Witness Name: Aziz Sheikh
Statement No.: 1
Exhibits: AS
Dated: 06/11/2023

UK COVID-19 INQUIRY

WITNESS STATEMENT OF AZIZ SHEIKH

In relation to the issues raised by the Rule 9 request dated 1 August 2023, and received on 17 August 2023, in connection with Module 2A, I, Aziz Sheikh, will say as follows: -

1. I am Professor Sir Aziz Sheikh, Director of the Usher Institute and Dean of Data at the University of Edinburgh, Edinburgh, UK.

2. I have prepared this statement myself with reference to documents and factual information provided by the Scottish Government Covid-19 Advisory Group (SGCAG) Secretariat with the support of my University of Edinburgh personal assistants. A draft of this statement has been reviewed by a solicitor.

3. Unless stated otherwise, the facts stated in this witness statement are within my own knowledge and are true. Where they are not within my own knowledge, they are derived from sources to which I refer and are true to the best of my knowledge and belief.

4. References to exhibits in this statement are in the form [AS/number – INQ000000].

Part A – Sources of advice; medical and scientific expertise, data and modelling

My roles and responsibilities

5. I am a clinical epidemiologist with long-standing interests in allergic and respiratory conditions, and health data science. I was part of the team that created the Scottish Early estimation of pandemic influenza Antiviral and Vaccine Effectiveness (EAVE) platform that was deployed during the previous H1N1 ('swine flu') pandemic. For other background information about me, please refer to Paragraph 1 of my earlier response to Module 2A questions to Amy Cornelius dated 15 February 2023 [AS/001- INQ000130200].

6. I have been Dean of Data at the University of Edinburgh since March 2020. This role sees me serving on the University of Edinburgh's Executive with a particular focus on health data. During the period covered by the Inquiry, my role as Dean of Data was almost exclusively on trying to create, refine and analyse Scottish and UK data on Covid-19 to support the Scottish/UK national response to the pandemic. In so doing, we created one of the world's first and most comprehensive national linked electronic cohorts that were then interrogated in various ways over the period covered by Module 2A.

7. I have been the Director of the Usher Institute since August 2017. In keeping with many other academic health groupings, the Usher Executive (which I chair) encouraged our academic and professional services staff to pivot their work to supporting the Covid-19 response as far as possible. Many colleagues from across the Usher Institute willingly responded to this steer making important contributions through their original research, evidence synthesis and expert perspectives, as well as through frontline clinical services. This also included several members of our academic staff serving on various Scottish and UK Government Covid-19 committees and, where appropriate, making preliminary research findings available to relevant government officials in advance of their publication in peer-reviewed journals.

8. I served in my role on the SGCAG on a purely voluntary basis. My work in this respect was undertaken with the full knowledge and support of the University of Edinburgh's Senior Leadership Team. To be clear, there was no remuneration for any of my time or expenses incurred.

Principles/policy behind the use of medical/scientific advice in the Scottish Covid-19 pandemic response

9. It was my understanding that the Scottish Government (SG) was committed to drawing on and, as far as possible, being guided by scientific evidence to support decision-making in relation to their pandemic responses. I was not involved in the formulation of policy and am therefore not in a position to comment on the extent to which scientific evidence was factored into decisions by policymakers. That said, over the course of numerous interactions with decision makers and civil servants, I gained the impression that the advice offered by SGCAG (and other scientific bodies such as the Scientific Advisory Group for Emergencies (SAGE)) was carefully and respectfully considered.

10. From my interactions with the then First Minister, Nicola Sturgeon MSP, during the SGCAG deep-dive briefings arranged by the Scottish Government Resilience Room (SGoRR), she appeared eager to understand scientific advances in relation to Covid-19 and how these might impact on SG's decision-making.

11. I believe that overall the SG did consider the best available scientific evidence in their decision-making, but recognise that there were inevitably other factors that also needed to be considered such as whether issues were devolved or reserved (and hence outwith SG's jurisdiction), economic impacts, resource implications and public opinion.

12. I believe that the regular public briefings by the First Minister accompanied by her Chief Medical Officer (CMO), or other senior health representatives, helped overall with maintaining public confidence in relation to Scotland's pandemic response.

13. From my dealings on SGCAG, initially the focus seemed to be on scientific advice that could inform policy, but over the course of the pandemic this became a more two-way dialogue including requests for scientific advice on policy considerations. I do not recognise SG having a policy that no death from Covid-19 was unacceptable. Rather, I understand that the policies that underpinned SG's responses were based on their 'Four Harms Framework' [AS/002-INQ000131028] which aimed to minimise overall societal harm. In essence, this aimed to suppress spread of Covid-19 as far as possible in order to buy time for vaccines and treatments to become available.

Informal decision making and communication

14. The scientific advice provided by the SGCAG was shared in papers and minuted Zoom meetings, by email, Slack and Objective Connect. What's App or other social media platforms were not used by SGCAG.

15. SGCAG routinely used Slack to share information and to enable members to provide individual comments in response to requests for advice before SGCAG agreed its final advice. The Slack exchanges informed subsequent discussions and the preparation of advice. Once formal advice had been produced, those exchanges were routinely deleted.

16. Comments on Slack and in meeting 'chat' informed SGCAG discussions. While these comments were not retained, the outcome of discussions and any conclusions reached on advice were, I understand, recorded.

17. As far as I am aware, all meetings of the SGCAG were minuted. I do not think these meetings were digitally recorded, but this information should readily be available from the SGCAG Secretariat.

18. I primarily used email and the Zoom meetings to provide evidence and advice to SGCAG. I was on Slack and Objective Connect, but posted materials very infrequently through these channels. I do not have a record of these posts, but these may be available through the SGCAG Secretariat.

19. I should have access to relevant emails with SGCAG and SG and the Zoom meetings have been minuted.

20. A summary of meetings was taken by the Secretariat of SGCAG. As far as I am aware, these represented accurate high-level summaries of our deliberations.

21. A chronological list of Covid-19 meetings I had with SG colleagues, other than SGCAG and the SGCAG deep-dive briefings organised by SGoRR, is provided [AS/003-INQ000315516]. I understand agendas, meeting papers and minutes of all these meetings have already been provided to the Covid-19 Inquiry by the SGCAG Secretariat.

22. As noted above, the majority of the conversations of which I was a part was on the actual Zoom calls and by email. Meeting papers were always circulated by email, but could include embedded links to papers on Objective Connect.

23. As far as I'm aware, these email discussions and meeting papers and draft documents will have been retained by the SGCAG Secretariat.

24. Confidential information (e.g. SAGE papers) was clearly marked and, as far as I'm aware, the confidential nature of this information was respected by SGCAG members. This was in keeping with the Terms of Reference of becoming a SGCAG member, which stated: "Information arising from SAGE is official sensitive and should not be shared outside of these structures. Any inputs shared with the group for discussion will be considered confidential and not for further sharing."

25. The main constraints of decision making by SGCAG members were lack of evidence in relation to known unknowns, the many unknown unknowns in relation to the virus and disease, and the limited time that SGCAG members had as they were typically serving on SGCAG on top of already busy jobs that had been increased in complexity as a result of the pandemic. Most of the informal meetings that I was involved in were primarily information gathering/sharing exercise to inform formal meetings. These were not decision making fora as far as I'm aware.

Scottish Government Covid-19 Advisory group ("SGCAG") and SAGE

Constitution, membership and role of the SGCAG

26. As far as I am aware, SGCAG had diverse representation from across Scotland with relevant expertise, including clinical care, epidemiology, ethics, health governance, public health, social sciences and virology; this was kept under review with additional expertise drafted in as appropriate as the pandemic evolved. I was not part of SAGE and so I am not in a position to comment on its membership.

27. Relevant expertise was available to SGCAG across most of the areas mentioned (and others) with perhaps the exception of health economics. The latter was discussed, but was not considered necessary as we were informed that SG had other groups with economics expertise available to them and also because health economic considerations (e.g. the cost-effectiveness of Covid-19 vaccines) were not influencing policy responses during the stage of the pandemic in question.

28. To the best of my knowledge, SGCAG's role was primarily to advise on medical and scientific considerations. As far as I'm aware, it did not have the remit to consider wider societal impacts such as the economy.

29. A cross-sectoral forum looking at other areas of expertise would I think have been useful – particularly, if chaired by the First Minister or other senior representative of the SG. This would have helped to make clearer what evidence/advice, in addition to the medical and scientific advice provided by SGCAG, was feeding into SG to inform their final decisions.

30. It was clear right from the outset that societal responses would be needed to curb the spread of the pandemic and minimise harm, which would require co-ordinated cross-sectoral responses. In highlighting "the need for cross-sectoral responses" in my questionnaire response of 15 February 2023 [AS/001- INQ000130200]. I meant that we were in SGCAG largely unaware of what other Covid-19 advisory groups were discussing and it was therefore difficult to assess how competing considerations were being considered by the SG.

31. Yes, with the benefit of hindsight SCSAG should have been formed much earlier – ideally from January 2020. I recognise however that this is a very difficult call as early convening of government advisory groups would potentially result in a large number of false alarms.

Operation of advisory structures

32. Senior representatives from Public Health Scotland (PHS) were members of SGCAG. SGCAG reported to the CMO who I understand in turn communicated directly with Scottish territorial health boards, primary care and NHS Scotland leadership. I interacted very closely with PHS colleagues in the context of establishing the national EAVE II (Early Pandemic Evaluation and Enhanced Surveillance of COVID-19) platform using near real-time linked health data from across Scotland and then using this to run analyses that we believed might generate important scientific insights and inform policy responses to the pandemic.

33. I'm not aware of whether delays in relation to the creation of PHS impacted on their involvement with SGCAG. PHS was represented through Dr Jim McMenamin from the first meeting of SGCAG on 26 March 2020.

34. Papers tabled at the SGCAG were prepared by different sources – some were prepared by members of SGCAG, others were from SAGE and others still by the CMO and SG. Commissioned papers were by and large prepared following discussion at SGCAG meetings. Papers were generally circulated with reasonable notice, but these were pressurised times with rapid advances in knowledge so some papers were circulated, for understandable reasons, at short notice.

35. As a member of SGCAG, I had very few interactions with ministers. As far as I understand, discussion with ministers was largely through the CMO's office.

36. I had no direct involvement in providing advice to Cabinet meetings or the Four Harms group. I was however involved in presenting data to several SGCAG deep-dive meetings organised by SGoRR where I thought the interactions were appropriately respectful with a keen interest from ministers to understand scientific advances.

37. My main role in SGCAG was the undertaking of analyses that might support key deliberations on various aspects of the pandemic.

38. There were several mechanisms through which scientific advice was communicated to SG, including through the CMO's office, SGCAG deep-dive meetings organised by SGoRR and briefing papers. Overall, I believe these mechanisms worked well and the insights and advice formulated was welcomed by decision-makers. I of course understand that there were, in addition to the scientific and medical advice, other considerations that ministers needed to take into account in making their policy decisions.

39. Given the circumstances under which SGCAG was operating where in effect all members were volunteering their services over-and-above their day jobs, I believe SGCAG was largely effective in communicating advances in scientific understanding, including pre-prints, and formulating timely scientific advice. With the benefit of hindsight, consideration should have been given to seconding scientific advisers into government support roles on a full-time basis.

40. SGCAG reported to the CMO. The CMO and members of her/his team would be aware of key scientific developments during meetings, but would also pose their own questions to SGCAG. Deputy CMOs (DCMOs) would often represent the CMO if she/he were unavailable or also attend in their own right. The Chief Scientific Adviser

(CSA) and Non-Clinical Director (NCD) were also present in some of these meetings. Finally, the Chief Scientist (health) was the Deputy Chair of SGCAG.

41. Both the minutes and the formal advice produced by the Group did record instances of differing views within the Group where a consensus was not reached.

42. There was a risk of information overload for everyone as the pandemic was associated with the most intensive period of scientific activity in my memory.

43. The advice communicated to ministers mainly emerged from advances that SGCAG members identified; there were however also specific requests for advice from SG, which SGCAG tried to respond to.

44. I think it would have been helpful to have a more direct line to the First Minister to ensure that the insights and advice being provided by SGCAG was received and understood. I do however recognise that there were enormous demands on the First Minister's time.

45. Members of SGCAG were in general made aware of how scientific advice was being used and that this consulted one source of information for decision-making. We were not given detailed feedback on whether advice was used and, personally speaking, I'm not sure that this was important. From my perspective, it was important that the data and advice we provided were understood and processed by relevant decision-makers, which I believe was largely the case. This could perhaps have been more effectively achieved with more direct interactions with the First Minister.

46. I was not aware that the CMO sought to focus advice to the Cabinet on the centre ground, but given the wide range of perspectives and the relative lack of data – particularly during the early stages of the pandemic – this sounds to me as having been a reasonable course of action.

47. During the early stages of the pandemic, most of the areas of advice covered were suggested by members of SGCAG. This changed as the pandemic progressed with government advisers asking for advice on specific areas under policy discussion. From my perspective, this advice was appropriately requested by SG from SGCAG. That said, it would have been helpful to know what other advice was also being requested by SG and from whom in the context of the particular policy decisions being considered.

48. The SGCAG deep dive meetings organised by SGoRR were designed to update the First Minister and members of her cabinet on specific key developments in relation to the pandemic. The topics discussed in these deep dive meetings have I believe already been made available to the Covid-19 Inquiry through the SGCAG Secretariat.

49. I made very limited use of the Scottish and UK Covid-19 dashboards and so am not in a position to comment on their usefulness.

50. As noted above at paragraph 37, my main role was to help with the undertaking of analyses that could prove helpful to policymakers. I tried to do this by participating in relevant discussions and then using these insights to, wherever possible, undertake relevant analyses and communicate findings to decision-makers as early as possible.

51. I did not feel constrained in relation to the advice that was given. I cannot recall any discussion where we were told to restrict our discussions to policy options that might be considered palatable by policymakers.

52. I think that SGCAG tried as far as possible to be transparent in the advice given, including in relation to detailing caveats. As key representatives of SG and the civil service were actually in the discussions, they would have heard first-hand the range of perspectives amongst SGCAG members on various topics under consideration.

53. As far as I'm aware there was ample opportunity for the First Minister and core decision makers to challenge advice from SGCAG, whether through the CMO/DCMOs, CSA, Chief Scientist (Health), NCD, civil servants or direct discussion with the chair of SGCAG. There were also additional opportunities to do this through the SGCAG deep dive meetings organsied by SGoRR.

54. There was no one set process for the way in which advice was formulated. Those with relevant expertise and interests would typically work together to draft advice, which was then shared with the wider group for critical scrutiny and challenge. The advice would then iteratively evolve until there was a form that SGCAG members were happy with. Those who were not happy with the consensus advice had the option to make this clear.

55. As far as I'm aware, multi-disciplinary expertise was sought in all the SGCAG advice that was formulated. As appropriate to the subject under consideration, I think SGCAG sought to engage with different disciplines in an even-handed way.

56. From my recollection, most of the time there was broad consensus among SGCAG members on most matters. In cases where there were major differences of opinion, these were expressed in the presence of the SG and civil servant members who were part of the SGCAG meetings. To the best of my knowledge, these were then communicated to SG both through their observers on SGCAG and through the advice that was made available to SG

57. I am not aware of any external assessment or peer review of SGCAG. That said, external experts were periodically invited into discussions, as appropriate, both to provide expert perspectives and to share international experiences.

58. I am not aware of any clear instances in which advice or modelling analyses were provided by SGCAG, but not followed by SG.

59. It would have been helpful to have data on the economic impacts of Covid-19, but I understand that this was being pursued by another Covid-19 advisory group reporting to SG. With the benefit of hindsight, it would also have been helpful to see modelling on the anticipated impacts of the "Eat out to help out" scheme.

60. SGCAG drew on the Four Harms Framework [AS/002-INQ000131028], whilst recognising that its specific remit related to its Terms of Reference. In relation to education, there were subgroups of SGCAG established on Education and Children's Issues and Universities and Colleges, which I was not part of.

61. Clinical input into SGCAG was provided by the CMO/DCMOs, and also those independent members with clinical backgrounds. With the benefit of hindsight, I think it would have been helpful to have had greater and broader clinical representation/input into SGCAG – for example, from allied health professional representatives.

62. Patient groups were not formally represented on SGCAG. Again, with the benefit of hindsight, I feel patient involvement may have proved helpful. This would however need to have been adequately supported as such was the range and volume of information that needed to be considered that this was well-beyond what is normally

expected of public representatives working on, for example, patient and public involvement panels.

63. Consensus was never going to be reached on ever matter, but on most issues there was broad consensus among SGCAG members. The CMO/DCMOs (and other decision makers) were present in most of the SGCAG meetings and so were able to hear differing perspectives first hand.

64. From memory, all members contributed to the SGCAG discussions without any particular perspectives/views being privileged. That said, there were clearly subjects where some individuals, on account of their disciplinary backgrounds, had particular expertise and these individuals were usually invited to comment first in discussions.

International perspectives

65. International perspectives were frequently discussed in SGCAG meetings. This could however have worked better by establishing formal relationships with Covid-19 advisory groups and governments in countries that were faring better than Scotland/the UK in the pandemic.

66. It rapidly became clear that several other countries, particularly those with recent experiences of managing Severe Acute Respiratory Syndrome (SARS) and Middle East Respiratory Syndrome (MERS), were faring better than us in Scotland/the UK in the pandemic. It could have proved very instructive to learn lessons from such countries, and to this end I instigated a series of webinars through the University of Edinburgh [AS/004-INQ000315517] which SCCAG and SG colleagues were made aware of. It would however have been better if SG colleagues had organised these to allow them to tailor content better to their needs. These were however time-consuming to set up and deliver, which may have been a barrier. From 30 March 2020, Professor Devi Sridhar was a member of SGCAG and was regularly asked to provide insights based on international perspectives.

67. Countries such as China, Singapore, South Korea, Thailand and Vietnam fared particularly well during the early stages of the pandemic. Key lessons are likely to have included taking early decisive action through non-pharmaceutical interventions (NPIs) to reduce community transmission, and the use of mobile phone technology to support public health messaging and surveillance.

SAGE

68. In theory, SGCAG had reciprocity with SAGE but in actual fact the relationship appeared more uneven. SGCAG members had no direct input into SAGE discussions unless they were also members in their own right. Going forward, the relationship should be clarified not least to try and stop SGCAG being referred to in the media as 'Scottish SAGE'.

69. The relationship between SAGE and SGCAG was described as reciprocal by the Chair of SGCAG. In practice, one of SGCAG's roles seemed to be to try and contextualise SAGE's advice for Scotland.

70. The terms of reference for SGCAG were initially drafted by Niamh O'Connor, the Deputy Director supporting the SGCAG in consultation with the CMO and DCMOs. These Terms of Reference are provided [AS/005-INQ0000217422. It may have been helpful to periodically review the Terms of Reference to check that they were still appropriate.

71. One example of differences between SAGE and SGCAG was in relation to advice on face masks/coverings during the early stages of the pandemic where some members of SGCAG had strong views that these should have been mandated much earlier. These views were made clear in SGCAG meetings in which SG representatives were present and, as far as I'm aware, these perspectives together with the supporting evidence provided by relevant SGCAG members informed SG decision making on face coverings.

72. Overall, I think the interactions between SGCAG and other UK Covid-19 advisory groups were effective. This was aided by the fact that several members of SGCAG were represented on SAGE, SPI-M and SPI-B. A challenge was the volume of materials that were being generated that needed to be digested by SGCAG members who were serving in a voluntary capacity on top of managing normal workloads and pandemic related changes to working.

73. I understand that SGCAG papers were made available to SAGE Secretariat, but I am unaware if these were shared more widely with SAGE members. I am unaware of whether these papers were also made available to SPI-B/SPI-M.

74. As far as I'm aware, there were no formally agreed relationships between SGCAG with GO-Science, JCVI, MHRA, NERVTAG, SPI-B or SPI-M, all of which should be clarified before any future pandemics to enable a more joined up approach to the UK/Scottish pandemic response.

Data and modelling

75. Relevant modelling was made available through the Chief Statistician's office, which was helpful. For access to data, my research team established the EAVE II platform working in conjunction with PHS. There were delays in establishing EAVE II as funding and permissions needed to be secured to bring EAVE out of hibernation and scaled-up to create EAVE II. These delays were at least in part because EAVE was placed into hibernation mode (i.e. so preliminary permissions were in place should the platform need to be urgently reactivated) following the end of the H1N1 pandemic. Data from EAVE II could have been provisioned much more quickly if EAVE data had been used to, for example, help address other Scottish health priorities, which would have enabled data permissions, infrastructures and analytical capabilities to be retained and rapidly repurposed in the event of any future pandemic.

76. These data needed to be available to inform insights into pandemic threats and how the pandemic was evolving in Scotland from the first day that SG was made aware of the threat posed by SARS-CoV-2. EAVE II ultimately became the main Covid-19 surveillance platform in Scotland, but this needed funding, unprecedented permissions to be obtained for a national surveillance platform, and staff to be hired, trained and security cleared to access data. The funding for EAVE II has now come to an end, permissions to use GP data have expired and staff are leaving so we are back to square one with Scotland again inadequately prepared on the data front for any future pandemic threats. The request for permissions started on 20/3/2020 with approvals to use data finally received on 6/8/2020, which is far too slow in a pandemic context [AS/006-INQ000315518]. The main reasons for the delays were having no precedent (anywhere in the world) for a whole country data platform and hence no processes in place to make timely decisions.

77. Modelling was initially undertaken on behalf of SGCAG by Chief Statistician, Professor Roger Halliday, and then by Dr Audrey MacDougall from 11 August 2021. Additional modelling was undertaken by Professor Chris Robertson from the University of Strathclyde/PHS. The Chief Statistician did not have access to GP

data, which limited their ability to run adjusted analyses. There were in addition other data gaps relating to, for example, A&E attendances, missed procedures, school attendance, economic impacts and ethnicity all of which could have proved helpful for modelling purposes.

78. There were delays in the provision of data, particularly during the crucial early stages of the pandemic as noted above in paragraph 75. As noted above, it is clear from the EAVE/EAVE II experiences, that a hibernation model is sub-optimal as it introduced unacceptable delays. What would have been better is if the data platform had been used for surveillance and research purposes between pandemics so as to ensure the data and capability were available for pandemic purposes as and when required.

79. QCovid is a risk prediction algorithm that was produced at the request of the UK's Chief Medical Adviser (CMA), Professor Sir Chris Whitty, acting on behalf of the UK's CMOs, to identify those at highest risk of severe Covid-19 outcomes i.e., hospitalisation and death. I was part of the team that developed QCovid and I led the Scottish validation exercises. QCovid was used by the UK and Scottish Governments to inform deliberations on who was at greatest risk of severe Covid-19 outcomes, and thereby to expand shielding categories and who should be prioritised for vaccination [AS/007-INQ000315529].

Constraints on operation

80. I have noted in my previous response to the Covid-19 Inquiry on 15 February 2023 that SGCAG was well run within the constraints under which it was operating. The constraints were that SGCAG had very little in the way of resources and that it was comprised of volunteers with no offer of backfill time to help manage their day jobs. This also meant that there was very little resource to commission specific pieces of work that needed to be done. I remember raising this lack of resources with the Chair of SGCAG during one of our early SGCAG early meetings, but was told that there was minimal resources made available to SGCAG.

81. It became clear early on in the pandemic that testing and tracing capacity had to be scaled up across the country, but this proved challenging because of lack of tracing staff and resources to increase staff numbers.

82. It was and still remains somewhat unclear to me exactly which aspects of funding and decision making were reserved or devolved and as a consequence how much of the constraints in Scotland's response were due to the devolution settlement.

Local government

83. I was not involved in deliberations with, or provision of advice to, local government and I cannot comment on how SG liaised with local government. I did however help provision maps of local Covid-19 hot spots based on analyses of the Zoe symptom tracker app, which was used to monitor likely infections in the early stages of the pandemic before testing became widespread. These maps should be available via the SGCAG Secretariat.

Conclusions and lessons learned

84. Overall, as noted above, I think the processes for preparing and communicating advice worked reasonably well considering the constraints under which SGCAG members were operating and the very limited resources made available to SGCAG.

85. In the context of planning for future pandemics, it would be helpful if the relationship between key UK Government and SG bodies could be worked out in advance, including ways in which these relationships are placed on an equitable footing. Ideally, there would have been international oversight of the functions of SGCAG, but given that key experts in other countries were likely to have been tied up in advising their own governments this may have proved difficult in practice.

86. I believe that we should have maintained testing and sequencing and data analysis infrastructure and capability in Scotland as these were fundamental to many of the scientific and public health breakthroughs that have offered a way out of the pandemic. There are of course financial implications of maintaining this capability, which it seems UK/Scottish Governments are reluctant to fund when considered against competing priorities.

87. Building on Scotland's pandemic science capabilities will require a combination of vision, leadership and resources, all of which are dependent on senior political buy-in from both the UK and Scottish Governments. I expanded on these ideas in the Scottish Science Advisory Council report 'Building on the Science Legacy of Covid-19 in Scotland' report [AS/008-INQ000315519], which I co-led.

88. I did not have any particular concerns with respect to SG ministers or senior civil servants as I felt they were responsive to the scientific and medical advice provided by SGCAG, but obviously had to balance this with other considerations (such as impact on the economy).

89. I had concerns that the decision to impose the first lockdown in March 2020 may have been taken too late.

Part B - Initial understanding of and responses to Covid-19 in the period from January to March 2020

Initial understanding of the nature and extent of the threat

90. I first became aware of Covid-19 from media reports in January 2020. My concerns were however particularly highlighted after reading the initial modelling analysis from Professor Neil Ferguson's team [AS/009-INQ000315530].

91. I raised concerns about the need to convene expert groups with senior colleagues at the University of Edinburgh and also with Professor Andrew Morris, the former Chief Scientist (Health) with whom I had existing working relationships. My work has mainly been as an epidemiologist investigating non-communicable disorders and on health data scientist – as a result, I did not at the time have well developed views on implications for policy or public health responses to pandemics and did not therefore feel I had appropriate expertise or credibility to raise my perspectives in the media.

92. My understanding in relation to transmission, incubation period and growth potential of Covid-19 increased and evolved rapidly as a consequence of extensive reading around infectious disease epidemiology/pandemics, discussions with colleagues with relevant expertise, and planning for a series of international Covid-19 webinars convened through the Usher Institute, which began on 27 March 2020, which I reference at paragraph 66 above.

93. I'm not aware of or privy to the ways in which the SG reacted in January and February 2020 to the news of the epidemic in China and spread of the virus in European countries. That said, I do believe that SGCAG should have been convened earlier with a direct reporting line to senior ministers in the SG.

94. I don't think the infection fatality rate was well understood by late January 2020. Early estimates suggested that it may have been anywhere between <1% to >5%; see, for example: [AS/010-INQ000315520].

Pre-lockdown response

95. I did not provide any information or advice to the SG or UK Government or to the World Health Organization (WHO) in relation to any decisions taken during the period February to early March 2020. My involvement with SGCAG only started with its first meeting on 26 March 2020.

96. With the benefit of hindsight, the initial precautionary measures (such as the issuing of respiratory and hand hygiene behaviours guidance) promoted by the SG were clearly inadequate as evidenced by the subsequent rapid increase in numbers of cases, hospitalisations and deaths, and the decision in due course to impose a national lockdown.

97. I was not privy to any SG strategy to prepare for a second wave during the first few months of the pandemic.

98. I understand 'herd immunity' to refer to large sections of the population developing infection and acquiring natural immunity, which would as a result decrease the number of susceptible individuals in the population assuming no waning of immunity or the emergence of variants. I am unaware of whether herd immunity formed part of SG's initial strategy. As far as I'm aware, herd immunity was not part of its subsequent strategy.

99. I'm not aware of any SG discussions or strategy to encourage herd immunity based on the belief that NPIs would not be tolerated by the Scottish population.

Super-spreader events

100. I am unaware of evaluations into the role of potential Scottish super-spreader events during the period February to March 2020, but from first principles these are likely to have contributed to community transmission – particularly if there were a high number of infected people at the time.

101. I am unaware of what advice was provided to SG in relation to these potential super-spreader events. With the benefit of hindsight, using the precautionary principle these should have been postponed until such time as there was a clearer understanding of the epidemiology of SARS-CoV-2 [AS/011 – INQ000315522].

Part C -Testing

102. It was vital to have an effective testing and tracing system in place across Scotland at the earliest opportunity. I was pleased to see this launched in May 2020, but from memory there were concerns about limited capacity for testing and tracing across Scotland.

103. The need for a robust testing and tracing strategy was discussed at SGCAG meetings with emphasis also on the importance of isolation and supporting individuals to isolate by, for example, mitigating financial challenges associated with this decision. As far as I recall, this advice in relation to testing and tracing was well received and acted upon within the budgetary and human resource constraints available to SG/PHS.

104. I agree that testing was vital, particularly once it became apparent that people with asymptomatic infections were also capable of transmitting SARS-CoV-2.

Part D - Decisions in relation to non-pharmaceutical interventions ("NPIs")

105. Please find my responses in relation to use of NPIs by SG below.

106. NPIs are vital public health measures to control community transmission of infections. They were particularly important when there were no effective vaccines or treatments for Covid-19. I am not aware if there was a plan in place across the UK/Scotland on when and how these should be deployed, and how their deployment was to be evaluated whether in terms of direct health benefits or corollary impacts. We undertook some work in relation to NPIs through analysis of the effectiveness of lockdowns using Google Mobility data and interrogation of social media data to understand public sentiments to contact tracing apps, the findings of which were shared with SGCAG) **AS/012 INQ000217534 and AS/012a INQ000217535** and also through evidence synthesis undertaken by the Usher-led UBCOVER Group.

107. It was initially assumed that the influenza high risk groups would also apply to Covid-19. At the request of the CMA/UKOs, I was part of the team that developed the QCovid risk algorithm [AS/007-INQ000315529], which was then made available to decision makers and which has subsequently been updated to take account of evolving understand of the condition. Other than the advice on shielding for high risk groups, other NPIs ware largely deployed at a population level. This appeared in part due to the risks of stigmatising those in high risk groups, which I agree was a concern. Long Covid was poorly recognised/understood during the early stages of the pandemic and so I don't recall this having been a key consideration in scientific deliberations or policy discussions.

108. From memory, face coverings were one of the most controversial areas discussed with divided scientific opinion about the effectiveness of these in general and also about specific approaches to face covering (e.g. home-made vs surgical mask vs N95 respirator). This topic grew in importance once it became apparent that SARS-CoV-2 could be transmitted through the airborne route, which then contributed to SG's decision to mandate the use of face coverings in public places.

109. In a personal capacity, I was unsure how effective face coverings were at the time and I remember making the point at a SGCAG meeting on 12 June 2020 that in the absence of clear evidence it might be possible to rapidly conduct a clinical trial to provide definitive evidence. This was however thought difficult to deliver in the context of a pandemic and so was not pursued.

110. There were concerns about the NHS capacity potentially being exceeded, particularly in relation to intensive care unit (ICU) beds and ventilators and this was therefore an important consideration in relation to the modelling presented. As far as I'm aware there were less discussion around staffing and personal protective equipment (PPE) in these discussions. I was in agreement about the need to minimise the risk of hospitals being over-run and to take this into consideration when advising on NPIs.

111. As it became clearer that schools were contributing to the growth in R, it became important to include school closures within the NPI toolbox. With the benefit of hindsight, what I think would have helped would have been an overall appreciation of the range of measures potentially available within the NPI toolbox and then informed discussion about their likely effectiveness, which of these should be deployed, in which order or combination, and how these were to be evaluated. A related discussion was also needed about the risks associated with deploying these NPIs

and how these could be mitigated. An evidence synthesis of the likely effectiveness of NPIs has recently been completed by the Royal Society, which I was part of [AS/013-INQ000315523].

112. In my earlier questionnaire response to the Inquiry dated 15 February 2023 where I refer to the need to strengthen public health as a lesson for future pandemics, I was referring to the limited capacity in PHS to test, trace and isolate infected individuals, particularly during the early stages of the pandemic. I believe that this in turn reflected lack of human capacity in PHS, which appears to be have under-invested in over the years preceding the pandemic.

113. In relation to vulnerable groups, as already noted, an initial priority was to understand which groups were at highest risk of severe Covid-19 outcomes and how these groups evolved over the course of the pandemic. The QCovid algorithm and other scientific developments provided these insights for at least some of the key vulnerable and at risk groups. There were however gaps in understanding – for example, by ethnic group – which we and others sought to fill through creating new data linkages. I think the greatest discussion was around the impacts on children of imposing NPIs bearing in mind that they were at relatively low risk of experiencing severe Covid-19 outcomes, but played an important role in community transmission through schools and posing risks to elderly and unwell family members.

114. In terms of how those who were medically vulnerable to Covid-19 should be defined, my advice to SGCAG was that we couldn't just assume that influenza high-risk categories could be applied to Covid-19 and that ways of identifying those at highest risk of severe outcomes therefore needed to be developed. I was part of the team that then developed and validated the QCovid algorithms to identify those at highest risk of severe Covid-19 outcomes, which was then used to expand the vulnerable group who were advised to shield during the early stages of the pandemic.

115. As far as I'm aware, SG was receptive to the evidence being generated on those with pre-existing conditions and how they should be protected. This was originally operationalised by expanding the shielding group and then prioritising these individuals for vaccinations and Covid-19 therapeutics as these became available.

116. During the early stages of the pandemic, there was very little understanding of Long Covid. I am not aware of whether Long Covid was considered by the SG in relation their decision to impose NPIs.

117. I feel the SG's responses during the early stages of the pandemic were sub-optimal. I was concerned by the delay in convening SGCAG, the seeming absence of any road-tested plan for responding to pandemics, delays in lack of access to data to support decision making, and the limited public health capacity to undertake testing, tracing and isolation.

118. The most crucial delay was the lack of any early attempts to control both imported and community transmission, and then the limited capacity for testing, tracing and isolation, which allowed community transmission to continue.

Part E - Decisions relating to the first lockdown

119. I was not involved in the decision to impose the first lockdown and am not privy to all the deliberations that led to this decision. That said, I agree it was necessary, proportionate and effective. I think it is likely to have been even more effective had this been imposed earlier.

120. I am not aware of what advice was provided to the SG with respect to lockdowns in Italy, Spain and France, but as noted above I think we delayed our initial suppression strategy only commencing this at a time when there was widespread community transmission.

121. Yes, a national lockdown could potentially have been avoided as was the case in some other countries – for example, South Korea and Taiwan. This would have been dependent on earlier action to control imported and community transmission, and more rigorous testing, tracing and support for/enforcement of isolation measures. The fact that we are an island nation offered geographical advantages with respect to border control measures.

122. I think by March 2020 there was little choice but to lockdown given concerns that the NHS might be over-run.

123. I was not aware of any SG lockdown exit strategy in March 2020.

124. I was aware that work was underway to develop a vaccine during mid-2020, but no-one I remember speaking to had any hope that a vaccine would be imminently available. There was more hope that a therapeutic might become available and this was proved to be the case with the release of preliminary data from the RECOVERY trial in June 2020 demonstrating the effectiveness of systemic steroids (i.e. dexamethasone) in improving outcomes in patients with severe Covid-19.

Continuation of the first lockdown

125. Given the widespread community transmission and the porous borders between Scotland and England, I did not think zero Covid was achievable in Scotland. This may have been an option had much more decisive action been taken in January 2020 to minimise the risk of importation of the virus and community transmission.

126. Under the circumstances, I think the decisions to extend the lockdown in April and May 2020 were appropriate given concerns about the number of cases, hospitalisations (with the risk that the NHS would be over-run) and deaths, particularly in the absence of vaccines or treatments.

127. I learnt that lockdowns were highly effective in suppressing transmission of SARS-CoV-2 although the implementation of this measure was delayed the longer it took to achieve suppression. I also learnt that overall the Scottish public was compliant with the Covid-19 laws and regulations despite the enormous personal inconvenience associated with restrictions.

Part F - Decisions relating to easing the first lockdown in the period from 29 May 2020 to 7 September 2020

General

128. I did not provide any advice to SG that was independent of that provided through SGCAG. I understand that the SGCAG has already provided the Covid-19 with relevant documentation in this respect. As far as I'm aware, SGCAG was not directly involved in these policy decisions (as its role was advisory only) and these decisions will therefore have been matters for SG.

129. Whilst I understood the rationale for the 'Eat out to help out' scheme (to support the catering sector), I think it is very likely to have contributed to increasing transmission, hospitalisations and deaths at a time when there were still no vaccines available. I do not recall SGCAG being asked to provide scientific advice on the 'Eat out to help out' scheme.

130. As noted above, my main focus on SGCAG was to try and undertake analyses to inform and evaluate decision-making. This was however challenging in the case of NPIs because of the range of measures often simultaneously being deployed. I also learnt that there were in addition to scientific evidence other considerations that the SG had to grapple with such as the state of the economy. Unfortunately, suitable data were not available to allow both health and economic considerations to be factored into modelling efforts as was, for example, highlighted by the Royal Society's report Economic Aspects of the COVID-19 Crisis in the UK [AS/014-INQ000315524].

Part G - Decisions relating to the period between 7 September 2020 and the end of 2020

131. All the advice provided by SGCAG has I understand already been made available to the Covid-19 Inquiry by the SGCAG Secretariat. I did not provide any advice independent of this to SG.

132. I was not involved in analyses investigating the severity of the Alpha variant.

133. From memory, I was of the opinion that further restrictions on mixing were needed in or around September and October 2020 in response to the Alpha variants. I am asked for views on the possibility of imposing a 'circuit breaker' or further lockdown in this period. Personally, I am unclear what the difference is between a circuit breaker and a lockdown.

134. I am asked by the Inquiry for my views on the Great Barrington Declaration (October 2020), which was an open letter published in response to the pandemic stating that lockdowns for the general population could be avoided, with those in at risk groups subject to other protective measures. I thought the Great Barrington Declaration was misguided, particularly given that there were at the time so many unknowns regarding the virus and no effective vaccines. The main lesson I took away was the need for evidence rather than opinion to guide and inform decision making.

Part H - Decisions relating to the second lockdown (January 2021 to 2 April 2021)

135. My team undertook an analysis of the increased risk of serious Covid-19 outcomes associated with the Delta variant in 2021 and shared this with the CMO, CSA and then SGCAG. These data have subsequently been published in peer-reviewed journals **[AS/015 INQ000315525, AS/015a INQ000315526, AS/015b INQ000315527 AS/015c INQ000315528].**

136. All the advice provided by SGCAG has I understand already been made available to the Inquiry by the SGCAG Secretariat. I did not provide any advice independent of this to SG. I am unaware of the scientific basis for the decision to relax restrictions on Christmas Day. The move to different levels of restriction were I understand an attempt to focus restrictions on those parts of the country with the greatest level of community transmission and so I understand mainland Scotland was put into level 4 restrictions, with some island communities put into levels with less restrictions.

137. I think you need to ask SG for their reasoning behind the decision to impose a second lockdown. The advice from SGCAG is, as previously noted, all recorded in the minutes. I was not asked to nor did I provide any specific advice to any SG colleague outside of these SGCAG meetings and the SGCAG deep dive meetings convened by SGoRR.

138. I don't recall any formal discussion at SGCAG meetings about lessons learnt; that said, there did appear to be a widespread realisation that lockdowns were an effective strategy in suppressing the virus, particularly if instituted early.

139. There was a SGCAG Education and Children's Issues subgroup, which I was not part of. I am not therefore in a position to respond to questions around the phased return of pupils to school from February – April 2021, and specific NPIs put in place in schools as part of this phased return.

140. As far as I understand, the aim of the second lockdown was again to try and suppress community transmission and minimise the risk of the NHS being overwhelmed. I believe this was achieved.

141. I learned that the Delta variant was significantly more severe than the wild type and Alpha variant and the importance of administering second dose vaccines to protect individuals.

142. The key lessons I learnt from this second lockdown was that lockdown works if complied with/enforced, the longer their imposition is delayed the longer it takes for lockdowns to be effective, and that lockdowns are temporary measures that buy time for other plans to be formulated. I also learnt of the enormous personal, familial, social and economic challenges posed by lockdowns.

Part I - Decisions relating to the period between April 2021 and April 2022

143. I did not provide any independent advice to the SG on policy decisions relating to the lifting of the 'stay local' rule in April 2021, re-opening of outdoor hospitality and non-essential retail in April 2021, the various decisions on levels of restrictions, removal of restrictions in August 2021, the Covid-19 passport scheme and management of COP-26 . All of the advice I was involved in providing was through the SGCAG, which I understand has already released relevant documentation to the Covid-19 Inquiry.

144. I first heard about the Omicron variant from an academic colleague at a dinner at the Royal College of Physicians of Edinburgh on the evening of 25 November 2021. My team and I then led an analysis of data on the severity of the Omicron variant the findings of which were shared with key colleagues in SG around 22 December 2021 and then SGCAG on 11 January 2022 showing that Omicron appeared more transmissible, but less severe than Delta. These findings were subsequently published [AS/016 – INQ000315531].

145. Given the emerging data from South Africa and the UK showing likely reduced severity of Omicron, I did not think a further national lockdown was needed. That said, I saw my role as primarily generating evidence that could help inform decision making rather than providing advice per se.

146. In my opinion, there was no need for a further lockdown in or around December 2021 as the emerging evidence was pointing to a substantially reduced risk of severe outcomes associated with Omicron infection.

147. As noted above, I did not provide any independent advice other than through SGCAG. I did however share some analyses that I've referred to above.

148. I learned about the crucial importance of contemporaneous data on new variants to help inform decision making.

Part J - Care homes and social care

149. I think the discharging of patients from hospital to care homes without adequate testing in the early stages of the pandemic contributed to the spread of Covid-19 through care homes. The advice provided by SGCAG has I understand already been made available to the Covid-19 Inquiry.

150. I cannot now recall when I was first became aware of the increased risk of serious outcomes amongst care home residents. That said, we had already learnt from QCovid that older age and underlying health conditions considerably increased the risk of serious outcomes so this was not particularly surprising.

151. I was not involved in any aspect of the generation of this advice relating to care home residents, but understand its rationale given the high number of cases, hospitalisations and deaths in care home residents.

152. I think the main thing that went wrong with care home residents was discharging them back to care homes from hospital without confirmation that there was no active infection.

153. The main lesson I learnt is that there is a need to identify those at greatest risk of serious outcomes – which may or not include care home residents – and then institute appropriate safeguards to mitigate these risks.

Part K - Borders

154. As far as I understand things, Scotland has no direct control over external borders as this is a reserved issue for the UK Government. I am unsure what powers SG has with respect to controlling migration across internal UK borders.

155. The main takeaway I had was that there needed to be closer co-operation between the UK and Scottish Governments with respect to border control issues.

Part L - Covid-19 public health communications

156. I think the regular briefings by senior government figures and scientific advisers was welcome and helpful to the Scottish public. From the data that I saw, these regular communications were overall valued by the Scottish public.

157. I did not provide any advice on public communications strategy or messaging. I did however share data on research undertaken through a research grant funded by the Chief Scientist's Office of the Scottish Government of social media analysis in relation to public sentiments (presentation given to SG colleagues on 27 August 2020 -[AS/017-INQ000315532].

158. In general, I believe that the SG's approach to messaging was open and transparent and did promote public confidence.

159. We were advised by the SGCAG chair that the nature of our conversations were confidential and should not be disclosed to the media. We did not have any impositions as such by the SGt, but this was in general I feel accepted by members of SGCAG. We were however free to speak to the media in relation to our research or in an independent capacity.

160. In general, where there were perceived accidental breaches of Covid-19 rules by ministers, advisers or officials in the Scottish or UK Governments, I do not think this undermined public confidence. However, where there were perceptions of deliberate breaches this led to the impression that there were different rules for politicians/civil servants and the public, I believe these did undermine public confidence.

161. I think the First Minister's briefings worked particularly well as these were open, frank discussions. The lack of any real SG strategy at the start of the pandemic however made it difficult to communicate effectively with the public at the outset of the pandemic.

162. There may be merit in the CMO presenting to the public, separately to politicians, to reduce the potential for or perceptions of political interference.

Part M - Public health and coronavirus legislation and regulations

163. In terms of SG's strategy with regard to the use of legislation, recommendations and guidance, I think there could have been greater enforcement of isolation, which could potentially have been done through tracking of mobile phone data.

164. I did not provide any advice on use of recommendations or guidance to SG independent of that provided through SGCAG. To the best of my understanding,

SGCAG had no involvement with the coronavirus legislation proposed and enacted by the SG.

Part N - Key challenges and lessons learned

165. Please see my responses in my previous response to the Covid-19 Inquiry dated 15 February 2023 [AS/001- INQ000130200] in relation to the key challenges and things that did not work well in relation to SG's response to the pandemic.

166. It seemed that the SG was unprepared at the outset of the pandemic. They did however eventually convene SGCAG in March 2020 and once established this was in general used to good effect. Scientific advice was however only one aspect of the decision making process and I'm not entirely clear what other considerations were taken into account and how conflicting evidence/perspective was reconciled by SG.

167. I think it would have been helpful to involve SGCAG members in lessons learned exercises undertaken by SG.

168. Overall, my response on serving on SGCAG was emotionally and physically exhausting as this was high stakes work that was over-and-above everything else that we were grappling with in our personal and professional lives. That said, I feel honoured that I and colleagues were able to undertake analyses that contributed to evidence informed decision-making. I did not serve on any SGCAG subgroups.

169. If asked to serve on a similar group again, I would. The experience of being overwhelmed with a very long list of questions in Rule 9 requests from the Inquiry to be completed within narrow timeframes is however a deterrent to future participation.

170. I have not been asked for feedback, but would of course value this so to understand how to improve processes.

171. I presented to the Scottish Parliament's COVID-19 Recovery Committee on 10 November 2022. This session was focused on trying to understand the economic impacts of Long COVID [AS/018-INQ000315521].

172. With the benefit of hindsight, had the Scottish and UK Governments been better prepared and acted more swiftly to control borders in January/February 2020 and had greater capacity to test, trace and isolate early on in the pandemic, it may have

been possible to reduce the rate of community transmission and reduce the risk of infection, illness and death, and also potentially avoid lockdowns.

173. The key recommendations are to invest in preparedness, maintain public health capacity and ensure appropriate data are readily available with the expertise to analyse these data at pace.

174. The key lessons from the research my group has undertaken include the identification of the groups at highest risk of severe outcomes, understanding the severity of new variants, and real-world data on the uptake, safety and effectiveness of vaccines and Covid-19 therapeutics.

175. I think the ways in which the scientific community pulled together was exceptional and is one of the key reasons that we have been able to make such rapid advances against a new pathogen and disease that has allowed normal social functioning to return for most people globally. I was overall pleased to see the SG receptive to scientific evidence and advice.

Part O - Documents

176. All advice, briefings and presentations given to SGCAG and SGoRR will be available through the SGCAG secretariat and the SG Covid Inquiries Response Directorate. I communicated primarily through emails with SG colleagues and occasionally through Slack; relevant emails can be provided. I don't have access to the Slack discussions but these should be available through the SGCAG secretariat. I did not communicate with any SG colleagues through What's App or other social media channels.

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: 06/11/2023