Witness Name: Professor Stephen Griffin

Statement No.: 1

Exhibits: 59

Dated: 03/06/2025

UK COVID-19 INQUIRY

WITNESS EVIDENCE FOR MODULE 7

WITNESS STATEMENT OF PROFESSOR STEPHEN GRIFFIN

I, Professor Stephen Griffin will say as follows: -

SECTION 1. INTRODUCTION

1. I make this witness statement to the UK Covid-19 Inquiry ("the inquiry") in response to the Rule 9 Request for Evidence dated 4 November 2024 and marked with the reference 'M7/GRIFFIN/01' in Module 7, which I understand concerns trace, trace and isolate from 1 January 2020 to 28 June 2022.

2. Unless stated otherwise, the facts stated in this witness statement are within my own knowledge and are true.

Personal background with relevance to module seven

3. I am a Professor of Cancer Virology at the University of Leeds. I graduated with a 1st Class BA(Hons) CANTAB in Natural Sciences from the University of Cambridge (1997), and a PhD CANTAB in Virology from the University of Cambridge (2001). My PhD was on HIV-2 RNA packaging and gene vector systems in the Dept. of Medicine, Addenbrookes Hospital. I undertook post-doctoral research at the University of Leeds School of Biochemistry and Microbiology beginning in 2001. I began my independent career in 2007, moving to the Faculty of Medicine and Health in 2010 as a University Senior Translational Research Fellow. I became a tenured Associate Professor in 2014, then obtained a promotional Chair in 2023.

4. My research has focused mainly upon RNA viruses, including hepatitis C Virus (HCV), HIV-2, influenza A virus (IAV), Zika virus (ZIKV), and SARS-CoV2. Work comprises four main areas, namely antiviral drug development vs. virus-encoded ion channels, virus-driven oncogenesis, virus-driven cancer immunotherapy, and antiviral immunity. I teach on multiple aspects of virology, oncology, and immunology at undergraduate and postgraduate level. I have supervised and mentored multiple PhD and masters' students, post-doctoral research fellows, and junior academics.

5. I feel that I am academically qualified to address how understanding of fundamental and applied virology could, and should, have informed testing strategy for the novel coronavirus. I can also speak to how prior neglect of public health infrastructure and failure to follow recommendations from prior pandemic preparedness exercises meant the UK was under-prepared during wave one through membership of Independent SAGE.

6. I was a member of several groups and committees with relevance to the module remit.

7. I was asked to join an expert panel meeting convened by Deloitte on behalf of the Government (members of the office for life sciences were involved) on 20/03/2020. This was to assist the establishment of home testing for SARS-CoV2 by RT-qPCR. I participated in several online meetings and via multiple email discussions (shared with Inquiry team).

8. I and other Virology academics across the UK were in contact with PHE during early March 2020 regarding how we might be able to assist with the testing efforts using the resources within our laboratories, links to local NHS testing teams, as well as providing our skilled research personnel to assist at PHE sites. Whilst initially met with enthusiasm, we were told few days later not to proceed but to keep the lists to hand. This was neither explained, nor followed up. Emails have been supplied to the Inquiry team.

9. I was invited as an expert to attend the Cabinet Office International Best Practice Advisory Group (IBPAG) meeting on 08/06/2020. The discussion included shielding and virus transmission. I was invited to speak regarding the former, particularly regarding the ending of shielding as lockdown rules were relaxed over summer. Access to testing was part of the discussion.

10. I was approached by Prof Deenan Pillay (UCL) during July 2021 and asked to appear on Independent SAGE briefings, the first on 30/07/2021. The next was on 15/10/2021, and I then carried on through Autumn. I was asked to join the group officially, commencing as of January 2022, but was active behind the scenes prior to this. I became co-chair of Independent SAGE in September 2022 when Prof. Pillay stood down ahead of his retirement. I continue as co-chair to this day, overseeing our online presence and chairing regular monthly meetings. Indie SAGE regularly discussed testing and surveillance, explained in more detail and with associated documents below.

11. I have been an expert witness on two APPG Coronavirus meetings, chaired by Layla Moran. The first (20/04/21) concerned UK border policy, international travel, etc. in relation to the Delta VoC developing in India and other countries and its relevance to the Government "roadmap" out of restrictions. My testimony contributed to an official APPG report sent to the Cabinet Office.

12. The second APPG (01/03/22) concerned the lifting of restrictions during 2022 and specifically discussed the end of freely available lateral flow devices (LFD). In particular, the effects upon clinically vulnerable and socioeconomically disadvantaged populations were highlighted.

13. I worked with a journalist at the Independent, Samuel Lovett, on a story [SG/01 - INQ000587714] exposing wasted stockpiles of LFD that had been allowed to expire by UKHSA, rather than using them for the public good (published 06/07/2022). His freedom of information request revealed that around forty million kits had been wasted. Concerns around sensitivity regarding Omicron subvariants were, in my view, unfounded due to the high degree of conservation for the N protein (the "target" for the antibodies used in LFDs). Similarly, given that LFDs were only universally available since April 2021 (first provided in October 2020), I consider the narrative that they had "expired" to be similarly unfounded.

14. NHS "Test and Trace" was neither run by the NHS, nor was it fit for purpose in achieving the full WHO recommended FTTIS, namely: "find, test, trace, isolate and support" [SG/02 - INQ000618215; SG/03 - INQ000618226]. Whilst our testing system was eventually sufficiently upscaled, and ensuing genetic epidemiology and phenotypic work was genuinely world-class, this was too late for the first wave, and little preparation was made for the second, third or subsequent waves until it became clear that the system was overwhelmed; Dido Harding, the then-head of the organisation, was infamously quoted as saying "nobody could have foreseen this" regarding prevalence in the Autumn of 2020 caused by the return of schools and universities (further undermining mistaken rhetoric regarding CYP "not transmitting the virus"). [SG/04 - INQ000618236; SG/05 - INQ000618243]

15. Notably, SAGE/SPI-M modelling in the spring of 2020 featured the likelihood and scale of a second (and subsequent) wave; less than 10% of the country had been exposed during wave one [SG/06 - INQ000618253] . The system could not curtail the spread of disease in isolation as seen in Southeast Asian countries, and the associated costs were astronomical by comparison due to Government over-reliance upon private industry. [SG/07 - INQ000618254]

16. Whilst testing capacity did eventually reach the 100s of 1000s per day, the system was ineffective due to the lack of consideration of the other FTTIS elements. Find: the app was late and disregarded by many and the contact tracing operation was both inadequate and overly expensive; Isolate & support:

guidance on the duration of isolation started sensibly, but was subsequently reduced to arbitrary values that left people at risk. However, many people were unable to follow guidance due to the lack of sick pay and other financial/legislative support needed for them to act responsibly. [SG/08 - INQ000618255]

17. In my view, the system could have functioned better had several confounders been dealt with ahead of time and as ongoing concerns, namely:

    a. Application of the precautionary principle in recognition of prior/developing virological and immunological knowledge of coronavirus infection, and the likelihood of both airborne and pre/asymptomatic transmission.

    b. Implementation of recommendations from previous pandemic preparedness exercises, most notably exercise Alice, which was inexplicably embargoed and so not provided to SAGE or NERVTAG.

    c. Preservation of public health budgets since 2010, with robust plans for rapid upscaling of PCR testing capacity.

    d. Utilisation of existing expertise and resource within the local NHS and academic laboratories for both testing and, critically, contact tracing. Had the investment into private industry been channeled instead into existing public health expertise and infrastructure, this would have been far more likely to succeed and cost less to the UK taxpayer.

    e. To have combined FTTIS with appropriate and timely mitigations to ensure the system was not overwhelmed by high disease transmission and prevalence, especially prior to vaccines becoming available. Notably, this would include use of appropriate RPE and maintenance of NHS/care stockpiles, appropriate infection control, and improved indoor air quality. In reality, little was done during the summer of 2020 to ensure a safe return to school, university, or the workplace. Hygiene theatre involving pointless pieces of Perspex and inappropriate face masks achieved little, as did social distancing in poorly ventilated/filtered spaces.

f. To recognise that vaccination would impact upon transmission, and so prevalence, if sufficiently broad across all age groups and matched to circulating strains.

g. To have ensured availability and education around testing was targeted towards "difficult to reach" groups, as well as those disadvantaged in terms of health or socioeconomic vulnerabilities.

h. Provision of free LFDs, particularly to disadvantaged/vulnerable groups, ought to have depended upon prevalence rather than policy.

i. To have ensured guidance around isolation recognised the likely infectious periods for both adults and CYP, and that appropriate financial/legislative support was in place to allow people, including children, to act responsibly.

j. In general, for the Government to have maintained clear and supported guidance around either a positive test, or a notification via the NHS app of contacting an infected individual (who ought to have been isolating). The so-called "pingdemic" (July 2021) was a good example of the lack of political will in Government to act upon increasing prevalence.

k. Whilst widespread use of PCR testing was understandably reduced due to cost, wastewater surveillance, as continued in Scotland, could have provided near real time information on both prevalence and viral variation had it not been abandoned. Moreover, this can extend to include surveillance for other viruses. However, reversion to pre-pandemic budgets and insistence that the additional burden of COVID surveillance be drawn from this funding made such efforts cost prohibitive in England, Wales, and Northern Ireland.

18. Virological and immunological factors that ought to have informed and improved FTTIS

19. SARS-CoV2 was clearly a more successful human-adapted virus in terms of transmission compared to its predecessor, SARS-CoV1, which also emerged from an intermediate mammalian host species in Chinese wet markets during 2002 [SG/09 - INQ000618256] . Amongst other things (e.g., inherent innate

immune evasion), the SARS-CoV2 spike protein has a much higher inherent affinity for human ACE2 [SG/10 - INQ000618206] (possibly via adaptation in an intermediate host), and the presence of the furin cleavage site (FCS) within this protein also increases infection efficiency [SG/11 - INQ000618207]. As such, the estimated R_0 of SARS-CoV2 is higher, and this increased further as the virus became better adapted to humans. The original virus (with the D614G adaptive mutation) was estimated at ~3.0, whereas omicron subvariants range up to ~9.0. By contrast, SARS-CoV1 R_0 was ~2.0-3.0.

20. Consensus arising from the first SARS epidemic, which involved around eight thousand confirmed cases with an approximate 10% case fatality rate (CFR), was that transmission was a) coincident with the onset of symptoms, and b) predominantly via droplet/close contact transmission. This meant that after the initial stages of the SARS-CoV1 outbreak, the majority of recorded transmitted symptomatic cases occurred within healthcare settings. [SG/09 - INQ000618256]

21. This message was the cornerstone of the "washing your hands" official advice that predominated within the UK during early 2020 [SG/12 - INQ000618208] which was repeated ad infinitum by scientists and clinicians in public fora. Regrettably, I include myself amongst this number as I initially took this advice at face value in good faith.

22. However, multiple retrospective peer-reviewed studies of the SARS-CoV1 epidemic provide high quality evidence that this virus could spread via airborne aerosols [SG/13 - INQ000618209] , yet this was not recognised by the prevailing narrative despite being supported by laboratory transmission studies. Despite this, and multiple studies since 2020, some official bodies, including the IPC cell, maintain that droplet transmission of SARS-CoV2 predominates [SG/14 - **INQ000421939**]. This has dramatic implications for infection prevention and control, contact tracing, and testng policy, including for NHS and other care sector staff.

23. SARS-CoV2 was initially categorised as an airborne high consequence infectious disease (HCID) [SG/15 - INQ000618211] but was then removed from

this list in March 2020 due to having a lower case-fatality rate (CFR) of ~1%, although this varied dramatically with age and other confounders. Accordingly, SARS-CoV1 remains listed as an airborne HCID by UKHSA, despite its lesser infectivity. The related Middle East respiratory syndrome coronavirus (MERS-CoV), highly pathogenic avian influenza viruses (e.g. H5N1) and M-Pox clade 1 are also on this list.

24. However, CFR differs (i.e. is usually greater) from the infection-fatality rate (IFR) if you're unable to identify all those infected, hence CFR usually appears higher at the beginning of an epidemic; initial reports from Wuhan for SARS-CoV2 were well above 1%. The limited number of human H5N1 or MERS-CoV cases, therefore, reflect a subset of more severe case presentations that are more readily detected (notably, the current US epizootic and associated spillovers support that most human infections with non-adapted H5N1 are not lethal). Retrospective studies confirmed exposed populations were infected by SARS-CoV1 in the absence of symptoms [SG/16 - INQ000618212], making the true IFR significantly lower than 10%, much like SARS-CoV2.

25. The majority of airborne HCID have not achieved widespread human transmission, so CFR, rather than IFR, is a major determinant of this classification. However, risk of community transmission is also listed as a criterion [SG/15 - INQ000618211], and the population-scale impact of an infectious disease is a function of both IFR/CFR and prevalence (infections over time). It is also notable that fatality is not the only major outcome of any given infection, and that morbidity incurs considerable associated cost, both financially and for society [SG/17 - *see link 17 at reference list below*]. In my view, the criteria for HCID should make better account of these factors going forwards, especially after vaccines decouple prevalence from the incidence of severe acute disease for the majority.

26. Interestingly, the New and Emerging Respiratory Virus Threats Advisory Group (NERVTAG) urged SAGE and the ACDP to reconsider declassifying SARS-CoV2 as an airborne HCID at their meeting on 13th March 2020. [SG/18 - INQ000618213]

27. One issue in some published studies is that an arbitrary cutoff of ~10 micrometers is used to define the diameters of aerosolised particles, when, in fact, these can occur with diameters up to 100 micrometers (SG/19 - INQ000618214; SG/20 - INQ000618216]. Whilst these require airflow (~0.1 m/s) to remain buoyant for extended times, this is commonplace within indoor environments so there is still ample opportunity for infection to spread. Moreover, larger particles can evaporate and so shrink, depending upon levels of humidity within the environment, and this can also lead to aerosols forming from larger respiratory droplets. Hence, one-way "protective (FFP2/3) masking" is less effective that majority compliance due to the lack of source control.

28. Whilst the whys and wherefores of being an HCID are a matter for debate, the logic and evidence in favour of SARS-CoV2 being an airborne pathogen from the outset ought to have been better-recognised. **The precautionary principle should have applied from the outset**. This impacts upon FTTIS given the scale and range of contacts that ought to be considered, the nature of precautions necessary (including respiratory protective equipment) to prevent transmission, and the conditions of isolation.

29. In addition to recognising airborne transmission, the infectious period in relation to symptoms is critical to determine, including the extent of pre/asymptomatic transmission. A significant degree of subclinical (non-pneumonic) and asymptomatic infections were documented, usually retrospectively, during the SARS-CoV1 epidemic in healthcare settings [SG/13 - INQ000618209], yet this was recognised right from the beginning of the SARS-CoV2 pandemic, including on the Diamond Princess Cruise ship [SG/21 - INQ000618217]. We now consider around of third of SARS-CoV2 transmission to occur in the absence of symptoms. Prior to widespread population testing, this means that symptom-based prioritisation of testing, as well as strategies such as thermal monitoring at transport hubs such as airports would have been highly unlikely to spot all infected and infectious individuals passing through, unlike during the SARS-CoV1 outbreak.

30. Moreover, combined with airborne transmission, pre/asymptomatic transmission means that the continuous use of respiratory protective

equipment (RPE), including respirators/filtering face masks (i.e. FFP2/3, NOT fluid-resistant surgical masks FRSM) was required to prevent R_0 rising, especially during high community prevalence. Crucially, this ought to have applied particularly to high exposure/consequence scenarios such as social/healthcare settings due to the presence of more vulnerable people.

31. Multiple studies and papers from NERVTAG, beginning in 2020 and continuing, considered the duration of the infectious period with respect to symptoms. Whilst some studies suggest that symptomatic patients were more infectious, this was not always the case, and in both circumstances infectious virus was present both prior to and following the standard, non-severe symptomatic disease course (~3-7 days), up to 14 days post-symptom onset with incidence decreasing over time. Rarely, this can continue for longer, but recoverable virus does not correlate with sometimes prolonged PCR positivity. [SG/22 - INQ000618218]

32. However, infectiousness does correlate well with positive LFD results. Hence, isolation guidance reducing from 10 to 5 days inevitably led to more transmission, as did use of an arbitrary timeframe rather than basing isolation upon patients becoming LFD negative.

33. "Freedom Day" and other premature diminution of the UK COVID response, abandoning anything other than encouragement to follow guidance "if you can" in the absence of support, has almost certainly therefore perpetuated transmission.

34. Similarly, (re)infection upon exposure is highly significant, especially as financial support to do remain home or otherwise act responsibly has been lacking. Perhaps the most irresponsible example of this is NHS policy, where staff are told NOT to test for SARS-CoV2 to avoid best practice IPC guidance, namely five-day isolation, due to staff shortages and the current "living with" policy. [SG/23 - INQ000618219]

35. In relation, I am entirely unaware of convincing evidence supporting that children were/are either less infectable, or infectious over time. Testing studies in early 2020 were largely symptom-driven and failed to account for the

dramatically reduced number of key worker children in schools [SG/24 - INQ000618220] . When it became clear that children are indeed at risk from COVID, this led to schools closing in January 2021 (albeit, after the then-PM permitted their return for the first day of term). When they reopened, we saw the welcome introduction of testing alongside some limited mitigations, although school masking policy was driven more by perception and politics than science.

36. In this regard, it was clear that the "NHS" Test and Trace system was not ready for the resurgence of SARS-CoV2 during the Autumn and winter of 2020, or for the emergence of the Alpha VoC (which was spotted due to S gene target failure in PCR results, "SGTF"). [SG/25 - INQ000618221]

37. Dido Harding maintained that the likelihood of a second wave could not have been predicted, despite SPI-M modelling in the spring including the impact of the second wave. Moreover, it became clear that less than 10% of the population had been exposed during the first wave, leaving the majority of the population susceptible to the virus. Predictably, infections started climbing again in the late summer, exacerbated by increased mixing via the "Eat out to help out" (EOTHO) scheme. Notably, this Inquiry revealed that EOTHO was launched without consulting SAGE or the CMO/CSA by the then Chancellor, Rishi Sunak.

38. EOTHO was then compounded by an ultimately disastrous intervention from fringe advisers (also drafted in by Sunak), as this Inquiry has heard. This precluded the implementation of SAGE recommendations in the Autumn of 2020 to curb exponential growth, which would have been timely considering the return of schools, universities and workplaces. Hence, prevalence overwhelmed the Test and Trace system, and many people struggled to access testing. [SG/26 - INQ000618222]

39. Use of FTTIS alone to control infections when prevalence is already high is challenging. Delaying SAGE recommended action meant that test positivity approached that of the first wave as autumn progressed, despite increased capacity. Neither the Tier system, nor the second "lockdown" in November was

sufficient to reestablish control; the tiers simply allowed the accumulation of infections, whilst the second lockdown was both too late, and nowhere near rigid nor long enough to regain control.

40. With R_0>1, emergence of the Alpha variant occurred, giving rise to the devastating December/January wave. Again, PCR testing per se and associated genetic epidemiology yielded benefits (i.e. spotting emergence of Alpha), but the limited capacity of the system was unable to effectively perform contact tracing to a level that contained infections in the face of so many cases. This also highlights how both mitigations, and later vaccinations, need to be coordinated with FTTIS for the longer-term control of infections.

41. As 2021 and 2022 progressed, reinfection of both previously infected as well as vaccinated individuals began to increase, coincident with first Delta, and then most prominently with the Omicron BA.1 and BA.2 VoC; the latter is the forebear of circulating subvariants to this day. This was caused by the onset of antibody evasiveness (along with other aspects of innate and adaptive immunity) being the main driver of viral evolution. Incompatibility between viral variants and immunity led to a much faster rate of waning for neutralising antibody-mediated protection. This now manifests as multiple annual waves of infection caused by successive, rapidly emerging, subvariants. Reinfection was well established by 2022, making the withdrawal of free testing at this time all the more short-sighted and inappropriate, with a disproportionately detrimental impact upon vulnerable groups. [SG/27 - INQ000618223]

42. Notably, reinfection could have been predicted based upon knowledge of seasonal coronaviruses [SG/28 - INQ000618224], where relatively minor variability combined with waning immunity leads to reinfection every few years. Like RSV, so-called “natural infection” also does not induce a long-lasting sterilising immune response. Thus, whilst accruing population immunity has limited the scale of the most severe disease outcomes, we remain in a dynamic scenario where imbalances between the virus and preexisting immunity promotes successive waves.

43. The result of ongoing exposure necessitates testing, and this would have the most benefit the more people undertook this responsibly. Providing tests for vulnerable groups is less beneficial in terms of their ability to engage with a society that is "living with" the virus than widespread responsible use of LFDs. This is because vulnerable groups are then able to gauge their risk of exposure in the community, rather than confirming after the fact that they have become infected (although this is also important). However, the ending of free LFD provision sent a clear message that engaging in such altruistic activity was no longer deemed a priority by the Government. [SG/27 - INQ000618223]

44. In addition to vulnerable groups, people with more typical immune responses exposed to reinfection can still experience severe disease courses, plus there is a cumulative risk of long COVID with each infectious episode. The lack of widely available testing outside of hospitals can complicate diagnosis as well as access to subsequent healthcare, insurance, etc.

45. Another feature of long COVID, as well as infection of immunocompromised people, is that the virus is not cleared, and persistent infection can ensue; this can remain undetected in the absence of testing. Persistence allows the virus to undergo protracted in-host variation and adaptation that takes it down an alternative evolutionary branch to other circulating strains [SG/25 - INQ000618221]. Eventually, there is a small yet appreciable chance that such adaptation can lead to a successful virus with dramatic changes that is immunologically distinct from circulating strains. Such "saltatory" (aka "jumping") evolution can promote large waves of infection with the strain in question becoming dominant. This was last seen with BA.2.86, the forebear of JN.1, but also occurred for previous VoC's including Alpha, Delta, and the ancestral Omicron VoC BA.1 and BA.2. Importantly, wastewater testing can identify such evolutionary outliers and so provide advanced warning of a potential new emergent strain.

46. Even in the absence of saltation, the evolutionary rate of SARS-CoV2 is 3-5 times faster than H3N2 influenza [SG/29 - INQ000618225]. This is not due to a faster inherent rate of error-prone replication causing mutations, but rather because the virus, and the spike protein in particular, is able to tolerate large

numbers of non-synonymous mutations (meaning that the RNA "codon" for a given amino acid is altered to encode for a different, often extensively so, amino acid). The associated variability within spike is what enables the virus to outpace our humoral (antibody) immune responses. This variation would be identifiable at the population level via the now-abandoned wastewater surveillance system in England. However, FTTIS relies upon individual testing and requires additional resource for contact tracing.

Lessons which ought to have been applied following Government pandemic preparedness exercises.

47. The previous Government conducted 11 pandemic and epidemic preparedness exercises between 2015 and 2019, including exercise Alice (MERS-CoV) and Cygnus (influenza), along with several other diseases (e.g. Ebola, Lassa Fever etc.). However, of particular relevance, the outcomes from Alice [SG/30 - INQ000618227] were kept out of circulation for "national security reasons", and only released after a legal campaign and FoI request in late 2021 [SG/31 - INQ000618228]. Hence, Alice was not shared with either SAGE or NERVTAG, which seems incredible considering the nature of the 2020 emergency.

48. The entire pandemic response plan was conservatively founded upon pandemic influenza because of the "swine flu" pandemic in 2009. However, not even recommendations from Cygnus had been implemented correctly/completely, leaving the door wide open for SARS-CoV2 to run rampant in the UK. Nevertheless, it is unclear why planning or implementation had not been updated in light of Alice, or other exercises, during the ensuing four years preceding the start of the COVID pandemic.

49. Alice yielded a total of twelve action points, although the details around many of these are scant in the official report (30). However, the question of upscaling testing capacity in the event of widespread community transmission is not covered.

50. The first recommendation from Alice is an instructional video regarding the use of PPE during a MERS-CoV for front line staff. Whilst the precise nature of the

PPE is not mentioned, reference is made to the Ebola virus outbreak in Western Africa, so presumably along with MERS-CoV being an airborne HCID, this includes RPE. However, it is unclear whether any such video was made, or its content adapted for COVID. As discussed above, acceptance of the need for RPE would have tremendous impact upon both the burden and nature of FTTIS. Notably, access to sufficient PPE including pandemic stockpiles were specifically mentioned, which makes the fiasco of shortages, supply and the VIP lane contracts during 2020/21 all the more appalling, especially as this was mainly after declassifying SARS-CoV2 as an airborne HCID.

51. Action five pertained to a briefing paper incorporating learning from Ebola and HCID best practice again, along with the 2015 MERS-CoV outbreak in South Korea. This outbreak was brought under control through exemplary FTTIS and awareness/acceptance of airborne transmission; ~17000 people were quarantined [SG/32 - INQ000618229]. Again, whether this paper was drafted or subsequently circulated remains unknown in the public domain.

52. Action five further emphasised the need for synergy between the devolved nations along with WHO and the ECDC, which has been covered previously during this inquiry.

53. It was also emphasised that screening protocols at ports of entry was a subject that required further exploration, alongside guidance relating to enforced quarantine vs. voluntary self-isolation. It was noted that HART ambulances may be required when moving patients, again suggestive of RPE use and acknowledgement of airborne transmission.

54. Action seven recommended a detailed options plan for quarantine vs self-isolation, including the need to accommodate asymptomatic contacts.

55. Action ten recommended revision of the PHE close/high risk contact protocols, accommodating learning from other areas of the world, as discussed above. Again, this impacts upon FTTIS for obvious reasons, as best practice (e.g. South Korea) acknowledges both presymptomatic and airborne transmission, as well as supported isolation. These features were conspicuously absent from

the initial UK response to COVID, and the downstream effects of this mistake are still being felt.

Consequences of funding cuts and not establishing FTTIS through PHE and related networks.

56. The Public Health grant awarded by DHSC has experienced a 28% real terms per person cut since 2015/16, according to the Health Foundation [SG/33 - INQ000618230]. Moreover, this has disproportionately affected more deprived areas; Surrey (145th most deprived area) experienced a per capita cut of -£9.15, whilst the reduction in Knowsley (2nd most deprived) is -£38.30.

57. The hardest hit activities were sexual health services, public health advice, and children's services.

58. From 2010 – 2019, the UK spent £3005 per person on healthcare, 18% below the EU14 average of £3665. This reflects a deficit of £40bn, and is £73bn less than Germany. [SG/34 - INQ000618231]

59. In 2020, the UK had fewer beds (2.43) and physicians (3) per 1000 population than the EU14 average (~3, 3.9), with Germany having 7.82 beds and 4.5 physicians per 1000. The UK also had fewer nurses (8.7/1000) than the EU14 average (9.9/1000).

60. The UK also invested £33bn less in healthcare capital between 2010-2019 compared to the EU14 average.

61. This dramatic underfunding has been linked to the larger increase in healthcare spending in the UK during 2020 in response to COVID (14.44%) compared to the EU14 average (5.82%).

62. PHE test and tracing capabilities were unable to cope with a large pandemic, as noted by SAGE in Feb 2020. However, instead of investment to upscale and support existing systems, there was instead a three-month delay before the Johnson government announced the new "NHS" Test and Trace system on 27th May. The UK experienced one of the highest death rates in the world during this period. [SG/35 - INQ000618232]

63. The newly established system was largely comprised of outsourced services (e.g. Sitel, Serco, Deloitte, Mitie, G4S, and Sodexo) and did not initially interface with existing public health/NHS data or infrastructure. It was led by Baroness Dido Harding, a Conservative life peer and friend of David Cameron. Her appointment by Matt Hancock was later found to not comply with the Equality Act by the High Court due to the lack of consideration of people who were not acquaintances of senior Conservative politicians for the role [SG/36 - *see link 36 at reference list below*]. This was also the case when Mike Coupe, former CEO of Sainsburys, was appointed as Director of Testing in September 2020. Clearly these appointments were made based upon considerations unrelated to expertise in FTTIS.

64. Notably, during March 2020, I and a number of academic colleagues specialising in virology, organised a list of RT-qPCR capable lab groups and personnel, linking with local PHE testing labs, and offered to assist PHE with sample testing. Initially, the offer was well received, and we were told that PHE was intending to establish a portal to organise the collective effort. However, we were subsequently told to put things on hold whilst retaining our lists for a later date (relevant emails have been supplied to the Inquiry team). No official explanation was given, but I presume it was because a decision had been made to pursue the NHS Test and Trace model.

65. Whilst some labs were allowed to continue and established their own PCR diagnostics facilities, including Kings/Guys and the Francis Crick Institute (the Crick was running ~15% of UK testing capacity within three weeks, indicative of what could have been achieved), other Universities shut down the majority of their research capacity in advance of the eventual national lockdown in late March. I wholly agree with Sir Paul Nurse, who termed this a "fundamental strategic error" in an interview with the BMJ. Sir Paul and others appealed to Matt Hancock but had no response. [SG/35 - INQ000618232]

66. Laudably, many of the personnel on our lists eventually joined "NHS" Test and Trace later in 2020.

67. NHS Test and Trace began publishing KPIs during summer 2020. However, as pointed out by Independent SAGE at the time (prior to my joining), the reporting of an 85% contact detection rate was disingenuous. The report stated that (paraphrasing): NHS Test and Trace stated that 26,895 of 31, 794 (85%) contacts were reached. However, it appears that only around 15% of these contacts were within the Test and Trace programme (compared to public health led teams).

68. Accounting for ONS survey prevalence at the time and approximately 30% of cases being asymptomatic, the detection rate was likely ~45%. This is well below the SAGE recommendations (1st May, 2020) which state that at least 80% of contacts from an index case need to be found for the system to be effective. [SG/37 - INQ000618233]

69. Baroness Harding also admitted that the system would not be fully functional before September, whereupon she claimed that demand in the Autumn could not have been predicted, blaming the return of schools for the problem. This was after being told by a member of the Commons Science and Technology Committee that she "clearly did not prepare enough" over the summer.

70. Harding would later state in February 2021 that nobody could have predicted that the virus would mutate, referring to the emergence of the Alpha (aka "Kent") variant, first detected via SGTF. As described above, the combination of EOTHO, ignoring SAGE advice to intervene, and an under-strength FTTIS system, contributed to the second Autumn wave and meant that R0 was > 1 when the Alpha variant emerged. Notably, the virus had already "mutated" prior to the emergence of alpha, and any RNA virologist would have confirmed that this would continue. [SG/38 - INQ000618234]

71. Importantly, whilst testing capacity was being increased during 2020/21, there was little provision of support for people to isolate following a positive test. Hence, front-line (aka "key") workers, and those on short-term/zero-hour contracts and/or with lower incomes, more often than not faced an impossible choice of isolating vs working once faced with a positive test. Whilst a tokenistic payment scheme for isolation was eventually rolled out, this was notoriously

difficult to access, of meagre value, and notoriously long-winded. [SG/39 - INQ000618235]

72. The UK strategy was mainly focused upon TT, rather than full FTTIS. This was in large part due to the almost total reliance upon private companies to deliver the service. Even then, the 1000s of contact tracers employed by Serco were given minimal training, despite the Government paying Serco £720M. The National Audit Office later found that the approx. 18000 call handlers were under-worked, at one point working for just one of every hundred hours they were paid for. All this, whilst several thousand NHS/PHE trained contact tracing staff were essentially inactive. [SG/40 - *see link 40 at reference list below*]

73. The UK was an international outlier in the extent to which test and trace was outsourced to the private sector, with the majority of contracts awarded under emergency measures and without competition. In addition to Sitel and Serco, Deloitte, Mitie, G4S, Boots, Randox, Amazon, Royal Mail, and Sodexo were all involved. Despite £37bn of Government funds being allocated during 2020-22, numerous issues with turnaround, logistics, and data integration plagued the operation. [SG/41 - INQ000618237; SG/42 - INQ000618238]

74. In 2020, a group of almost 70 Clinical Virologists from the UK Clinical Virology Network (CVN) wrote to the government voicing their concerns over both the outsourcing approach, as well as the Government investing significant funds in new testing technologies that were unproven in clinical settings (e.g. DNANudge, LamPORE). They once again argued that the existing UK network of NHS, PHE, and academic labs could have provided high quality testing, if supported appropriately [SG/43 - INQ000618239]. Notably, many local authorities established local testing programmes to supplement the central testing programme during the summer of 2020. My view is that they ought to have been listened to, and that investing the money into established PCR and later LFD testing, as well as support for those required to isolate, would have been more a more fruitful endeavour.

75. In March 2021, the Public Accounts Committee criticised the programme for not achieving what it was designed to do, namely avoiding further lockdowns

[SG/38 - INQ000618234]. They cited over-use of consultants, some of whom were paid £6600 per day (the average was £1100), the failure to deal with the surge during Autumn and winter 2020, failing the 24 hr turnaround target, and the under-working of contact tracers. The system was plagued by complexity (e.g. 400 contracts with 217 different suppliers according to the BBC) and inefficiency, never truly integrating with the NHS/PHE. Notably, compliance with self-isolation was reported to be poor, due both to a lack of support as well as increasing public distrust of the Government's handling of the pandemic.

76. It is my opinion that the use of private contractors, "connected" individuals, and the private sector as a whole, led to immense waste. This is both in terms of the exorbitant finances, but also the wasted opportunities to minimise harm, disruption, and deaths. Testing certainly gave measurable benefits, but when compared to other countries, particularly in SE Asia, the investment should have yielded far more. Ultimately, the system did not fulfill the WHO recommended FFTIS remit, and, as discussed above, was unable to control prevalence against the context of yo-yoing public health mitigations put in place by the previous Government.

77. Perhaps indicative of the risks concerned with outsourcing, the "Immensa" scandal (Dante Laboratories), another outfit awarded a contract in the absence of competition. It was estimated that failures at the laboratory led to some 43K people being told they were SARS-CoV2 negative, when this was not the case. A surge in cases within the area served by the Immensa lab followed. Notably, despite Jenny Harries assuring the public that the lab was fully accredited and appropriate quality assurance was in place, this was promptly contradicted by the UK accreditation service (UKAS). [SG/44 - INQ000618240]

78. Independent SAGE published multiple reports and statements regarding FTTIS strategy, performance, and improvement; these are all easily discoverable on our revamped website [SG/45 - *see link 45 at references list below*; SG/46 - *see link 46 at references list below*]. Many were produced before I joined, but I was involved in several works. These include a statement regarding the end of free testing (Feb 22), Immensa (Oct 21), and "Living" with COVID (March 22). There was also discussion of FTTIS/NHS Test and Trace within numerous

weekly online briefings (>45), both as part of the "numbers" element as well as specific topics of discussion. These continuously emphasised the need to involve NHS/PHE expertise and local resource, the wastage and poor reliability resulting from outsourcing, the lack of digital and logistical integration with NHS/PHE systems, and the decision making by those in charge. Notably, this involved expert guests as well as Indie SAGE members.

NHS Test and Trace did not achieve full FTTIS, but its potential effectiveness also depended upon maintaining prevalence at manageable levels

79. As seen during both the early stages of the pandemic and during subsequent surges, the ability of the system to cope with demand was often overrun.

80. The starkest illustration of this was the transition from the summer of 2020 into autumn and winter. The SARS-CoV2 prevalence in the UK over summer after the spring lockdown was amongst the lowest on the planet. However, it was clear by August, as many predicted, that infections were increasing in various hotspots and that this would lead to a resurgence. Notably, countries such as Japan, South Korea and Taiwan had similarly low prevalence, and were able to control the virus using robust FTTIS systems.

81. The inquiry has already heard the tragic missteps that led to SARS-CoV2 resurgence at this time. These included the EOTHO scheme, implemented by the then-Chancellor without consulting the CMO or UKHSA, encouraging people to mix indoors within reopened hospitality venues.

82. Mr. Sunak also drafted in three non-SAGE, self-professed experts, to argue in favour of allowing the virus to spread through the population. This was a futile and wholly irresponsible attempt to achieve "herd immunity", which has never been achieved in the absence of a vaccine. This led to the recommended course of action from SAGE not being followed, namely an early stage "circuit breaker" to prevent the rapid rise in transmission. Notably, by this time it was clear that vaccines could be available within months.

83. As prevalence began to build, infection was still arguably at levels manageable by FTTIS for some considerable time into September. However, the system

lacked sufficient capacity, and people were not given the motivation or the means to self-isolate following a positive test, unlike other countries. The capacity of testing was overwhelmed by schools and universities returning, despite the network having the quiet summer to prepare. The roof was not fixed while the sun had been shining.

84. Claims from Dido Harding that NHS Test and Trace had not been warned that scaling up of testing would be necessary were strongly rebuked by Sir Jeremy Farrar, SAGE member and head of the Wellcome Trust. [SG/47 - *see link 47 at reference list below*]

85. Airborne transmission was still not officially acknowledged at this time, so face coverings and FRSMs were in use in conjunction with "social distancing" and various infection control theatrics, like Perspex screens. Whilst hand washing is laudable for many reasons, it did not interrupt SARS-CoV2 transmission. However, restrictions did dramatically reduce e.g. norovirus and virtually eliminated influenza during the winter of 2020.

86. Free LFDs were provided in targeted settings from September 2020, and were then extended to universal testing in the spring of 2021 as the country followed the "roadmap" out of restrictions [SG/48 - INQ000618241] . Many were cautiously optimistic regarding the new focus upon "data, not dates", enabled by mass testing and the ongoing vaccine programme. However, it quickly became apparent that dates and data were likely to switch in terms of Government priorities.

87. One of the red lines for the roadmap was the emergence of a new VoC. However, the importation of the Delta variant seemingly did not count despite its high inherent virulence and increased ability to reinfect. In some ways, the focus upon mass testing was used as an excuse to not implement population-scale mitigations that would prevent a surge of infections and keep the roadmap on track. Mitigations were consistently branded as restrictions/lockdowns in official communications, yet unnecessarily so; this framing did not help public understanding of the ongoing risk from the

pandemic, especially when the alternative was Boris Johnson's "Freedom Day". [SG/49 - INQ000618242]

88. Delta caused two spikes in hospitalisations, both reaching ~9/100K, over the spring and summer of 2021. Notably, this included "Freedom Day", July 19th 2021, where limitations on the number of people gathering indoors were dropped along with the majority of other mitigations.

89. The requirement to self-isolate was changed in Aug 2021 to being contingent upon a positive PCR test, whilst under 18s were no longer required to isolate. I am still to hear of any logical explanation of why it shouldn't matter if CYP are infected and/or infectious.

90. Also at this time, the NHS App was being blamed for a so-called "pingdemic", with huge numbers of people coming into contact with somebody infected with SARS-CoV2. The app, when eventually rolled out, represented an important aspect of FTTIS, namely the "find" component. However, the narrative around the "pingdemic" was one of "blaming" the app for the lack of people being able to attend work, rather than focusing upon the high prevalence of SARS-CoV2 at the time. The Delta waves peaked at ~3.5% positivity. The sensitivity of the app was eventually dialed down in response to negative press, removing yet another barrier to transmission. [SG/50 - INQ000618244]

91. Delta was dwarfed by the ensuing Omicron variants, BA.1 and BA.2, which peaked at ~10% and 9% positivity, respectively. Like Delta, the majority of those affected were younger, including children. Boris Johnson reluctantly implemented "Plan B", in December 2021 as BA.1 peaked, which involved face masks (not respirators), NHS passes, and working from home "where possible". Predictably, this had little impact upon the shape of the epidemic. [SG/51 - INQ000618245]

92. The BA.2 peak coincided with the end of both "NHS" Test and Trace (February) as well as the Universal Testing Offer in March 2022 (UTO, i.e. free LFDs and PCR tests). This heralded the switch over to the Government "Living with COVID" strategy. Independent SAGE published a statement on the end of the

UTO and its impact upon both the progress of the pandemic, as well as the disproportionate impact upon vulnerable groups. [SG/27 - INQ000618223]

93. Notably, despite the rhetoric around Omicron being "nature's vaccine" and assurances that it was a "milder disease", the peak hospitalisations for BA.1 and BA.2 were at ~20/100K, more than twice as high as Delta, higher than November 2020, and around half that of the Alpha wave. Moreover, the number of CYP admitted to hospital during this period was the highest on record. As testing remained in place, this suggests that both the motivation to take part and enablement of actions in relation to a positive test make a significant contribution to effectiveness. [SG/52 - INQ000618246]

94. Following March 2022, the majority of UKHSA reported cases were in healthcare settings (although even these were not comprehensive enough to define the number of admissions or nosocomial infections), with a clear disconnect from the gold-standard ONS infection survey. Hospitalisations became the next best marker of SARS-CoV2 prevalence, especially as the ONS finished the infection survey in the spring of 2023.

The impact of vaccination upon prevalence and its effect upon Test and Trace.

95. Since "living" with COVID began, subsequent waves of SARS-CoV2 infection have been countered by a diminishing booster/vaccination regimen, privately available vaccines, and a limited number of therapeutics available to treat those most clinically vulnerable. Moreover, access to the latter has become increasingly difficult over time and the number available has fallen; the majority of monoclonal antibodies have now become clinically redundant due to viral evolution. The UK never procured prophylactics such as Evusheld (AZ) despite them being MHRA approved [SG/53 - INQ000618247] . Had this been available in the UK during times when testing remained in place, many vulnerable people could have enjoyed a (limited) improvement of their daily lives, as was the case in countries where it was rolled out.

96. Limiting eligibility for immunisation is non-ideal given that infection carries a far greater inherent risk compared with vaccination, ensuing immunity is much less

consistent, and survivorship bias is obviously a factor. The end of free tests and NHS Test and Trace during the Omicron period has led to widespread ignorance of the fact that COVID continues to pose a relentless public health challenge, despite the individual chance of developing severe disease being dramatically reduced in vaccinated people.

97. Immunity vs severe disease, whether from vaccines or infection, also wanes, albeit at a much slower rate compared to immunity vs. infection (see below). Moreover, vaccine immunity, but not infection-induced immunity, is one of the few protections vs. the incidence of long COVID [SG/54 - INQ000618248] . Hence, the end of testing coincided with reduced vaccine (booster) eligibility, and where younger age groups were (and still are) poorly immunised in relation to older ones. This is an issue as people of all ages, including children, can develop long COVID and the risk is cumulative with reinfections. Sadly, long COVID, transmission and other factors are not taken into account by JCVI assessments of cost-effectiveness.

98. Nevertheless, immunity does impact upon transmission, despite it not being sterilising; R_t (the real time reproductive rate, accounting for immunity and other factors) is far lower than R_0 for SARS-CoV2, despite minimal mitigations in place. Numerous studies show how recent infected/vaccine convalescent sera can both succeed or fail to neutralize the virus, showing how immuno-evasive adaptation in spike (primarily) is a key aspect driving SARS-CoV2 evolution.

99. Tracking of this evolution in the UK now relies upon comparatively low numbers of PCR tests taken in healthcare settings being sequenced. Whilst reducing mass PCR testing was understandable given cost and the usefulness of LFDs, not replacing it with wastewater testing (in England) has severely impaired genetic epidemiology at a point where viral diversity continues to perpetuate multiple epidemic surges every year. Moreover, the risk of a new, more virulent and/or immuno-evasive variant remains, as seen for BA2.86 and JN.1.

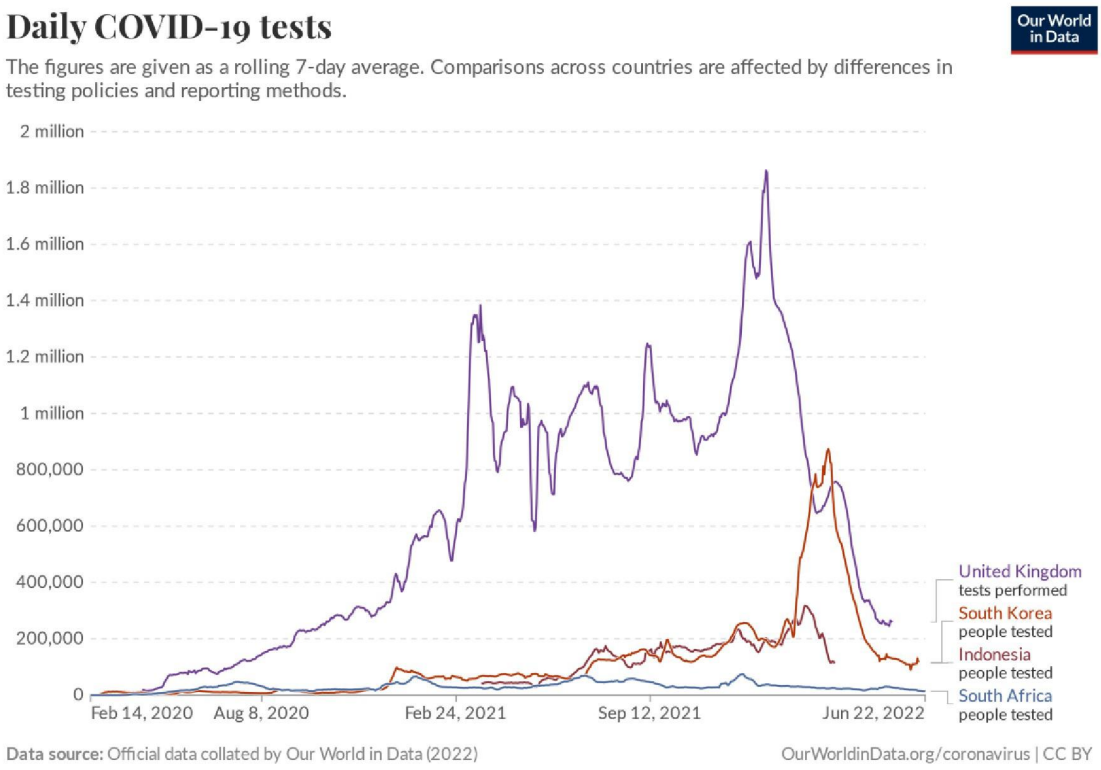
Final considerations – what if we had been South Korea?

100. South Korea is often heralded as an exemplar COVID responder, and for good reasons [SG/55 - INQ000618249; **SG/32 - INQ000618229** ; **SG/56** -

INQ000618251], many of which highlight the issues with "NHS" Test and Trace. I will use a comparison as a vehicle to summarise my evidence statement:

a. South Korea learned and, critically, **remembered** lessons from the past. This involved direct experience from both SARS-CoV1 and MERS-CoV, both of which were highlighted by UK pandemic preparedness exercises as gold standard examples of how to curtail respiratory virus epidemics. We must improve our institutional memory, most importantly of this Inquiry, to enable the implementation of any pandemic response plans going forwards. By contrast, the South Korean Government considered its handling of the MERS-CoV outbreak as flawed, and so implemented 48 reforms to boost public health emergency preparedness and response.

b. South Korea embraced the WHO recommended principles of FTTIS, whilst the UK focused upon "TT" and the other elements were secondary. Interestingly, this actually meant that South Korea used substantially fewer tests (accounting for differences in policies and reporting) on average during 2020-22, until the onset of the Omicron BA.2 wave. For example, according to Our World in Data, the peak testing capacity in the UK reached 1.86M tests/day during the BA.1 peak, whilst South Korea was at 196K tests/day; this is actually much higher than the majority of this time period. Moreover, the test positivity rate in South Korea was much lower, reflecting better control of the virus.



c. What this demonstrates is that merely **testing en masse is not enough, it also matters what action is taken in relation to a positive test result**. For socioeconomically disadvantaged groups, there simply wasn't the financial, logistical or legislative support in the UK to self-isolate.

d. South Korea **acted quickly** at the beginning of the pandemic and was able to suppress infections early on. This **avoided extreme lockdown** measures such as stay at home orders, etc. The country was one of the first outside of China to have an imported case during January 2020, and the **Government activated its "Central Disaster and Safety Countermeasures Headquarters" within days**. This met daily during 2020, and the Prime Minister attended three times per week from the outset. This demonstrates the value of acting early and fast during an epidemic, as famously espoused by Michael Ryan at WHO, and is in stark contrast to the UK response and the COBR attendance record of the former UK Prime Minister.

e. The South Korean response was embedded within a **well-maintained national healthcare system with significant bed capacity, utilising partnership with, rather than dependence upon, private industry**, to enable sufficient testing capacity from the very beginning of the pandemic, i.e. during wave one.

f. South Korea implemented **appropriate use of mask wearing** alongside other measures such as **improved indoor air quality**, once again learning (rather than debating) from past epidemics [SG/57 - INQ000618252]. This was enabled by good supply and price control, as well as fines for those objecting to wearing one in public. Whilst the latter policy is certainly a matter for debate, 94% compliance was achieved during March 2020. This compares with the UK (5%) and other countries where skepticism led to masks only being recommended under certain scenarios, with the ulterior, futile, motive of achieving herd immunity by infection.

g. South Korea achieved a **high rate of vaccination across the entire population** (>87%) before beginning to relax mitigations and testing during the spring of 2022. Despite the BA.2 wave, an associated increase in cases, and more than doubling of the previous death toll, this still leaves South Korea to this day with only 35.9K confirmed deaths linked to COVID. Whilst measures remained in place, levels were incredibly low, only reaching 2K in June 2021. UK confirmed COVID deaths in June 2021 numbered in excess of 150K, and are now over 230K.

h. Finally, as discussed in the UK Parliament's Health and Social Care Committee and Science and Technology Committee joint report in Oct 2021 [SG/58 - INQ000587713], and during this Inquiry, the **UK needs to improve its ability to learn from other countries** in terms of pandemic preparedness. Sadly, we seem to be in a situation at present that squarely ignores the ongoing issues with COVID, the annual pressures from seasonal infections, as well as the imminent threat posed by avian influenza. Public attitudes and Government readiness seem to have declined compared to 2020, so it's **essential that a revised plan for rapid**

implementation of FTTIS during an emergency has either begun, or will be implemented in response to the learnings from this module.

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: 03/06/2025

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