

Written evidence submitted by UCL, 16 July 2020
House of Commons Select Committee on Science and Technology
Inquiry: UK Science, Research and Technology Capability and Influence in Global Disease Outbreaks

A. Executive Summary

1. Universities play an essential role in both providing novel research and solutions and adapting pre-existing studies and expertise to tackle COVID-19 and inform government initiatives.
2. The breadth and depth of the research response to the pandemic has shown that the UK research base has the capacity to understand, model and predict the nature and spread of the virus. However, the capability of the Government and related departments to fully leverage this knowledge base is currently lacking.
3. We highlight a number of measures needed to fully leverage the capacity of UK research base to tackle global disease outbreaks in future, including:
 - a. More flexible and pragmatic approaches are needed for testing and for the development of new therapeutics so that the UK can respond more rapidly to future outbreaks.
 - b. Accelerating the integration of electronic health care records and enable such data to be pooled rapidly in an emergency pandemic situation.
 - c. Adopting more transparent approaches to evidence-gathering and ensure that all data generated is open to wider communities for use and scrutiny.
4. It is crucial that the Government takes into account evidence from diverse disciplines and perspectives, especially public health, behavioural sciences and frontline clinicians, to inform decisions during times of national crises.
5. To prepare for future outbreaks, the Government must ensure that there are appropriate emergency plans in place that can be rapidly implemented when necessary.

B. Introduction

1. UCL has rapidly mobilised the depth and breadth of our cross-disciplinary research expertise and major NHS and commercial partnerships to help the world recover from COVID-19,¹ and to make our societies more resilient and equitable in future. UCL is urgently researching new ways of tackling the virus, with over 100 funded research projects already underway.² More will be supported through UCL's Coronavirus Response Fund, charitable and public funding sources and philanthropic efforts. Further information is available on our COVID-19 research webpages³ or directly.
2. The following submission represents the collated views of academic experts from a range of disciplines from across UCL. It does not constitute a single, unified, institutional response, but rather a range of views and perspectives. As a multi-

¹ https://www.ucl.ac.uk/grand-challenges/news/2020/may/recovery-covid-19-update-ucl-grand-challenges-director-dr-ian-scott?utm_source=UCL%20%28Internal%20Communications%29&utm_medium=email&utm_campaign=115422

² <https://www.ucl.ac.uk/campaign/news/2020/jun/ucl-reaches-ps1m-fundraising-milestone-tackle-covid-19>

³ <https://www.ucl.ac.uk/covid-19-research/>

Faculty, comprehensive University, UCL colleagues are well placed to respond to this call.

3. This response has been prepared by UCL Public Policy⁴ with contributions from: Professor David Alexander (Institute for Risk and Disaster Reduction); Dr Robert Aldridge and Dr Henry Potts (Institute of Health Informatics); Dr Jo Billings (Institute of Mental Health); Professor Ariberto Fassati (Division of Infection and Immunity); Dr Guy Harling and Dr Nigel Field (Institute for Global Health); Professor Graham Hart and Professor Dame Anne Johnson (Faculty of Population Health Sciences); Dr Efrosyni Konstantinou (Faculty of the Built Environment); Professor Susan Michie (Division of Psychology and Language Studies); Professor Hugh Montgomery (Division of Medicine); Dr Jasmina Panovska-Griffiths (Institute of Epidemiology and Health); Professor Sarah Pett (Institute of Clinical Trials and Methodology); Professor Geraint Rees (Faculty of Life Sciences); Professor Rebecca Shipley (UCL Mechanical Engineering); Dr Chris Tyler (Department of Science, Technology, Engineering and Public Policy) and Professor Bryan Williams (UCL Institute of Cardiovascular Sciences).
4. We would be pleased to speak further about any element of our response. Please contact Professor Graham Hart (g.hart@ucl.ac.uk) and Ms Audrey Tan (audrey.tan@ucl.ac.uk) in the first instance, and we will be able to direct you to the individual contributor or to the appropriate expertise in UCL.

C. The contribution of research and development in understanding, modelling and predicting the nature and spread of the virus

5. UCL researchers have contributed to national efforts to address COVID-19 in a number of ways, including:
6. **Understanding the virus**
 - a. The new COVID-19 Genomics UK Consortium – in which UCL is leading the genome sequencing of viruses in London – is delivering large scale, rapid sequencing of the whole virus genome in people with confirmed COVID-19.⁵ The ability to monitor changes in the virus at a national scale is critical for planning effective public health interventions.
 - b. The ‘Virus Watch’ study, led by UCL and UCLH, is testing thousands of people for COVID-19 antibodies across the country to record in real time how the virus spreads among communities and NHS workers.⁶ The fast track funding by MRC of ‘Virus Watch’ will provide vital real time evidence of transmission, with the potential to identify local outbreaks or more generalised surges in incident infection. Within this a separate award to UCL allows us to undertake a hospital-onset infection study, which will determine whether local sequencing can provide more granular data to impact the efficiency of infection control measures and ultimately reduce the spread of hospital acquired infection.
 - c. The UCL Genetics Institute is leading an international research team that has analysed virus genomes from over 7,500 people infected with COVID-19 and characterised patterns of diversity of SARS-CoV-2 virus genome, offering

⁴ <https://www.ucl.ac.uk/public-policy/>

⁵ <https://www.cogconsortium.uk/> ; <https://www.ucl.ac.uk/news/2020/mar/leading-ucl-scientist-joins-major-new-alliance-map-spread-coronavirus>

⁶<https://www.ucl.ac.uk/news/2020/apr/virus-watch-study-launched-monitor-spread-covid-19-across-england>

clues to direct drugs and vaccine targets.⁷ They developed a new interactive, open-source online application so that researchers across the globe can review the virus genomes and apply similar approaches to better understand its evolution.

7. Treatment

- a. A consortium spanning UCLH clinicians, UCL engineers and Mercedes AMG High Performance Powertrains focused their combined expertise on the large-scale manufacture of non-invasive respiratory support technology: continuous positive airway pressure (CPAP) devices. The UCL-Ventura CPAPs were rapidly manufactured at scale and have been delivered to over 60 hospitals.
- b. Vax-Hub, co-led by Professor Martina Micheletti (UCL Department of Biochemical Engineering) and Professor Sarah Gilbert (Jenner Institute, University of Oxford), is accelerating the manufacturing process for a COVID-19 vaccine.⁸

8. Assessing the impacts of the virus

- a. NIHR support for further research on the increased risk of morbidity and mortality in black and minority ethnic (BAME) populations builds on the Institute of Global Health's preliminary work demonstrating the unequal impact that COVID-19 has had on these populations.⁹ Lower socio-economic status was also identified as a risk factor for poorer outcomes by UCL researchers, as was increased risk in those living with cardiovascular disease.
- b. The UCL Institute of Health Informatics (IHI) used modelling to quantify how access to accommodation can mitigate the impact of the pandemic on people experiencing homelessness in England, and reduce the burden on acute hospitals.¹⁰ The IHI also led the study at the start of lockdown that provided estimates of excess mortality from COVID-19 and called for stronger lockdown measures.¹¹
- c. UCL's Division of Psychiatry has already informed clinical guidance to support the mental health of frontline healthcare workers.¹² Dr Daisy Fancourt of the Faculty of Population Health Sciences is leading a large scale survey to understand the psychological and social effects of COVID-19.¹³

D. The capacity and capability of the UK research base in providing a response to the outbreak, in terms of:

9. Advice to government, public bodies and others on managing the outbreak

- a. **Future decisions should include a broader reflection of implications and impacts, particularly economic and societal issues, through taking into**

⁷ <https://www.ucl.ac.uk/news/2020/may/mutations-sars-cov-2-offer-insights-virus-evolution>

⁸ <https://www.ucl.ac.uk/biochemical-engineering/research/research-and-training-centres/vax-hub>

⁹ <https://www.ucl.ac.uk/news/2020/may/bame-groups-two-three-times-more-likely-die-covid-19>

¹⁰ <https://www.medrxiv.org/content/10.1101/2020.05.04.20079301v1>

¹¹ <https://www.ucl.ac.uk/news/2020/mar/new-estimates-excess-mortality-covid-19-suggest-stronger-suppression-measures-needed>

¹² Billings, J., Greene, T., Kember, T., Grey, N., El-Leithy, S., Lee, D., Kennerley, H., Albert, I., Robertson, M., Brewin, C.R. and Bloomfield, M.A.P. (2020) Supporting Hospital Staff During COVID-19: Early Interventions. Occupational Medicine. Published online May 25, 2020.

¹³ <https://www.ucl.ac.uk/news/headlines/2020/mar/new-study-psychological-and-social-effects-covid-19>

account a diversity of expertise. For example, the Terms of Reference for this inquiry omitted 'the development of behavioural, social and environmental interventions'. Without a vaccine or effective primary therapeutics, these are key to preventing outbreaks becoming epidemics and to suppressing epidemics/pandemics once established.

- b. National academies, learned societies, and royal colleges, as well as Departmental scientific advisory groups, chief analyst networks, and the Chief Scientific Advisor networks have the diversity of expertise to provide interdisciplinary insights and perspectives.
- c. Researchers from the UCL Institute of Global Health have led two pieces of analyses within the Royal Society convened Data Evaluation and Learning for Viral Epidemics (DELVE) group regarding the 'Test and Trace' programme¹⁴ and minimising hospital-acquired infections.¹⁵ **Universities can play a key role in engaging with public bodies, such as PHE, NHSE and the ONS to contribute to research that feeds directly into government responses, such as SAGE and its sub-committees.**

10. The development of testing, diagnostic methods and technologies

- a. The UK has a world class base of researchers and development teams who are responding to the outbreak. For example, the success of the UCL-Ventura CPAPs (see Section C.7.a.) was due to **the rapid mobilisation of an interdisciplinary team to focus on a clearly defined, immediate need, and was possible because of the long-standing collaborations between the academic, clinical and industrial partners.**

11. The development and testing of vaccines

- a. UCL and the University of Oxford are co-leading Vax-Hub (see Section C.6.b.). The UCL Vax-Hub is currently concentrating on the development of large-scale manufacturing processes to ensure the rapid mass production of the vaccine candidate ChAdOx1 nCoV-19 vaccine at Oxford's Jenner Institute. One of our partner hospitals - UCLH - is one of the largest recruiting sites to the phase 2/3 study to determine the efficacy, safety and immunogenicity of the vaccine candidate. UCLH has begun recruiting at least 500 healthcare workers who have patient facing roles. Additionally, over 2,000 participants have been recruited to vaccine studies at UCL and associated hospitals.

12. The development and testing of therapeutics

- a. Across the UK, 48 clinical trials for COVID-19 have been rapidly established.¹⁶ The UCL Institute of Clinical Trials & Methodology, which hosts the MRC Clinical Trials Unit (CTU), has been vital to the successful delivery of early results from trials with regard to treatment and prevention. The MRC CTU is involved with delivering CoVaC-01 and CoVaC-02; PENTA-CORONA; INSIGHT-11; ACTT-DMDD 20-000/INSIGHT-010; INSIGHT-13; TICO; COVID-PRACTICAL and INSIGHT-012.¹⁷
- b. Additionally, academics from the MRC CTU have been members on numerous expert panels, including those advising the Chief Scientific Officer

¹⁴ <https://rs-delve.github.io/reports.html>

¹⁵ <https://rs-delve.github.io/reports/2020/07/06/nosocomial-scoping-report.html>

¹⁶ <https://www.nihr.ac.uk/covid-studies/>

¹⁷ <https://www.ctu.mrc.ac.uk/news/news-stories/2020/march/mrc-ctu-at-ucl-response-to-covid-19-pandemic/>

with regard to potential therapeutic candidates for national clinical trials. This includes the Expert COVID-19 Prevention Panel convened by the Chief Medical Officer and the Global Effort on COVID-19 Health Research convened by DHSC/UKRI.

- c. UCLH is participating in the RECOVERY trial, which has enrolled >11,000 patients across 175 NHS hospitals to test six drug candidates (Lopinavir-Ritonavir, low dose Dexamethasone, Hydroxychloroquine, Azithromycin, Tocilizumab and convalescent plasma). To date, results have concluded that hydroxychloroquine provides no clinical benefit in hospitalised patients,¹⁸ but that dexamethasone may substantially reduce mortality in severely ill patients with COVID-19. Given that it is an inexpensive, readily available drug, this finding has the potential to immediately save lives worldwide.¹⁹

E. The flexibility and agility of institutions and processes to respond on the above during a crisis including:

13. The availability and responsiveness of funding

- a. The flexibility and ability of UK research to respond to the crisis was hampered by a workforce employed on short-term, project-based contracts. In some cases, grant funding has been delayed due to the pandemic halting research activity and has consequently left junior colleagues and early career researchers facing a full or partial loss of salary with many initially unable to access the Government's furlough scheme.
- b. While COVID-19-specific funding calls were introduced very quickly, they were still slow compared to the pace of developments in the real world. **Working with UKRI to create a national contingency fund (and asking all funding bodies to do likewise) would assist for future mitigation planning.**

14. The optimal functioning of regulatory and ethical processes

- a. The MHRA approved the UCL-Ventura CPAP device (see Section C.6.a.) within just 36 hours of the application's submission. This was only possible due to a close collaboration between the team and the regulatory body and the team's ability to demonstrate like-for-like in terms of performance. In order to facilitate similarly effective collaborations between regulators and researchers, **the MHRA and similar bodies should offer routes for fast-track approval where researchers who build on existing approved-devices are taken through an expedited approval process.**
- b. While considerable funding and focus in the UK has been placed on the RECOVERY mega-trial (see Section D.12.c.), the centralised approach has hindered research and innovation in testing other therapeutics. The rapidly evolving nature of the pandemic requires a more dynamic approach to regulatory and ethical processes. The 20 NIHR Biomedical Research Centres (BRCs) form the NIHR's experimental medicine infrastructure, which enables researchers to develop clinical applications from scientific breakthroughs and to translate these discoveries into new treatments for patients.²⁰ **The**

¹⁸ <https://www.recoverytrial.net/files/hcq-recovery-statement-050620-final-002.pdf>

¹⁹ <https://www.ucl.ac.uk/joint-research-office/news/2020/jun/steroid-drug-reduces-mortality-hospitalised-covid-19-patients>

²⁰ <https://www.nihr.ac.uk/explore-nihr/support/experimental-medicine.htm>

capabilities of the BRC experimental medicine infrastructure should be better utilised to facilitate greater innovation and research as the pandemic evolves.

- 15. The availability and influence of scientific advice in all Government departments and public bodies- including by departmental Chief Scientific Advisers; and the extent to which decisions taken drew on that advice.**
- a. The initial lack of transparency regarding SAGE membership and the evidence being used made it difficult to assess how decisions taken drew on scientific advice. Upon publication of the SAGE membership, we note that there is a lack of public health and frontline expertise. Given that COVID-19 is a novel disease, the experiences and insights from clinicians and clinical academics working on the frontline are crucial for informing decisions. As recommended in Section D.9.a., **Government departments and public bodies should draw on a multidisciplinary and diverse range of expertise, particularly from public health and frontline experts, when making decisions.**
 - b. **The Government should adopt an Open Science approach and ensure that all data generated should be open to the scientific and other communities to interrogate and use.**
16. Research teams and institutions, including those based at UCL, have proved to be very adaptable. For example:
- a. The i-sense project (a collaboration between UCL, UCLH and four other universities)²¹ has adapted existing tracking and diagnosis technologies to track Covid-19 using online search data, and build smartphone-connected diagnostics to provide faster test results and help identify infection hotspots.
 - b. INHALE has been evaluating 'molecular diagnostics' to identify the presence of pneumonia bacteria directly without the need for lab culture. Currently, INHALE is refocusing to investigate the secondary bacterial pneumonias that COVID-19 patients acquire.²²
 - c. Dr Laura Shallcross (UCL Institute of Health Informatics) is leading the Vivaldi 1 and Vivaldi 2 studies to understand the burden and impact of COVID-19 in care homes.²³ The studies are building on existing collaborations with an independent health care provider and are now working with the DHSC and NHS Data Foundry. This represents a valuable example of how pre-existing studies can be adapted to the needs arising from the pandemic. Similarly, UCL's Institute of Health Informatics has used data previously collected by Flu Watch to study seasonal coronavirus infections in the UK prior to COVID-19.²⁴

F. The capacity to manufacture and distribute testing, diagnostics, therapeutics and vaccines (including both the standing capacity and capacity that is able to be mobilised)

²¹ <https://www.i-sense.org.uk/interview-i-sense-professor-deenan-pillay>

²² <https://www.ucl.ac.uk/news/2020/apr/real-time-pneumonia-test-covid-19-patients-aiding-faster-therapy>

²³ <https://www.ucl.ac.uk/health-of-public/response-covid-19/ucl-covid-19-research/case-study-burden-and-impact-covid-19-care-homes>

²⁴ <https://wellcomeopenresearch.org/articles/5-52>

17. From February-May 2020, lack of capacity and stringent testing guidelines meant that most infections in the community went undetected. The centralised approach adopted (outlined in Section E.14.a.) was also a major contributor to the lack of testing capacity. PHE did not have enough testing kits or PCR machines, a fact demonstrated by multiple requests made by PHE to UCL, amongst other universities, to donate equipment and PCR plates. Meanwhile, several commercial enterprises developed and mass produced COVID-19 specific testing that received Emergency Use Authorization from the FDA.²⁵

18. It is not clear why some of these commercial assays were not validated early on. The Francis Crick Institute, of which UCL is a founding partner, is one of the very few research centres that has been allowed to perform testing but only at a late stage.²⁶

A more flexible and pragmatic approach to testing is needed whereby PHE rapidly validates commercially available tests and outsources as much testing as possible to private labs and academic institutions following accreditation and establishment of appropriate protocols.

G. The capturing, during the crisis, of data of the quantity and quality needed to inform decisions made during the crisis and to maximise learning afterwards

19. Current data analysis is retrospective due to health data not being fully integrated electronically. There is an opportunity to **accelerate integration of electronic health care records and enable such data to be pooled rapidly in an emergency pandemic situation.**

20. There is a dearth of evidence and a lack of infrastructure to capture data needed to understand the behaviours associated with viral transmission.²⁷ **We need the means to collect data about behaviours and basic descriptive data.**

21. The DECOVID project exemplifies a large-scale collaboration, including UCLH, the Alan Turing Institute, UCL, University Hospitals Birmingham and King's College London. DECOVID will create a scalable data repository and data analytics centre providing clinicians with real-time actionable intelligence into patient care and operational planning during the COVID-19 pandemic.²⁸

22. UCL is playing a leading role in promoting knowledge exchange throughout the pandemic and is committed to open dissemination. UCLB, part of UCL Innovation & Enterprise, won the 'Knowledge Exchange External Initiative of the Year' award for their successful global dissemination of the design and manufacturing instructions for the UCL-Ventura breathing aid (see Section C.6.a) through e-lucid, UCLB's online licensing platform.²⁹

H. The mechanisms for communication of scientific evidence internationally, within national governments and with the public:

²⁵<https://www.fda.gov/medical-devices/emergency-situations-medical-devices/emergency-use-authorizations#coronavirus2019>

²⁶<https://www.crick.ac.uk/news/2020-04-02-francis-crick-institute-and-uclh-develop-covid-19-testing-service-for-patients-and-nhs-staff>

²⁷ West R, Michie S, Rubin GJ, Amlot R (2020) Applying principles of behaviour change to reduce SARS-CoV-2 transmission. *Nature Human Behaviour*, 4, 451–459.

²⁸ <https://www.ucl.ac.uk/health-informatics/covid-19-and-institute-health-informatics>

²⁹ <https://covid19research.uclb.com/product/ucl-cpap>

23. The handling of conflicting scientific opinions

- a. Persistent disciplinary silos and barriers to knowledge transfer have become all the more pressing during the pandemic. **The DHSC supports Policy Research Units in Universities throughout England which are provided with funding to provide rapid response and data syntheses - more use could have been made of this investment.**
 - b. We applaud the initiative of the International Network for Government Advice (INGSA) (founded by Sir Peter Gluckman, Visiting Professor in the Department of Science, Technology, Engineering and Public Policy (STeAP) at UCL) in creating an information hub to aggregate and share the resources and discussions relating to how science advice and evidence functions in emergencies.³⁰ **Further initiatives of this kind would help support evidence consumers in a rapidly changing situation.**
24. Advising structures, such as SAGE, can increase their transparency and ensure that expertise is acknowledged. **Live-streaming committee meetings or releasing meeting minutes, as is already done in Select Committee oral evidence sessions, would facilitate greater transparency.**
25. While the volume of research published has been enormous, early analyses suggest that female academics are posting fewer preprints and starting fewer research projects than their male peers.³¹ As these effects will compound as lockdowns persist, **universities and funders should take steps to mitigate gender disparities as quickly as possible to avoid furthering issues of diversity in academia.**

I. The UK's readiness for future outbreaks

26. The National Risk Register

- a. The political nature of the national risk registers,³² compounded by short electoral cycles, which lead to politicians focusing more on short-term issues, contributed to lack of preparedness for managing the COVID-19 pandemic. **Risk registers should be produced largely outside the political process.** There should be a **partnership between experts and policymakers, and also diverse ranges of groups**, for example key workers, so their interests are included in both identifying risks and planning responses.
 - b. The UK could **learn from how other countries are analysing risks and planning for them**, particularly the countries who were most affected by SARS and thus handled COVID-19 with more emergency.
27. The scenario for a major pandemic was consolidated by a number of sources from 2003-2009.³³ The Government's approach during the current pandemic to managing daily developments suggests that there has been little recognition of the plans and procedures developed previously. Additionally, no recommendations from Dame

³⁰ <https://www.ingsa.org/covid/>

³¹ <https://www.nature.com/articles/d41586-020-01294-9>

³² <https://theconversation.com/coronavirus-governments-knew-a-pandemic-was-a-threat-heres-why-they-werent-better-prepared-136857>

³³Smith, R.D., M.R. Keogh-Brown, T. Barnett and J. Tait 2009. The economy-wide impact of pandemic influenza on the UK: a computable general equilibrium modelling experiment. British Medical Journal 339, b4571: 1-7.

Deirdre Hines' independent review³⁴ of the UK Government's preparedness and management of the H1N1 pandemic have been implemented. **To prepare for future outbreaks, the Government must ensure that there are appropriate emergency plans in place which can be rapidly implemented when necessary.**

28. Given the unpredictable nature of future disasters, **it is crucial that the Government has multidisciplinary perspectives and disciplines to call on to assist with decision making during times of national crises.**
29. Without collecting information about how the advice emanating from SAGE and other bodies and individuals is used by the Government, it is impossible to know what happened and therefore learn how things could be done better. In order to promote the better use of evidence and justification of policy decisions, **all government departments should consider adopting an Evidence Transparency Framework.**³⁵
30. The UK is now taking proactive measures to prepare for the winter months, when a resurgence of the pandemic is expected. A cross-disciplinary contingency of UCL researchers are part of the Expert group that has contributed to the Academy of Medical Science's 'Coronavirus: preparing for challenges this winter' report commissioned by Sir Patrick Vallance and presented to SAGE.³⁶ This collaboration underscores the importance of multidisciplinary perspectives in considering the key preparations and actions required to mitigate impacts of COVID-19 on the health and social care system in the winter.³⁷

³⁴ <https://www.gov.uk/government/publications/independent-review-into-the-response-to-the-2009-swine-flu-pandemic>

³⁵ <https://www.instituteforgovernment.org.uk/publications/evidence-transparency-framework>

³⁶ <https://acmedsci.ac.uk/policy/policy-projects/coronavirus-preparing-for-challenges-this-winter>

³⁷ acmedsci.ac.uk/more/news/prepare-now-for-a-winter-covid-19-peak-warns-academy-of-medical-sciences