

Witness Name: Professor Ian Hall

Statement No.: 1

Exhibits: IH/01 to IH/44

Dated: 20 July 2023

UK COVID-19 INQUIRY

WITNESS STATEMENT OF PROFESSOR IAN HALL

I, Professor Ian Hall, will say as follows: -

1. I am employed by Manchester University as a Professor of Mathematical Epidemiology and Statistics in the Department of Mathematics (80%) and School of Health Sciences (20%).
2. This statement is provided in response to a Request for Evidence under Rule 9 of the Inquiry Rules 2006, that I received from the UK Covid-19 Public Inquiry ("the Inquiry") dated 12 April 2023, requiring me to provide a witness statement in respect to my experience and knowledge so far as it is relevant to the Inquiry's Module 2 assessment of the Covid-19 Pandemic ("the Module 2 Request").
3. Per the Module 2 Request, I will address the matters of interest to the Inquiry during the period from the beginning of January 2020 to 24 February 2022, with a particular focus on the period from 1 January 2020 to 31 March 2020 ("the Inquiry's Module 2 Timeframe"). Where a matter is of interest but falls outside of this date range, I will make this clear and explain why this is relevant to the Module 2 Request.
4. To the extent that the facts set out in this Witness Statement are within my own knowledge, I confirm that they are true. Where facts and matters are not within my own knowledge, I state their source and confirm that they are true to the best of my information, knowledge and belief.

Career History and Professional Background

5. I received my master's degree in Pure Mathematics and Applied Mathematics (Hons) from the University of Exeter in 1999. Following this, I was awarded a Doctorate in Applied Mathematics from the University of Exeter in 2003.

6. I am not currently employed by UK Health Security Agency (“UKHSA”), (formerly Public Health England (“PHE”)), though I have held the position of Honorary Senior Principal Modeller in Emergency Preparedness since 2019 and the University of Manchester received grant income for my time on specific projects (up to 20% FTE). Before this, I was a Principal Modeller in Emergency Preparedness (20% FTE) from 2018 to 2019, a Scientific Programme Leader and Principal Modeller in Emergency Preparedness from 2006 to 2017, and a Senior Modeller in Emergency Preparedness from 2002 to 2006 (both 100% FTE).
7. I am currently employed by the University of Manchester and have held the position of Professor of Mathematical Epidemiology and Statistics since 2021. I was Head of Statistics and Probability Group from 2019 to 2022 and a Reader in Mathematical Statistics from 2018 to 2021.
8. I have contributed to many major publications, a list of which are exhibited at **IH/01 - INQ000215661**.

Scientific Advisory Group for Emergencies (“SAGE”) and its Sub-groups

9. I have been asked to provide information on the SAGE and sub-group meetings I attended during the Inquiry's Module 2 Timeframe. I provide detailed information on each below, however, to summarise, I was a participant in:
 - 9.1. SAGE;
 - 9.2. Scientific Pandemic Influenza Group on Modelling (SPI-M);
 - 9.3. Scientific Pandemic Influenza Group on Modelling, Operational sub-group (“SPI-M-O”);
 - 9.4. Social Care Working Group (“SCWG”);
 - 9.5. Hospital Onset COVID-19 Working Group (“HOCl”); and
 - 9.6. Environmental Modelling Group (“EMG”).

SAGE

10. SAGE provides scientific and technical advice to support government decision makers during times of emergency.
11. I was a participant in SAGE from February 2020 to April 2022. I attended 18 SAGE meetings and 5 of these as an observer. I exhibit minutes of the SAGE meetings where I was in attendance (exhibits **IH/02 - INQ000106114 to IH/19 - INQ000215647**). When acting as a participant, I offered comments where relevant and provided a steer on outputs.

SPI-M

12. SPI-M is not a sub-group of SAGE, but rather is a standing group attached to the Department of Health and Social Care (“DHSC”) that advises the government on preparations to manage the risk of pandemics using mathematical and statistical modelling. SPI-M is active during non-pandemic periods meeting roughly every three months.
13. Mathematical modelling provides a representation of a phenomenon or idea which may be difficult to observe directly. As such disease transmission and mitigation is a natural application of modelling. A model should allow transparent and reproducible scrutiny of impact of proposed intervention scenarios. However, a model is underpinned by assumptions and data and so assumptions can and should be tested and challenged. Often there is no single model involved in assessment and discussion as having a range of models with different assumptions mitigates against reliance and sensitivity to assumptions.
14. I have been an active member of SPI-M since 2006. Graham Medley is the academic Chair of SPI-M.

SPI-M-O

15. SPI-M-O is a sub-group of SAGE and is called into existence by SAGE at a time of suitable emergency to provide expert advice to the UK government on infectious disease modelling and epidemiology. SPI-M-O had wider participation from infectious disease modelling community than SPI-M.
16. I was a participant in SPI-M-O from January 2020 (when SPI-M-O was mandated) to April 2022. I attended 100 out of the 104 SPI-M-O meetings over this period.
17. In February 2020 I held the position of acting chair for a short period (1 week) whilst Graham Medley was on leave. During this time, I also attended SAGE meetings.
18. In the early stages of the pandemic, from January 2020 to March 2020, I understood the primary focus of SPI-M-O was to provide advice to policy teams intending to save lives and reduce cases of Covid-19. This was necessitated by the exponential rise in Covid-19 cases at this time. This was never clearly articulated to me, but this was my understanding and the general understanding amongst participants of SPI-M-O and the other sub-groups of SAGE that I was involved in. If wider economic impact was intended to be in scope it would have been helpful if this mission statement had been clearly articulated by government ministers.

19. In late 2020, the government's mission statement changed to focus on 'saving the NHS', which whilst not specifically articulated to myself this was clearly articulated in the public message from government ministers at this time so became the presumed objective.
20. As expert modellers, we designed tools for evaluating infectious diseases and the associated level of direct harm. We were not necessarily experts in enumerating the harm of wider impacts, therefore, where a commission required input that was outside our area of expertise, such as economics, education or behavioural science, we would collaborate with experts in those fields to inform our report and enable us to provide a comprehensive response to any commission.

SCWG

21. In order for SPI-M-O to fulfil the role that it had been commissioned for by SAGE, SPI-M-O had the remit to establish various sub-groups to gather and collate specialist expertise. As chair of SPI-M-O, it is my understanding that Graham Medley had operational flexibility to be responsive to developments without seeking direct approval from SAGE in a similar manner to SCWG which had the remit to set up temporary working groups to consider questions relating to social care, as specified in paragraph 9 of the Terms of Reference for SCWG (exhibit **IH/20 - INQ000215646**).
22. In April 2020, Graham Medley contacted me in his role as Chair of SPI-M-O and asked me to set up a care home working group. Graham thought I would be best placed for this role as he was aware that I had undertaken work on outbreaks in enclosed institutions pre-pandemic. He was also aware I had been looking at cruise ships (with UKHSA), prisons (with UKHSA and Ministry of Justice) as well as reasonable worst case for care homes with DHSC adult social care team in the previous few weeks (exhibit **IH/21 - INQ000215645**). At the time of setting up the group, I understood the group would be a 'task and finish' group, meaning that the group would be set up to deliver a particular objective; in this case to understand the data available and scope of modelling possible.
23. Following this, SAGE invited Charlotte Watts (Chief Scientific Advisor, Department for International Development) to set up a SAGE Care Home Working Sub-group ("CHWS") to consider hazard mitigation and respond to a commission. Graham referred Charlotte Watts to me in an email sent on 23 April 2020 as I had already established a CHWS (exhibit **IH/22 - INQ000215644**). Accordingly, our group was adopted as a sub-group of SAGE. I acted as academic co-chair and participant of the group from April 2020 to April 2022. Executive co-chairs were Charlotte Watts (April 2020 to September 2020, Jenny Harries, September 2020 to April 2021, Eamonn O'Moore April 2021 to April 2022, Thomas Waite September 2021 to

April 2022) As a co-chair, I helped to facilitate discussion in meetings to assist the group in reaching a consensus, created task and finish groups or specified individuals to deliver reports, received and assessed commissions and when called, I attend SAGE.

24. It was clear that the issue of social care was a multi-disciplinary issue and that there would be ongoing scientific questions in relation to social care throughout the pandemic. In September 2020, Dame Jennifer Harries, Deputy Chief Medical Officer (“DCMO”), replaced Charlotte Watts as co-chair of the CHWS and the terms of reference for the group were amended to reflect its new parameters (exhibit **IH/20 - INQ000215646**). Pursuant to the new terms of reference, CHWS was renamed as SCWG.
25. Paragraph 6 of the new terms of reference stated that SCWG could receive commissions from SAGE and/or DHSC (exhibit **IH/20 - INQ000215646**). Further, as UKHSA were secretariat for SCWG, where DHSC or SAGE commissioned SCWG to carry out work, as the final report was reached by consensus, the advice within the consensus report was de facto advice from UKHSA as well as SCWG.
26. As Jennifer Harries was also a participant in SAGE, there was no need for me to attend the majority of SAGE meetings. When Jennifer Harries became Chief Executive of the UKHSA in April 2021, I was invited to participate in SAGE more regularly as it was no longer possible for Jennifer Harries to attend.
27. Transmission was a large area of focus for SCWG. The types of epidemic model structures that we used to consider patterns and drivers of transmission in care homes and the data required to form reliable models are detailed in a SCWG paper prepared for SAGE on Care Homes Analysis dated 12 May 2020 (exhibit **IH/23 - INQ000215643**).
28. Further, on page 6 of the same SCWG paper dated 12 May 2020, we considered the routes of transmission in care homes (exhibit **IH/23 - INQ000215643**). This paper concluded that the main route of transmission into care homes was care home staff, particularly as around January to March 2020, care home staff were often working in multiple care homes which accelerated transmission. This, in addition to other research and scientific investigation, led to interventions to discourage care home staff from working in multiple care homes. We also highlighted a lack of reliable data on contact patterns within care settings and on staff movement.
29. SCWG also considered hospital discharges in the early stages of the pandemic relevant to the Inquiry’s Module 2 Timeframe, these findings were published later in the pandemic, see exhibit **IH/24 - INQ000215624**.

HOCI

30. HOCI is another sub-group of SAGE. The group was formed to focus on hospital onset Covid-19 infection.
31. I was invited by Mark Wilcox, the Chair of HOCI to participate in the group from September 2020 to April 2022. Unfortunately, I do not have a record of the number of HOCI meetings that I attended and I do not have copies of any HOCI meeting minutes. My role was to provide updates at each meeting on the potential interaction between outbreaks of Covid-19 in care homes and hospitals.
32. Whilst I had an existing interest in hospital outbreaks through my honorary contract with Manchester Foundation Trust clinical data science unit, the invitation was entirely due to my role as academic chair of SCWG. I was well placed to provide briefs on the current work of SCWG with a particular focus on the relationship between outbreaks of Covid-19 in hospitals and care homes.
33. Aside from my comments above, I cannot comment on how effective HOCI was or how it communicated with other sub-groups as my role was primarily to provide updates in relation to social care and aside from this, my involvement with HOCI was minimal.

EMG

34. I also participated in EMG, another sub-group of SAGE, from April 2020 to April 2022.
35. I was initially asked to participate in EMG as a representative of SPI-M (to provide a conduit between the two groups) and due to my previous involvement in environmental modelling work (I had been involved in quantitative microbial risk assessment projects in Public Health England pre-pandemic and led a work package on an EU project considering pandemic risks to transport hubs). Over time, however, I became a regular, core participant in EMG and provided regular input to discussions.
36. I attended 23 out of 39 meetings across this period. I understand that EMG did not keep formal meeting minutes, therefore, I am unable to provide copies of these.

Effectiveness of the Working Relationship Between SAGE and its Sub-groups

37. The conceptual framework for SAGE is sound and operates effectively to provide immediate scientific advice in an acute emergency. In my view, the membership of SAGE had sufficient expertise to fulfil its remit. The representatives from UKHSA (PHE at the time) in the early stages on the pandemic were admittedly experts in virology rather than outbreak management, but I was not privy to the process within UKHSA that determined who should represent UKHSA at SAGE, nor was this necessarily reflective of an issue as response cells were created within the organisation (for a detailed list the inquiry should ask UKHSA).
38. SAGE operated by providing commissions to its sub-groups. These were usually provided via email or at meetings, but were not proforma in nature. This was necessary as a proforma format would have been restrictive and would not have assisted the scientists who were interpreting the commission.
39. Following this, the sub-groups considered the commissions, discussed these at sub-group meetings and drafted a report which was provided to SAGE. These reports were termed 'consensus reports' as they represented the agreed consensus and view of the individuals in the sub-group who attended the sub-group meetings.
40. Throughout my involvement in SAGE's sub-groups, there was a high degree of appropriate challenge amongst the participants. Although we were working at pace, the participants were inquisitive and would ask questions to ensure that they understood the discussion before agreeing to any consensus report. As the membership of SAGE is multi-disciplinary, there may have been a lesser degree of challenge to the technical science of a sub-group consensus report at a SAGE meeting, but the members would always query information to ensure a comprehensive understanding. Further, delegation of work to sub-groups was necessary to achieve an expert view on a particular area and to ensure that SAGE was not overwhelmed with work and could operate in an efficient manner.
41. When consensus statements were submitted to SAGE, the chair would brief the SAGE participants and the participants would have the opportunity to comment on the consensus report. These comments would not change the content of the report but would be included in the SAGE meeting minutes and the SAGE consensus report.
42. A potential source of tension between the sub-groups and SAGE was a discussion around the distinction between scientific investigation and operational implementation. By way of example, as a sub-group of SAGE, we would advise that testing should be carried out, but we would not advise or discuss how this should be implemented as this was beyond our remit.
43. That said, it is difficult to separate science from implementation completely. It is important to have an effective feedback process in place between implementation and scientific

investigations so that modellers can incorporate the implementation recommendations and actions in their scientific models. Different styles of implementation may change adherence and eventual effectiveness from that expected at the time of modelling.

44. When we presented our findings from SCWG to SAGE, I felt that the stakeholders listened to our findings and sought to develop advice quickly based on our reports. Whilst my role did not include policy discussions or developments, I felt that our consensus reports were valued and were considered as part of SAGE's advice to the government.
45. Following a SAGE meeting, Patrick Vallance, the Government Chief Scientific Adviser ("GCSA") and Chris Whitty, the Chief Medical Officer ("CMO") would then brief government ministers on the SAGE consensus. I cannot comment further on the process of SAGE providing advice to government ministers, nor can I comment on how consistently the work of the sub-groups were incorporated into SAGE's advice, as I was not involved in this process. I would of course be privy to SAGE's reports and advice which was made publicly available. Similarly, I cannot comment on the relationship between SAGE and its sub-groups and senior politicians as I was not privy to this information, this question could be better addressed by the Chair of SAGE.

Diversity of SAGE and its Sub-groups

46. I am aware of general criticism pre-pandemic that the geographic diversity of SAGE and its sub-groups was confined to London. With the pre-pandemic expectation of SAGE being set up for acute period with in-person meetings some geographic proximity is to be expected for practical reasons. The move to and acceptance/expectation of remote working breaks down this London-centric barrier. I am only able to comment on the geographic diversity of modellers on SPI-M and SPI-M-O as this is within my knowledge and professional expertise.
47. The geographic distribution of participants in SPI-M was and is diverse. The two largest modelling centres in the UK are located in London (Imperial College London and London School of Hygiene). I was based in Manchester and other participants were based in Cambridge, Warwick and Scotland.
48. In my view, geographic diversity was dictated by the location of senior experts in the field of modelling. I do not consider that there was any specific bias on SPI-M to expert modellers who were located in London. If diversity is a direction for the Inquiry then they would have to consider academic funding mechanisms. When SPI-M become SPI-M-O there was a request from the SPI-M secretariat in January 2020 to offer names of candidates to expand participation (which I strongly supported) and so SPI-M-O had wider academic diversity

(Bristol, Lancaster and Wales) with participation from other public sector institutions, such as the Defence Science and Technology Laboratory, to provide expertise as well as contingency should participants be affected by pandemic.

49. In regard to other SAGE subgroups, I purposely established SCWG (formerly CHWS) as a diverse multi-disciplinary group. Initially, the geographic diversity of its participants was led by my own contacts and the immediate expertise that was required for the initial commission as the group needed to be established at pace. As time went on, the participant base in SCWG evolved to suit the demands of the service and the participants grew in number. I cannot comment on diversity of other subgroups other than to say the expertise appeared to be well represented for the demands of the service.

International Perspectives and the Extent to which these were Considered by SAGE and its Sub-groups

50. The inquiry has told me there is criticism that during the period January 2020 to March 2020, the UK failed to consider the international perspective.

51. At this time, there were concerns in relation to the reliability of data that we received from other countries. For example, when we received information from UKHSA, we were provided with access to UKHSA's data experts to ask about the data and potential weaknesses and biases in data, to ensure that the information that we were using was reliable. This was not the case with information provided by other countries and there was no systematic mechanism to verify the international data.

52. That said, the sub-groups I participated in considered international data where this could be reliably obtained, but this was extremely limited. When international data could be reliably obtained, we also considered whether the data could reliably translate to the UK. In February 2020 we saw the first epidemiological summary data from China CDC for example exhibit **IH/25 - INQ000215642**. The most reliable data streams for a country (hospital admissions/occupancy, etc.) are likely hard to make publicly available. The World Health Organisation ("WHO") and the European Centre for Disease Prevention and Control ("ECDC") were making only confirmed cases and deaths available which may have been biased by symptomatic PCR testing or symptom diagnosis in this phase of pandemic.

53. At times, the severity shown by the international data created cause for concern and was taken extremely seriously by SPI-M-O. For example, around 18 March 2020, we were provided with Italian data. The original source of this Italian data was the Italian Ministry of Health website. The Italian data showed that the time taken for the number of occupied

Covid-19 hospital and ICU beds to double was 3 days, which was twice as fast as previous estimates based on the information received at that time from hospitals in China. The Italian data is referred to in the paper entitled 'Challenges in control of COVID-19: short doubling time and long delay to effect of interventions' (exhibit **IH/26 - INQ000215641**). The Italian information in particular was vital and contributed to the UK government's decision to enforce a national lockdown in March 2020.

54. During the Module 2 Timeframe, I attended the WHO Modelling Group and the Africa CDC Modelling Group to obtain information on the international perspective. I also presented the perspective of the UK to other countries during the pandemic.

55. When asking these international groups about other countries experience of social care outbreaks the experience was quite divergent in relation to the age and social distribution in countries making social care less of a direct issue or service provision being very different.

Reliance on Modelling

56. I do not consider that there was an overreliance on modelling during the pandemic, by SAGE and its sub-groups.

57. The process of modelling involves making assumptions, writing these down, coding them into the model and facilitating a discussion around these assumptions. By investigating these through a model and demonstrating the output, this provides an output that can be analysed, tested and reviewed.

58. It is important to stress that models are not always correct and that the reliability of models are impacted by the reliability and availability of data. This can be viewed as a 'limitation' of modelling and is something that we were very careful to stress and reiterate in consensus statements of the sub-groups that I participated in. A model fundamentally provides a means of inferring population level dynamics from surveillance systems; without a model one is guessing.

Government Involvement with SAGE and its Sub-groups

59. The GCSA and CMO acted as interlocutors between SAGE and policy makers. This was logical and effective in the circumstances as it provided a consistent voice to brief policy makers on the SAGE consensus. In my view, there is a perception that in order to have balance you need a number of voices, but this can be counterproductive in a crisis situation. The SAGE consensus reports had been agreed by the members of SAGE and it was entirely

appropriate for the GSCA and/or the CMO to act as a go between to brief policy makers on the content of these reports.

60. This process did not delay the communication of advice and in my view, was the most efficient and effective way to brief policymakers on SAGE's scientific advice.

Transparency and communication of scientific advice

61. At the start of the pandemic, there could be long lead times in relation to the publication of SAGE's advice compounded with delays in the traditional peer review system as many experienced reviewers were busy with SAGE activity and researchers worked in smaller teams meaning it took longer to transfer reports to academic papers (without the resources of say Imperial to disseminate reports on its own website). This is explained further at paragraph 74. However, this issue was alleviated as time went on and SAGE became more efficient at publishing advice and reports in a timely manner. I am aware that through general media reports was a perceived misconception amongst the general public that scientific reports were delayed or withheld from publication, which was not the case as far as I am aware. By the time reports were published in academic press, due to the availability of new data over this time period, the papers were updated (which was forced by peer reviewers) to include additional models and information so may have different confidence or outputs. This may have contributed to the perception that there was a delay in publishing scientific information. I would encourage thinking about the nature of work underpinning SAGE papers to support and facilitate participants on rapid dissemination.

The First National Lockdown

62. The first national lockdown was necessary and based on the quality of data that was available at that time, I believe that national lockdown was introduced at the earliest practical opportunity. A national lockdown could have been implemented marginally earlier had we not taken the time to verify the international Italian data as detailed further at paragraphs 50 to 52. In my view, and taking into account the uncertainty in relation to the international data that was available at this time, it was necessary and crucial to verify this data. Once this had been analysed, a SPI-M paper was urgently drafted by the team in Manchester and provided to SPI-M-O and discussed with contributions of analysis from other SPI-M-O participants (exhibits **IH/27 - INQ000215639** and **IH/28 - INQ000215621**).

63. I recall that after submitting that SPI-M paper, a national lockdown was instigated. I was not, however, directly involved in the UK government decision making process, therefore, I am

unable to comment on the quality of government decision making or the factors that were considered by ministers to inform their decisions.

64. Following national lockdown and given the continuing situation in social care on 22 April 2020, a meeting between myself and PHE took place with the aim of subsequently informing SPI-M about modelling and potential datasets for capturing outbreak data in care homes. Soon after we held the first CHWS meeting and so the meeting must have been productive and achieved its aims. Unfortunately, I cannot recall specifically who attended this meeting, or the detail of any discussion. I have contacted the SPI-M secretariat to request minutes of this meeting and they have confirmed that they do not have any minutes of this meeting. I can, however, exhibit a report from 26th April 2020, submitted to SPIM, with authorship of some of those in attendance, see exhibit **IH/29 - INQ000215640**.

65. In October 2020, the government implemented a three-tier system to manage local lockdowns and restrictions. In my view, the three-tier system could be confusing for members of the public as areas that were close in proximity could have drastically different restrictions in place, meaning that groups of people who socialised together could be subject to different rules and restrictions. I understand that the government did not want to enforce a national restriction unless this was necessary, but I do not know how much input or involvement was had from behavioural scientists who are best placed to advise on the impact and to consider any suitable alternative measures that could be implemented in the future.

Eat Out to Help Out Scheme

66. I am not aware if SAGE was consulted in relation to the 'Eat Out to Help Out' scheme, nor was I involved in providing any advice in relation to the scheme. On the one hand, the scheme allowed people to mix in August 2020 and potentially boosted the second wave of the pandemic, particularly in areas such as Manchester and Liverpool. On the other hand, I understand that the scheme to some extent aimed to provide people with some sense of normality and improved wellbeing at a time when prevalence rates were low, perhaps with a view to encourage compliance with future lockdown measures.

67. A key consideration when implementing a policy that will result in increased transmission is to have an effective exit strategy to combat the likely increase in cases. In my view, we would likely have experienced the second wave of the pandemic regardless of the 'Eat Out to Help Out' scheme due to other factors such as seasonal variations of the disease and the alpha variant which emerged in November 2020. It was crucial to use interventions to manage the second wave of the pandemic after the 'Eat Out to Help Out' scheme and in my view this is a more useful area to focus on such planning in Government.

Lessons learned

68. There are a number of areas that could be the focus going forward in light of the lessons learned during the Covid-19 pandemic. I have categorised my views below.

SAGE and its sub-groups

69. With regards to SAGE and its sub-groups, I believe multi-disciplinary and cross disciplinary working should be encouraged to facilitate collaboration and the integration of academic disciplines in groups such as SCWG. In addition, I believe that sub-groups, such as SCWG, should meet regularly in peacetime to enable these groups to operate more efficiently at a time of emergency.

70. When SAGE and its sub-groups meet during a time of emergency, it is important to balance the frequency and length of meetings to allow sufficient time for work to be carried out.

71. On occasion, I believe that some participants in the SAGE sub-groups found it difficult to balance their personal contributions to the sub-group meetings with their institutional roles. There was one occasion where we were unable to reach a unanimous consensus at SCWG as one participant felt that our consensus was at odds with the interests of her employer. This could be examined for future pandemics to ensure that participants of sub-groups can effectively balance their commitments.

72. Where commissions were received by SCWG directly from DHSC, this did lead to temporary delays in relation to the dissemination of information as DHSC found it more difficult to find a mechanism to publish reports in as timely manner as SAGE, for example the SCWG advice on vaccine coverage levels in residents and staff (exhibit **IH/30 - INQ000215662**). This was not a critical issue as the policy teams had the advice in a timely manner, but this could be an area of improvement for future pandemics to ensure the expedient dissemination of scientific findings.

Social Care Research

73. When considering a SCWG consensus report on the benefits of allowing visitors into care homes, we looked at the balance between the risk of bringing disease into care homes with the improvement in wellbeing of those living in care homes (exhibit **IH/31 - INQ000215625**). As part of this, we discussed putting this question to a citizen jury. I was concerned in relation to this suggestion due to the difficulties in considering how to convene a representative jury.

If we were to convene a jury from the general population, this would likely include individuals with no interest in care homes, but if we were to include only care home residents and family members of care home residents, this would create ethical dilemmas. Going forward, we should consider how to go about conducting this assessment in a reliable and balanced manner as part of planning and preparedness for any future pandemic. This type of work requires planning and funding.

Communication

74. There is scope for improvement in communication between experts and civil servants. Establishing a core of scientifically competent staff in the civil service is critical to the effective operation of SAGE and its sub-groups. Training to enable analysts to become comfortable with advanced analytics and modelling would be extremely worthwhile to broaden the existing pool of talent that exists and to ensure effective communication between experts and civil servants.

75. There is also scope for improvement in communication with the public. During the pandemic there was a public perception that information was hidden or that there was a delay in providing information to the public. In reality, and as previously discussed at paragraph 60, this was not the case, but arose from practical issues and difficulties publishing scientific reports due to a delay in the peer review system and capacity of participants. If SAGE papers had peer review status, on the basis that the scrutiny of the sub-group effectively fulfils the requirement of a peer review, it would allow SAGE papers to be published with greater speed and efficiency. This would also help the careers of early career researchers supporting the work of SAGE participants. Further, these reports were not created for the public audience and it would aide public trust and understanding if this was made clear to the general public. This is something that should be considered when planning for any future pandemic.

76. In addition, the public and the media focused on tangible written reports and meetings, when in reality, scientific advice and considerations are sometimes verbal or develop from previous papers and reports as additional evidence and data is collated. It would assist if the public had a better understanding of this iterative build of advice and that the publication date is not the definitive date of advice.

77. The effective communication of information to the public and how to facilitate this in a time of crisis is an area that requires careful consideration. I have drafted a report on public engagement during the Covid-19 pandemic which was commissioned by DHSC. This has now been finalised and published, and I attach the report which provides some information which may be of assistance, see exhibit **IH/32 - INQ000215638**. Further, I am aware that the Winton

Centre in Cambridge had a number of projects that are considering issues around communication and therefore, staff involved would be well placed to comment on this.

Data Sharing

78. Improvements in data sharing are essential and should be carefully considered going forward. Structural improvements need to be made to organisations such as the NHS, UKHSA and the Office for National Statistics (and other data owners) to facilitate efficient data sharing in a pandemic which directly informs the reliability of scientific modelling and analysis. For some providers the trusted research environments allowed access to data but without the necessary infrastructure to allow analysis. Later in the pandemic, the virtual machines I used allowed sufficient analysis but required another email address which extended the risk of important messages going unread.

79. By improving communication between scientists, civil servants and policy makers, this can build levels of trust which can encourage and facilitate data sharing and can ensure the effective translation of scientific advice into evidence-based policy.

Funding

80. In my view, in the early stages of the pandemic funding could have been distributed differently. For example, consultants were used rather than domain experts, to set up systems such as data visualisation tools. This is, on one hand, sensible as consultancy companies have a pool of staff to deploy whereas academic groups often need to recruit which carries a risk. However, consultants do not understand some of the public health challenges or the data analytics so the provided solution could have been better. The distribution of funding, its allocation and subsequent project management/steering group, during a pandemic should be carefully reviewed and considered.

81. Following the pandemic, it has been very difficult to obtain funding to examine some of these issues. Whilst I acknowledge that vast amounts of money were spent during the pandemic, and the general challenge of attracting funding in academia in general it feels like there is a reticence to spend money now to help prepare for a future pandemic.

Extracts from my questionnaire response

82. I have been asked to expand on the comments in my Questionnaire response, sent to the Inquiry around October 2022. The Inquiry has, at times, included quotes from my

Questionnaire response alongside extracts from external sources which puts my quote out of context. I have made clear where this occurs below.

My Questionnaire

83. The Inquiry has asked me to expand on my comment in the Questionnaire that, *“there was at times a perceived confusion on source of advice between SAGE subgroups and UKSA from external stakeholders”*.

84. My comment relates to a comment in a single meeting between the Director of Adult Social Care in DHSC in late 2021/early 2022 to discuss the future of SCWG in anticipation of SAGE going into abeyance. I am not in possession of any minutes for this meeting, nor am I aware that any exist. In the meeting DHSC said at times it was unclear when the advice given was from UKHSA and when it was from SCWG. This was in part because the co-chair Eamonn O'Moore was a UKHSA employee. From a UKHSA/SCWG view point the advice was clear and consistent as UKHSA had a strong voice in SCWG discussions as a key science partner. I do not think this was a major issue in the long term as it was never raised in early stages of the pandemic, so was a temporary issue pointing more to future clarification in terms of reference or mandate of such a group. DHSC are better placed to comment on any impact this may have had.

85. The Inquiry has asked me to expand on my comment in the Questionnaire that, *“there were perhaps some dominant voices that had seats at SAGE as well as SPI-M-O that may have biased the view on modelling at that stage”*.

86. The 'dominant voices' that I referred to are Neil Ferguson and to a lesser extent, John Edmunds. Both individuals are well respected in their fields and their views in SPI-M and SPI-M-O were important and valued. In my view, there was no real issue with Neil and John having voices in SPI-M and SPI-M-O as both groups would facilitate a discussion with all the participants and then write a consensus to be agreed by everyone at that meeting. If one voice dominated a discussion point inappropriately, I am confident this would have been challenged given the diversity of participation. There was, however, the potential for issues to arise, as both Neil and John also had seats at SAGE, in their own capacity as scientific experts (noting above their position as figurehead of the two largest modelling centres).

87. The correct process when reporting to SAGE is for the chair of SPI-M-O to provide a brief of the consensus reached by SPI-M-O to the SAGE members, after which there will be a discussion between the SAGE members. As both Neil and John had been party to the SPI-M-O meeting and were already aware of the consensus, there is a risk that they could have

sent reports directly to Patrick Vallance, Government Chief Scientific Adviser, thereby side stepping the review process that should have been followed.

88. In addition, as John and Neil were participants of SAGE, regardless of their participation in SPI-M-O, if their views changed or differed from the consensus report compiled by SPI-M-O and they aired these views at the SAGE meeting, there is a risk that this could be perceived as representing SPI-M-O in disseminated material particularly with the associated media work they conducted.
89. In the early stages of the Covid-19 pandemic (January 2020 to early February 2020) as SPI-M-O was gearing up, this participation on SAGE was credible. As time went on the rationale for their participation in SAGE may have put them in an awkward position regarding the scope and remit for their participation with activity on SPI-M-O unless clearly defined.
90. Active participation across subgroups and organisations is sensible to provide connection and communication on the proviso it is clear in what capacity advice and comment is provided.
91. The Inquiry has asked me to expand on my comment in the Questionnaire that *"it was hard to distinguish science from operations at times"*.
92. In an emergency response, you can divide actions into strategic, tactical, and operational considerations. In general, these distinctions are effective, but scientific investigations can cross over in each of these areas indeed mathematics has a sub-discipline of operational research in part to consider logistics and delivery.
93. In a SAGE meeting, the GCSA and/or the CMO commented that the consensus provided from SCWG was becoming operational rather than strategic. For me personally, at that time (which was later in pandemic than the Module 2 Timeframe and so perhaps reflective that as the pandemic went on challenges did move from strategic to operations), it was difficult at times to see where a model or science was strategic and where it became operational in nature. This was complicated by the fact that I was a participant in SAGE and its sub-groups, but SCWG also received commissions from DHSC and I sat on UKHSA's (formerly PHE) Joint Modelling Team which was operational in nature. For example, using rapid diagnostic testing as an intervention is a strategic choice but low adherence by staff or public would limit effectiveness and so would depend on implementation. In my opinion this was not a real issue for SAGE, with the specific comment raised being said off the cuff but instead an artefact of single papers serving a number of audiences.

94. That said, there was a benefit to my involvement in the strategic as well as the operational spheres as I had a more rounded understanding of the scientific considerations and investigations. I do not see this as a conflict of interest.
95. In a SCWG paper on the commission 'What are the appropriate layers of mitigation to deploy for care homes in the context of post vaccination risk landscape?' dated 26 May 2021, we went into a lot of detail about implementation (exhibit **IH/33 - INQ000215637**). My feeling was we had to do that as implementation was integral to the strategic considerations because as stated above variation or bottlenecks in implementation or adherence would strongly affect effectiveness in settings. This is also critical because when we model an intervention we make assumptions about delivery and implementation that require an evidence base.
96. The Inquiry has asked me to expand on my comment in the Questionnaire that *"decision makers did not articulate the objectives of interventions"*.
97. In the very early stages of the pandemic, the government objectives and priorities were unclear to me. This would not necessarily have impacted the advice of SAGE and its sub-groups, but it would have been helpful to have a clear objective to focus the efforts of the sub-groups.
98. The Inquiry has asked me to expand on my comment in the Questionnaire that *"science communication needs time to be effective as results may be nuanced or uncertain"*.
99. By this, I meant that it is important to have a consistent group of individuals to facilitate communication with scientific experts. There is certain terminology in scientific and mathematical language which can lead to difficulties in communication for those who are unfamiliar with this terminology. The Secretariat of SPI-M-O is an example of a group of individuals who were experienced and had a sound understanding of scientific and mathematical terminology which enabled the Secretariat to communicate effectively with the scientific and mathematical experts.

Extracts from external sources

100. The Inquiry has asked me to provide my view on various extracts including extracts from Institute for Government Reports and 'The Year the World Went Mad' by Mark Woolhouse. I am unable to comment on the reliability or accuracy of the statements in these extracts. I am only able to comment on matters that I was involved with and wherever possible I have endeavoured to provide my input.

Institute for Government Reports

101. I am unfamiliar with the Institute for Government. I believe that it is a think tank, but I am unaware of its funding arrangements and its remit.
102. The Inquiry has asked me to comment on the view set out in the Institute for Government that *“in the initial months, ministers put too much weight on SAGE – relying on it to fill the gap in government strategy and decision-making that was not its role to fill”* (exhibit **IH/34 - INQ000215635**).
103. I do not feel able to respond to this comment comprehensively as I had limited involvement with government ministers during the pandemic and I am not aware of the weight they placed on advice from SAGE and the extent to which this informed government policy. However, during the pandemic and particularly in the early stages of the pandemic, I fail to see what alternatives were available to the government other than reliance on the scientific advice from SAGE.
104. The Inquiry has asked me to comment on the view set out in the Institute for Government that there was a *“lack of definition of roles within SAGE”* (exhibit **IH/34 - INQ000215635**).
105. I struggle to understand this view. Everyone at SAGE was a chief scientist for a government department, a recognised expert in their field and/or chair of a sub-group of SAGE. In my view, each member of SAGE had clearly defined roles and responsibilities. I am sure that for each SAGE meeting the secretariat carefully considers participation based on current need and the scope of the agenda.
106. The Inquiry has asked me to comment on the view set out in the Institute for Government that the desire for ministers to avoid a lockdown framed the advice commission from SAGE and contributed to a delay in considering and implementing these measures as they were *“politically unpalatable”* (exhibits **IH/34 - INQ000215635** and **IH/35 - INQ000215634**).
107. As referred to previously, I do not consider that there was a delay by policy makers in considering scientific advice in relation to the implementation of the first national lockdown. We experienced difficulties verifying the international data which informed the content of the scientific advice, but as I have previously stated this verification needed to be carried out to ensure that the scientific analysis was accurate.
108. The Inquiry has asked me to comment on the view set out in the Institute for Government that there was a *“lack of joined-up thinking”* in government decision making as the UK exited the first national lockdown (exhibit **IH/34 - INQ000215635**).

109. I am unable to comment on this view as my role was to provide scientific advice and did not extend to any involvement in government thinking or policy making.
110. The Inquiry has asked me to comment on the view set out in the Institute for Government that there was a *“lack of transparency about SAGE’s membership and advice in the first four months”* (exhibit **IH/34 - INQ000215635**).
111. Responsibility for transparency in relation to SAGE’s’ membership and publication of this information resided with the government and, therefore, I am unable to comment on any reasons for lack of transparency. The early months of the pandemic were understandably demanding and in my view, any impact on public understanding and confidence caused by lack of transparency with regards to the membership of SAGE was negligible. In SPI-M, we tried to publish articles based on early advice which were rejected by journals outright or after peer review by academics outside of SAGE not bound by pressures of service.
112. The Inquiry has asked me to comment on the view set out in the Institute for Government that *“decision-making at the centre of government was too chaotic and ministers failed to clearly communicate their priorities to science advisors”* and whether this *“delayed decisions and made it harder for scientific advisors to provide useful advice”* (exhibit **IH/34 - INQ000215635**).
113. I am unable to comment on whether decision making at the centre of government was chaotic as I was not involved with this. From my perspective the public briefings appeared to be organised and professional, particularly in light of the uncertainty at this time.
114. In the early stages of the pandemic, the government objectives and priorities were unclear. We proceeded on the basis that the objective was to save lives. As the pandemic progressed, members from the Cabinet Office attended SPI-M meetings to provide a short brief on the current objectives and what the policy commissions would be. This helped to further understanding amongst the participants at SPI-M.
115. I am aware of one instance where there appeared to be a delay in implementing scientific advice from SAGE. In September 2020 SPI-M advised that it would be sensible to implement a ‘circuit breaker’ national lockdown in October 2020 for a short period of time with a view to allow the general population to have a relatively normal festive period (exhibit **IH/36 - INQ000215636**). This advice was not followed and led to an enforced national lockdown in November 2020 and again in January 2021. This advice in September 2020 could not have accounted for the eventual impact of the alpha variant which was unpredictable, or the arising

geographic split in pandemic trajectory (the November lockdown was less effective in my opinion because of the increase transmissibility of the alpha variant). I am unaware of any reasons why this scientific advice was not followed as I was not involved with government decision making.

116. The Inquiry has asked me to comment on the view set out in the Institute for Government that *“ministers’ insistence that they were ‘following the science’ was inaccurate and damaging”* (exhibit **IH/34 - INQ000215635**).

117. My role did not extend to communication with the public and the reports that I contributed to were not drafted for interpretation by the general public. Therefore, I am unable to comment on whether scientific advice, data and statistics were presented effectively to the public.

118. In my view, ministers saying that they were ‘following the science’ could be misleading as it could appear that ministers were hiding behind the science to justify a lack of clarity in government policy. There is a danger that this may erode confidence and trust between policy makers and scientists and public. Whilst ‘following the science’ is a sensible and entirely defensible approach, as scientists, we were not involved in the decision-making process which lay solely with the policy makers. Due to this, policy makers should have taken more responsibility for their decisions rather than displaying a reliance on ‘the science’ as a means to justify policy decisions. To be clear if the Government were not following the scientific evidence they would have been making decisions without any logical justification.

119. The Inquiry has asked me to comment on the view set out in 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”* (exhibit **IH/34 - INQ000215635**).

120. I was not involved with government communication and this is not my area of expertise, therefore, I am unable to comment on the government’s communication strategy. I would advise the Inquiry to speak with expert behavioural scientists that participated in SPI-B, in relation to this.

121. The Inquiry has asked whether I agree with the view set out in the Institute for Government that *“as an ad hoc committee, SAGE was not designed for the semi-permanent role it has had during the Covid crisis”* (exhibit **IH/34 - INQ000215635**).

122. The demands placed on SAGE in the Covid-19 pandemic were unprecedented and despite SAGE’s effectiveness, I agree that it was not designed to operate for an extended

period of time and nor was this anticipated when SAGE was formed in 2020 or planned a decade or so earlier. Further thought should be given to how SAGE would operate and the role it would play in a future pandemic that goes on for an extended period similar to Covid-19. Further planning for participants who are employed by institutions to be reimbursed so that backfill can be put in place for loss of teaching for example would be helpful so that organisations can plan ahead.

123. In comparison to the H1N1 swine flu pandemic, SAGE was only active for about a year as that pandemic was far less severe with regards to the impact on the population and the response level required to manage the pandemic.

124. Based on my experience, the scientific advisory structure in the UK is effective and well-structured. There is no other country that I am aware of that had a similar set up to the UK, with the same resourcing capabilities. Further, when looking at international comparators, there are additional factors at play that need to be considered such as population size and composition and cultural and behavioural factors that prevent direct comparisons to the UK.

125. Whilst there are always improvements that can be made, in my view, the UK scientific advisory structure is sound and functions well.

Professor Mark Woolhouse, *The Year the World Went Mad*

126. I am aware of Mark Woolhouse as an expert initially on foot and mouth disease and now a senior member of the epidemic modelling community based in Scotland. I would like to caveat my comments below on the basis that I have not read Mark Woolhouse's book, 'The Year the World Went Mad' and I have only reviewed extracts of this book that were provided to me by the Inquiry. Further, the content of this book is the opinion of Mark Woolhouse and it is for the Inquiry to determine what weight should be placed on the accuracy of reliability contents.

127. The Inquiry has asked whether I agree with Mark Woolhouse's statement that the UK government "*could and should have done far more to protect the most vulnerable during the second wave*" (exhibit **IH/37 - INQ000215632**).

128. With the benefit of hindsight, it is always possible to argue that more could and should have been done. This is particularly true in relation to care homes and in light of the impact that the second wave of the Covid-19 pandemic had on those in care homes.

129. Shielding, whilst conceptually simple, is a challenge to implement. Later in the pandemic the SCWG paper on visitors into care homes considered these challenges and associated wider impacts of reduced contacts over long time frame (exhibit **IH/31 - INQ000215625**).
130. The Inquiry has asked for my views of Mark Woolhouse's comment that the sequencing of relaxations in Summer 2020 *"often felt arbitrary, given that the policy objective was still to keep the R number low. There were no reliable estimates of how much transmission was occurring in places like gyms, hairdressers or churches"* (exhibit **IH/38 - INQ000215631**).
131. My primary involvement was in care homes (and to a lesser extent other semi-closed settings such as prisons) and I am able to respond to this comment in that context. Relaxation of interventions in care homes and other vulnerable settings was difficult and complex. As well as seeking to reduce the R number, we also needed to focus on the compound impact of the interventions that were in place. An Australian virologist, Ian McKay, developed the concept of the Swiss Cheese model. This is a simple conceptual analogy that the various interventions that were in place (i.e. face masks, hand hygiene, social distancing etc.) and the numerous 'layers' that the virus must travel through to be transmissible. At some point, the holes in the 'Swiss cheese' will align and the virus will transmit, but the challenge is understanding which interventions can be removed whilst ensuring that the holes in the 'Swiss cheese' do not align. More formally EMG wrote a paper introducing the established risk mitigation of the hierarchy of control which was in early May 2020 (first published on 7th May 2020 and updated on 14th May 2020) (exhibit **IH/39 - INQ000215633**). Here we said that measures needed to consider all transmission routes and all activities - thinking about mitigating risks in work places specifically. EMG mentioned the need for multiple measures more explicitly in the paper on 4th June 2020 (exhibit **IH/40 - INQ000215630**), and from then on I think always emphasised this in EMG and cross SAGE papers. The cross SAGE NPIs paper from 21 sept 2020 emphasised the need for packages of measures though that was more around widespread restrictions rather than masks and ventilation (exhibit **IH/41 - INQ000215629**). Later than the time frame stated, but relevant, SCWG wrote a paper regarding hazard mitigation post vaccine and the need to be careful in relaxing interventions (exhibit **IH/42 - INQ000215628**).
132. This demonstrates that the removal of interventions was more nuanced than it may have appeared.

133. The Inquiry has asked me to comment on the view set out in the Sense About Science Report that the UK government “*did not see transparency of evidence as an integral part of managing the Covid-19 crisis*” (exhibit **IH/43 - INQ000215627**).

134. As previously mentioned, in the early stages of the pandemic, there were issues publishing scientific reports promptly. As stated in paragraph 74, if SAGE papers had peer review status, this would allow SAGE papers to be published with greater efficiency. Whilst there were some delays, the intention was always for complete transparency. There was a sense that the public wanted SAGE and its sub-groups to operate in the public eye, whereas scientific groups should be able to have a technical discussion and then be afforded a reasonable period of time to process that discussion and communicate that in a written paper.

Chancellor’s Statement to the House, 5 November 2020

135. The Inquiry has asked to what extent I agree with the statement of the Chancellor of the Exchequer, Rishi Sunak on 5 November 2020 that “*we would be able to stay ahead of the virus*” after lifting restrictions (exhibit **IH/44 - INQ000215626**).

136. As this statement is the “*belief*” of the Chancellor, I am unable to comment on the strength of his belief. I would, however, like to point out that the Chancellor’s statement would have been based on the transmission statistics from October 2020. With the benefit of hindsight, we now know that at the time the Chancellor’s statement was made, the virus was evolving in Kent, which led to the development of the alpha variant. This had a drastic impact on our scientific considerations and outputs as the alpha variant was more transmissible than the previous variant and caused a steep rise in cases of Covid-19. To stay ahead of the virus, however, requires clear understanding of the doubling time; if one was somehow to double hospital capacity, but the doubling time is 7 days, then the additional resource and effort would only keep you one week ahead of virus.

137. Further, the Chancellor appears to be relying on the ‘Test and Trace’ strategy in his statement, the effectiveness of which was rendered uncertain due to asymptomatic transmission.

Statement of Truth

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

Personal Data

Signed: _____

Dated: 20/7/23