture-fasteners-for-new-agp-shield

Rugby-based Autins Group has manufactured and supplied millions of PPE items, including nearly 200,000 face masks and millions of parts for visors to customers over the last four months, after securing a £3.05 million finance package. thebusinessdesk.com/westmidlands/news/2043647-acoustic-and-thermal-insulation-specialist-delivers-millions-of-ppe-items

Medilink West Midlands is working with Sylatech, a UK-based engineering company, on behalf of the West Midlands Combined Authority. Sylatech has launched a personal handheld device called the KeepSafe, designed to enable users to avoid touching handles, buttons, or grabbing items unnecessarily. medilinkwm.co.uk/2020/04/launch-new-personal-handheld-device-help-limit-spread-covid-19

The COVID-19 Catalyst – How the pandemic has optimised the opportunity for digital health

Spirit Digital

Although the virus has been devastating for so many, it has also accelerated development and adoption of technology across many areas of the healthcare system.

Prior to the pandemic, use of digital technology in the NHS was patchy and acceptance was slow. Some health teams were using it brilliantly, but many were not. Despite having a strong evidence base of successful outcomes for patients, the Spirit team were finding adoption of remote management technology to be a real challenge. It was clear how Spirit's digital platform could improve lives, save money and enable the clinical teams to focus their precious time on those who needed their expert care – but tradition was trumping innovation.

Nadine Miles, Director of Market Development at Spirit Health Group reflects on this.

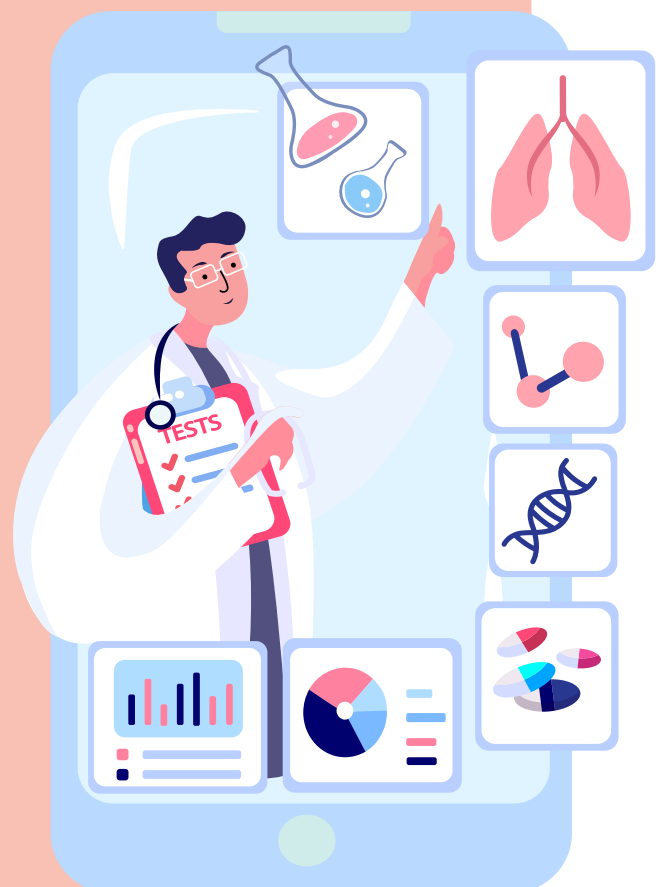
“The pandemic has been the catalyst for clinicians to look at clinical services and see how we can use technology to support and care for our patients in new, safe and efficient ways.

We were able to deliver in weeks, what had previously been anticipated over a number of years, with thousands of respiratory patients now being monitored remotely.

As a business, we faced some challenges – not with our technology platform, but more around how we enabled hundreds of patients to access it quickly. For those patients who had their own smart-phones or tablets, it was a simple matter of sharing our software links. For those who didn't, we needed to send them a tablet device, pre-loaded with our software. Normally, one of the clinical team would have visited their home and sat with them to show how easy it is to use and help with any minor connectivity issues. To make sure all those receiving kit by post (due to the pandemic and social distancing) could get up and running we set up a call centre advice team to 'onboard' patients in a non-contact manner. All of this was done while some of our team began working from home. We also had to expedite a few of our hardware contracts and recruit new members of our team using Teams and Zoom!

We responded, by adapting to a fully de-centralised team, and proving it is possible to recruit and induct brilliant people in a hurry, we broadened our supply lines, enhanced our service delivery capacity, launched two additional products (Pulmonary Rehab and post COVID-19 Discharge) and forged great partnerships with healthcare organisations.”

The team at Spirit have been privileged to support the NHS and are proud to be working on multiple projects which are directly supporting the delivery of patient care.



Regionalism At The Heart Of Innovation

Professor Alec Cameron

**Vice-Chancellor and Chief Executive at
Aston University
Chair of Midlands Innovation**



“While universities have always been at the centre of the UK research landscape, our response during the COVID-19 pandemic has demonstrated beyond doubt the strength and breadth of the expertise we host. The Midlands is no exception to this.

Our partners have dedicated themselves to fight the virus, support communities and save lives. We have taken our responsibility very seriously and I thank each and every one of our staff and students for their support delivering these world-leading accomplishments.

Translating excellence into real world capabilities in rapid time is not only a job for a single institution, nor a single sector. The current situation has highlighted the importance of trusted partnerships and their potential to create, speed and deliver advanced health innovations. The Midlands is home to dynamic partnerships, such as Midlands Innovation and our health theme Midlands Innovation Health, which have enabled the region to collaborate effectively, tailoring activity to meet these new and specific needs. Universities, industry and the NHS each have a role to play and we are dedicated to supporting our collaborations to deliver their maximum potential.

I am incredibly proud of what we have achieved across the region, from scientific discovery to clinical endeavour and mobilisation of resource. This report rightly describes the Midlands as a Life Sciences Powerhouse and I look forward to what we will go on to accomplish in the future as we continue to battle with this devastating virus.”

Rebecca Brown

**Acting Chief Executive
University Hospitals of Leicester NHS Trust**



“Patients have the right to access research opportunities; it is a key part of the NHS constitution and something I and thousands of colleagues across the NHS wholeheartedly support. COVID-19 has made this principle even clearer, as research is our best hope for emerging from this pandemic soon. NHS organisations in the Midlands have responded by recruiting thousands of patients, providing evidence on what works and what doesn’t, and using this new knowledge to change clinical practice, increase survival rates and support patients on their path to recovery.

The Midlands region has made huge strides in recent years with strong partnerships and networks like the Midlands Health Alliance. This has enabled the NIHR infrastructure hosted by many NHS trusts in the region to better co-ordinate their research programmes through expert NHS investigators and deliver so much innovation and progress. Arguably, this has never been as apparent as now, when so many of us are united in the shared global response to the COVID-19 pandemic.

The achievements of the Midlands region highlighted throughout this report are astounding. They demonstrate not only what has been accomplished to date, but the promise of what we can continue to achieve as we work together to build and strengthen our NHS-academic-industry partnerships for the benefit of our patients, today and in the future. Our shared commitment is stronger than ever and I am proud of the role the NHS continues to play in supporting this vitally important work.”

Professor Martin Levermore MBE

**CEO, Medical Devices Technology
International Limited
Chair of Medilink Midlands**



“As a focal point of life science industry in the Midlands, Medilink Midlands has played a pivotal role from the onset of COVID-19; supporting the business community by connecting them with suppliers, distributors, key NHS contacts and other like-minded businesses who were pursuing similar COVID-related goals.

This led us to set up ‘The Big Ask’ alongside the East and West Midlands’ academic health science networks (AHSNs). The Big Ask is a central repository of the needs and wants of life science businesses in the Midlands, including included the manufacture of gowns, gloves, masks and face shields, COVID-19 testing, remote consultation, mental health services and medical textiles.

There have also been some exciting developments within Medilink itself, with the ongoing creation of Medilink Midlands. The reason we decided to look to formalise the revised structure now, of all times, was the recognition that in these times of uncertainty, what businesses need more than anything is reliability and steadfastness.

We saw the opportunity to give this to the Midlands life science community by providing a united, Midlands-wide front, in the form of Medilink Midlands. This operating model will ensure there is a truly region-wide life science network operating under a single governance structure, whilst the delivery of our sub-regional contracts continue.

For us here at Medilink Midlands, lockdown and COVID-19 has been an invaluable time to revise and reflect on our current internal processes and capabilities, take stock and adjust our approach to allow us to continue to best serve the Midlands life science community.”

Midlands Engine Health

Championing and amplifying our region's world-leading strengths in Health, Medical Technologies and Life Sciences.

In recognition of the fundamental connection between health and economy, the Midlands Engine partnership has worked closely with industry, academic, health sector and public sector partners to establish Midlands Engine Health. This collaboration will be crucial as we seek to champion and expand the world-leading capabilities we have, right here in the Midlands, in Health, Medical Technologies and Life Sciences.

Exceptional progress has been made by:

- Midlands Health Alliance, to connect industry experts with investigators within the NHS to develop collaborative opportunities;
- Midlands Innovation Health, to connect the medical strengths of seven Midlands universities with industry to create a joint academic-NHS innovation environment and drive cutting-edge research and skills development.

Midlands Engine Health will underpin and expand on the extensive work already achieved by these partners, enabling close collaboration to showcase our regional strengths, such as being host to the UK's largest cluster of MedTech companies, and delivering world-leading, clinical research that is improving outcomes for patients. With proven excellence in delivery, the Midlands hosts world-class health research infrastructure in numerous disease areas.

We will identify and capitalise on new opportunities, attract international investment and accelerate sector-wide growth. We will also seek to address clinical and social care needs, with a reflection on how COVID-19 has impacted our people, places and economy.

Together we can maintain a powerful spotlight on the phenomenal capabilities and facilities our region has to offer in this field, ensuring that we maximise the benefits of innovation for our regional economy and society in general.

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