Witness Name: Sir John Bell

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Exhibits:

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UK COVID-19 INQUIRY

WITNESS STATEMENT OF SIR JOHN BELL

I, Sir John Bell, will say as follows: -

1. I was extensively involved in the testing programme that emerged during the Covid pandemic at multiple levels. My involvement arose in part because, as Life-Sciences Champion I was close to Government Ministers and Civil Servants and it was recognised that I had substantial expertise in the field of in vitro-diagnostics and pathogen testing, in part because I had previously been a non-executive board member of Roche AG, the world's largest in vitro diagnostics company, and had a background in immunology and genetics.
2. The importance of testing as a key element of any country's response to an infectious outbreak or pandemic has been well documented and was the subject of many public announcements made in the first few months of 2020. Without the ability to detect and identify individuals infected with the pathogen many public health measures and certainly all those associated with the TTI programme could not possibility be successful. The tools available for pathogen detection provide information about different analytes and provide different information which can be used to manage such a healthcare crisis. Understanding where they can be used and how best to apply them to get maximum benefit is a complex process and one that inevitably needs to evolve as data is generated over the course of the pandemic.
3. At the beginning of the pandemic, the publication of the sequence of the SARS CoV-19 virus by George Gao and his colleagues at China CDC permitted the rapid development of the primers necessary to identify the pathogen using the polymerase chain reaction (PCR) This provided a diagnostic tool which was likely to be both highly sensitive and highly specific to enable testing to begin almost immediately. Although, PCR turned out not to be the perfect test it was one of the best available at the beginning of the pandemic. However getting it to work at scale, and to be used effectively in the pandemic response still proved to be challenging.
4. I was involved in meetings in March brought together by No10 to discuss the implementation of PCR in the NHS and Public Health England labs. I cannot remember precisely who else was in these meetings but Will Warr, the No 10 Health Special Advisor, and Jeremy Farrar as well as Deputy CMOs were at

these meeting which were held by video link. The purpose of these meetings was to establish the scale of NHS testing for the virus and to try and accelerate the implementation of PCR testing.

5. At our first meeting it was reported that there were very few PCR tests for Covid 19 being done across the NHS. As I recall they were in low single digit thousands per day (approximately 5000) which was substantially below what would be required if one was to screen even symptomatic individuals across the country. In the absence of much more testing the likelihood of containing the pandemic was very low. After the first meeting we agreed to track the progression of testing in the NHS and PHE to see whether it was scaling at a rapid rate but we acquired several more data points which showed that testing capacity was falling, not rising, from a very low base and it was clear that we had a fundamental problem.
6. What became clear over the next few weeks was that the NHS was totally unprepared for the complexity and scale of generating high through-put PCR tests for Covid 19. Many of the clinical labs in the NHS do not run on commercial proven, validated, tests but instead they have their own 'home brew' which is a form of lab-developed tests where their reagents are put together in each lab. The problem with this approach in these circumstances was that there is very little systematic quality control, there was a serious problem with the supply chains for the various reagents that need to put together for a test. These reagents were rapidly being purchased and utilised around the world and were no longer accessible to your average NHS lab. The possibility of scaling through automation and high throughput was a completely unavailable in NHS laboratories. With a few verbal reports of why testing capacity was not growing it became clear that there needed to be a new strategy to establish and expand PCR rapidly as it was clear there would be a major wave of infections emerging across the country in very short order.
7. Within the first week I suggested to the group that what we needed to do was to identify testing centres that could be automated and expanded rapidly to undertake high throughput PCR testing, unconstrained by the limitations of small cottage industry-like NHS facilities. As it happened I was aware of a facility in Milton Keynes which had been funded by NIHR, through Oxford University, as a facility to store samples from large epidemiological cohorts. This centre was referred to as the Biocentre and was run by a very capable board chaired by Peter Weissberg and run by Dr Tony Cox, the CEO. This building, if converted properly, could have the capacity to run tens of thousands of tests a day in an automated fashion. Similarly I was aware, through Dr Chris Malloy, of capacity in Manchester adjacent to one of the catapult centres which could also take the development of large scale PCR testing capability and I assumed that the Scots would also be able to find such capability which ultimately they did with Professor Anna Dominiczak in Glasgow. I set up meetings with Chris and Tony and we got going.
8. The argument was placed that this might be better done as a widely distributed set of PCR machines (the small boat theory) but I, and others, argued that if you wanted to collect the data systematically, automate for high throughput and ensure that the testing machinery was properly supported it would be better to have a smaller number of very large automated centres than a multiplicity of individual machines widely distributed unconnected and uncontrolled. The committee broadly agreed with that view. During the course of that first week, in my role as Life-Sciences Champion, I received a call from the head of the

Thermo Fisher commercial team in the UK, Claire Wallace. She called me because she was having difficulty contacting PHE and had been trying to reach through to get the attention of NHS leadership. A few companies had developed commercial PCR tests and had them approved by the regulators. Roche was another company with an approved test but was having serious problems with supply and manufacture of tests. Thermo Fisher was one such company and Clare said to me that she felt that they had sufficient supply of these tests that they could help support the role-out of a large capability in the UK but didn't know who to talk to to land that idea. I immediately asked what scale they could reach and the answer was 100,000 tests a day scaling to 200,000 a day in a relatively short time frame. Knowing that there was a serious shortage of tests and testing in the UK I immediately thought this could be an answer to building out substantial testing capacity and so with permission of Ministers I contacted Kristin McLeod who had been the Head of the Office of Life-Sciences with whom I had worked very closely as my role as Life-Sciences Champion. Kristin was a Civil Servant who could actually get things done and hence I thought she would be a very safe pair of hands to think about how we could roll this programme out and I contacted the leads of the Centres I thought could act in what would ultimately be the Lighthouse Lab network. There was enthusiasm to contribute by all those parties and we began thinking about how we could equip them with the necessary RNA extraction and PCR machine that would allow them to do this at scale. Obviously all the available new PCR machines had been soaked up by multiple countries trying to buy PCR machines but it was well-recognised that there were a large number of PCR machines around academic centres and institutes around the country and as a result we decided to contact the MoD to see whether they would go and obtain as many machines as they could to consolidate them in these Centres. Thermo Fisher was the major manufacturer of those machines and knew exactly where they were but was also able to provide, in these centralised facilities, support for these machines to ensure they continued to run at scale through the pandemic. Thermo Fisher was also completely aligned with the view that large centralised facilities were the only way to keep these machines running at full capacity and properly supported and was willing to work extremely hard to make sure the flow of reagents and tests we needed was forthcoming.

9. Kirsten McLeod did a spectacular job lining up the capabilities we needed, getting sign-off of the necessary procurement paperwork we needed in Government and we managed to get moving very quickly to establish facilities particularly in the Milton Keynes Biocentre facility. This was the exemplar for the rest of the country and turned out to be an exemplar for the rest of the world.
10. It became clear early on that we needed to manage three things carefully, One is the swabs would be delivered to these Lighthouse Labs would be carrying infectious particles and as a result they needed to be handled with an appropriate level of PPE, secondly we needed to start to introduce automation in a way to allow these to flow successfully and to scale appropriately. Thirdly, we needed to develop a system whereby people would be swabbed and the samples moved immediately for analysis, data captured and returned both to individuals but also to the healthcare system so we knew who was infected.
11. All these aspects of the development of the Lighthouse Labs were carried out with remarkable speed and precision. Volunteers poured in from local communities to man the labs. Kirsten McLeod was heavily involved in developing the drive-through centres that allowed individuals to come and be swabbed and

those swabs to be delivered to the Lighthouse Labs. I recruited some industry-experienced automation engineers to help with the automation and there was a full refit of the labs in Milton Keynes to report these activities. By this stage the testing taskforce under Matt Hancock was in-play and we got help from a number of other entities in particular Boots and Amazon.

12. The creation of the Lighthouse Labs was a break-thought moment for scaling testing in the UK and the target was immediately set of trying to achieve 100,00 tests a day by the end of April. Matt Hancock chaired the testing taskforce which oversaw progress towards that target and once the challenges of automation and sample-flow were solved the progress was steady and continued well after the end of April. Further developments in PCR testing occurred with additional sites particularly one based at the AstraZeneca site in Cambridge but also the introduction of a different type of PCR reaction called 'end point' PCR which allowed very high throughput PCR to occur based on reels. That was developed and implemented as part of the Rosalind Franklin Centre in the midlands as the numbers of tests continued to scale.
13. An important feature of PCR testing was its exquisite sensitivity for the RNA produced by the virus and its specificity which is defined by the oligonucleotides that drive the PCR reaction. What became clear over time however was that false negatives could occur largely due I suspect due to sampling error and that we also came to recognise that RNA could be found present in the nasopharynx long after the disease had passed. The presence of RNA was therefore the metric against which PCR was judged rather than other phenotypes such as infectiousness or the presence of active disease. This is important when I discuss the role of lateral flow tests in this setting.
14. The introduction of large-scale PCR testing capabilities and the sample logistics was a major effort but one that the UK pulled off with remarkable success over a very short period of time. Large numbers of people were involved in that but those running the Lighthouse Labs deserve enormous credit for making that work and scaling it. The success was such that other counties, such as Australia, did over time decide to develop a similar methodology for large-scale testing. The exercise also demonstrated that the NHS was not really equipped to deal with this kind of health crisis and the widely distributed cottage-industry 'home brew' enabled laboratory infrastructure within the NHS was really not suitable to deal with this type of problem removing, moving testing to an independent structure got the UK out of very serious trouble.

Serological testing

15. Shortly after PCR problem had begun to be resolved, the question was asked how individuals who had been exposed to the virus could be detected based on the presence of Covid antibodies in their serum. There are two types of serological test: one is based on a lateral flow design – portable, easy to used, based on a finger-prick of blood – and the other is large scale ELISA tests made by the big manufacturers Roche, Siemens, Abbott, Thermo Fisher. The ability of these tests to detect the presence of antibodies is highly dependent on the quality of antigen which is used as the target for these tests as well as the underlying format that is used for the test itself. When it became a possibility that we could identify people using serological tests and potentially provide them with assurance that they had immunity and could go back to work or operate

normally, there was a considerable interest in trying to find tests that had the right sensitivity and specificity that could be used in that context. In addition the use of serology was a crucial piece of the necessary toolkit for tracking the progress of the pandemic, how many people had been infected, at what pace had they been infected, how were those infections distributed across the population. Early on in the pandemic a group at Harwell in the Diamond Synchrotron who have expertise in protein expression and structure had undertaken to create a recombinant protein of the Spike protein. Their protein accurately reflected the native protein antigen that neutralising antibodies would target. Professor David Stuart led that team and recognised that we might provide access to this recombinant antigen for the development of tests. This led to the creation of a large format ELISA assay that could assess very large numbers of serological samples at scale. This ultimately was partnered with Thermo Fisher. Its sensitivity and specificity was excellent and indeed the head-to-head study which was published showed that the Roche product and this ELISA were the two most sensitive and specific of the tests that were available. This test was made available for the Covid Infection Study run by Sarah Walker and was used extensively in that context until the end of the pandemic.

16. The idea that lateral flow tests might also be used for this was also emerging. Lord Bethell, who was Minister of Health and who I was working with closely, suggested that we set up a 'skunk works' group of scientists who could start to evaluate the available lateral flow tests. From very early on in April there were a flood of lateral flow tests purporting to provide serological data to detect the presence of Covid 19 antibodies. Their validation data came largely from very sick people who had been in hospital and as a result had very high titers antibodies and there seemed to be very little good data available on the effectiveness of these tests at low titre. Matt Hancock and James Bethell wanted us to set up a small group to look and evaluate these tests to see if any of them would be available for use in the population. This led to a variety of rather dubious products being presented to us. It became known that we were doing evaluations of these tests and we had phone calls from a whole range of different entities all of whom wanted their test to be evaluated, some appearing with plastic bags, leaving them on the doorstep to be looked at. Almost all of these had rather dubious provenance.
17. In order to do these tests properly we first of all needed sera from people who had ideally been infected 28 days before. We sent one of the training fellows from Oxford on road trips to try and bleed people who had disease in the earliest clusters of disease in late February. They were obviously not able to be bled until mid-March and as a result we accumulated one of the first and most robust sets of sera from people who had been infected with a wide range of serological activity that could be tested against these devices. The results that emerged indicated that none of the tests performed well and I published a blog (Trouble in Testing Land) which suggested that these tests were not worth pursuing given their limited positive predictive or negative predictive value.
18. We were being inundated with people with and we set up a serological testing evaluation forum where we could test and evaluate a limited number of lateral flow tests on the back of evidence provided by the suppliers on the quality of the antigen used in the test and any data they had to support their utility. This was run by Civil Servants and I chaired the committee and we had a range of people involved from PHE and DHSC in helping to deliberate on which tests would be progressed. None of them performed well and as a result we set off to try and

see whether by using the highly purified antigen from David Stuart's lab we could create a better lateral flow test ourselves in a relatively short time frame and engaged Abingdon Health, a lateral flow manufacturer, to see if they would be prepared to do so. They did so remarkably quickly and in the summer had produced a very good test that was ultimately never used.

19. All this discussion came to a relatively rapid halt when it became clear that a previous infection with the virus did not necessarily protect you from future viral infections with the virus. This was a really fundamental question that challenged the utility of having the serological tests. As a result we paused this programme and Susan Hopkins at PHE established a trial called the Siren Study which was set up to determine whether people who had had the infection with samples required from hospitals actually went on to develop a second infection. The results of that study which came out 6 months later suggested that previous infection was good but not a perfect protection against subsequent infections. Protection was certainly not durable.
20. On a sero-epidemiological level the large-scale ELISA platforms became increasingly viable as the antigens improved and tests began to be used test levels of seropositivity in the population. The first observation showed that very few people appeared to have been infected even after several months of the pandemic. The numbers were very low in the order of 5% and then growing to 15-20% over months. There was a real interest in trying to validate these large scale tests in different populations and the NHS activated its ELISA machines and was funded to undertake a large number of serological tests across multiple hospital sites. That data was, to my knowledge, never assembled because there was no way within the NHS of consolidating the data amongst multiple sites hence this proved largely a waste of time.
21. Interestingly, serological data was to be increasingly important over time as we started to plot the distribution of the pandemic and its impact on populations. Most notable of these outcomes was work by the Gates Foundation which had sampling from large numbers of people in the big Africa urban centres who showed long before there were any substantial vaccination programmes in Africa that 70-80% of the African populations in the major cities had already been exposed to the virus. This data was important in that it revealed that, on the whole, Africans were getting along and developing their own immunological protection simply from exposure to the virus rather than vaccines and the apparently low mortality in that population was an ascertainment issue and may have been due to fact that this was a younger and fitter population.
22. In the same way that Kristen McLeod led the development of the Lighthouse Labs and the PCR testing, Tamsin Berry who had succeeded Kristin at the Office of Life-Sciences, but returned to help us develop serological testing at scale and to work with Dr Derek Crook, Dr Tim Peto and myself in thinking about lateral flow testing for serology and antigen testing. Like Kristin, she did an outstanding job in keeping Ministers informed, ensuring that decisions were taken within appropriate Civil Service guidelines so working tirelessly to ensure that the programme continued to progress throughout the first year of the pandemic. Her relationships with industry proved to be extremely helpful and she helped guide Abingdon Health creation of a new lateral flow test but she also enabled the production of high quality antigen from commercial partners like GSK and interfaced with AstraZeneca testing team.

Antigen lateral flow testing

23. There was widespread scepticism about whether lateral flow testing of viral antigens could ever be used as a sufficiently accurate sensitive and specific diagnostic test for the disease. Because the Skunk Works team had worked heavily on serological testing using lateral flow tests we were asked by Ministers to look again at whether lateral flow tests could ultimately be used for viral testing in the population. The initial results from looking at these tests suggested that they lacked sensitivity although could have very high levels of specificity. The programme moved to Porton Down where it received support of Alex Sienkiewicz, the PHE lead at Porton Down, and his team and that enabled the use of live virus and sensitivity testing at scale. Much thought was given to how one could possibly test these lateral flow tests and the team created a multiple layer evaluation and multiple lateral flow tests could be tested and evaluated. They started with the tests of the limit of detection and progressed through using swabs that had been stored from earlier in the pandemic at the John Radcliffe Hospital and then ultimately progressed to field testing. Progress was slow as many tests failed to meet the demanding criteria that had been set but over time several interesting products appeared, one from Innova and one from Orient Gene that seemed to have relatively high levels of sensitivity and specificity of over 99%. These we felt would be reasonable candidates for rolling out as potential tests.
24. The argument for working hard on lateral flow tests was that the constraint on PCR (and indeed LAMP testing) was that one needs to get samples to a laboratory and this involves extensive logistics. One also needs a pathway by which to undertake scaled testing in that laboratory. This puts a natural limit on the testing one can do. In addition there was a serious health and safety issue about moving amounts of infected samples around.
25. One of the most important issues which drove us towards trying to develop and evaluate and implement lateral flow testing was that it was the only truly effective point of care test that could be used by individuals wherever they were. All the other tests required substantial lab set-up and healthcare professionals to help take the samples and run it in machines or to access swabs from elsewhere through some complicated logistic network. Lateral flow tests could be kept in the home and used by individuals and this we believed was a crucial element of their overall utility. There was much confusion about whether LAMP tests had the same sensitivity and specificity (which they probably did) but they are not effective in terms of individual use as they require a lab set-up and healthcare workers to run them.
26. The crucial clinical question that the lateral flow tests could answer was to detect individuals who were asymptomatic. There was much discussion at the beginning of the pandemic whether there was significant asymptomatic carriage of Covid 19 and there was a strongly held view from some officials at the Department for Health that this was not the case. This of course was not evidence based but was necessary for them to believe in their strategy of only testing people who were symptomatic. This turned out to be a significant oversight and one that was only corrected when the Covid Infection Survey, set up with ONS and Sarah Walker, with the help again from Tamsin Berry, began to report. The first data that came through on this was, I believe, in late April where the early suggestion from the Covid Infection Study suggested approximately half of infected people were asymptomatic when they carried the virus. This of course was a real

problem with the existing testing strategies. The best way therefore to handle a much larger number of people who might be infected, but also to scan them regularly to see who was infected, was to use a test like the lateral flow test and that is why we pursued this so aggressively.

27. Two developments occurred in lateral flow test validation that were important. One was the increasing quality of the tests we were receiving to evaluate, the Innova test in particular seemed to perform extremely well and provided sensitivity in the range that would make it useful for screening populations while the specificity was also extremely good which was the crucial feature of the test that would make it useable in large populations. A poor specificity would mean that one would generate many false positives and that would cause a great deal of noise in the system particularly when infection levels were low. One in a thousand was an acceptable level of false positives particularly when there was a high level of infection in the population.
28. As the teams began to develop better insights as to how these lateral flow tests might perform at Porton Down I chaired the committee that oversaw the results on a weekly basis. Professor Tim Peto then began to think about the thresholds at which they were positive based on the Ct values of PCR giving an index of the viral load that they could detect. They had less sensitivity for viral load than PCR tests but what was interesting was that viral loads they could detect seemed to correlate very well with the infectiousness. Instead of marking the sensitivity against viral antigen load we thought it would be helpful to think about how effective they would be telling people if they were infectious or not. This is something that PCR could also do but there was a tail in PCR where the tests were positive long after the infection had gone. This was not the case with lateral flow tests. On the back of this different way of thinking we did some population experiments to demonstrate that this infectiousness correlation was correct. That made the use of these lateral flow tests valuable for identifying asymptomatic and symptomatic patients but also identifying those who are likely to be infectious.
29. There was a further problem. All the lateral flow tests that were available had approvals which were designed for them being used by a healthcare professional. This of course undermined one of the major premises which was that these could be self-use tests. We approached the Department of Health and obtained permission to approach the MHRA for these to be used as self-use tests. The DHSC very helpfully agreed to take the risk and with Derek Crook, Tim Peto and Alex Sienkiewicz we did the necessary work to demonstrate the utility of these self-use tests. Testing accuracy fell very little by them being handled by individuals rather than healthcare workers. Anterior nasal testing proved to be effective. Approval was given by MHRA for a self-use and we began to test and evaluate these at a larger population scale. Several large studies were done, one in Liverpool under the guidance of the Liverpool School of Tropical Medicine and a number of others were done in schools or universities. The consultants never seemed to get the idea that these should not be done by healthcare workers or other staff but could be self-deployed by individuals but nevertheless we gradually accumulated data to show this was a highly effective way to test all population levels.
30. The NHS caught on to this quickly and ordered substantial numbers of lateral flow tests to be used by their staff and ultimately the Department of Health made these tests available through local pharmacies so individuals could collect several boxes of these to have at home to be used if they were going in to

circumstances where they risked passing on infection, even from an asymptomatic state, to others.

31. The UK became a real global leader in the use of these tests and they did have a substantial impact on the identification of people with virus up their nose at a level where they could be infectious. No other country to my knowledge developed such a programme in such a short time but also implemented it across the whole population something that we should be very proud of.
32. I was involved in numerous sub-groups set up by DHSC Ministers and the Chief Government Scientist. I joined the Testing Task Force early because of my role in helping to create the Lighthouse Lab network. The testing taskforce was mostly used to monitor the progression of testing numbers over the first two months of the pandemic. A target had been set by Matt Hancock for 100,000 tests per day by the end of April and all eyes were on that number and how it could be achieved. Obviously the activity in the Lighthouse Labs was central driver for better numbers. The taskforce itself grew rapidly and soon became unmanageable in terms of the people in the room. Much of the discussion could have been done by 4 or 5 people who were the ones driving the generation of testing capacity but it did fulfil a function of keeping others in the system informed of what was happening which was positive.
33. The lateral flow antigen testing committee again became a crucial part of the development of individual use tests that could be self-administered. Again the key people who were involved were Derek Crook and Tim Peto.
34. Susan Hopkins was an enormous supporter from PHE and an incredibly valuable partner in the project. Alex Sienkiewicz was leading Porton Down at the time and made many of the validation assays possible in that setting with this team. Once we had determined a set of evaluations for new lateral flow tests becoming available it was a question of screening them for specificity and sensitivity and then subsequently thinking hard about what they were actually detecting. Tim Peto deserves a lot of the credit for working out that they were probably a good marker for identifying people who were infectious as opposed to those who weren't which was a crucial milestone in demonstrating their wider utility in populations. Others including Emma Stanton were involved in procuring tests at scale and many were involved in some of the clinical pilot studies that were done. The Liverpool School of Tropical Medicine did a large study with the armed forces in Liverpool to demonstrate the utility of these tests in identifying asymptomatic and symptomatic individuals. One aspect of this which worked badly was NHS Digital who had been asked to develop a lateral flow visualisation tool which would automatically record positives and negatives and probably give more accurate results than simply the naked eye. They promised to produce a result, rejected a number of contractors who had an off-the-shelf solution which probably would have worked and in the end, a year after they promised, failed to deliver a product in any usable timeframe.
35. It is correct to say that the UK benefited from active engagement from industry, academia and the NHS in responding to this health challenge. No one of those entities was equipped to deal with such a challenging issue and I did play a supporting role in bringing many of these partners together to try to solve individual problems. The reason we were able to do that was the very strong academic and commercial network built up over many decades and familiarity with the operations of the NHS.
36. I was also involved and convened other small panels of experts at the request of Ministers. A good example of this was the Immunology Working Group. I was

able to identify a world-class immunologist who had substantial experience in T-Cell biology (Paul Moss, Professor of Immunology at University of Birmingham) and together he and I identified a small number (6-8) leading immunologists who could contribute to an ongoing discussion of the immunologic events associated with natural infection and vaccination both in testing the utility of both of those events in providing protection and characterising the nature of immune response. We met every month. There was usually data to review and we provided, I think, expert content for the Government. Given this event was predominantly about the protective effects of an immune response on a viral infection this was a particularly important group to have in play.

37. I had very little difficulty facilitating these discussions. On occasions these discussions were very international and again with my contacts through the Gates Foundation and its main Scientific Advisory Board and other contacts I have in the global health field I could rapidly pull groups of experts together to discuss a range of different issues. These included discussions about different vaccine platforms that were being evaluated outside the country but also we were also able to bring groups together to, for example, discuss the pipeline of antiviral drugs so that the antiviral task force could be informed by people who were actually developing these drugs rather than rely entirely on speculation.
38. There were always gaps in our knowledge as this was a brand new disease and we relied heavily on people being willing to convene with real expertise and to provide solid opinions that could be fed back in to decision makers in Government. This happened on multiple occasions and I believe was helpful to Ministers and Civil Servants who were attempting to understand and develop the best mitigation strategies for the pandemic.

The Bill and Melinda Gates Foundation

39. The Bill and Melinda Gates Foundation were extremely helpful at the beginning of the pandemic. I attended and chaired their Scientific Advisory Board meeting in mid-January and it was there where Ken Klugman and others had reported, based on their recent trips to Asia, that there was a pandemic brewing and that everyone should be prepared for a fairly bumpy ride. The Foundation has a powerful set of contacts and a very large network and as a result was extremely helpful in providing input to me and through me to the Government about a whole range of issues. For example they had spotted, as we had, the global lack of swabs that were going to be needed for widespread testing and were busy thinking of mechanisms to speed up the production of swabs that could be used for this purpose. We had a very similar problem in the UK that at times was an impediment to getting more tests done in the population. Similarly they had insights in to the vaccine platforms that were not being used in the UK. The Foundation was also interested in things like the quality of modelling data and was comparing modelling data from around the world to see where individual modelling groups were more successful than others. On that metric the UK did not do well. The Foundation and its network particularly, Shabir Mahdi, gave us the best insights into the severity of the Omicron infection long before the UK worked out that it was unlikely to be a severe wave of the disease. Interestingly it was through the Gates Foundation that I first heard that the serum positivity rates in many of the big cities in Africa had reached 70-80% by the middle or end of 2021 indicating that even without vaccines the populations had immunised

themselves from the natural infection. This was a very important data point for global health. Finally the Gates Foundation were the entity which first identified the potential role of end-point PCR as a high-throughput PCR methodology that was ultimately adopted in the UK . They had been busy setting up a centre for end-point PCR in the US and communicated progress which I relayed back in to the Government here. There is no question that the Gates Foundation was a very valuable ally throughout the course of the pandemic in relation to testing but also in relation to vaccines and a whole range of other issues that arose during Covid. They are a massive asset for our understanding of infectious disease at a global level and having strong links with them is a crucial bit of the network that would make us more capable of dealing with future pandemics.

40. I was obviously involved in many different touchpoints in the development of testing protocols and the implementation of the two most important tests, lateral flow antigen tests and PCR across the UK in the two years in question. I was greatly facilitated by a strong set of collaborators both commercial entities and academics who, alongside some outstanding Civil Servants, were able to make these systems work. I didn't want to comment on the TTI programme as I was mainly interested in developing the testing protocols but I did make my concern known about the excessive mandation associated with that programme from the very beginning and felt that individuals would largely take a responsible view if they were able to test themselves and know they were positive.

Pandemic Preparedness

41. It is perhaps not surprising that the country was broadly unprepared with its testing and PPE capacity for a pandemic although given the number of close calls we have had since 2000 more should have been done to think about the potential requirements for scaleup in the event of an incident. As I have described before, the NHS was totally unprepared to provide testing support for the whole country. This is in part because the laboratory system in the NHS has received relatively little attention and operated largely on the basis that it did many lab developed tests because there would be then no need to pay for tests approved by the international regulatory authorities. The consequence to this is that scale up of these laboratories was impossible to achieve. By failing to invest properly in this aspect of the health system the NHS ultimately let the country down in the context of the pandemic and there has been no sign that this is likely to change in the near future. Testing capacity, should another pandemic occur, would need to be scaled again but I think we are better prepared to do this simply because we have had the experience in 2020 – 2021.
42. I had hoped that there would be a substantial effort to expand the testing capabilities to the extent that new tests could be created quickly and the sort of delays we saw in getting validation of both lateral flow and PCR tests would not in the future be an impediment but there seems to have been little effort to do that, testing seems to have taken a back seat yet again even though it is the first step in the management of any major infectious disease health crisis.
43. The list of people I interacted with in Government is very long . There were multiple Civil Servants as well as Ministers in DHSC, BEIS but also in the Department of Education and Treasury. The Ministers I interacted with were all focused on trying to resolve some of the issues which were preventing us from moving quicker to deal with the pandemic. They were active 7 days a week and

extremely engaged. There were also many Civil Servants who had the same approach which was welcome. I cannot really give you a full list of all those I interacted with as so much time has gone by but it would have included up to 100 individuals in Government, industry and academia.

44. The various task force committees and groupings I was involved in invariably had a Civil Servant sitting in the room taking notes so that the outputs could be delivered back to Ministers and senior officials in Government. This seemed to have worked well. I think some of the very large groups such as the testing task force and the antiviral task force brought together a range of very good people but few of them were actually focused on the mission of getting something accomplished which would make a difference to the pandemic and as a result they were more for people to be informed of what decisions had been taken and what progress was being made. Too many people on a zoom call is an unhelpful method for making decisions.
45. One of the crucial advantages the UK had during the pandemic was its access to data from a single system. Fortunately Matt Hancock had introduced a COPI notice which had stopped healthcare institutions blocking access to data in the presence of a public health emergency. Data became more accessible and usable to helping form decision makers about the course of the pandemic but also the levels of viral infection, the extent of serious illness, the update of vaccines and the results of testing campaigns. This proved to be enormously powerful asset and the world at large I believe recognised that the UK was in a unique position in terms of our data relevant to the pandemic, one that was used by many nations which did not have similar capacity. It is of great tragedy that the COPI notice is still not being used given the severity of the public health challenges in the current environment and indeed putting the shutters back down on the access to health data is one of the great mistakes made after the pandemic.
46. One of the contributions I made to the data which is also relevant to the inequalities agenda came from a phone call from Treasury. It was suggested that I enquire as to whether the ONS might be able to put together a representative survey that covered all geographical reasons, the full range of socio-economic groups and ethnic diversity the UK contains so that we could survey infection levels in that population systematically through the pandemic. On the back of that phone call I spoke to Ian Diamond, the Head of ONS, who was extremely helpful in helping us to think through the Covid infection survey and I identified Sarah Walker and Tamsin Berry to help get the study established. This happened in record time and created the backbone of data that the Government would use for much of its decision making as have an ongoing and regular assessment of infection levels across the full socio-economic and demographic space.
47. The challenges of modelling a disease where the inputs were not clear are obvious but it was clear that SAGE was dominated by modellers. This was undoubtedly helpful up to a point but the confidence intervals around their predictions were admittedly extremely wide and there was a tendency for this group to choose the most severe predictions. One could argue whether this was the right tactic to take but it certainly proved to be misleading in several settings the most obvious of which was the Omicron epidemic when speculation about the location and nature of the mutations in spike led to a very pessimistic view about the severity of that wave of the pandemic when a simple phone call (originally made by Andy Pollard and myself) to Shabir Mahdi in South Africa

where the virus had already taken off revealed that this was not a severe disease as had been predicted and as a result the decisions about the lock-down at Christmas 2021 would have been greatly simplified if we worried less about modelling and more about gathering genuine data.

48. In summary therefore the UK developed from a low base an extremely impressive testing capability but did so without the help of the NHS. The scale of the challenge was very large but many, many people were involved in making the testing system work initially with the Lighthouse Labs but also with the use of widely distributed personalised lateral flow tests that detected something besides RNA from the virus and were highly effective at identifying individuals who were infectious. The politics to how much of this should have been mandated I will leave to others but the system the UK produced in terms of scale and speed by which it was developed must, by international standards, be viewed to be one of the impressive contributions the UK made. It is important to remember that it was a combined effort of multiple people in both the private and public sector that made this work and almost certainly saved many lives as well as contributing to the decisions made about how the country would manage the pandemic .

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.

Personal Data

Signed: _____

23 June 2025

Dated: _____