Witness Name:
Statement No.:
Exhibits:
Dated:

UK COVID-19 INQUIRY

WITNESS STATEMENT OF PROF ALAN MCNALLY

I, Professor Alan McNally, will say as follows: -

Background

1. I am a professor of microbial evolutionary genomics and inaugural head of the School of Infection, Inflammation, and Immunology in the College of Medicine and Health at University of Birmingham (UoB). During the time frame I have been requested to cover in this statement (January 1st, 2020 – June 28th, 2022) I was Director of the Institute of Microbiology and Infection at University of Birmingham. Prior to working at University of Birmingham I was a senior lecturer in microbiology at Nottingham Trent University where I was awarded funding by the EU FP7 funding program, and the UK Technology Strategy Board to develop rapid diagnostics for infectious diseases. This was due to successful post-doctoral research I conducted at the Veterinary Laboratories Agency - VLA (Now the Animal and Plant Health Agency - APHA) in Weybridge Surrey on PCR based diagnostics for H5N1 avian influenza under the supervision of Prof Ian Brown.

2. My work on H5N1 avian influenza contributed to a publication in 2007 that was adopted as the standard PCR test for H5N1 across all European reference laboratories [AM/01 - INQ000582859]. I also published a review article in 2009 outlining recent advances and challenges in developing rapid test for infectious diseases [AM/02 - INQ000582858]. However, the majority of my research is on

tracking the spread and evolution of antimicrobial resistant bacteria using genome sequencing technology.

3. I am writing this statement due to my involvement in setting up and then running the SARS-CoV-2 PCR testing laboratory in Milton Keynes, the so-called Lighthouse lab referred to as MKLL. I was seconded to the laboratory on March 26th, 2020, and worked there until June 1st, 2020, as the designated "infectious Disease Lead". On the request of the Department of Health and Social Care (DHSC) I also set up and ran a PCR testing laboratory at University of Birmingham which was active between September 2020 and March 2021. This laboratory was integrated into the Lighthouse lab network and provided Pillar 2 PCR testing for the UK. I also led the creation and running of the University of Birmingham asymptomatic screening facility which operated from November 2020 to March 2021 in response to a government request of all universities to provide lateral flow test facilities for students.

4. Alongside being a high-profile microbiologist employed by University of Birmingham and my roles running testing infrastructure, between the time periods in question I was an elected trustee of the Microbiology Society and engaged with and advised them extensively during the period. I also became a paid consultant for Prenetics, the company who were awarded the testing contract to allow Premier League football and test match cricket to resume. My role was purely to provide them with expert advice on their testing and analysis workflow.

5. As a result of my involvement in the UK pandemic response I have authored numerous articles on Covid-19. Articles of relevance I led include publication of the complete detail of setting up a Pillar 2 PCR testing lab in University including all quality control information and logistics [AM/03 - INQ000582840]. I also led the publication of data from our UoB testing lab showing that what would become known as the alpha variant of the virus appeared to be associated with higher levels of virus in infected individuals [AM/04 - INQ000582846]. And I led the publication of data generated by our PCR testing lab and our lateral flow testing facility to compare the efficacy of the two tests across our test data [AM/05 - INQ000582847]. All three of these publications were driven by my frustration that

the work we were doing and the data being generated was not being catalogued for the public record. On only one occasion was I approached to provide expert insight that could directly inform government, when I was invited by Prof Chrstophe Fraser and Prof Deirdre Devine from University of Oxford to speak to key members of SPI-M (the modelling experts for SAGE) to explain what Ct values are in PCR testing and what can and cannot be inferred from them. I am afraid I cannot recall the date of this meeting that I attended and cannot provide evidence to support this. Other than this I have never contributed to any official government advice on Covid. It is due to this that I frequently took to Radio, Television and printed news media to air my thoughts and opinions as I considered this the only avenue I had to get across what I considered to be important and factually driven perspectives on the pandemic. I have not covered every piece of media attributed to me relevant to this module of the inquiry but with the assistance of the external relations team at UoB I have retrieved the key articles and interviews I conducted from the 2400 instances of press activity quoting or referencing me, and reference them throughout this statement.

Pandemic preparednes: testing technologies, infrastructure and capacity

6. There are a small number of different technologies which are routinely used as diagnostic tests for viral infections. Modern methods for diagnosis of respiratory virus infections detect either the specific viral proteins (antigens) or the viral genetic material (nucleic acid test (NAT)). Serological testing for antibodies to specific viral proteins are also used for some viral infections as they can indicate an infection has occurred at some time in the past. The most widely used antigen tests are immunochromatographic lateral flow tests (LFTs), or lab based ELISA (serology) tests which use antibodies coated on a surface to detect the presence of viral antigens in a sample, and the most widely used NAT is the now famous PCR.

7. All viruses, incldluing SARS-CoV-2, contain both proteins and nucleic acids as their genetic material. For humans our genetic material is DNA, but for SARS-CoV-2 (and many other pathogenic viruses) the genetic material is a closely related molecule termed RNA. The aim of the PCR test is to detect the

virus nucleic acid. In a clinical sample the amounts of virus RNA can be very low and the basis of the PCR procedure is to make multiple copies of that virus RNA in the sample so that it can be detected in an appropriate instrument. A particular type of PCR is used in diagnostic labs called qPCR, which is an abbreviation for quantitative polymerase chain reaction. In each cycle of the reaction the nucelic acid is copied so that the amount is doubled in each reaction (1- 2 -4- 8-16 etc). qPCR is highly sensitive and can detect as low as 10 RNA molecules in a sample (10 virus particles). PCR testing is the gold standard method for diagnosis of viral respiratory pathogens and is routinely used in the human clinical (Influenza, RSV) and veterinary (Avian influenza) sectors.

8. Lateral flow tests (LFTs) are designed to detect the virus proteins. It is not possible to make multiple copies of the virus proteins in a sample so the sensitivity of the LFT assays are not as good as qPCR. The basis of the test is that in the LFT device there is a band of antibody that is able to bind tightly to the virus protein in the sample and capture it. This produces the 'test' line on an LFT. A sample prepared by the test subject is processed in a provided solution and loaded by a drop on the LFT device with the sample moving up the test by capillary action. If there are SARS-CoV-2 proteins present, they will be captured at the test line resulting in a positive signal. Very low levels of virus in a sample are likely not to be detected. The routine use of LFTs for diagnosis of respiratory viral pathogens was extremely rare prior to the pandemic.

9. I am unable to provide definitive statements on what the actual laboratory testing capacity was for respiratory viral infections in the UK from January 1st 2020. Only DHSC, NHS England and the United Kingdom Health Security Agency (UKHSA) would be able to authoritatively provide such detail. However it is fact that from Jan 1st 2020 until the MKLL went live in April 2021, it was compulsory for all clincially actionable diagnostic tests for a respiratory virus In the UK to be conducted in a UKAS accredited clinical or public health laboratory. Prior to the Covid-19 pandemic, UK pathology provision across many clinical areas, including clinical microbiology and clinical virology were in the process of change with the aim of moving from 122 individual pathology units within NHS Hospitals in England to a series of 29 pathology networks by 2021. These networks are spread across England using a hub and spoke model per network, with a mixture

of hospital provision, outsourced publicly funded provision and outsourced private provision. As such, not every NHS acute Trust had an on-site microbiology/virology service, instead only retaining low-capacity 'cartridge-based' testing at these 'spoke' sites. In addition, not all microbiology laboratories offered full virology services. These tended to be in larger teaching hospitals, often the 46 laboratories that were formerly part of the Public Health Laboratory Service.

10. Whilst I cannot offer definitive information on the capacity available on January 1st, 2020, to undertake SARS-CoV-2 PCR testing in the UK, there are publicly available data which can be drawn upon to set the scene. In January 2020 only a single Public Health laboratory (Public Health England, now UKHSA) was performing SARS-CoV-2 PCR testing, which by February 7th 2020 was expanded to 12 public health laboratories, giving a total lab test capacity of one thousand tests per day [AM/06 - INQ000582848]. A decision on March 1st, 2020, allowed for diagnostic tests to be conducted in labs with a designated containment level of CL2 from its previous designation of CL3, which requires very small and specialist labs with extra safety measures. This move to CL2 increased the potential capacity of clinical and public health laboratories to perform SARS-CoV-2 PCR testing to approximately five thousand tests per day. This was at a time when the UK had reached one thousand cases with a clear increase linked to half term holiday travel. The decision was then taken on March 12th, 2020, to stop testing for SARS-CoV-2 other than for patients hospitalised with suspected Covid. This decision effectively meant the UK had decided to stop trying to track the increase in incidence and spread of the pandemic.

11. I had conducted several conversations with journalists in February 2020 where I chatted about how important testing should be in the early stages of a pandemic, and how other countries had approaches to this honed by the SARS epidemic of 2002 [AM/07 - INQ000582849]. When the news of the scrapping of testing for non-hospitalised patients broke, I was approached by many journalists for on the record interviews. I conducted interviews with BBC West Midlands politics live, The Guardian, The Times, the Financial Times, and BBC Radio 5 Live where I made clear that without community testing the UK was trying to manage Covid

blind with no information on cases, transmission, range of symptoms, as an example of things that are essential to understand an epidemic. I argued in all these interviews that UK universities had the equipment and expertise to start testing to alleviate the situation, that such a situation was tried and tested in other countries (such as the accredited laboratory of medicine network in Germany – [AM/08 - INQ000582850]) and there was a willingness from UK universities to help but that this was falling on deaf ears.

12. UK universities were never called on as I had hoped and suggested. Large amounts of UK university equipment were taken and transported to private sector centralised testing labs, the Lighthouse lab network. University staff were also seconded to those labs to staff them and bring the expertise that those lighthouse labs were lacking. NHS England were used to ensure the Lighthouse labs were working to the quality standards expected of a diagnostic testing lab. And UKHSA (then Public Health England - PHE) provided oversight of test data and results reporting and integration into national reporting data. It is very much my opinion that the huge expertise and infrastructure available was used to create the Lighthouse lab network rather than left in situ to work together collaboratively to provide a solution to the shortfall in testing capacity that was clearly needed.

13. Summarising the points above it is my view that the UK was horribly under prepared to develop and deploy a mass testing system for a novel pandemic pathogen that was not Influenza. The reasons behind this are likely multifactorial (underfunding of the then PHE, underfunding of hospital microbiology laboratories, the lack of testing reagent manufacturers in the UK to name a few) but over reliance on a small number of insufficiently resourced public health labs seems important and this is a system that was clearly swamped as early as the first week of March of 2020.

Development of testing policy, strategy and programmes

14. In the interviews referred to in paragraph 11, I stated that I believed we had the staff and equipment to be able to offer around five thousand PCR tests per day at University of Birmingham. On Thursday 19th March my Pro Vice Chancellor and Head of College at the time, Prof David Adams received an email from the

Medical Schools Council on behalf of Prof Jeremy Farrar [AM/09 – INQ000582851]. This email was a request for universities to supply equipment capable of supporting PCR testing using the equipment and reagents produced by the company ThermoFisher including nucleic acid extraction, qPCR and safety cabinets to allow processing of samples to appropriate health and safety levels. The email states the equipment will be sent to a small number of centralised super labs that will allow the UK to scale up testing from the available capacity at the time of five thousand tests per day to the two to three hundred thousand tests per day calculated as being needed at the peak of the pandemic. No citations are provided as to how that number was obtained. Prof Adams responded directly to Prof Farrar to reinforce my opinion that University labs could contribute to scale up of testing and informed Prof Farrar of work we had been doing round the clock to stand up a testing lab in the University [AM/09a – INQ000585205].

15. Prof Adams' email response was forwarded by Prof Farrar to William Warr and Kristen Macleod at the Office for Life Science at Number 10, and Ed Whiting at the Wellcome Trust, resulting in an email from Ed Whiting on March 20th for Prof Adams, myself and a UoB colleague Prof Andrew Beggs to attend an online call. The attendees of the call were to be Ed Whiting, Prof Sir John Bell of University of Oxford, **Name Redacted** from BEIS, and Kevin Tsang from Deloitte, the latter two of whom were described as HMG/Deloitte project team. The email was also copied to Andrew Gilligan from No 10 office (AM/10 - INQ000582852]. At the meeting Prof Beggs and I spoke to Ed Whiting and Prof Bell where we were informed of plans to create 4 large, centralised testing labs in partnership with ThermoFisher and Amazon. I was also asked if I would be able to help recruit volunteers to work in these labs having successfully recruited around 30 university staff to help with demand at the UKHSA (then PHE) West Midlands lab at Heartlands hospital in Birmingham. I sent an email that day to the CEO of the Microbiology Society, Peter Cotgreave informing him of the testing plans and asking if he could coordinate a communication to the society membership for volunteers [AM/10a – INQ000585206]. An email was then sent to me, Prof Beggs and Prof Adams on March 20th from Ed Whiting confirming that he and Prof Bell agreed we should continue to work towards creating a local university lab to support local hospital and public health testing, and that Prof Bell and Kristen

Macleod would continue to lead their larger community testing project (the four super labs – [AM/11 - INQ000582853]).

16. On March 25th I received a phone call from someone I believe to have been in Kristen Macleod's team asking if I could find 15 staff from UoB willing to volunteer to staff the lab being established in Milton Keynes, MKLL. I sent an email around UoB [AM/11a – INQ000585207] and received dozens of responses all of which I forwarded including my own name. On March 26th I received a phone call asking if I could travel to Milton Keynes to be part of a team of around 6 people running the lab and travelled to MKLL the next morning to begin my participation there.

17. The exchanges laid out above are the complete extent to which I believe either my or UoB's input contributed to the development of the UK Covid testing strategy. I know from my role as an elected trustee and member of council of the Microbiology Society that my senior colleagues in Universities across the UK felt the same, that their collective voice was not being considered in even the smallest of ways to how the UK was planning for the coming pandemic. There was frustration across the UK Higher education system that collective expertise was not being sought or listened to. My own observation is that a very small number of selected academics heavily biased towards the "golden triangle" are the default go to points of contact for government on all matters relating to infectious diseases and microbiology, with a huge number of globally recognised and respected scientists across the rest of the UK marginalised and left to provide soundbites to the media. I do believe that a body like SAGE is essential to provide scientific evidence and opinion to policy makers in a clear and coherent way. But I believe the membership of such committees could be dynamic to reflect the absolute best available national expertise based on the specific matter at hand. I also believe the membership of such bodies needs to be created in a much more transparent way, similar to how UKRI form expert panels based on the choice of a diverse expert selection panel ensuring a diverse committee of experts. That committee should also have the freedom to elicit external expert opinion as they encounter it ensuring they are as up to date and informed as possible.

18. Based solely on my observations I believe that the strategy around testing could have been better. I have already stated in paragraph 11 I believed that university and private sector labs could have been mobilised quickly to scale up testing. That is not to say that the Lighthouse labs were a bad idea, and I firmly believe they were needed. But a consortium of smaller labs could have provided an immediate boost to testing capacity whilst the Lighthouse labs were created and validated. If this was done in February we would have been far ahead of the virus in our tracking of the spread and growth of the virus in early 2020, and there was precedent for this from the experiences already cited in Germany and South Korea. Similarly, as Covid cases dropped in May 2020 and we entered summer, testing pressure was eased. This was a perfect time to reflect and then consider how best to strategically utilise the incredible capacity that had been built to most effectively combat the surge in cases that would inevitably happen in Autumn 2020. Again I resorted to the media to convey these opinions in the absence of any other available route providing an interview to the Independent on June 28th [AM/12 - INQ000582828] outlining where testing could have been better in early 2020 and how it could be used to its maximum benefit in late 2020, focusing testing on likely hotspots of infection such as education facilities, health care and social care facilities. I also spoke out about innovating testing such as using pooled samples, whereby multiple swabs are combined and tested in a single PCR reaction, reducing the number of tests needing to be run [AM/13 - INQ000582829]. Whilst it is open to debate if pooling would have been beneficial, the key point is that there was no effort made to strategise the testing capacity we had to maximise the public health benefit of how it was deployed. I believe this was a missed opportunity as the lighthouse labs and the testing pipelines that were developed were truly world class in their capacity and capability. By having a clear strategy of how to use that capacity we could have deployed testing where and when it was most needed providing more efficient tracking of the dynamics of the pandemic.

19. The benefits of being ahead of virus infection growth with testing are based on a simple premise. If you are performing mass testing and detecting cases of infection early, then you can isolate infected individuals and disrupt transmission chains. Disrupting transmission chains drives down the opportunity for the virus

to spread and increase logarithmically in incidence, thus helping enormously to control the epidemic. In the independent article I stated, "If the Lighthouse Labs had been operating four weeks earlier it would have made a huge difference." My justification for this is that if the UK had been able to perform tens of thousands of tests per day in early March as opposed to late April, then many of the transmission chains that were triggered at that time could have been interrupted early due to early detection and isolation. This could have slowed growth of the epidemic and alleviated the time pressures to implement the many other actions required to manage a pandemic. This is the exact same reason why I believe a targeted and focused testing strategy ready to implement in Autumn 2020 could have slowed the rate at which wave 2 of the pandemic grew buying more time for the vaccine program that was being rolled out to introduce protection to the population. Instead, the UK relied on a testing approach driven solely by its size. In early September it was proven that capacity alone does not provide an efficient tool to help manage a pandemic, with demand for tests outstripping the huge capacity by September 3rd [AM/14 - INQ000582830; AM/15 - INQ000582831].

Milton Keynes Lighthouse Laboratory

20. As outlined in paragraphs 15 and 16 I was involved in discussions around the creation of a "centralised mega testing lab" in mid-March, and received a phone call on March 26th asking if I would be willing to travel to the lab site in Milton Keynes and help operate it. My first day in Milton Keynes was March 27th. I arrived at 9am alongside around 10 other people including Dr Joana Viana from University of Birmingham, Dr Maddy Searle from University of Oxford, and Dr James Whiteford from Queen Mary University of London. The lab was situated in the National Biosample centre on the edges of Milton Keynes [AM/16 - INQ000475105]. We were met by HR staff from the Biosample centre and staff from Deloitte who talked us through terms and conditions of working in the facility and then gave us a tour and Health and Safety induction. We were then met by two University of Oxford employees, Dr Mike Hill and Dr Stewart Moffatt, who had been on site for around 10 days to establish the testing lab with three members of their lab team from Oxford. We were shown the lab space that had been created which consisted of four distinct laboratories containing safety cabinets to

perform initial work with swabs, then nucleic acid extraction equipment, and then a separate room containing qPCR machines.

21. Dr Hill and Dr Moffat had done an excellent job creating standard operating procedures and a laboratory workflow. However, it was clear that none of the staff had any real experience working with viral samples so myself, Dr Viana, Dr Searle and Dr Whiteford took the lead in demonstrating to the staff there how to work safely with the swab samples and re-working the SOPs and workflows. At the end of the shift, we sat down with Dr Hill and Dr Moffat and worked through our proposed changes. I also suggested we should ask the APHA for staff as they are highly experienced in viral diagnostics lab work. We were informed that through social media, the Microbiology Society and Deloitte, there would be more volunteers with lab experience arriving each day to staff the lab, primarily from universities but also a team from the APHA led by a close friend of mine Dr Angus Best.

22. In those first few days of the MKLL's existence it could feel rather chaotic. We were testing samples, but to my knowledge these were samples that had been tested elsewhere then transported to us to allow us to develop our testing pipeline. Dr Hill, Dr Moffat and I created SOPs and training programs for new staff, and we started to create lab teams. My feeling is that when I arrived at MKLL no one there had any idea who I was or that I had been involved in my conversations with Prof Bell and others the previous week. However, Dr Hill quickly realised I was a senior and experienced microbiologist and suggested I was given the title of Infectious Disease lead. I was then involved in MKLL management meetings. The lab was under the leadership of Dr Tony Cox who was the CEO of the Biosample centre, with Dr Hill seeming to have control of lab operations. There was also a substantial team from Deloitte in the building who had taken over considerable office space and seemed to have complete operational control of the entire project including relaying questions and directives from DHSC and government to us, with one gentleman in particular (whose name I am afraid I cannot recall) running their team and seeming to have ultimate control over the project. At the time Dr Chris Molloy was stated to be director of the Lighthouse lab network, with other labs being created in Cheshire,

Glasgow, Belfast and Cambridge. I was never introduced to Dr Molloy nor spoke to him directly or encountered him in meetings. I saw him in the building on a small number of occasions where it was suggested to me, he was overseeing the creation of the network of labs.

23. On April 1st we had three teams established to operate shift patterns with all staff trained and signed off by me as competent, or in training supervised by a trained competent lab member. Our staff contained some Biosample centre staff but were mostly University researchers whose labs had been closed due to lockdown, or APHA staff who were seconded. We were given free accommodation in a Holiday Inn hotel in central Milton Keynes which was opened solely for MKLL workers, and food was delivered to the MKLL for us, with breakfast left at our hotel room door each morning. There was no mixing in the hotel and staff had use only of their rooms to avoid virus transmission. Some of the staff opted to take a contract through Reed employment agency to be paid, whilst others were still being paid by their employer so only took expenses incurred for travelling to MKLL. I was still being paid by University of Birmingham and so chose to work on a fully voluntary basis and did not seek compensation for any expenses either.

24. I was assigned the title of Infectious Disease Lead by Dr Hill, primarily for the lead role I took in the workflow development and staff training. My main role was as the lead of one of the now four established shift teams that were created to allow the lab to switch to 24 hours operation on April 28th. I led a team of 60 staff working two day shifts then two night shifts and then three days off. As team lead, I assigned staff to specific roles in the lab and oversaw the operation of the testing for the 12-hour shift, troubleshooting problems as they arose and ensuring the safe and efficient working of the lab. I would not say that this was the role I expected when I agreed to go to MKLL. Indeed, a specific role was never discussed when I was asked if I would be involved, I just wanted to help in any way I could as did all the scientists who volunteered to work at MKLL. Everyone was extremely driven by a sense of wanting to do something to help.

25. I have been quoted in the press as stating that "I have no idea why it was based there; it was not an obvious choice; they had no expertise in infectious disease

diagnostics". I stand by this statement. The National Biosample Centre is a facility for the storage and archiving of samples from clinical trials for future research use. It did not have a large suite of containment level two laboratories required for infectious disease testing, and until I arrived no one there had experience of working with live virus samples or performing viral PCR diagnostics. This is also my understanding of the other Lighthouse labs in Cheshire, Glasgow and Belfast, though the Cambridge lab was based in Astra Zeneca which I am informed was a fully equipped containment level 2 facility. I was always of the opinion that university and industry labs could have been used to scale up testing, as many of these can house 50 – 100 lab staff and all necessary equipment easily. There were also facilities such as the APHA in Weybridge, the Institute for Animal Health in Pirbright, the UKHSA (then PHE) lab facilities in Collindale and Porton Down, the National Institute for Biological Standards and Controls - NIBSC in Hertfordshire, and numerous other facilities with both the equipment and expertise to have been operational as Covid testing labs in a shorter time frame.

26. From March 27th to March 31st, we tested around 500 samples per day at MKLL. This period allowed us to establish a key team of lab staff, train everyone and become familiar and competent with the testing workflow. We were not given details of the nature of the samples we were testing but I was led to believe they had already been tested by an accredited lab and were residual samples for us to practice and train on. On April 1st we started to receive "real" samples which I was informed were coming from the walk-in test sites being established across the country. On that day we performed around 600 tests, and one week later we performed over 1200 tests per day. The capacity increased gradually daily as new automation platforms went live and the trained staff base grew such that we had 240 people allowing us to create four shift teams and move to 24-hour operations on April 28th, when we performed 28,000 tests in 24 hours. On the 3rd May we achieved what was at that time our operational maximum of 30,000 tests in 24 hours. The major advancement that allowed us to get to this number was the use of automated liquid handling platforms that performed the initial part of the testing process on the sample, removing a small amount of sample from the vial containing the swab and adding reagents to lyse cells and virus particles and

stabilise the viral nucleic acid so the PCR test can be conducted. The automated platform could process 90 samples in 10 minutes compared to 45 minutes by two people in a safety cabinet. This lab automation was the key skill set that the Biosample centre senior staff brought to the facility.

27. I had no input into how the testing capacity was utilised, and I have no knowledge of how that was determined, and I had no input into any modelling or planning for the increase in testing capacity we delivered. I was solely involved in operationalising the ramp up and delivering it through our shift teams. As a shift team we had very little knowledge of the origin of samples we were testing. Sometimes we would receive very specific delivery of samples such as the ONS study samples which Dr Hill would inform us of, or we would be informed By Dr Hill of samples coming from care homes as a priority in the pipeline. We also frequently received samples termed as "Randox samples". These were very unpopular in the lab as these samples came in a vial that was different to normal test site samples (I believe they were supplied by Randox to the testing system) which meant they could not be processed in the automated platforms but had to all be done manually. There were also suggestions that we were receiving the samples as the Randox lab was unable to run PCR tests at those times, but this was never confirmed. Often, we would receive these during night shifts and they would number in their thousands.

28. Once established MKLL ran a single PCR testing workflow. Samples were initially processed either manually by two people working in a microbiological safety cabinet, or on an automated liquid handling platform located within huge microbiological safety cabinets. The safety cabinets had been acquired from universities as part of the request letter sent by Prof Farrar through the Medical Schools council . The automated liquid handling platforms were acquired from the company Tecan, with the huge safety cabinets acquired by the MKLL team. Once the sample had been processed it was safe to remove from the safety cabinets and move to a workstation for nucleic acid extraction. This was performed on an automated machine made by the company ThermoFisher called a KingFisher. The lab had around 20 of these instruments all acquired from ThermoFisher who also supplied the reagents for this step.

Once the nucleic acid was extracted it was moved to another workstation where the PCR reactions were prepared in plastic 96 well plates using two automated liquid handling platforms acquired from Tecan. And finally, once prepared the plates were taken to a separate room containing around 100 qPCR machines, the vast majority of which had been provided upon request by universities. All samples were tracked using a Laboratory Information Management System (LIMS) that was in situ in MKLL. The pipeline was developed such that it worked with the ThermoFisher SARS-CoV-2 PCR diagnostic kit, which was fully validated and commercially available as an in vitro diagnostic test. No other PCR workflow was ever used in MKLL, and this workflow and assay was also implemented in the Lighthouse labs in Cheshire and Glasgow, with whom I collaborated in the early phase of the network to help them troubleshoot as they were setting up. The Astra Zeneca laboratory in Cambridge used their own assay, and the lab in Belfast was operated by Randox who also used their own assay. In May 2020 there was significant investment and research in MKLL to introduce a different type of PCR workflow called End-point PCR which was quicker and could be multiplexed to far greater levels than qPCR, but despite the investment and work conducted this was never implemented to my knowledge.

29. I worked in MKLL from March 27th to June 1st, 2020. I left in June because I felt the laboratory was now completely established and was running very smoothly and so no longer required my oversight. Additionally, cases of Covid were falling considerably and the lab was not running as many samples as in April, with some shifts often finishing early. The University was planning to re-open and in my leadership role there I felt it was important I was on campus. I was also physically and emotionally exhausted from the experience, many of our volunteers were leaving to be replaced by paid staff, and the atmosphere in the facility had gone from that of an exciting, vibrant and adrenalin fueled environment to a much more business-like facility. All these things combined in my decision to step away.

Other work relevant to TTI

30. In the first week of July 2020 I was contacted by Jason Goh, an employee of Deloitte. He wished to initiate a discussion about the feasibility of a Pillar 2 PCR

testing laboratory being established at University of Birmingham. I was invited to an online video conference call on July 29th, where I was shown very well-developed plans to expand the number of laboratories in the Lighthouse lab network, including a lab at University of Birmingham [AM/17 - INQ000582854; AM/18 - INQ000582855]. Through August the university drew up contracts with DHSC and equipment was procured to allow me to establish a small-scale replica of the MKLL workflow within our university laboratory. Together with Prof Alex Richter and numerous University professional services staff we created a UoB PCR testing facility. Our lab was referred to as a surge capacity laboratory and was established to run 3,800 samples per day routinely with an ability to flex to 5,000 tests per day in emergency. The laboratory went live on October 1st and operated using three shift teams to allow activity from 7am to 10pm 7 days a week. The laboratory was operational from October 1st, 2020, to March 31st, 2021, conducting around 0.5 million tests including 24-hour turnaround tests taken at the walk-in test centre on our university campus. We were notified of the decision to remove our laboratory from the network on February 26th 2021 via an online call and then a following email and letter from Prof Anna Dominiczak, the Director of Laboratories for Test and Trace [AM/19 - INQ000582856; AM/20 - INQ000582857]. We were never given a reason as to why our lab was dropped from the network.

31. Though only adding a tiny increase in capacity to the network, I believe the UoB laboratory provided an excellent example of what could be achieved by using University facilities and expertise. We were reporting results to members of the local Birmingham public within 24 hours of having a swab taken and then feeding positive samples to Professor Nick Loman's Covid Genomics UK laboratory in University of Birmingham, generating genome sequences of virus within 48-72 hours of swab being taken, meaning that local public health teams could act immediately on transmission events or localized outbreaks, and that variant tracking was closer to real-time. In comparison the genome sequence data generated at the Sanger Institute in Cambridge on Pillar 2 positive samples lagged by around 5-7 days due to transport logistics and sequencing logistics [AM/21 - INQ000582860]. As with MKLL our participation in the network and our operational effectiveness was completely managed by people from Deloitte.

Oversight of our laboratory quality and safety was provided by a project team at NHS England led by Prof Sue Hill. I was involved in weekly lab director video conference calls chaired by Prof Dominiczak. The gentleman from Deloitte who I felt had ultimate lead of the entire project at MKLL was also on those calls and similarly gave the impression he had overall control of the network project.

32. In November 2020 the Department for Education contacted all universities in England to request that they provide the capability to perform SARS-CoV-2 testing to all university students before leaving campus in December for the Christmas break. The rationale was that this would capture students with Covid and prevent them from travelling and transmitting the virus whilst travelling or to friends and family during the Christmas holidays. Given my experience with MKLL and the UoB laboratory I was asked by the university Vice Chancellor (Sir David Eastwood) if I could lead on this project at UoB along with an exceptional team of professional services colleagues from UoB. The guidance on Lateral flow tests in November 2020 was that the swab should be taken with supervision to ensure correct sampling, and the lateral flow test should be done by a trained competent person. As such we decided to set up an asymptomatic Lateral Flow testing facility on campus in our Great Hall. We created a booking facility containing around 40 booths surrounding a central working area where the tests would be conducted. This was staffed by university students who were trained and supervised by my own laboratory personnel, with the University paying them as causal workers. In the first two weeks of December, we conducted around 20,000 lateral flow tests on students and staff and continued to operate the facility until March 2021. I personally supervised the facility for the two weeks of operation in December 2020.

33. There was extremely heated debate on the roll out of lateral flow testing in the UK in late 2020. Given how busy I was with PCR testing I decided not to get involved in those debates, but it was clear there was uncertainty about how effective they were and how robustly they had been validated and tested prior to their implementation for educational site testing in December 2020. Given the unique opportunity I believed we had with both a lateral flow test site and Pillar 2 PCR laboratory on the University of Birmingham campus, I took it upon myself to

design a simple study where we would PCR confirm every positive LFD, and PCR test 90 randomly selected negative lateral flow tests per day to compare their efficacy. I reached out to Prof Susan Hopkins at PHE and Prof Christophe Fraser of University of Oxford (a friend and colleague advising on test and trace) to inform them I was going to do this, to which both showed enthusiasm. I made our data publicly available immediately, showing that the lateral flows worked well and worked to a level where they would capture all cases of infection likely to be transmissible, and this was published in the journal PLOS Biology [AM/22 - INQ000582832]. I strongly believe that lateral flow tests made a huge contribution to our management of Covid from January 2021 onwards. Being able to self-test at home for infection undoubtedly interrupted chains of transmission. Their implementation was and still is a matter of heated debate, but I made my opinion on how best to use them clear in an opinion piece for the New York Times as the USA began to adopt their use [AM/23 - INQ000582833].

Robustness and efficacy

34. I am very proud of my involvement in establishing the MKLL, and in the process leading the way for the other Lighthouse lab network laboratories. However, I do believe they came online too late to affect the 1st wave of the pandemic in February/March 2020. By the time we got up to full operating capacity of 30k tests per day at MKLL at the end of April, cases and as result demand for tests was falling. I and all the colleagues I spoke to were convinced by late January 2020 that there was going to be a pandemic, and it was also clear we were not equipped to provide mass scale testing in the public health lab system that was running at that time. There was a missed opportunity in January and February to develop a testing plan.

35. Despite the delay in creating a testing strategy, once a small number of centralised mega labs was decided, I firmly believe that the speed with which we delivered these was staggering. It required a herculean effort by very many people and pragmatism with regards to the ways in which infectious disease testing is done and who does it, but I consider it to have been successful. The turnaround time for tests to be conducted and the result reported was also very

good in my opinion. In all my involvement at both MKLL and the UoB lab, turnaround time was the number one priority of the Deloitte consultants. The part of that turnaround time that we could control was from receipt of the sample to reporting the result and that was always within 24 hours in my experience. The delay was always with the transportation of the samples from the walk-in test sites to the laboratories, which was most commonly via Royal Mail delivery trucks. I do not have any data on what the average time from swab to result was for the public, and if this differed between the public and specific groups such as health care workers. I can say that every swab that came to MKLL and the UoB lab was processed the exact same way with no priorities given to any specific set of samples unless explicitly requested through Dr Hill as happened on a handful of occasions at MKLL with ONS study samples and some care home samples.

36. The narrative that was created around the Lighthouse lab network was that it was a triumph of the private sector working in cooperation with government. This provoked frustration in me as the enormous role played by higher education was often overlooked. Of course, the private sector was pivotal with companies such as Tecan and ThermoFisher putting huge resource and focus into the testing infrastructure and capacity, but also to their financial benefit. What is overlooked is that MKLL, and the labs in Cheshire, Glasgow, and Belfast were all established with equipment belonging to universities and were all staffed by university researchers or seconded civil service laboratory staff, with many such as myself taking leading roles in the process. In my opinion the most confusing and frustrating involvement was the reliance on a large number of Deloitte consultants to project manage the Lighthouse labs. As they had no expertise in laboratory work, infectious disease or diagnostics I often found myself having to spend lots of time explaining concepts and facts to the consultants and having to set realistic expectations of what was feasible again and again. I do see the importance of having exceptional and experienced project managers for such a complex and important project as the Lighthouse lab network but did not see the need for the number of consultants I encountered in my time in the network. As an example of how I was often not impressed by their project management, on April 2nd there was a sudden realisation at MKLL that we did not have the logistics expertise to supply the lab with the consumables and reagents needed

to conduct tens of thousands of PCR tests every day, despite the number of consultants on site and their responsibility for planning. One of the consultants (whose name I cannot recall) had joined Deloitte from the military and reached out to contacts, and on April 3rd troops from the Royal Army Logistics Corps arrived on site setting up an industrial warehouse of consumables and reagents, making inventories and taking complete control of stock. Their involvement was transformational to MKLL and testing would have quickly ground to a halt without their logistics expertise.

37. There is no doubt that establishing a small number of centralized mega labs made logistics of testing easier, with everything required to do PCR testing focused on delivery to a small number of key sites. And I am very proud of what was achieved at MKLL. However, I do still believe that the existing expertise and infrastructure around microbiology laboratories and diagnostic and PCR capability was not utilised. Universities were plundered for equipment and staff rather than keep them in situ with the involvement of the exceptional microbiology experts we have in the UK to oversee them. By the end of 2021 UoB was the only university to successfully establish a Pillar 2 Covid PCR testing lab providing testing to the network. Other universities including Liverpool, Nottingham, Oxford, and Cambridge established labs to test students and staff, and help with hospital testing. But local labs were never mobilized to help with testing efforts.

38. An obstacle stated to such a local lab system is the complexity of data sharing and sharing of patient information. In all my involvement in the network I never had any access to any information on people whose samples were being tested. We had a unique sample identifier number which was used to track a sample through the testing process and to report the result. This very simple data set of sample number and result was then uploaded regularly to a data upload portal. That was my only involvement with any such data. Another obstacle to lots of local labs is continuity of quality of testing. However, the ThermoFisher test was validated and approved as an in vitro diagnostic test with appropriate controls included to monitor performance of the test. During my time in the network, we scrutinised every PCR run to ensure that the test had worked to the level expected and any tests not performing perfectly were re-tested. Data was also

scrutinised by NHS England experts to ensure the quality of the testing provision. I have no documentary evidence to this point, but the Immensa lab scandal of 2021 where tens of thousands of incorrect test results were given to the public suggests this process was not happening to the same level after March 2021 [AM/24 - INQ000582834; AM/25 - INQ000582835].

Compliance

39. My recollection of the guidance for having access to a PCR test from April 2020 onwards was that it was solely for people showing symptoms of SARS-CoV-2 infection. Given that the highest positivity rate ever reached at MKLL was around 30% of samples, and that a more usual positivity rate was around 10%, and that this was outside of normal respiratory infection season, it seems highly likely that many were seeking tests for reassurance as opposed to having Covid symptoms. Given how busy I was in MKLL and working night shifts I was rather oblivious to much of the messaging to the public at that time. I and many of my colleagues at MKLL and across the university landscape were frustrated at the constant rhetoric around the testing infrastructure we had created of being "world beating" and being driven by target numbers of 100K tests per day, then 250k tests per day, and then 0.5M tests per day. It was frustrating as it drove the focus on what we had created into a numbers competition rather than strategising the incredible testing capacity we had created to ensure maximum benefit in containing the pandemic in the UK.

Lessons for the future

40. I have not been involved in or contributed to any lessons learned exercises conducted by any organisation with regards to SARS-CoV-2 testing in the UK. The only outlet I have given any thought to lessons learned to was an interview published in the Independent in June 2020 as to the early stages of ramping up Covid testing [AM/12 - INQ000582828]. I am willing to share my own reflections on the adequacy and efficacy of SARS-CoV-2 testing in the following paragraphs.

41. I believe that the national testing strategy, once launched, was well considered and designed and effective at providing a fast definitive SARS-CoV-2 test result to members of the public believing to have symptoms of Covid. Many commentators external to the testing program have been heavily critical of the lighthouse lab network in its early days [AM/26 - INQ000582827]. I very strongly disagree with this assertion and am incredibly proud of the hard work we as volunteers put in to creating a remarkable infectious disease testing infrastructure the likes of which had never been done before in the UK, and in a matter of weeks [AM/27 - INQ000582861]. By the end of April 2020 effectively anyone who wanted a PCR test for SARS-CoV-2 could walk or drive to a test site and have a PCR test conducted and the result messaged to them within 48 hours. My frustration is at the delay in deciding as to how testing was going to be scaled up, and if that decision had been made in February, we could have possibly slowed the growth of the 1st wave of Covid in early 2020. I do believe that university, research institute and industry labs could have been stood up in February and March to increase capacity whilst the Lighthouse labs were established.

42. Regarding the actual testing strategy. I think this started out well with the ability for anyone to obtain a gold standard PCR test for SARS-CoV-2. However, the focus on capacity of numbers of tests available I believe led to a complacency in our testing strategy. I felt that a decision had been taken that with 0.5M tests per day available there was no need to consider testing capacity and strategy, something I disagreed with. It was clear to me that as schools and universities returned in September 2020 there would be a surge in cases and testing demand [AM/28 - INQ000582837]. I had also commented on the possibility of using pooled testing in education settings as one example of a way of performing increased numbers of tests without putting undue strain on testing capacity [AM/13 - INQ000582829]. When I rejoined the network from September 2020 as director of the UoB testing lab these were points I also tried to raise at the lab directors weekly meeting chaired by Prof Dominiczak, but it was clear this meeting was solely a lab operation meeting and not for discussion of testing policy and strategy.

43. The decision to split the UK testing strategy into pillars was one I believe to have been very sensible and something to be kept for future pandemic planning. By splitting clinical setting testing and community testing it created the head space for hospital laboratories to focus on patient and later staff testing whilst the community testing was funneled through pillar 2 and the lighthouse lab network. I believe this is a key lesson learned and should be retained in UK pandemic planning.

44. Community testing was largely through pillar 2 testing, then followed by a move to Lateral flow tests for members of the public. I believe both were successful, with the obvious caveat of issues which arose with Pilar 2 testing as outlined in this statement. Pillar 4 of the testing program was I believe vital in our understanding and planning during the pandemic. This was primarily the Office for National Statistics surveillance program. These tests were largely conducted in the Lighthouse labs, but this was the only statistically modelled and designed point prevalence survey for SARS-CoV-2 in the UK and was the single best source of information on the dynamics of the pandemic in the UK. It is essential we can quickly step up such programs rapidly in the UK in the face of new epidemic threats.

45. On September 2nd 2020 the Secretary of State for Health and Social Care announced a range of new testing initiatives under the umbrella of a "Moonshot project" with £500M earmarked in the initial phase of a £100 Billion investment [AM/29 - INQ000582839]. I have made my opinion of operation Moonshot very clear in an opinion piece for the BMJ [AM/30 - INQ000582841]. In summary, I believe it was ill advised, ill thought out, under powered and I believe an enormous waste of money, which I argued would have been better used to scale up more small labs as testing labs as was happening at UoB under my directorship. I believe time has proven me to be correct on my opinions on operation moonshot, with not a single initiative supported by the project having any impact on testing infrastructure or capacity during the pandemic or since.

46. I believe Moonshot is just one example of the complete lack of careful planning and strategising around SARS-CoV-2 testing, and indeed future infectious disease testing in the UK. Another project which was launched with fanfare, but

to much scepticism from diagnostics experts was the investment in LAMPore technology [AM/31 - INQ000582842]. Despite significant investment and implementation into clinical settings this technology had no significant impact on testing infrastructure or capacity UK wide. I also know of one instance at University Hospitals Birmingham NHS Trust where DHSC committed investment to the clinical microbiology laboratories in the Queen Elizabeth Hospital to install and run a fully automated ThermoFisher PCR testing platform. This happened at the same time as our UoB lab was being implemented as part of the network and involved the same team of Deloitte consultants. The machine was purchased, labs were refurbished and the platform installed on site at the Queen Elizabeth Hospital but never ran a single test.

47. As mentioned in paragraph 28 significant investment was made to introduce an alternative PCR testing system called end-point PCR at MKLL, including equipment and reagents to establish and validate. But the technique was never implemented. One final example of a lack of clear thought and strategy was the decision to create the Rosalind Franklin testing laboratory in Leamington Spa [AM/32- INQ000582843]. This was established at the same time as the expansion of the Lighthouse network and the creation of the UoB lab, and there was a call for universities to staff the lab as had been done for MKLL and others. The Leamington spa lab never made a significant contribution to UK testing capacity or infrastructure and was mothballed and then sold [AM/33 - INQ000582844].

48. In general, I believe the response to Covid testing was a success. However thee response to Covid testing was also littered with poorly thought through mistakes. The creation of non-clinical, high-quality labs for molecular testing of infectious disease was a first in the UK and was a success in my opinion. But there was muddled thinking by policy decision makers around testing strategy and initiatives that I believe led to multiple streams of overlapping activity and no clear strategy for test capacity utilisation informed by modelling and expert opinion. Whilst there are or were SAGE sub-committees for modeling (SPI-M) and respiratory infection (NERVTAG), to my knowledge there was no such sub-committee for testing methodology and utilisation strategy which could go some way to explaining the

many mistakes made around testing. I and colleagues always felt that testing in the UK was seen simply as a numbers game to appease criticism and the public desire for testing, rather than a scientifically strategised weapon in the nation's toolkit to manage the pandemic.

49. With the benefit of hindsight there are a number of things I believe could have been done differently with regards to testing, which I will list below.

a. I believe there should be a SAGE type committee focused on infectious disease testing, transparently appointed based on diverse skill sets which can be immediately convened in response to a new emerging infectious disease threat. Working closely with UKHSA, NHS England and Universities UK this committee could provide detailed thought, modelling and planning as to how testing could be conducted, expanded, and strategically employed. Having such a committee would have expedited the decision to create new testing labs during the Covid pandemic

b. I believe that university, research institute and commercial labs could have been deployed sooner to provide an expansion of testing in February or March. This would have been a quicker expansion of testing and would have created a less stressful environment in which to establish the necessary scale of the Lighthouse labs.

c. I do not believe that the large number of Deloitte consultants were required to run and manage the network. I do see a place for experienced project managers, but they were often trying to make decisions on complex technical lab matters for which they were not qualified which would often get in the way of operation. UKHSA and NHS, as well as commercial and government institute facilities have a wealth of experienced lab and operational management personnel who could have taken this role in my opinion.

d. I believe there were more suitable alternative sites for the Lighthouse labs which had some experience of handling infectious material and experience of large laboratory workflows. This could have allowed a more rapid implementation.

e. In the summer of 2020, there could have been a taskforce similar to the one suggested in comment **49a** established to create a strategy for best

use of testing capacity and additional resource available to testing. This could have maximized the impact of our testing infrastructure on management of the growth of the second wave of the pandemic almost certain to occur in Autumn 2020 and beyond.

f. The choice of new lab providers into the Lighthouse network from March 2021 and the level of scrutiny and oversight applied to those labs from March 2021 was clearly not up to standard (as evidenced by the Immensa scandal [AM/34 - INQ000582845]) and there should have been a transparent selection process as to how existing labs were removed and new labs recruited into the network.

50. In a similar vein there are lessons I consider could be learned for future diagnostic testing in the event of a pandemic, which I will list below.

a. Clinical and public health microbiology laboratories are not sufficiently resourced to implement a significant increase in testing capacity for an emerging infectious disease episode. Rather than attempt to stretch the available capacity there needs to be a clear mechanism to switch to an emergency plan for testing. The model utilizsd in Germany and South Korea of academic and commercial labs being funded to be accredited as emergency utilisation testing labs able to scale up rapidly with support should be fully analysed at a logistical and economic level to determine if this is an approach we should pursue in the UK.

b. That emergency plan must be ready to operationalise in around two weeks or it is possible the increase in capacity will be too late to allow meaningful impact on managing the emerging infectious disease.

c. An existing database of transparently selected personnel who can be seconded to support emergency testing plans should be in place and constantly reviewed and updated. This would alleviate finding willing volunteers and ensure that the very best and most skilled people possible were ready and willing to help.

d. There should be expert scientific input from UKHSA, NHS, Universities and research institutes, and commercial accredited lab providers into how to implement and then strategically use testing capacity during an

emerging infectious disease episode. We should use the outstanding expertise in the country to guide how testing is done.

e. There should be a full evaluation of the potential benefit gained from experiences such as the University of Birmingham where there was a small-scale pillar 2 testing lab joined to a COG-UK genome sequencing hub, providing testing to local walk-in test sites and joined to local public health officials, compared to the benefit of centralised testing, sequencing and analysis of data. This is the only way to scientifically determine what is the most economically and public health impact beneficial way of scaling up testing in a pandemic. Without such an evaluation the argument of small local labs versus centralised mega labs will never be resolved.

f. Lateral flow tests can be a hugely impactful community testing methodology for a pandemic pathogen allowing large scale democratised testing. It is important that their use and interpretation is nuanced and well communicated to the public with respect to what a negative test does and importantly does not mean. The UK should have the expertise and capacity to develop and design new tests for new emerging pathogens rapidly and then produce tests at scale rapidly. Community rapid tests combined with targeted PCR tests early in a pandemic could have huge potential to control transmission and growth of a pandemic.

g. A lack of transparency on decision making, of rationale for decisions made, and of data around test performance and levels of validation, results in criticism from experts and creates an environment where it is easy to instill doubt and fear on whether testing is up to scratch. This could be reflected upon for future pandemic communications around tests and their utility and fitness for purpose.

51. There are a number of developments that happened regarding testing in response to the pandemic that I would like to see retained. I will list them below.

a. The testing response to the pandemic saw for the first time in the UK a move away from a very rigid belief that all infectious disease testing must be done in accredited and validated laboratories, primarily NHS clinical

laboratories. Infectious disease testing was democratised by the introduction of lateral flow tests, and I believe this could revolutionise infection diagnostics if we allow it to. Clinical microbiology laboratories are burdened by having to perform diagnostic tests which have been ordered but are not necessary and are negative for pathogens. Having a more point of care triage test could ease the burden on clinical labs allowing them to focus on real infections. One could envisage this being done at pharmacies or general practices and could be done for urinary, respiratory or gastrointestinal infections to triage serious infections from non-urgent cases. Thought needs to be given as to the clinical decision making around a positive test for an infection, but I believe the UK now has an opportunity to revolutionise how infection diagnostics are conducted and should explore this fully.

b. I would have absolutely liked to have seen the UK retain some of the Lighthouse laboratory capacity, either in a scaled down way or in some sort of mothballed but fully maintained facility. Sadly, this has not happened, with all the labs fully decommissioned and staff moving on to other jobs, and equipment sold off. What this means is that if a SARS-CoV-3 were to happen in Winter 2025 we would be in exactly the same position we were in Winter 2019 and 2020 with respect to testing. We currently have no mechanism to rapidly scale infection testing and would be relying once again on the good will of scientists willing to volunteer their expertise and experience from 2020. I fear many are tired and disillusioned from that experience. With specific reference to the ability to provide diagnostic testing I am genuinely fearful of another pandemic in the near future.

c. In my opinion the facility we established in Birmingham with support from the government had true transformational potential, linking diagnosis to full genome sequence typing and local public health in real time. I would like to see this model retained, tested and fully examined for its economic and public health benefits to be scientifically determined. This could be done in a small number of sites with the existing capability and could act as sentinel surveillance sites for emerging high consequence infectious diseases as well as testing scale up sites. This could be an academic,

UKHSA and NHS collaborative venture to provide the expertise and head space and capacity to deliver it.

d. The pandemic brought infectious disease diagnostics and genomics to the forefront of public attention, with huge investment in deploying molecular and rapid diagnostics and genome sequencing typing for infectious disease epidemiology. It was a startling example of the power of these methods in managing and tracking infectious diseases. I would love to see this momentum maintained now and extended to other pressing infectious disease issues such as antimicrobial resistance, funding both research and development as well as collaborative functional surveillance, point prevalence and epidemiology programs for the most important infectious diseases. Such programs have a significant cost and resource implications, but this is likely far outweighed by the costs incurred by not having them when a major epidemic or pandemic strikes. A full health economic benefit analysis could be conducted to scientifically determine the cost benefits.

Further relevant information

52. There is one other piece of information I would like to share relevant to module 7. This relates to how easily misinformation around the use of PCR testing was created and spread. PCR testing has been the gold standard diagnostic test for viral infections for decades, and there is an enormous body of literature to corroborate this. However, it was extremely easy for concerted campaigns to emerge on social media calling into question the accuracy, and the reliability of PCR tests to diagnose SARS-CoV-2. Scientifically this is a nonsense argument but the extent to which this misinformation was amplified was alarming and led to claims of “casedemics”, backed by prominent academics to the surprise of most of the scientific community. As a prominent figure in PCR testing, I took it upon myself to combat this misinformation, often resulting in baseless and libelous accusations I was on the payroll of large PCR companies, and on occasions resulting in threats of intimidation and violence against me and my family. Prior to the pandemic it is hard to imagine such discourse going unchallenged by social media providers and health authorities, but I often felt very alone in combatting

this misinformation (other than excellent support from the University of Birmingham). Perhaps authorities considered this misinformation as background noise, but I felt then and still do now that accurate expert information to the public that PCR testing is a standard infection diagnostic test that is highly accurate and effective was vitally important in convincing the public to engage with what was an entirely new way to undertake infectious disease testing.

Statement of Truth

I believe that the facts stated in this witness statement are true. I understand that proceedings may be brought against anyone who makes, or causes to be made, a false statement in a document verified by a statement of truth without an honest belief of its truth.

Signed: Personal Data

Dated: 27/03/2025