Witness Name: Professor Sir Peter Horby
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UK COVID-19 INQUIRY

WITNESS STATEMENT OF PROFESSOR SIR PETER HORBY

I, Professor Sir Peter Horby, will say as follows: -

1. This statement is provided in response to a Rule 9 request from the UK Covid-19 Inquiry ("the Inquiry") in relation to Module 2 and is intended to cover the relevant time period identified in the Inquiry's Module 2 Rule 9 request from the beginning of January 2020 to 24 February 2022, with a particular focus on the period from 1 January 2020 to 26 March 2020.

Inquiry's Rule 9 request for an overview of the Centre for Tropical Medicine and Global Health

2. The Centre for Tropical Medicine and Global Health (CTMGH) is a Centre within the Nuffield Department of Medicine, University of Oxford, comprised of research groups who are permanently based in Africa and Asia as well as in Oxford. The research portfolio is currently around £340 million, mostly directed at tackling infectious diseases.

3. CTMGH currently has 72 principal investigators, 220 staff employed in Oxford, and 2,000 staff employed overseas at three programmes in Kenya, Thailand and Vietnam. CTMGH also brings together several sister groups in Laos, Cambodia, Myanmar, Indonesia, Nepal, Uganda and the Democratic Republic of Congo, as well as multiple collaborators around the world.

4. CTMGH has developed and maintained world-leading infectious disease research partnerships in resource constrained countries for more than 40 years, with research partners in more than 130 countries, including the very least resourced settings. In relation to pandemic threats, CTMGH has for decades worked on epidemic and pandemic prone infectious diseases such as Severe Acute Respiratory Syndrome (SARS), highly pathogenic avian influenza, pandemic influenza, Middle East Respiratory Virus coronavirus (MERS-CoV), Zika virus, Ebola, Rift Valley fever, Lassa fever and plague.

Inquiry's Rule 9 request for an overview of the Pandemic Sciences Institute

5. One of the lessons that can be drawn from the pandemic is that academic excellence, when partnered with strong public health and commercial capabilities, can deliver major benefits at unprecedented speed. In response to the Covid-19 pandemic, the University of Oxford mobilised extensive scientific capabilities across many different disciplines to make a major national and international contribution. Achievements of the University of Oxford include:

    - The Oxford/AstraZeneca vaccine - over 3 billion doses made available for use in 183 countries, estimated to have saved 6.3 million lives in the first year of the global vaccine rollout.
    - The RECOVERY trial of Covid-19 treatments – the world's largest and most influential trial of treatments for moderate to severe Covid (further details of the RECOVERY trial can be found at paragraphs 22 to 37 below).
    - A high-throughput serology platform capable of testing antibody status in 50,000 samples per day – used for the Office for National Statistics (ONS) Covid Infection survey.
    - The world's largest Covid clinical dataset – with more than 950,000 patient records, the International Severe Acute Respiratory and emerging Infections Consortium (ISARIC) database is the largest and richest international individual patient dataset of hospitalised Covid-19 cases.
    - The NHS contact tracing app - Oxford academics contributed to the development of the NHS Covid-19 app, which is estimated to have

prevented around 1 million cases, 44,000 hospitalisations and 9,600 deaths during its first year.

- The Covid-19 Government Response Tracker that enabled comparison of government policy responses around the world.

6. The Pandemic Sciences Institute (PSI) was created to ensure that the level of innovation, multidisciplinary and multisectoral partnership that led to these achievements is consolidated and continues to protect us from another devastating pandemic. I am the inaugural Director of the PSI.

7. The PSI was officially launched in July 2022 as a multi-disciplinary centre of global research collaboration in pandemic sciences. The purpose of the PSI is to help ensure that the world is better equipped to prepare for, identify and counter future pandemic threats. The PSI has 23 senior investigators, each of whom lead a research field, representing all four divisions of the University (Medical Sciences; Humanities; Mathematical, Physical and Life Sciences; and Social Sciences). The expertise of the members of the PSI include infectious disease, vaccines, therapeutics, clinical trials, diagnostics, data analytics, epidemiology, ethics, history, social science and policy.

8. The PSI acts as an academic partner to public health agencies, such as the UK Health Security Agency (UKHSA) and the World Health Organisation (WHO), and commercial entities.

Inquiry's Rule 9 request for a summary of work conducted by ISARIC in relation to Covid-19

9. ISARIC (International Severe Acute Respiratory and emerging Infections Consortium) is an investigator-led federation of independent, hospital based clinical research networks with a shared interest in emerging and epidemic infectious diseases. ISARIC was created in 2011 to remedy the poor clinical research response to the H1N1 influenza pandemic in 2009/2010. I am currently the Executive Director of ISARIC and held this position throughout the pandemic.

10. ISARIC aims to be a global federation of clinical research networks, providing a proficient, coordinated, and agile research response to outbreak-prone infectious diseases. ISARIC's mission is to generate and disseminate clinical research evidence for outbreak-prone infectious diseases, whenever and wherever they occur.

11. The work of ISARIC during the Covid-19 pandemic includes the following initiatives:

Rapid, standardised clinical characterisation of Covid-19

12. In 2012, the ISARIC-World Health Organization Clinical Characterisation Protocol (CCP) was developed and activated for MERS-CoV and has been adapted and implemented in multiple outbreaks since, including Ebolavirus disease, Zika, yellow fever, tick-borne encephalitis, Mpox and severe acute hepatitis in children. A copy of the CCP is exhibited at PH2/1 [INQ000221979].

13. In an email to the Chief Medical Officer (CMO) dated 17 January 2020 I requested activation of the CCP for Covid, to which the CMO agreed the same day. A copy of this email is exhibited at PH2/2 [INQ000221945]. The ISARIC WHO CCP-UK study was activated the same day, on 17 January 2020, as described and exhibited in the paper entitled 'Features of 20133 UK patients in hospital with Covid-19 using the ISARIC WHO Clinical Characterisation Protocol: prospective observational cohort study' exhibited at PH2/3 [INQ000221983].

14. The ISARIC Covid-19 CCP and its associated database were operational for free public use from 24 January 2020, when only 846 Covid-19 cases had been reported globally. A copy of the 'core case report form' for Covid-19 (which is the patient data collection form) is exhibited at PH2/4 [INQ000221981].

15. The CCP was used for the first clinical report of Covid-19 and the first clinical trials in Covid-19. The first patient data were entered on 24 January 2020 (from Canada) and the first UK patient data were entered on 31 January 2020 (these were the

very first cases identified in the UK). Subsequent massive global uptake resulted in rapidly pooled data which were analysed and reported weekly, informing clinical trial designs and public health policy.

16. Now, with more than 950,000 records, the ISARIC database is the largest and richest international individual patient dataset of hospitalised Covid-19 cases. It is a good example of global peer-to-peer collaboration, with contributions from 1,700 sites across 76 countries. More than half of the data originate from low- or middle-income countries (LMICs), as do half of the collaborators on more than 50 reports and manuscripts which have been published under collective authorship involving hundreds of contributors. The ISARIC Covid-19 CCP has been acknowledged or cited in over 7,700 publications.

In depth understanding of Covid-19 disease

17. The first clinical description of Covid-19 cases was prepared by an ISARIC member (using the CCP case report form) in a paper entitled 'Clinical features of patients infected with 2019 novel coronavirus in Wuhan, China. Lancet 2020'. This was accompanied by a commentary piece which I co-authored entitled 'A novel coronavirus outbreak of global health concern. Lancet 2020'. This commentary highlighted '*grave concerns about the future trajectory of the outbreak*', that '*rapid information disclosure is a top priority for disease control and prevention'*, and the risk that it could become a pandemic. These papers were published online in the Lancet on 24 January 2020, and are exhibited at PH2/5 [INQ000221999] and PH2/6 [INQ000222003].

18. In partnership with researchers and public health agencies across the UK, the ISARIC Comprehensive Clinical Characterisation Consortium (ISARIC4C) was established. This was an extension of the ISARIC WHO CCP-UK study that incorporated more detailed sampling of patients. ISARIC4C was launched in January 2020 to recruit the first Covid-19 patient admitted to hospital in the UK, and over 330,000 others over the next 3 years. Samples were shared immediately with WHO for use in the international serology reference standard, and with vaccine development groups. Clinical data and samples were collected and

analysed to characterise the pathogen and severe disease. ISARIC4C has, to date, published over 60 original research papers and contributed to more than 170 others. The outputs from ISARIC4C have guided the UK government policy and response, contributed to nationwide prescribing guidance for Covid-19 treatments, and provided evidence that improved care and outcomes for patients worldwide.

Clinical trials in moderate to severe Covid-19

19. The very first randomised clinical trial in Covid-19 (of lopinavir-ritonavir) enrolled its first patient in Wuhan on 18 January 2020, just 20 days after the outbreak was first made public. This trial was led by an ISARIC member and supported by the membership, including using the ISARIC CCP for data capture and elements of a MERS-CoV clinical trial protocol provided by another ISARIC member. The very first randomised placebo-controlled clinical trial in Covid-19 (of remdesivir) enrolled its first patient in Wuhan on 6 February 2020. Again, this trial was led by an ISARIC member and supported by the membership. The resulting publications (of which I am a co-author) are exhibited at PH2/7 [INQ000221986] and PH2/8 [INQ000222012].

20. As the pandemic moved from China to Europe, ISARIC was also involved in establishing the UK RECOVERY Trial. Further details of the RECOVERY trial are provided below.

21. Another influential clinical trial of treatments for severe Covid-19, the Randomised, Embedded, Multi-factorial, Adaptive Platform Trial for Community-Acquired Pneumonia (REMAP-CAP trial), had its origins in ISARIC. In 2012 ISARIC members developed the Global Adaptive Clinical Trial-Severe Acute Respiratory Infection (GACT-SARI) study concept which later evolved to become REMAP-CAP.

Inquiry's Rule 9 request for an overview of the RECOVERY trial

22. The Randomised Evaluation of Covid-19 Therapy (RECOVERY) trial of treatments for moderate to severe Covid-19 was given in-principle agreement by the CMO at

a face to face meeting I had with him and the Deputy Chief Medical Officer (DCMO) at the Department of Health and Social Care (DHSC) offices in London on 10 March 2020. As requested by the Inquiry, my hand written note and email to Professor Sir Martin Landray dated 10 March 2020 on the occurrence and outcome of this meeting are exhibited at PH2/9 [INQ000222019] and PH2/10 [INQ000221947] respectively.

23. The RECOVERY trial enrolled its first patient just nine days later on 19 March 2020. The trial is co-led by Nuffield Department of Population Health Professor, Sir Martin Landray, and the Nuffield Department of Medicine (myself) at the University of Oxford. It was designed to discover new drug therapies to treat people hospitalised with Covid-19.

24. The RECOVERY trial is now the world's largest and most influential clinical trial of treatments for moderate to severe Covid-19. Since its inception, RECOVERY has tested 13 different drugs, comparing the effects with usual care alone in over 48,500 participants.

25. The trial has uncovered four treatments that reduce the risk of death from Covid-19: dexamethasone, tocilizumab, ronapreve, and baricitinib.

26. The finding that dexamethasone saves the lives of seriously ill patients provided the first major breakthrough in the Covid-19 response. In March 2021, NHS England estimated that the use of dexamethasone had already saved 22,000 lives in the UK and 1 million worldwide. This announcement is exhibited at PH2/11 [INQ000222008].

27. RECOVERY also demonstrated that nine treatments, many of which were being used for and championed as treatments for Covid-19, were not actually beneficial, and that one other treatment was harmful. These important results allowed efforts to be focused on other promising treatments, and informed the way in which patients are treated around the world. RECOVERY is continuing to recruit patients to test additional therapies.

28. Results from the RECOVERY trial have demonstrably changed clinical guidelines for the treatment of moderate to severe Covid-19 worldwide.

29. RECOVERY used a streamlined trial design which enabled it to be set up quickly and integrated with the National Health Service (NHS) whilst minimising the burden on frontline staff. Around 190 acute NHS hospitals in the United Kingdom have been involved in recruiting participants to the RECOVERY trial. In addition, RECOVERY has expanded internationally to six countries: Ghana, India, Indonesia, Nepal, South Africa, and Vietnam to find treatments appropriate to different settings (including low- and middle-income countries) and to help address the emergence of further new variants of SARS-CoV-2.

30. The trial also pioneered novel data linkage to routinely collected NHS data. Data are brought together from over 25 source files from seven organisations through deployment of 50 bespoke algorithms; this is the first time such broad linkage has been used in a clinical trial. Over 75 full cycles of data linkage have been completed.

31. RECOVERY has received multiple awards including the David Sackett trial of the year, BMJ research paper of the year, Times Higher Education Research project of the year, Project Management Institute's best Covid-19 response project of the year, Health Data Research UK's Impact of the Year Award 2021, MRC Outstanding Team Impact Award 2023, and the Prix Galien UK Award 2023 for Best Public Sector Innovation.

32. The trial is cited as a 'world-leading' case study in the UK Government White Paper: Saving and improving lives: the future of UK clinical research delivery (March 2021) and is cited as an exemplar of UK life sciences excellence in the UK Life Sciences Vision (March 2021). These two documents are exhibited at PH2/12 [INQ000221974] and PH2/13 [INQ000221968].

33. The RECOVERY trial was also 'lauded' in the G7 report '100 Days Mission to prepare for future pandemic threats' (June 2021), which is exhibited at PH2/14 [INQ000221971].

34. The trial provides a model for future clinical trials, particularly in pandemic settings; it has been described as a 'beacon of excellence' and championed as a model that should be adopted in other countries. For example, three of the US Food & Drug Administration leadership team have stated that "*Patients in the US would be more likely to benefit from novel findings of effectiveness earlier if a similar streamlined approach to clinical trials were adopted*." This opinion piece entitled 'Benefits of Streamlined Point-of-Care Trial Designs Lessons Learned From the UK RECOVERY Study; December 2022' is exhibited at PH2/15 [INQ000221972].

35. Based on my RECOVERY experience and the data generated by the trial I have provided expert advice on NHS clinical commissioning policy for six Covid-19 treatments through membership of NHS National Expert Working Groups. I have also advised the European Medicines Agency (EMA), for example I presented results of the tocilizumab comparison to EMA on 15th February 2021, and the U.S. Food and Drug Administration (FDA), for example I presented results of the dexamethasone comparison to FDA on 11th September 2020, on treatments for Covid-19.

36. I would like to emphasise that the RECOVERY trial success was in large part a result of clear and robust leadership from the UK Government and other central institutions, particularly:

    a. The clear support of the CMOs, DHSC and the NHS leadership for rigorously evaluating Covid-19 treatments through clinical trials;
    b. DHSC and PHE support in drug provision and supply;
    c. The designation and support by the National Institute of Health Research (NIHR) and the NIHR Clinical Research Network of a limited number of national Urgent Public Health prioritised studies and of the Government Office for Science of National Core studies;
    d. Establishing the Covid-19 Therapeutics Advisory Panel (CTAP) to review and recommend drugs for evaluation;
    e. Willingness of NHS Digital to support extensive data linkage as a mechanism to streamline the trial, and

f. Timely and constructive review and feedback on the trial by the Health Research Authority (HRA) and Medicines and Healthcare products Regulatory Authority (MHRA).

37. This central strategic support combined with academic independence and leadership in delivering the trial proved very successful, and ought to be a model for the future.

Scientific Advisory Group for Emergencies (SAGE)

38. There were meetings of the NERVTAG main committee that took place in early January 2020, on 13 and 21 January 2020, prior to the Scientific Advisory Group for Emergencies (SAGE) being convened. For completeness, minutes of the NERVTAG meetings on 13 and 21 January 2020 are exhibited at PH2/16 [INQ000023107] and PH2/17 [INQ000023119].

39. My first dealings with SAGE was at the first (Precautionary) SAGE meeting on 21 January 2020 and I recall that directly after that meeting the CMO, the DCMO, the Government Chief Scientific Advisor (GCSA) and I discussed how NERVTAG and SAGE would interact. The output of that discussion is referenced in the minutes of the second SAGE meeting that took place on 28 January 2020 (exhibited at PH2/18 [INQ000057492]) which state, "*SAGE is responsible for coordinating science advice across HMG, including from NERVTAG*."

40. The existing protocol from DHSC indicated that NERVTAG would be stood down in an emergency, but it was decided that NERVTAG should remain active during the Covid-19 response and continue to accept commissions from DHSC and from SAGE via DHSC so that NERVTAG's members could continue to contribute their expertise to the Covid-19 response.

41. In my view, this approach worked well and as the response to Covid-19 progressed we took commissions from DHSC and Public Health England (PHE, latterly the UKHSA) in relation to the Covid-19 response and provided expert advice directly

to SAGE via papers that were submitted for discussion at SAGE meetings. The papers that were submitted directly to SAGE did not require sign off by DHSC.

42. I attended SAGE meetings in my capacity as Chair of NERVTAG and as a representative of NERVTAG. I attended 89 of 105 SAGE-Covid-19 meetings.

43. As a member of SAGE, I was part of the discussion at the meetings and would comment on matters on the agenda and comment on whether a proposed commission was appropriate for the NERVTAG committee to consider or not. I would raise any questions needed to clarify the commissions, report back on any NERVTAG committee view on issues being discussed at SAGE and answer any questions from other SAGE members about NERVTAG's submissions.

44. Through my attendance at SAGE committee meetings, I could see how the information provided was reviewed, discussed and incorporated into the advice that the CMO and the GCSA would then provide to the UK Government. However, I was not part of or privy to the discussions between the CMO and GCSA and COBRA or UK Government ministers, so I do not know exactly how the advice that was discussed and agreed at SAGE meetings was communicated to ministers.

45. The GCSA and CMO would gather information and views at the SAGE meetings and SAGE would verbally agree a position at the meeting. As I understand it, the SAGE agreed position was often directly communicated to ministers immediately after the SAGE meetings by the GCSA and CMO. The strengths of this approach were efficiency and clarity of communication. The GCSA and CMO are both clear and effective communicators with very strong technical understanding. In my view this was an efficient way of communicating the advice from SAGE. Whilst formal committee agreement of written minutes prior to giving advice to minsters would be ideal, this was not practicable given the often very urgent need for scientific advice to guide policy decisions.

46. My view is that SAGE was run very well. The GCSA and CMO drew out the views of the members, sought and gave effective challenge, and ensured SAGE reached

an agreed position before advice was provided to ministers by the GCSA and CMO.

47. I believe independent scientific members of SAGE did not generally have direct interactions with ministers and senior politicians. In my role as a SAGE member, I did not have any interactions with senior politicians, although I met with the Prime Minister, Boris Johnson, on one occasion on 16 June 2020, to discuss the dexamethasone results of the RECOVERY trial but that was in my role as co-chief investigator of the trial and sat outside of the remit of SAGE and NERVTAG. All communications with ministers and senior politicians regarding SAGE advice were largely dealt with by the GCSA and CMO.

48. In my view it was unavoidable that SAGE members did not have direct visibility of the discussions the GCSA and CMO had with ministers and policymakers about SAGE's advice. However, this did mean that when policy formulated by ministers was not fully aligned with SAGE's advice, the reasons were sometimes unclear. A case could be made for summaries of these discussions to be fed back to SAGE to help improve the understanding of the committee of the decision-making context and process.

49. SAGE spent considerable time reviewing international data, perspectives and lessons that might be learned. The members of the committee often had direct relationships with affected countries that provided up to date and detailed information. For example, at the 6th SAGE meeting (that took place on 11 February 2020) all UK Heads of Mission in affected countries were requested to provide data to the UK Government, with priority given to data from Japanese and Singaporean Governments. Also the scientific paper 'Comparing interventions in Italy and UK' was considered at the 22nd SAGE meeting. The minutes of the 6th and 22nd SAGE meetings and the scientific paper are exhibited at PH2/19 [INQ000221966], PH2/20 [INQ000106108] and PH2/21 [INQ000221949].

50. In terms of pre-existing scientific advisory committees reviewing international data, the review of international data was broadly split as follows:

a. SPI-M (Scientific Pandemic Influenza Group on Modelling) was focussed on epidemiology;
b. NERVTAG focussed largely on clinical and virological data although had a fairly broad brief (especially in the early stages of the pandemic); and
c. JCVI (Joint Committee on Vaccination and Immunisation) looked at vaccines and vaccination.

51. Information and advice from all of the groups would be brought to SAGE, whether via discussions from SAGE members or scientific papers presented to SAGE.

52. The Inquiry have asked whether I believe there was sufficient public health expertise on SAGE. In terms of public health expertise, I am a qualified consultant in public health, but I did not work in the UK public health sector at the time of the pandemic. The CMO is a clinician with a lot of global health experience and the DCMOs were public health practitioners. A director of public health active at a local authority level attended SAGE later in the response to Covid-19, with Dr Jeanelle de Gruchy, Director of the Association of Directors of Public Health, joining from SAGE 73 onwards. In my view early in the Covid-19 response there was not sufficient representation of front-line public health practitioners on SAGE. Although SAGE is a scientific advisory committee with most of the members rightly being scientists, representatives from PHE and the NHS were present from the earliest stages to give an operational perspective on the science needs and technical challenges. It would likely have been helpful to SAGE to have similar operational insight from the district public health perspective. Whilst I am not able to identify any instances where this may have affected the quality of SAGE advice, this would, in my view, be worthy of further inquiry.

53. The Inquiry have asked whether I believe there was sufficient clinical expertise on SAGE and its subgroups. I believe NERVTAG had sufficient clinical input: the committee had three clinician members already and we added a further two. However, NERVTAG did not have input from a primary care clinician or a geriatrician, which might have been useful.

54. In my experience, SAGE and NERVTAG were subject to significant challenge. For example, NERVTAG provided papers on facemasks, entitled 'Face mask use in the community' dated 13 April 2020, exhibited at PH2/22 [INQ000074914], and reviewed at the 25th SAGE meeting, and 'Wearing facemasks in a community setting: options and evidence' further précised on 16 April 2020, exhibited at PH2/23 [INQ000074918], and reviewed at the 26th SAGE meeting.

55. Separate analyses of the use of facemasks were provided by Imperial College London, entitled 'Potential impact of face covering on the transmissibility of SARS-CoV-2 in the UK' dated 20 April 2020, exhibited at PH2/24 [INQ000221973], and the Royal Society Data Evaluation and Learning for Viral Epidemics (DELVE) group entitled 'DELVE Report on Face Masks for the General Public' exhibited at PH2/25 [INQ000221975] and considered at the 27th SAGE meeting.

56. Therefore, between the 9th and the 24th April 2020, three separate scientific opinions on the use of facemasks were commissioned and considered by SAGE resulting in SAGE advice that is outlined in the minutes of the 27th SAGE meeting, which are exhibited at PH2/26 [INQ000062295].

57. SAGE meetings were, in my experience, an open forum for challenge with robust discussions and sharing of views. I believe the CMO and GCSA did a good job of encouraging challenge whilst also moving the conversations forward to a meaningful conclusion.

58. In my experience, SAGE were well aware of what was happening internationally and were open to challenges and external views. There were frequent discussions about what SAGE could learn from elsewhere. There has been an accusation that the Government and science advisors were guilty of 'group think' when it came to border controls and earlier lockdowns. I understand the term 'group think' as meaning that a relatively closed group are unwilling to critically challenge majority positions within the group or to seriously consider alternative, external options. I do not think the term 'group think' is accurate since SAGE was not a forum where views went unchallenged and the actions being taken were not that dissimilar to many other countries at that time. The European Centre for Disease Control

(ECDC) and WHO also did not recommend travel restrictions at that time. My own view is that the reluctance to recommend very disruptive, society-wide measures at an early stage whilst there was considerable uncertainty probably reflects wider political, social, economic, and scientific cultural traditions.

59. Around May 2020, a meeting between the Chairs of SAGE and Chairs of the other scientific advisory committees began. The purpose of these meetings was to discuss forward planning and the points that needed to be discussed at the main SAGE meetings. These meetings would be an opportunity for the Chair of each scientific advisory committee to report on what tasks they were working on and to allow opportunity to coordinate to ensure that all areas were covered. These meetings of the Chairs were useful and were usually held one week before a SAGE meeting.

NERVTAG

60. In relation to the circumstances in which I was appointed as Chair of NERVTAG and the roles and responsibilities of this position, a vacancy for the position of Chair of NERVTAG arose in 2018 after the Chair at the time, Jonathan Van-Tam, was appointed to the position of Deputy Chief Medical Officer (DCMO). Jonathan Van-Tam stepped down as Chair of NERVTAG due to his appointment to DCMO, as was necessary since the Chair of NERVTAG reported to the DCMO. I applied for the position of Chair of NERVTAG and was appointed following a competitive interview process. As Chair, it was part of my role to discuss the agenda for NERVTAG meetings with DHSC and attend pre-meetings with the DCMO and the secretariat. These meetings were informal and were not minuted.

61. I was also responsible for the practical running of the committee including ensuring that any conflicts of interests were declared, the right people were represented at the meeting, that diverse views were solicited and heard, the terms of reference around the papers the committee was considering were clear, that the discussions at the meetings were respectful and productive, and that any recommendations were clear. It is part of my role to review the first draft of the minutes prepared by the secretariat before they are sent out for review and approval by the rest of the

committee. My role as Chair also includes the preparation of the annual reports, which contain a summary of the activities of the committee and are prepared in conjunction with the secretariat and DHSC. In my role as Chair of NERVTAG, I would report back to the CMO about the findings from NERVTAG meetings by way of the minutes. The minutes would contain written recommendations and we would raise specific questions with DHSC in the minutes and the committee may, for example, recommend that DHSC commission some research if we felt there was an evidence gap. On some occasions the minuted action was for NERVTAG to send a formal letter to DHSC, as a mechanism for emphasising an important issue.

62. In terms of the different types of NERVTAG meetings we ran two types of full or "main" committee meetings. Our "routine" main committee meetings would be non-Covid-19 related meetings where the whole committee would meet to discuss NERVTAG's general agenda (excluding Covid-19). Example minutes from a routine main committee meeting during the Module 2 time period that took place on 8 July 2020 are exhibited at PH2/27 [INQ000204003].

63. In response to the emergence of SARS-CoV-2, NERVTAG began holding Covid-19 specific main committee meetings where matters relating to Covid-19 were discussed with the whole committee. Initially these meetings were held as frequently as could be accommodated, particularly prior to SAGE being convened. We then settled into a rhythm of holding the meetings approximately every two weeks. The timing of the meeting was important to allow us to receive updated papers from SPI-M and consider the data before we fed our advice into SAGE. Example minutes from a Covid-19 specific main committee meeting during the Module 2 time period that took place on 24 April 2020, which was the15th NERVTAG Covid-19 meeting, are exhibited at PH2/28 **INQ000120161**.

64. There were also meetings of 'task and finish' subgroups that would consider a particular topic and then report back to the main committee. Example minutes from a subgroup meeting during the Module 2 time period, specifically the NERVTAG Subgroup on Clinical Risk Stratification, that took place on 20 May 2020 are exhibited at PH2/29 [INQ000221967].

65. NERVTAG 'bird table' meetings were introduced during the Covid-19 response. These were called 'bird table' meetings since they were conceived as more informal, free-form meetings to give an opportunity for committee members to review the general status of the pandemic and raise any issues of interest or concern not covered under the main meeting agenda items. The main Covid-19 meetings were so full that we found we rarely had time for committee members to raise and discuss more speculative or horizon scanning issues. Hence, we introduced this alternative meeting format.

66. Bird table meetings were shorter meetings where any NERVTAG member could raise any topic they chose. This was an open call for topics to be discussed and some topics would be picked up for discussion at the main NERVTAG Covid-19 committee meetings. At the 'bird table' meetings there was usually an update and discussion about the current status of the pandemic, which we found was best dealt with outside of the main committee meetings as the updates tended to take up a considerable period of time. For example, we could receive an update on what was going on in specific areas such as care homes. Example minutes from a 'bird table' meeting during the Module 2 time period that took place on 12 June 2020 are exhibited at PH2/30 [INQ000120458].

67. Extraordinary meetings were ad hoc meetings convened where NERVTAG were asked to provide an urgent opinion on a topic, for example a new variant, contact tracing or facemasks. Example minutes from an extraordinary meeting on contact tracing that took place on 26th April 2020 are exhibited at PH2/31 [INQ000120452].

68. There were 40 full NERVTAG committee meetings in 2020 and 16 to the end of June 2021. In addition, there were 11 "Bird table" meetings in 2020. Extraordinary meetings were held to consider specific topics; novel therapeutics in February and March 2020, non-invasive ventilation (NIV)/high flow nasal oxygen (HFNO) in March 2020, contact tracing in April 2020, and four meetings on new SARS-CoV-2 variants in December 2020 and January 2021. In the 18 months from January 2020 to June 2021, NERVTAG held a total of 75 meetings.

69. NERVTAG's membership was made up of a range of individuals with a variety of expertise including clinical, epidemiology, virology and behavioural sciences. The NERVTAG committee's composition did evolve during the Covid-19 response, and further expertise was co-opted including an additional virologist (see exhibit PH2/32 [INQ000221950]), some additional clinicians and an epidemiologist.

70. Other experts were also asked to join our discussions on a case-by-case basis and the meetings were open to a wide range of observers to allow external visibility of the committee deliberations and challenge. For example, the 15th NERVTAG Covid-19 meeting on 24 April 2020 had 10 additional invited experts and 12 observers, the minutes of this meeting are exhibited at PH2/28 **INQ000120161**

71. Additional expertise was also extensively co-opted for task and finish subcommittee meetings. See, for example, the NERVTAG Subgroup on Clinical Risk Stratification meeting that took place on 20 May 2020 where 9 external experts that were not NERVTAG members attended the meeting to provide additional expertise. The minutes from this meeting are exhibited at PH2/29 [INQ000221967].

72. Details of the NERVTAG co-opted members as part of the response to Covid-19 are contained within Appendix C of NERVTAG's 5th annual report for the period January 2020 to June 2021, a copy of the full report is exhibited at PH2/33 [INQ000221969].

73. Given the urgent nature of the discussions held by the committee during this period, there was no time to advertise for co-opted roles as would usually happen, but the process of co-opting additional members to the NERVTAG committee was conducted openly. In terms of the process, there was a discussion at the committee meetings about whether additional expertise was required at a committee level and these discussions led to recommendations being made by the existing committee members about who might be best placed to contribute to the discussions. Then the individuals that had been identified by the committee were approached and invited by me, as the Chair, to join the committee as a co-opted member and contribute to NERVTAG's work.

74. As a committee NERVTAG was keen to ensure that there was a suitable mix of academics and individuals with front line experience at the appropriate level of expertise.

75. In April 2021, the membership of the committee was reviewed with a view to determining whether committee members' terms on the committee would be renewed. This was a routine appraisal and renewal process but also considered the significant advisory work being undertaken at that time in parallel by SPI-B (Scientific Pandemic Insights Group on Behaviours) and SPI-M, and the desire to avoid the potential for overlap between the scientific advisory committees.

76. In relation to the Inquiry's question within the Module 2 Rule 9 request, regarding why I decided, as Chair of NERVTAG, that it was appropriate for Professor Neil Ferguson to remain a member of NERVTAG after his resignation from SAGE in May 2020, I refer to the contents of the email that I sent to the CMO and DCMO on 6 May 2020 (at Inquiry document reference INQ000069117 as disclosed by the Inquiry) which comprehensively explains the reasoning behind this decision. For completeness, a copy of the email is exhibited at PH2/34 [INQ000221953].

Effectiveness of the working relationship between NERVTAG and SAGE

77. In my view, NERVTAG and SAGE worked well together during the pandemic. NERVTAG provided its expertise and recommendations to SAGE in an effective manner.

78. There was some lack of clarity about lines of accountability which was borne out of the pre-Covid-19 governance queries that I raised with DHSC and the DCMO prior to the pandemic. The governance structure that NERVTAG sat within was quite complicated, and I recall having conversations during my time as Chair to try to clarify the governance and reporting structures. I was provided with an organogram but it wasn't clear to me who was accountable to whom. The reporting structures set out in the organogram did not reflect what I understood to be the situation in reality. For example, in the organogram SPI-M reported into NERVTAG

but this was not the case in practice. I raised this with DHSC, and some clarifications were provided but this didn't completely resolve the issue. My understanding is that NERVTAG reported into DHSC and did not have any committees that reported into it. I had a meeting with Jonathan Van-Tam in April 2019 to discuss objectives for NERVTAG for the forthcoming year and I confirmed that I also wanted to discuss the governance organogram at the meeting. I recall we did have a brief discussion at this meeting about governance, I cannot recall the outcome or any arising actions from this part of the discussion. The organogram suggests that the NERVTAG committee was to be stood down in an emergency situation, but when the COVID-19 crisis began this was not the case as it was considered that there was value in keeping the committee running. It is my view that this was the right decision. I discussed the relationship between SAGE and NERVTAG face to face with the GCSA, CMO and DCMO immediately after the first SAGE meeting on 21 January 2020, and we all agreed the reporting framework, which worked well.

79. NERVTAG was a DHSC scientific advisory committee but sometimes PHE and SAGE would send commissions directly to us without routing them through DHSC. This opened the committee up to an intense workload and we reminded the groups of the need to route commissions for NERVTAG through DHSC.

80. Another reason why it was best for the commissions to be routed through DHSC is to ensure they were sufficiently specific and detailed. Sometimes the commissions that NERVTAG were provided with were too broadly specified which meant that we sometimes needed to seek further clarification to determine exactly what we were being asked. I raised this with the DCMO in an email dated 31 January 2020, exhibited at PH2/35 [INQ000221946]. The preceding email in the chain contains an example of a broadly specified commission in the form of questions from SAGE to which I refer. Although I believe this was not minuted anywhere, the consequence of this correspondence was that DHSC agreed to, and indeed did, strengthen their involvement in clarifying and screening NERVTAG commissions.

Understanding of scientific advice

81. The teaching sessions that NERVTAG hosted for employees of the Cabinet Office and DHSC were open sessions about the current status of knowledge in relation to specific topics. We provided this background information to assist policymakers with their work and the session requests came about through the Government Office for Science. A copy of the slides from a teaching session that I was involved with on Health Status Certification in relation to Covid-19 that was delivered on 22 January 2021 is exhibited at PH2/36 [INQ000221963].

82. I am not in a position to comment on whether the scientific advice provided by SAGE and NERVTAG was adequately communicated to the relevant policy makers as I was not present when this took place. The GCSA and CMO held the discussions with the policy makers and as I mentioned at paragraph 45 above the GCSA and CMO are, in my view, both clear and effective communicators. NERVTAG advice to DHSC, as opposed to SAGE, would be communicated to policy makers via the CMO or DCMO.

83. My impression is that the policy makers generally understood the scientific advice they were receiving but there was sometimes a difference in policy makers and politicians understanding of the nature of the evidence and the role of science advice compared to that of the scientists. For example, the models SPI-M were producing were sometimes presented in the press and other fora as being wrong because they failed to correctly predict the future. The outputs of modelling are more complex and diverse than this simplistic representation and whilst short term forecasts may be accurate, many of the outputs were scenarios that estimated what might happen under certain conditions ("what if" scenarios), rather than predictions of the future.

84. I believe the relationship between scientific advice and the formulation of policy was not well communicated to the press and the public. The phrase "following the science", was widely disliked by those of us giving science advice for two reasons. First, the phrase implies that there is always certainty in the scientific advice being given. Science is inherently uncertain and where there was uncertainty in the

science advice being given this was clearly communicated. In fact, the presence and scale of uncertainty is an important factor for policy makers to consider. Second, the phrase incorrectly implies there is a direct relationship between scientific advice and policy and unfairly places responsibility for policy decisions on scientific advisors. Scientific evidence and advice is just one source of information that is considered when policy is being formulated.

The role of NERVTAG in the response to the Covid-19 pandemic

85. A summary of the role that NERVTAG played in supporting the UK's response to the pandemic is best explained via the annual report covering the time period from January 2020 to June 2021 (exhibit PH2/33 [INQ000221969]) which provides an overview of the committee's work.

86. Throughout the pandemic NERVTAG provided evidence, scientific papers, and recommendations to SAGE and DHSC. As stated in NERVTAG's 5th annual report (exhibit PH2/33[INQ000221969]) a core element of NERVTAG's work was the preparation of papers and statements to summarise available evidence and make recommendations on particular issues of concern. These papers were either written in response to specific commissions from the DHSC or SAGE, or they were initiated by NERVTAG members. As set out in the 5th Annual Report, in the 18-month period covered by the report, NERVTAG prepared and published 37 papers on topics ranging from SARS-CoV-2 transmission dynamics, to changes in the viral phenotype, with a full list of papers published during the relevant period, with links to where they were published online, at appendix B of this 5th annual report.

87. An overview of the areas and topics on which NERVTAG provided evidence, advice and recommendations in relation to Covid-19 is contained within the 5th annual report at section 4 from page 11 to page 18. These areas as referred to in the annual report are listed below:

    a. Clinical management of Covid-19;
    b. Contact tracing and contact management;
    c. Covid-19 symptoms and case definitions;
    d. Decontamination and environmental survival;

e. Epidemiology of SARS-CoV-2;
f. Establishment of the G2P consortium;
g. Immunity to SARS-CoV-2;
h. PPE and IPC (Infection Prevention and Control) guidance;
i. Aerosol Generating Procedures (AGPs);
j. SARS-CoV-2 and travel screening;
k. SARS-CoV-2 in care homes;
l. SARS-CoV-2 reinfection;
m. SARS-CoV-2 variants;
n. Transmission of SARS-CoV-2;
o. Virology of SARS-CoV-2.

88. The detail of advice and recommendations from NERVTAG relating to those areas are summarised in the Annual report.

89. NERVTAG was committed to transparency from the outset. Detailed minutes were created, despite the enormous pressures on the secretariat and members, and made publicly available, albeit not until mid-February 2020. NERVTAG made frequent calls for papers to made public. This can be seen from the actions within the minutes of the 12th, 14th and 15th NERVTAG meetings, which are exhibited at PH2/37 [INQ000220209], PH2/38 [**INQ000120154**] and PH2/28 [**INQ000120161**]. The relevant actions from within the minutes are reproduced below:
    a. NERVTAG #12 action: "*Secretariat to ensure that the Minutes reflect that the committee considers that the PHE internal surveillance reports are valuable, and should be made publicly available in summary form and with appropriate interpretation.*"
    b. NERVTAG #12 action: "*Secretariat to ensure that the Minutes reflect that the committee considers that the CO-CIN reports would be valuable nationally and internationally, and should be made publicly available in an appropriate format.*"
    c. NERVTAG #14 action: "*CO-CIN data regarding hospital hot-spots for hospital acquired infections should be fed back to the individual trusts.*"
    d. NERVTAG #15 action: "*Secretariat to note in the minutes that the excess mortality breakdown data should be made publicly available*."

90. I have been asked by the Inquiry to provide details of the NERVTAG subgroups including when and by whom they were commissioned, their membership, how often they met, the aims and objectives of the subgroups, and how the subgroups were used to inform government policy. I do not propose to provide a further overview of these meetings since the information requested by the Inquiry is best provided by way of the minutes of those meetings which I have set out below to assist.

91. The creation of the NERVTAG subgroups during the pandemic were discussed at the NERVTAG main committee meetings and are referred to in the minutes of those meetings. The main subgroups created during the pandemic are as follows:
    a. Covid-19 NIV (Non-Invasive Ventilation) and Nosocomial Transmission Subcommittee – the only meeting took place on 3 March 2020, I was not in attendance for this meeting;
    b. Subgroup on Clinical Risk Stratification - a preliminary meeting was held on 18 May 2020, the minutes are exhibited at PH2/39 [INQ000221970] which set out the membership, those attending and the purpose of the subgroup. There were 12 meetings of this subgroup held between 20 May and 16 December 2020, the minutes of these meetings are exhibited at PH2/40 [INQ000221965]. I was in attendance for 7 out of the 12 meetings. I attended the early meetings to ensure the commission was properly understood and was being adequately addressed but once the group was established my input was no longer required;
    c. Covid-19 Therapeutics Subcommittee – the first meeting took place on 27 February 2020, with further meetings on 2 and 9 March 2020. The minutes are exhibited at PH2/41 [INQ000221982], PH2/42[INQ000221962] and PH2/43 [INQ000221978] and I was in attendance for these meetings;
    d. Covid-19 Endpoints and Populations Subgroup – the only meeting took place on 3 March 2020, the minutes are exhibited at PH2/44 [INQ000221964] and set out the purpose and scope of the subgroup and the recommendations made. I was in attendance for this meeting.

92. In relation to the Inquiry's question within the Module 2 Rule 9 request, about an epidemiology subgroup, whilst clinical epidemiology and population level epidemiology were reviewed at NERVTAG, SAGE and SPI-M meetings there was not a specific epidemiology subgroup that I am aware of.

93. The membership of these subcommittees are described in Appendix C of NERVTAG's 5th annual report (exhibit PH2/33 [INQ000221969]). The purpose and scope of, and the recommendations made by, these subgroups are set out within the minutes of the subgroup meetings. Where appropriate, the recommendations of the subgroups were reported back to the main committee either for endorsement or information depending on the circumstances.

94. As a scientific advisory committee NERVTAG did not make policy but due to the nature of the work we were doing as part of the Covid-19 response the committee did make recommendations that were closely linked to policy. See for example the recommendations of the extraordinary meeting of NERVTAG on contact tracing on 26th April 2020, one of which was, *"The recommended period of quarantine for contacts is 14 days, but contacts would be immediately released if the index case's test result is negative."*

The early stages of the pandemic

95. As referred to above at paragraph 17, I reached out to clinical colleagues in China on 2 January 2020. My understanding of the situation in China based on this informal information was fed into my discussions with DHSC, NERVTAG and SAGE. I was in contact with WHO colleagues from 2 January 2020 to ask if they had any additional information to share and to offer my services. I contacted the DCMO on 3 January 2020 to inform him of my understanding of the situation and subsequently on 5 January 2020, to ask about plans for a call to discuss the UK response to this incident. This contact took the form of emails exchanged with the DCMO on these dates and are exhibited at PH2/45 [INQ000221944]. Between 2 and 9 January 2020 I had numerous communications with WHO, Chinese colleagues, and colleagues in the international clinical research networks ISARIC and the Platform for European Preparedness Against (Re-)emerging Epidemics

(PREPARE) to try to ascertain as much information as possible and to plan response activities. I participated in a WHO clinical management meeting on 9 January 2020 to help develop the first WHO clinical management guidance document, exhibited at PH2/46 [INQ000222020].

96. In relation to the Inquiry's question within the Module 2 Rule 9 request regarding the comment by Matthew Henderson (Director of the Asia Studies Centre at the Henry Jackson Society) that "*given that Professor Horby had this level of access, it seems extraordinary that better use was not made of this to establish how bad things really were and to report back to our Government more urgently*." This comment would appear to have been made without knowledge of the substantial proactive efforts I was making to gather information on the situation and ongoing communications I was having with WHO and DHSC.

97. It is also worth noting, further to Matthew Henderson's comment, that I was involved in China with the development of clinical trials of lopinavir/ritonavir and remdesivir in patients with 2019-nCoV in Wuhan, China at the end of January 2020 and so it is evident that I took prompt and effective steps to contribute to the effort to tackle Covid-19. The resulting publications (of which I am a co-author) are exhibited at PH2/7 [INQ000221986] and PH2/8 [INQ000222012]. The knowledge that I gained as a result of my involvement in these trials was used to inform my contributions to UK scientific advisory committees.

98. Planning for an extraordinary NERVTAG meeting began on 9 January 2020 when WHO announced that the cause of the outbreak was probably a novel coronavirus. At this time only 41 cases had been reported. The first NERVTAG meeting relating to the Wuhan outbreak was organised and held four days later on 13 January 2020. There were two observers from the Government Office for Science present, namely NR and NR who I understand to be junior officials, in case SAGE was required to be convened.

99. At the NERVTAG committee meeting on 13 January 2020 it was discussed and minuted that NERVTAG supported the position, at that time, that port of entry screening was not advised. The reasoning behind this decision is contained within

the minutes from this meeting exhibited at PH2/16 [INQ000023107], with the scientific background outlined in the paper that was considered at the meeting, exhibited at PH2/47 [INQ000222004]. In short, arrival screening by symptoms (not by lateral flow devices or PCR tests, which were not available at this time for screening) is widely considered as a relatively ineffective intervention since viral respiratory infections have an incubation period, during which people are asymptomatic, and the key screening sign of fever can be suppressed using over the counter antipyretic medication, for example paracetamol. Additionally, there is likely to be a high false positive rate due to fever and symptoms caused by common infections, leading to substantial pressure of screening and quarantine services, which is referred to in the paper entitled 'Entry screening for severe acute respiratory syndrome (SARS) or influenza: policy evaluation' by Pitman et al which is exhibited at PH2/48 [INQ000221985].

100. Travel restrictions (i.e. stopping certain or all travel routes) are considered to be more effective than screening at reducing introductions of infectious people but need to be extensive to have a meaningful impact. At this time both WHO and the ECDC were recommending against travel restrictions. In retrospect, it can be argued that very early and extensive travel restrictions might have been the right course of action, but it is uncertain that we could have acted early enough to prevent widespread domestic transmission. New Zealand closed its border on 18 March 2020 by which time there was already widespread community transmission in the UK as can be seen by reference to the minutes from the 16th SAGE meeting on 16 March 2020 exhibited at PH2/49 [INQ000075664], where it states that, "*it is possible that there are 5,000-10,000 new cases per day in the UK*".

101. In relation to the Inquiry's assertion within the Module 2 Rule 9 request that The Lancet and the New England Journal of Medicine papers highlighting the severity of Covid-19 based upon the situation in Wuhan were not considered at SAGE meetings, I am certain that these papers were discussed at SAGE meetings, not least because I was co-author on one of the Lancet papers, but it would appear that they were not submitted as formal SAGE papers and the detail of the discussion about the papers was not recorded within the SAGE meeting minutes. Due to their urgent and fast paced nature, the minutes from SAGE

meetings were less detailed than one might desire and so the minutes do not capture everything that was discussed and focus on the decisions that were made and actions to be taken. There was an enormous amount of discussion and consideration of data that would not be apparent from a review of meeting minutes alone. I believe more detailed SAGE minutes would have been beneficial for transparency and accountability, both contemporaneously and retrospectively. For completeness, a copy of the Lancet papers referred to are exhibited at PH2/5 [INQ000221999] and PH6 [INQ000222003] and the New England Journal of Medicine paper is exhibited at PH2/50 [INQ000222015].

102. The Inquiry have asked me to explain the early risk assessments made by PHE and endorsed by NERVTAG. The PHE risk assessments were assessments of the instantaneous risk at that time, which is termed in PHE documents as the 'current risk', not the future likelihood of escalation or harm. As such the endorsement by NERVTAG on 13 January 2020 of the PHE risk assessment that the "*Risk to the UK population is considered: Very Low*", exhibited at PH2/51 [INQ000221991], was referring to the risk at that very time to an individual within the UK, and was consistent with the assessments made by the ECDC. It is important to read the full meeting minutes and papers to appreciate that the potential future risk was not being underestimated and these risk assessments did not result in complacency or inaction.

103. At the main NERVTAG committee meeting on 21 February 2020 the committee considered whether an update to the PHE risk assessment was needed. The PHE risk assessment to the UK population was 'moderate' at that time. As a scientific advisory committee NERVTAG raised concerns about the worsening situation, however this point relates to the issue around understanding and communication of the assessment of risk as detailed above. The risk assessment process used by PHE, which NERVTAG were asked to review, assessed risk at a particular moment in time but not future risk, which is sometimes difficult to convey and communicate. NERVTAG were asked to assess risks that had been identified and were considered current, not future or unknown threats. The process of risk assessment and its communication is complex and is an area that would benefit from more work.

104. In response to the Inquiry's question within the Module 2 Rule 9 request regarding the suggestion made in a Reuters article that "*for more than two months, the scientists whose advice guided Downing Street did not clearly signal their worsening fears to the public or the government*", this is incorrect, as is obvious from the amount of activity ongoing within the scientific advisory structures and the clear indication, which is evident from the minutes of the 2nd SAGE meeting exhibited at PH2/16 [INQ000023107], that a serious pandemic was considered possible.

105. In relation to the Inquiry's question within the Module 2 Rule 9 request regarding the paper entitled *'Distance, Time, Handshakes'*. This paper was produced at the request of SAGE to consider whether people should be shaking hands and is exhibited at PH2/52 [INQ000074911]. This paper is, I believe, clear and would have been discussed at the 15th SAGE meeting before a settled position on shaking hands was arrived at, which would then have been communicated by the GCSA and CMO to ministers. It does not appear that the discussion around the paper was minuted and I was not in attendance at this meeting.

106. In relation to the Inquiry's question within the Module 2 Rule 9 request, my understanding as to why NERVTAG was not asked to look at social distancing measures early in the pandemic is that this was being considered by SPI-M who were considering the modelling of a variety of non-pharmaceutical intervention options including social distancing.

107. The Inquiry has specifically asked about herd immunity, which is the concept whereby there is sufficient immunity to infection within the community that onward transmission of infection is limited to the extent that the reproduction number ("R number") falls below 1 and the epidemic naturally declines. In my experience of chairing NERVTAG meetings and of those SAGE meetings I attended (89 of 105 meetings), herd immunity was never advised by SAGE or NERVTAG as a strategy in response to Covid-19. In fact, in a paper submitted to SAGE and considered at the 16th meeting, entitled 'Low critical care capacity and

high severity of Covid-19 mean there is little functional difference between successful "flattening the curve" and ongoing containment', exhibited at PH2/53 [INQ000222002] it was explicitly stated: "*...the acquisition of sufficient herd immunity for the population to be resistant to re-infection by SARS-CoV-2 may be a consequence of other actions but is not a goal.*"

The first lockdown

108. In relation to the Inquiry's question within the Module 2 Rule 9 request about the necessity and timing of a lockdown, from my perspective as a doctor and health research professional, and as Chair of NERVTAG, an expert scientific advisory committee to DHSC, I was considering ways to minimise Covid-19 related mortality and morbidity, and disruption of the health care system. The NHS was in very serious difficulties by late-March 2020, with around 1,000 hospital admissions per day, 400 deaths per day, and exponential growth. From that perspective effective interventions were, in my view, necessary to reduce deaths from Covid-19 and prevent NHS capacity, particularly intensive care capacity, being overwhelmed. The SPI-M-O (Scientific Pandemic Influenza Group on Modelling, Operational sub-group) consensus statement dated 20 March 2020, exhibited at PH2/54 [INQ000071111], refers to ICU admissions and the potential for ICU capacity being breached.

109. A range of interventions and their mix, not only a full lockdown, were considered by SAGE. For example, a scientific paper entitled 'Timing and Triggering of NPI's', exhibited at PH2/55 [INQ000221998], was presented at the 15th SAGE meeting. When certain behavioural interventions were discussed at SAGE meetings, behavioural fatigue was considered. As such there was an awareness that a lockdown might be challenging to maintain or repeat, but in my experience as a member of SAGE, a legally enforced lockdown was not considered to be unrealistic. I do not recall substantive conversations taking place at SAGE about whether a lockdown was politically palatable.

110. With respect to protection of the vulnerable, there were a lot of discussions at SAGE about this issue and consideration of various policies including cocooning

and shielding, for example see the minutes of the 15th SAGE meeting on 13 March 2020 where shielding was discussed at point 18. Consideration of optimal policies to protect the vulnerable were a recurrent theme throughout the lifetime of SAGE. For example, population segmentation was considered at the 48th SAGE meeting on 23 July 2020 and at the 62nd SAGE meeting on 15 October 2020 but this was not considered feasible. Copies of the relevant SAGE meeting minutes and the SAGE advice on segmentation are exhibited at PH2/56 [INQ000109142], PH2/57 [INQ000119954], PH2/58 [INQ000221987] and PH2/59 [INQ000074986]. NERVTAG was, however, concerned that more might be done to protect care home residents (see paragraphs 119 to 124 below).

111. Situational awareness was improving in mid-March 2020 as more data were becoming available, this is apparent from the minutes of the 14th meeting of SAGE which state "*Available data for the UK are accruing fast. Firmer estimates of infection rates will be available next week*", and the minutes of the 15th meeting of SAGE, which state "*Owing to a 5-7 day lag in data provision for modelling, SAGE now believes there are more cases in the UK than SAGE previously expected at this point, and we may therefore be further ahead on the epidemic curve*". The minutes of the 14th and 15th meetings of SAGE are exhibited at PH2/60 [INQ000109125] and PH2/56 [INQ000109142].

112. Modelling data available by 16 March 2020 (exhibited by way of a SAGE paper at PH2/61 [INQ000212040]) was suggestive that NHS capacity would be massively overwhelmed if stringent measures to reduce transmission were not introduced. This point was discussed at the 16th meeting on SAGE and the minutes of this meeting (exhibited at PH2/49 [INQ000075664]) state at item 1 on page 2, "*On the basis of accumulating data, including on NHS critical care capacity, the advice from SAGE has changed regarding the speed of implementation of additional interventions.*" These minutes also state at item 13 on page 2 that "*The science suggests additional social distancing measures should be introduced as soon as possible.*" The first lockdown was introduced on 23 March 2020, so it is possible that the lockdown might have been introduced somewhat, perhaps one week, earlier.

Government decision making

113. As I was not directly involved in the UK government decision making processes (i.e. discussions with ministers) in respect of the lockdown or otherwise, I am not in a position to comment on factors that ministers may have considered as part of their decision making.

114. SAGE would provide scientific advice then there would be ministerial discussion about the policy implications of that advice in the context of other considerations, such as social and economic factors. I believe most other SAGE members were not privy to these discussions. I therefore do not know and cannot comment on the weight that was placed by ministers on the scientific advice provided by SAGE versus other non-scientific considerations. It was repeatedly made clear by the GCSA that SAGE was not making policy decisions: SAGE provided scientific advice and the ministers made decisions and policy.

NERVTAG - papers, joint meeting with SPI-M and contact with CMO and GCSA

115. I have been asked by the Inquiry to summarise the following NERVTAG papers:

a. 'Face mask use in the community' dated 13 April 2020, exhibited at PH2/22 [INQ000074914] – this paper contains an evidence summary and a section headed 'Summary and Conclusions' at pages 6 and 7;
b. 'Duration of infectiousness following symptom onset in COVID', exhibited at PH2/62 [INQ000120389]; this paper is only one page long and the summary is contained within: "*Based on the available, but very limited, information it is NERVTAG's opinion that for mildly unwell individuals managed in the community, a period of seven days of self-isolation after illness onset is reasonable. This may need to be revisited as additional evidence on the duration of infectiousness arises. A longer period of isolation (14 days) may be warranted for certain groups*".
c. 'Wearing facemasks in a community setting: options and evidence', exhibited at PH2/23 [INQ000074918]; this paper is a brief summary of the

evidence and options regarding the use of facemasks in the community based on the fuller paper cited in (a.) above and prepared at the request of SAGE (see minutes SAGE #24). It does not provide recommendations.

d. 'View on SARS-CoV-2 protective immunity' dated 27 April 2020, exhibited at PH2/63 [INQ000120491]. This document is a short 2 page summary of the state of evidence at that time,27 April 2020, on the duration of protective immunity following natural SARS-CoV-2 infection.

116. The above papers are all short and concise, often only 1 to 2 pages, except the 13 April 2020 paper which itself is summarised in two pages in the paper dated 16 April 2020. Therefore, I do not believe these papers require a summary. In general, I do not think it is appropriate to seek to provide summaries of technical papers that need to be fully considered and understood, were co-authored, and when the papers themselves are the 'source documents' that are available for review and often already contain summaries. I consider that looking to add a further layer of interpretation post-hoc is likely unhelpful.

117. The Inquiry has specifically asked about the NERVTAG and SPI-M extraordinary meeting that took place on 26 April 2020 in relation to contact tracing, the minutes of that meeting are exhibited at PH2/31 [INQ000120452]. A number of members of NERVTAG and SPI-M provided input during the course of this meeting. A summary of the discussions alongside the six questions posed by the DHSC policy team (labelled Question 1, Question 2 etc.) followed by a summary of the six NERVTAG recommendations (section 4.1) related to the six questions are set out within the minutes. The basis for these recommendations is also set out within the minuted discussion. In my view, the NERVTAG recommendations made at this time were cautious in that we recommended retaining a stringent approach to contact tracing to maximise its impact.

118. The Inquiry has specifically asked for the rationale for the statement in the minutes from the NERVTAG and SPI-M extraordinary meeting that took place on 26 April 2020 that the Government should "*consider measures to mitigate the socioeconomic impact of serial quarantine*". The rationale is described in the minutes as follows, "*The committee noted that under this policy a large number of*

people would be quarantined, the majority following contact with a case that will test negative. The committee also noted concerns about the impact of the policy in terms of equity, with AH noting there may be an unequal impact on some socio-economic or occupational groups, who will suffer disproportionately from unnecessary and/or serial episodes of quarantine (e.g. self-employed people with frequent contact with customers)."

119. On 11 May 2020, I wrote a letter in my capacity as NERVTAG Chair to the CMO, Professor Chris Whitty, headed 'NERVTAG concerns regarding transmission of Covid-19 in care homes', a copy of which is exhibited at PH2/64 [INQ000069186]. The following paragraphs outline the background to this letter.

120. The 13th NERVTAG- Covid-19 meeting on 9 April 2020 (minutes exhibited at PH2/65 [INQ000220210]) heard a short update on respiratory infection outbreaks and as a result noted "*the apparent lack of success of measures in place in institutional settings*" and requested three actions:

(i) PHE to provide further data on the acute respiratory outbreaks in the UK particularly for care homes;
(ii) PHE to feedback on any intelligence related to staff working between care homes; and
(iii) DCMO to feedback NERVTAG concerns to DHSC about the number of outbreaks in care home (this last recommendation was reported as 'complete' at the next meeting).

121. An update on care home outbreaks was then heard at the 14th NERVTAG-Covid-19 meeting, where members "*suggested that there should be some level of intermediate care provision between leaving hospital and re-entering a care home"* and "*asked if there was a specific taskforce for the strategy for care homes*" (which there was not at this time). As Chair, I asked that the issue of care home outbreaks be further discussed at the next meeting. A copy of the minutes from this meeting are exhibited at PH2/38 [**INQ000120154**].

122. The 15th NERVTAG-Covid-19 meeting on 24 April 2020 had a very long agenda which included a presentation (a 'brief update' for information) of the investigation of care home outbreaks over Easter 2020, known as 'the Easter 6'. This paper is exhibited at PH2/66 [INQ000120155]. NERVTAG members were concerned by the high rates of SARS-CoV-2 positivity in both care home residents (range 21-76%) and staff (range 6-46%), and the fact that many positive individuals were asymptomatic at the time of swabbing. At this meeting it was noted that NERVTAG had not been asked to provide advice on Covid-19 control in social care settings. As a result, PHE would bring a paper to the next meeting with specific questions on the management of SARS-CoV-2 positive people in care homes.

123. At the 16th NERVTAG-Covid-19 meeting on 1 May 2020 we considered the paper provided by PHE containing specific questions on the management of Covid-19 in care homes. A copy of the paper and the minutes from the 16th NERVTAG-Covid-19 meeting are exhibited at PH2/67 [INQ000220211] and PH2/68 [INQ000120162]. The committee members "*agreed that more stringent measures are needed for nursing homes to improve shielding of highly vulnerable individuals"* and that the NERVTAG comments would be relayed to DHSC and made a specific recommendation to DHSC that "*PCR-positive asymptomatic staff should not provide care or have contact with susceptible vulnerable individuals*."

124. At the 17th NERVTAG-Covid-19 meeting, committee members commented that they "*would like more reassurance that the concerns they have raised about transmission in care homes are being acted upon*" and as Chair I agreed "*to write to the CMO identifying the concerns raised by the committee and asking for assurances of ongoing actions in areas of intervention and a copy of the action plan*." A copy of this letter is exhibited at PH2/64 [INQ000069186]. The concerns contained within the letter were addressed, to include reference to the care home support package, by the CMO in his letter in response dated 26 May 2020 a copy of which is exhibited at PH2/69 [INQ000221994].

125. The Inquiry has asked about the purpose of a meeting I attended with the GCSA, Sir Patrick Vallance, and CMO, Professor Chris Whitty, on 5 June 2020.

This meeting was about the outcome of the RECOVERY trial and we discussed a preliminary finding that dexamethasone was an effective treatment for moderate to severe Covid-19. As far as I am aware, there were no minutes taken of this meeting.

126. The Inquiry has asked about the 4th NERVTAG Bird Table meeting on 5th June 2020, where members discussed a paper on science requirements and governance which was to be discussed at the 40th SAGE meeting. The minutes and paper from that meeting are exhibited at PH2/70 [INQ000070306] and PH2/71 [INQ000221988]. This paper indicated "*a move of government science towards 'business as usual,' with a danger of fragmentation of advice*." All members were asked to send comments on the SAGE paper regarding the future of scientific advice to government to the NERVTAG secretariat. This action was reported as 'complete' at the 22nd NERVTAG-Covid-19 meeting but I am unsure if comments were forwarded by the NERVTAG secretariat to SAGE and whether the paper was actually ever discussed at SAGE as it was a deferred agenda item at the 40th SAGE meeting and was not minuted in the 41st and 42nd SAGE meetings.

127. The Inquiry has asked about the purpose of a meeting I attended with the CMO and Professor Steven Powis on 6 July 2020. This meeting was held in response to a letter from NERVTAG dated 23 June 2020, a copy is exhibited at PH2/72 [INQ000222016], relating to NHS management of Covid-19 cases. The letter arose as an action point from the 22nd NERVTAG-Covid-19 meeting, where that it was felt that cohorting Covid-19 patients in specialist Covid-19 hospitals or units could reduce the incidence of hospital transmission (from patient to patient, and from staff to patient). The meeting was about the feasibility of separation of Covid-19 patients and their carers from other NHS patients. As far as I am aware, there were no minutes taken of this meeting but my recollection is that the CMO and Professor Powis described the work that had been done within the NHS to separate Covid-19 patients from other patients and the limitations of what could be achieved given the structural, organisational and resource constraints of the NHS. I recall that I was satisfied that the separation of Covid-19 patients from other patients within hospitals was, as far as was practicable, being pursued.

Relaxation of measures in summer 2020

128. The Inquiry has asked about my views of the Eat Out to Help Out Scheme. I do not believe that SAGE were consulted on this policy. To my mind, there was a clear risk that the scheme could increase transmission of Covid-19.

129. By early June 2020 the modelling data were consistently suggesting that the R number in the UK was below 1 and SPI-M-O had looked at the potential impact of relaxation of various social distancing measures in papers submitted to the 33rd meeting of SAGE on 5 May 2020. This SPI-M-O paper suggested that the R number would go above 1 and exponential growth would restart if restrictions were largely lifted. The paper stated that "*Even with contact tracing in place, there will need to be sustained, deep reductions in contacts outside work and schools to keep the reproduction number below 1*". As a member of SAGE I was aware of this paper and the discussions at SAGE but I was not party to the decision-making process regarding the relaxing of restrictions over Summer 2020. Given the earlier SPI-M-O consensus work on the relaxation of social distancing, the lifting of most restrictions on 4 July 2020 and the Eat out to Help Out schemes were likely to contribute to a return to exponential growth which would require reintroduction of local or national measures.

130. The Inquiry has asked whether I agree that the Treasury's statement that "*we would be able to stay ahead of the virus*" after lifting restrictions, was optimistic. I do agree that this statement was optimistic.

Autumn 2020

131. At the 58th meeting of SAGE on 21 September 2020, a package of NPIs (Non-Pharmaceutical Interventions) was recommended and the shortlist of NPIs that SAGE advised should be considered for immediate introduction are set out at item 2 (a) to (e) of the meeting minutes exhibited at PH2/73 [INQ000214073]. The national circuit-breaker lockdown was one of the NPIs listed. This was recommended as there were various data sources indicating that the UK was in an early stage of substantial growth of Covid-19 transmission and that if it

continued there would be an increase of Covid-19 cases requiring hospitalisation that would put the NHS at risk. The potential need for further national or local measures was reiterated at the 61st meeting of SAGE.

132. I, and many of my colleagues, were surprised that the recommendation for a circuit-breaker lockdown was not followed, as previously high growth rates that threatened NHS capacity had been successfully controlled with national measures. I do not think it would be helpful for me to speculate as to why the government did not follow the recommendation in this instance as I was not involved in the government decision making process.

133. To my recollection the tier system was not discussed at SAGE or NERVTAG prior to its introduction. The minutes of the 66th meeting of SAGE (exhibit PH2/74 [INQ000120563]) state "*If the tiers applied to localities are primarily based on the number of confirmed cases rather than growth rate, and if the highest tier does not reduce R substantially below 1, this would result in all localities rising to the highest tier and remaining at high prevalence. SAGE noted at its previous meeting that this would result in prolonged periods of high incidence, and consequently high levels of hospitalisations and deaths*." In practice, it turned out that the tier restrictions, particularly tiers 1 and 2, were insufficient to keep the R number below 1. The SPI-M-O: 'Statement on tiers in England and other measures in the devolved nations', dated 11 November 2020, exhibited at PH2/75 [INQ000222005], was submitted to the 67th meeting of SAGE and states '*Tier 1 measures alone are not enough to prevent the epidemic from growing rapidly*'.

134. In my view the UK Government was not sufficiently aggressive in Autumn 2020 as by this time, unlike in March 2020, we had good situational awareness and it was clear that "go early, go hard" is a better strategy for pandemic control than incremental, suboptimal measures that fail to reign in exponential growth.

135. On 23 October 2020, I emailed the CMO and GCSA regarding the 'test and trace' system, a copy of this email is exhibited at PH2/76 [INQ000221956]. In this email I conveyed the view, following the NERVTAG bird table meeting on the same day, that "*it was felt that currently the test and trace system is unlikely to be having*

a significant impact on infection transmission and there may be value in convening a SAGE subgroup with representation from NERVTAG, SPI-M and SPI-B to explore how the impact of the test and trace system can be improved." This email was prompted by a discussion at the NERVTAG bird table meeting on 23 October 2020 where it was highlighted that the NHS Test and Trace data from 28 May to 21 October (as shown on page 17 of the PHE Situational Awareness report appendix dated 22 October 2020) reported an average of zero contacts identified outside of the household. Around this time, SPI-M-O, as can be seen from their consensus statement of 21 October 2020, which was considered at the 63rd SAGE meeting on 22 October 2020, were estimating there were between 53,000 and 90,000 new infections per day, an infection rate far too high for test and trace to be able to play a significant role in reducing infections. As can be seen from the minutes of the bird table meeting on 23 October 2020, exhibited at PH2/77 [INQ 000120462], action BT9.2 on page 4 refers to proposing the setting up of a joint SPI-M, SPI-B and NERVTAG SAGE subgroup to review the functioning of test, trace, and isolate and advise about the most efficient use of the system.

136. In response to my email of 23 October 2020 the CMO and GCSA separately responded in emails on 25 October 2020, copies of which are exhibited at PH2/78 [INQ000221958] and PH2/79 [INQ000221957]. The CMO communicated that he thought a SAGE subgroup would be helpful. As far as I am aware such a SAGE subgroup was not convened. The test and trace system was discussed at the 64th SAGE meeting on 29 October 2020 where it was noted in the minutes of this meeting at item 21 that "*Direct and indirect mortality and morbidity from COVID-19 is likely to be low in the event of low prevalence and a controlled epidemic, where test and trace can play a larger role in containing outbreaks, and interventions are in place to successfully control surges in cases where they occur, although economic and other harms arise from interventions*." A copy of the minutes of this SAGE meeting are exhibited at PH2/80 [INQ000137982].

Early 2021

137. In January 2021, on the Andrew Marr show, I expressed the view that the UK was "*now in the eye of a storm*." I used the wrong analogy there, I meant to

say that we are in the middle of a storm, i.e. in the middle of a crisis. It was the worst moment of the pandemic in terms of healthcare pressures, hospital admissions, patients requiring mechanical ventilation and patient deaths. As is illustrated by the graphs that can be found on the coronavirus.data.gov.uk website, the relevant page from which is exhibited at PH2/81 [INQ000222021], there was a clear peak in January 2021 in hospital admissions that was higher than the peak during the first wave in April 2020.

138. The Inquiry have specifically asked about the spread of the Delta (B.1.617.1; VUI-21PAPR-01; B.1.617.2, VOC-21APR-02, B.1.617.3, VUI-APR21-03) variant of SARS-CoV-2 in the UK. The Delta variant was first detected in India on 5 October 2020 but that does not mean the variant originated there, since the availability of sequencing data is very patchy. This variant was first detected in the UK on 22 February 2021 (B.1.617.1, VUI-21PAPR-01), as referenced within 'Variant of Concern Technical Briefing 10 Data England', exhibited at PH2/82 [INQ000222010]. This earliest subtype of Delta detected in the UK (B.1.617.1) was predominantly detected in travellers in the early period of its circulation, as referenced within 'SARS-CoV-2 variants of concern and variants under investigation in England, PHE Technical briefing 10' dated 7 May 2021, exhibited at PH2/83 [INQ000222014], at table 6 and figure 10. Hence my comment on the Andrew Marr show (27 June 2021), in response to a direct question "*is the reason* [that the Delta variant spread so fast in UK] *because we didn't have strong enough border control controls earlier in the summer?*', that whilst "*stronger border measures may have delayed* [the introduction and spread of the Delta variant in the UK]" there is a trade-off that policy makers have to make, i.e. accept a risk of introductions of new variants or close all borders. The Government did add India to the travel 'red list' on 23 April 2021 in an attempt to control importation but it is now clear that a lot of introductions had already happened by that date and domestic transmission was already seeded as referred to within the paper entitled 'Context-specific emergence and growth of the SARS-CoV-2 Delta variant' 11 August 2022 exhibited at PH2/84 [INQ000222009].

139. The Inquiry has specifically asked about my response to a question on Times Radio on 11 April 2021 about "potentially" the need for some ongoing legal

restrictions after the planned opening up on 21 June 2021, to which I replied that whether restrictions are legally enforced or not is a matter for debate but "*I think there is going to be a need for continuing some of the measures that we know are not very restrictive but do have a benefit like hand washing, potentially ensuring good ventilation in indoor spaces*". I believe this was sensible and proportionate advice that was borne out by the need to delay the planned release of legal restrictions on 21 June 2021 to 19 July 2021.

Data sharing

140. The inquiry has asked about my understanding of the reference to "*lack of data-sharing* [is] *seriously hampering understanding of WN-CoV*" at the fourth SAGE meeting on 4 February 2020. I believe this related to data on the epidemiology, clinical features, and virology of the outbreak in Wuhan. Some key parameters that SAGE wished to estimate are outlined later in the minutes from that meeting including the Case Fatality Rate (CFR), reproduction number, incubation period, duration of infectivity, duration of illness, asymptomatic transmission, and infection in children. International sharing of data remains a substantial challenge and efforts are needed to resolve this through both formal (intergovernmental and interagency) and informal (networks like ISARIC) mechanisms.

141. The Inquiry has asked about my communications with DHSC regarding the sharing of clinical data with WHO. I sent emails to the DMCO regarding sharing of Covid-19 clinical data on 11 April 2020 and 4 May 2020, the chain of emails is exhibited at PH2/85 [INQ000221952]. I then followed up with an email to the CMO and DCMO on 8 May 2020, in which I stated *"I feel very uncomfortable that the UK has the largest global Covid clinical database, with relevance to millions at risk globally, and is not sharing with WHO. It is not my data but I feel we should share and someone needs to take ownership for making it happen."* The chain of emails which includes the above is exhibited at PH2/86 [INQ000221954]. This was an attempt to resolve at government level the impasse with sharing data with the WHO that academics were unable to resolve. It took a long time to resolve, which is illustrated by the chronology of key events in relation to seeking to share data

with the WHO that I have prepared and is exhibited at PH2/87 [INQ000222017]. There is an important lesson to be learned here about the need to have arrangements in place to share data under conditions that satisfy the various legal requirements of different countries and the intellectual property rights of the data generators.

142. In relation to the data sharing processes that took place between NERVTAG, the Covid-19 Clinical Information Network (CO-CIN) and NHS England and NHS Improvement (NHSE&I) the origins of these data sharing processes arose from the UK ISARIC database, referred to above at paragraph 16. CO-CIN were gathering data on UK admissions to hospitals and the data was starting to indicate that transmission of Covid-19 within hospitals was increasing. NERVTAG requested that the NHS made the directors of the Trusts aware of this and we wanted to check that the NHS executive level was communicating to the hospital level. The letter that I received from Ruth May, the Chief Nursing Officer for England, dated 29 April 2020, exhibited at PH2/88 [INQ000068984], refers to the actions that were to be taken by NHSE&I to support NHS trusts. The data sharing process between NERVTAG and NHSE&I was collaborative and worked well in my view.

143. I believe NERVTAG shared knowledge, research and information effectively with key actors such as SAGE, DHSC, PHE and the NHS. In order to ensure that there was a forum for members to share knowledge and information from the wider Covid-19 community, NERVTAG set up bird table meetings (as referred to above at paragraph 65 where committee members could raise issues and concerns and adopt a horizon scanning approach. As noted above at paragraph 89 NERVTAG was committed to transparency, preparing and sharing detailed minutes (despite the extreme time pressures on the secretariat and committee members), releasing public statements, inviting observers and co-opted members to the meetings, and frequently called for transparent sharing of data.

Transparency and communication of scientific advice

144. The Inquiry has asked to what extent I agree with the suggestion that the UK government "*did not see transparency of evidence as an integral part of managing the Covid-19 crisis*". Whilst I do not fully agree with this statement, I do believe that transparency of evidence was not prioritised early enough in the pandemic. The membership and minutes from SAGE meetings were not made publicly available initially and this may have impacted negatively on public understanding of the scientific advisory processes and confidence in the decisions being taken by government. This situation may have partly influenced the establishment of so-called 'Independent SAGE' – a name that I felt was deeply unhelpful to science advice and communication since it incorrectly implies SAGE scientists are not independent and risked causing confusion between SAGE and this group. I do not know why the SAGE minutes were not made publicly available from the outset. However, this was rectified, and the minutes and membership and the associated papers were made publicly available from 29 May 2020. PHE also made its technical updates publicly available, which were very well received nationally and internationally. The daily televised briefings, where situation updates and major policy decisions were announced were also aimed at transparency. My personal impression was that the presentation of data and statistics to the public at these briefings was very helpful. It was the most up to date and accessible way to communicate the science and it was useful to facilitate the wider dissemination of the information and evidence behind policies.

145. The Inquiry has asked to what extent I agree with claims that Government ministers failed to clearly communicate their priorities to science advisors and that this made it hard for science advisors to provide advice. I agree with this assessment. To my recollection, at several SAGE meetings there were requests from science members for clarity from government about their policy objectives, which is illustrated by the following statement at item 2 of the minutes of the 9th SAGE meeting on 20 February 2020, "*It is also essential to understand the objectives behind seeking to manage the epidemiological curve, informed by key challenges the NHS is seeking to mitigate*." The minutes of this meeting are

exhibited at PH2/89 [INQ000106123]. Providing useful science advice is challenging when it is unclear what the government is wishing to achieve.

146. The Inquiry has asked to what extent I agree with the finding of the Institute for Government that the government's communication of risk was "*confusing…ministers have switched back and forth between alarm and reassurance, while failing to drive home key messages, such as the risk of gathering in indoor and poorly ventilated settings.*" I believe this was the case and likely reflected, as did the inadequate communication of policy objectives to SAGE, a failure of whole of government to develop, agree, and articulate sufficiently long-term and future-proofed policy objectives and an associated strategy to achieve them. Several plans were released (see exhibits PH2/90 [INQ000222022], PH2/91 [INQ000086652], PH2/92 [INQ000106867] and PH2/93 [INQ000065168]) which felt quite reactive and did not instil confidence that the Government had a clear and consistent vision.

Lessons learned

Risk detection, characterisation, and communication

147. In the early months of the pandemic there was limited situational awareness of the extent of introduction of Covid-19 cases into the UK and of domestic transmission of SARS-CoV-2. As awareness grew in mid-March it became apparent that infections were increasing exponentially, the NHS was at serious risk, and urgent action was needed. Later in the pandemic the UK had put in place some of the best surveillance and epidemiological tools available anywhere in the world, such as the Covid-19 Genomics UK consortium (COG-UK), NHS data streams, PHE surveillance reports, and national core studies such as ISARIC4C and the ONS survey. These were often a collaboration between academic institutions and public bodies such as ONS, PHE and the NHS, and required significant innovation. For example, a high-throughput robotic serology platform capable of processing 50,000 tests a day was developed. Many of my international colleagues eagerly anticipated UK Covid-19 reports, which were highly regarded for their rigour and quality.

148. A major lesson from the pandemic is, therefore, that the UK has world class science capabilities that could make a major contribution to epidemic and pandemic detection and characterisation, and thereby more effective mitigation. In my view many of these capabilities should be retained and developed in some form as national and international assets. However, I have a concern that these capabilities are not being maintained and we may be little better equipped for the next pandemic or national health emergency.

149. I would like to see an independent review of national intelligence needs for major infectious disease threats which provides recommendations for critical national capabilities, infrastructure, and resources, shared across public and academic bodies.

150. Through my work in NERVTAG and SAGE, and previously with WHO, I have learned that a systematic approach to the assessment and communication of risk is very challenging. Work should be commissioned on how to better evaluate data and other intelligence to systematically and dynamically assess the risk posed by pathogens and a standardised framework to communicate risk assessments to policy makers and the public. Whilst the Civil Continencies Secretariat National Risk Register does this at a macro-scale, there is, to my knowledge, no agreed methodology to do this at a finer scale, for example in relation to pathogen strains.

Interventions

151. The UK excelled in evaluating treatments for Covid-19 through national clinical trials such as RECOVERY, REMAP-CAP and Panoramic, and in the development of the Oxford/AstraZeneca vaccine.

152. As with intelligence functions, these capabilities to generate and evaluate medical countermeasures to infectious threats should be retained and developed in some form as national and international assets. However, I have a concern that these capabilities are also not being maintained and there is no national strategy

for developing, evaluating, and accessing medical countermeasures for known, and unknown, existential infectious threats.

153. There is much to be learned from the pandemic about the optimal use of NPIs. Learning from the pandemic needs to be taken forward, perhaps by developing, testing and simulating an '*NPI playbook*' for a range of future epidemic and pandemic scenarios.

Pandemic policy response and its communication

154. I was not privy to internal government discussions and deliberations, but it appears to me that improvements are needed in procedures for developing (and scrutinising) a coherent, whole of government strategy for responding to the entire life cycle of a national emergency like the Covid-19 pandemic. This process should be separate from the operational response.

155. A national emergency requires a collective national response. Future responses would benefit from greater transparency with the public from the outset of available data, science advice, government considerations and deliberations, and the rationale for policy decisions. This should include transparent acknowledgement and explanation of any dissonance between science advice and policy positions.

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: 27th July 2023