COVID-19 INQUIRY

MODULE 2

QUESTIONNAIRE RESPONSE

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M2/SAGE/01/AMX

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INTRODUCTION

1. This response is provided in relation to a Rule 9 request from the Inquiry in the form of a questionnaire, dated 13 July 2023. I address the eight questions asked by the Inquiry in sequence. I have referred to, and linked, the documents I have relied upon when formulating my response. To avoid unnecessary duplication, I have cross referred to statements provided to the Inquiry in Module 1, which address some of the relevant issues in greater detail.

SECTION 1: A brief overview of my qualifications, career history, professional expertise and major publications.

2. On 3 April 2023, I became the UK Government Chief Scientific Adviser ("GCSA"), a position previously held by Sir Patrick Vallance. I am asked about my involvement with a number of science advisory groups between January 2020 and February 2022, as such this response focuses on that period, and not my new role. The role of the GCSA is summarised in Dr Wainwright's third statement [**INQ000148407** – paragraph 14]; there has been no relevant change to that the role since my appointment.

3. Prior to becoming the GCSA, I was the Chief Scientific Adviser ("CSA") for the Ministry of Defence ("MoD") between 2019 and 2023. The role of the CSAs is set out in Dr Wainwright's third statement [**INQ0000148407** – paragraphs 23-32]. This was a very broad role, which called on my interest in using data to support policy decision-making. I have always had an interest in science advisory roles; I previously had experience on the Science Advisory Councils of a number of different Whitehall departments, as an independent expert adviser.

4. In the period that SAGE was activated (see detail below), I acted as the deputy GCSA, from Spring 2020. This role included standing in for press briefings and signing off papers on behalf of SAGE.

5. Before my appointment to GCSA, I was also a Professor of Mathematical Biology in the Department of Zoology at Oxford University and a Fellow of All Souls College. My research interests and expertise lie in the use of mathematical models to aid our understanding of the evolution and spread of infectious diseases. I am also interested in the use of natural science evidence in formulating public policy and I co-developed the Oxford Martin School Restatements: an activity which restructures and presents

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the evidence underlying an issue of policy concern or controversy in a short, uncharged, intelligible form for non-technical audiences.

6. The below is a summary of my qualifications, career history and prizes:

Qualifications

1983-1986	PhD in Biomathematics, Imperial College London
1982-1983	Graduate Student, University of California
1979-1982	BA in Mathematics, Somerville College, University of Oxford

Career History

2023 - present	Government Chief Scientific Adviser
2019-2023	Chief Scientific Adviser for the MoD
2008-2023	Senior Research Fellow, All Souls College, University of Oxford
2000-2008	Professor of Mathematical Biology, University of Oxford and Fellow of St Catherine's College, Oxford
1990-1998	Royal Society University Research Fellow, Oxford (seconded 1994-98 to the Institut Pasteur, Paris)

Prizes

2009	Elected a Fellow of the Royal Society
2011	Royal Society Gabor Medal for work on the mathematical population biology of immunity
2018	Weldon Memorial Prize
2018	Received a damehood in the Queen's Birthday Honours List.

7. A full list of publications is available online.[1]

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[1] Dame Angela McLean DBE, FRS: List of publications:
https://www.biology.ox.ac.uk/symplectic/publications/list/2777621/52639046/1998346/?filter_types-2777621%5b%5d=&widget_max_publications_to_display-2777621=8&widget_show_author_and_editor_names-2777621=0&widget_limit_to_favourites-2777621=0&widget_page_title-2777621=Dame%20Angela%20McLean%20DBE,%20FRS

SECTION 2: My involvement in science advisory groups between January 2020 and February 2022.

8. This section addresses questions two and three of the questionnaire. Question two asks me to list the groups (i.e. SAGE and/or any of its sub-groups) that I have been a participant of. Question three asks for an overview of my involvement with those groups between January 2020 and February 2022 including: when and how I came to be a participant; the number of meetings I attended and my contributions to those meetings; and my role in providing research, information and advice.

9. In summary, I was a participant in SAGE from 11 February 2020 to 10 February 2022 and in SPI-M-O, from 27 March 2020 to 23 March 2022. I also contributed to the following SAGE task and finish groups:
   a. Multidisciplinary Task and Finish Group on Mass Testing - 11 August 2020 to 24 August 2020
   b. Impact of Interventions Task and Finish Group – 1 November 2020 to 17 November 2020
   c. Vaccines Science Co-ordination Group (also known as the Vaccine Updates Group) – 18 December 2020 to 3 June 2021[2]

SAGE

10. SAGE (the Scientific Advisory Group for Emergencies) exists to provide independent science advice in civil emergencies to decision makers in government. For an overview of SAGE, see Dr Wainwright's third statement [**INQ0000148407** – paragraphs 44-50].

11. I was invited to join SAGE by its co-chair and the then GCSA Sir Patrick Vallance, and the first SAGE meeting I attended was SAGE 6 on 11 February 2020 [**INQ000061514**]. I attended 89 SAGE meetings between 11 February 2020 and 10 February 2022, and my presence is recorded in the SAGE minutes. My attendance was initially as the CSA for the MoD and then later as SPI-M-O co-chair (discussed below).

12. My role on SAGE was to contribute to the development of the consensus advice SAGE formulated, and to present consensus statements and papers from SPI-M-O.

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[2] I did not attend the final meeting on 29 September 2021

Consensus positions on modelling were often established in SPI-M-O before being presented to SAGE for discussion. At each SAGE meeting, the extent of my participation depended on the expertise required for the issues under discussion.

<u>SPI-M-O</u>

13. SPI-M (the Scientific Pandemic Influenza Group on Modelling) is a modelling sub-group of the Scientific Pandemic Influenza Advisory Group ("SPI") within the Department of Health and Social Care ("DHSC"). In non-emergency periods, SPI-M provides expert advice to the government based on infectious disease analysis, modelling and epidemiology. The last meeting of SPI-M prior to the COVID-19 pandemic was in July 2019. I was not a member of SPI-M.

14. During a civil emergency, SPI-M-O (the Scientific Pandemic Influenza Group on Modelling, Operational) can be stood up as a sub-group of SAGE to support the government's emergency response. This was the case during the COVID-19 pandemic, as is recorded in the minutes of the first "full" SAGE meeting on 28 January 2020 [**INQ000061510** - paragraph 4].[3] Detail about the group is set out in the first statement of Sir Christopher Wormald [**INQ000184643** – paragraphs 144-159].

15. SPI-M-O brought together a variety of scientific perspectives and models developed independently by different world-leading UK institutions. SPI-M-O members used all the available data from multiple sources to understand the progress of the pandemic, to parameterise models of the dynamics of infection and in the development of projections. This ensured SAGE's advice considered a full range of data sources, modelling approaches, and plausible outcomes, not a single result or viewpoint.

16. I became co-chair of SPI-M-O on 27 March 2020 at the request of Sir Patrick Vallance, replacing Professor Sir Jonathan Van-Tam. I was the executive chair, whilst Professor Graham Medley was the academic chair. The first meeting I attended and co-chaired was on 30 March 2020. I remained as co-chair until 23 March 2022, which was the date of SPI-M-O's last meeting before it was stood down. During this period, I attended 81 SPI-M-O meetings.

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[3] This meeting is generally referred to as SAGE 2. SAGE 1 was the precautionary SAGE meeting convened on 22 January 2020, before the first COBR (M) meeting. See: https://www.gov.uk/government/publications/sage-minutes-coronavirus-covid-19-response-28-january-2020

17. My role as co-chair included, but was not limited to: commissioning work, writing and signing off consensus statements before they went to SAGE, and attending daily Cabinet Office led COVID-19 Taskforce analysis meetings to answer questions on the latest epidemiology and modelling.

Task and finish groups

18. As part of my role in SAGE, I contributed to three task and finish groups, detailed below. I was asked to join these groups at the request of Sir Patrick Vallance. These groups were established to answer particular questions, and it was necessary to produce work in a matter of days. These groups instantly focused everyone's minds to work together to iron out issues and help secure a common focus. Consensus reached from these groups was then scrutinised through SAGE. As independent advisory groups, they did not comment on or recommend specific policies.

Multidisciplinary Task and Finish Group on Mass Testing ("TFMS")

19. TFMS was a multidisciplinary group established to examine from epidemiological, clinical and behavioural perspectives, the potential benefits and challenges of mass screening for COVID-19.

20. I was asked to join this group because I had knowledge in this area but no pre-conceptions about the correct approach to be taken. The first TFMS meeting I attended was on 11 August 2020, and I was chair from the second meeting onwards. I attended three meetings of this group.

Impact of Interventions Task and Finish Group

21. In the autumn of 2020, all four nations of the UK faced a second wave in the numbers of people infected with COVID-19. SAGE 67 on 12 November 2020 [**INQ000061575**] considered the effect in the UK of the "tiering" system that had been introduced in England and the "firebreaks" introduced in Wales and Northern Ireland the previous month.[4] As more work was required on understanding these interventions, I offered

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[4] https://www.gov.uk/government/publications/sage-67-minutes-coronavirus-covid-19-response-12-november-2020

to Chair a group that would examine this issue in more detail, which resulted in this group being set up to consider the following three questions by way of an observational study:

a. What interventions were made, where and when?

b. How fast did epidemics shrink or grow before and after those interventions?

c. What can we learn from autumn 2020's efforts to control the spread of COVID-19 in the UK?

22. The first meeting I attended was on 16 November 2020, and a paper was presented to SAGE on 19 November 2020 (see details below). I attended two meetings overall.

Vaccines Science Co-ordination Group

23. This group, also known as the Vaccine Updates Group, was established to maintain an integrated view of science advice in the COVID-19 vaccines programme across a range of the groups and organisations involved.

24. The first group meeting I attended was on 18 December 2020. I attended five out of seven meetings of this group.

SECTION 3: A summary of any documents to which I contributed for the purpose of advising SAGE and/or its related subgroups in the Covid-19 pandemic.

SAGE minutes

25. SAGE produced minutes after every meeting, which were published. All the SAGE minutes can be found online, organised by month. See for example all the SAGE minutes for February 2020 are held in one online repository on the gov.uk website.[5] The SAGE minutes are discussed in detail in Sir Patrick Vallance's statement [**INQ000147810** – paragraphs 49-52]. The draft minutes were circulated amongst SAGE participants to comment on. I occasionally had comments on the draft, but was otherwise not involved in their drafting. The minutes were finalised and provided to

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[5] https://www.gov.uk/government/collections/sage-meetings-february-2020

decision makers, usually very shortly after the meeting. I understand that efforts were made to ensure publication and transparency of the SAGE minutes and papers, such that by May 2020, the minutes were published and freely available online.

SPI-M-O consensus statements

26. SPI-M-O produced consensus statements, which were also published along with all the papers presented to SAGE, see for example here. Consensus statements were drafted following SPI-M-O meetings by the SPI-M-O secretariat with assistance from myself and my co-chair. Members of SPI-M-O would then consider and comment on the draft. Like SAGE minutes, the SPI-M-O consensus statements were carefully drafted to reflect both the range of views within the group and where there was uncertainty, which was inevitable given that we had independent and distinct groups of modellers working with the same data on the same questions and scenarios.

27. For example, the SPI-M-O consensus view on the potential relaxing of social distancing measures from 4 May 2020,[6] presents on one page four different graphs from four distinct modelling groups (Imperial College London, the London School of Hygiene and Tropical Medicine, the University of Bristol and the University of Warwick) and explains the differences in their findings. In the note added for publication, the evidential uncertainty inherent in the analysis is made clear: "*R is an average value that can vary in different parts of the country, communities, and subsections of the population. It cannot be measured directly so there is always some uncertainty around its exact value. Regional estimates are subject to greater uncertainty given the lower number of cases and increased variation*". The consensus document also lists some general conclusions that can be drawn from the work. This is typical of the output of SPI-M-O.

28. SPI-M-O consensus statements were then presented to SAGE, informing SAGE advice and minutes.

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[6] Available online: https://www.gov.uk/government/publications/spi-m-o-consensus-view-on-the-potential-relaxing-of-social-distancing-measures-4-may-2020#full-publication-update-history

<u>Academic papers</u>

29. The academic papers that informed the advice of SAGE and SPI-M-O were also published. SAGE always received the academic papers which informed SPI-M-O consensus statements and advice. These papers took longer to publish than the minutes or consensus statements, often because at the point at which they were discussed in SAGE/SPI-M-O meetings they were not finalised for publication. Those meetings amounted to an extremely high-quality level of external analysis and essentially acted as real-time expert peer review. On the day that a policy decision was announced, all the papers that informed that decision were in the public domain.

30. There was academic rigour in this process, despite it being done rapidly. The authors of the papers, along with the SPI-M-O secretariat, would meticulously comb through the papers for omissions, inconsistencies or typographical errors. The authors of the papers then gave their permission for them to be published. There was further academic scrutiny of those papers once they were in the public domain, which the authors were willing to be subject to, as they were acutely aware of the significance of their work during this time.

<u>Task and Finish Groups</u>

31. Multidisciplinary Task and Finish Group on Mass Testing: inputs from the teams were reviewed and a SAGE product was presented at SAGE 53 on 27 August 2020 [**INQ000061561**].

32. Impact of Interventions Task and Finish Group: a paper '*The UK's 4 nations' autumn interventions*' (here) was presented at SAGE 69 on 19 November 2020 [**INQ000061577**] and an updated version (here) was presented at SAGE 70 on 26 November 2020 [**INQ000061578**].

33. Vaccines Science Co-ordination Group: two papers from the group were presented to SAGE. The first '*Considerations on when and how to update SARS-CoV-2 vaccines*' (here) was presented at SAGE 83 on 11 March 2021 [**INQ000061591**], and the second '*Setting up medium- and long-term vaccine strain selection and immunity management for SARS-CoV-2*' (here) was presented at SAGE 99 on 5 May 2021 [**INQ000061607**].

SECTION 4: A summary of any article I have written, interviews and/or evidence I have given regarding the work of the above-mentioned groups and/or the UK's response to the COVID-19 pandemic.

34.   I have not written any articles nor appeared in any interviews regarding my contributions to either SAGE or SPI-M-O. I appeared in several No.10 led Government COVID-19 press conferences, assisted with some background technical briefings, and appeared in a House of Commons Science and Technology Select Committee hearing.

No.10 led Covid-19 Government Press Conferences

35.   I presented slides and datasets at eight Government COVID-19 press conferences between 6 April 2020 and 18 November 2020. The slides and datasets can be found online,[7] as can all the recordings of the conferences.[8]

36.   The slides and datasets I presented came from the No.10 press office and I believe that they would have arisen from the No.10 daily dashboards. I would have variable amounts of time to interrogate those slides and datasets in advance. I was asked to appear directly by No.10, and I appeared in my capacity as deputy GCSA.

Background Technical Briefings

37.   I provided 12 background technical briefings to journalists between 19 April 2020 and 12 July 2021. These were briefings to science and health correspondents, and gave them an opportunity to ask more technical, science-focused questions and to help inform the accuracy of their reporting on the current COVID-19 situation and the relevant underlying data. These briefings were non-attributable and not intended to be directly quoted. I was asked to assist with these briefings by Sir Patrick Vallance, often when reporting was based on modelling and the work of SPI-M-O. Several other SAGE participants volunteered their time to support these briefings.

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[7] https://www.gov.uk/government/collections/slides-and-datasets-to-accompany-coronavirus-press-conferences
[8] https://www.youtube.com/playlist?list=PLqHKtAbFyKz5iB9nY94YIIxJGCXXY7JHy

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House of Commons Science and Technology Select Committee

38. I appeared in front of the House of Commons Science and Technology Select Committee on 17 February 2021 to give evidence to their inquiry into Global Disease Outbreaks. The transcript of this session can be found online.[9]

SECTION 5: My views as to whether the work of the above-mentioned groups in responding to the Covid-19 pandemic (or the UK's response more generally) succeeded in their aims.

39. I am asked in the questionnaire to give my views on whether the groups discussed above succeeded in their aims when responding to the COVID-19 pandemic, and I am specifically asked to consider:
    a. The composition of the groups and/or their diversity of expertise;
    b. The way in which the groups were commissioned to work on the relevant issues;
    c. The resources and support that were available;
    d. The advice given and/or recommendations that were made;
    e. The extent to which the groups worked effectively together;
    f. The extent to which applicable structures and policies were utilised and/or complied with and their effectiveness.

SAGE

40. The aim of SAGE was to give the best science advice possible during the pandemic, and to make clear where uncertainties lay. I believe that SAGE did achieve this aim throughout the pandemic. SAGE advice was not the only advice being given to decision-makers in government, who had to weigh up various different and often competing considerations when formulating policy. As an independent advisory group, SAGE did not make policy recommendations.

41. The academic diversity of SAGE was very broad, and it constituted a range of scientific disciplines relevant to the pandemic. SAGE participants came from different stages in their respective careers, from mid-career onwards. This fostered an environment of professional intellectual challenge, which worked well. Amongst the SAGE participants, gender diversity was quite high and as it became obvious early

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[9] https://committees.parliament.uk/oralevidence/1721/html/

on during the pandemic that certain ethnicities were more vulnerable to the effects of COVID-19, the Chairs set up a sub-group on ethnicity led by Professor Kamlesh Khunti.

42. I had no involvement in, or direct knowledge of, the commissioning process for SAGE, therefore I defer to other witnesses' evidence on this matter.

43. Participation in SAGE was voluntary and unpaid. Due to the prolonged length of the pandemic, some resources were made available to support academics for their time, mainly by authorising payments to universities to support the release of academics providing critical advice to SAGE so that they could continue their participation, however this was mostly quite small amounts and later in the pandemic response. On the whole, participation in SAGE relied on the goodwill of its participants, who recognised that these were extraordinary times and so extraordinary efforts were needed. Due to the volume of work required, involvement in SAGE often also came at a significant personal cost to attendees.

44. Support from the civil service secretariats working with SAGE was exemplary. We could not have asked for more. In terms of wider support, on one occasion SAGE participants received a letter from the Prime Minister thanking us for our efforts, which was well-received.

SPI-M-O

45. SPI-M-O's aims were similar to SAGE's as outlined above, but those aims were specifically concerned with advice grounded in epidemiology and modelling. My view is that the advice given by SPI-M-O was excellent, rooted in science, carefully caveated about uncertainties, and timely. Some concepts that the work of SPI-M-O engaged were more difficult to express to non-scientists than others. For example, the concept of rapid exponential growth can be hard to understand but it is critical, as it underpins the rationale for why interventions work more effectively when implemented as soon as possible, and is crucial to understanding why delay has such a profound impact on infection rates and on the hospitalisations that follow.

46. The extent and duration of the COVID-19 pandemic were unprecedented and inevitably there were aspects of the response which were suboptimal initially, but

which improved as time went on. Commissioning is a good example of this. In the early stages of the pandemic, SPI-M-O received a high volume of requests from different groups and departments in central government, some of which exposed some weaknesses in understanding of the purpose of epidemiological modelling. From mid-Autumn 2020, commissioning improved. In my view this was in part down to the introduction of a better triage system for commissions from across government, and because the general understanding of the purposes of modelling improved.

47. In respect of lessons for the future, I consider that a long-term plan and a clear strategic steer from central government are both vital. It took some time for such desirable behaviours to emerge. In early 2021 the commission for the roadmap out of lockdown was a good example of how to make a long-term plan with effective and timely science input. We had good data to forecast vaccine availability and effectiveness, a good idea of hospitalisation and mortality rates by age, a good understanding about what the government wanted to achieve, and a good ability to monitor the effect of each stage of the 'unlocking'. Accordingly, SPI-M-O were able to advise on the design of the route out of lockdown, in a scheme that took proper account of what data would be available and when and in the context of evolving plans that covered a six-month period.

48. As I note in section 6 below, a lesson for the future would be to ensure that commissioning is appropriate and manageable, and undertaken within a clearly defined strategic framework, so that advisory bodies are clearly informed of decision makers' clearly articulated strategic aims.

49. SPI-M-O recruited a good proportion of the relevant academic expertise in the UK. It was a great strength of the group that three large research groups that would have been competitors in 'peace time' were represented and were very active contributors. This, along with the participation of multiple smaller research groups and individuals, led to a diverse, curious, driven collaboration that was able to maintain high engagement and output for the two years they were needed.

50. The position of SPI-M-O in terms of resourcing and support reflects that of SAGE and so my observations above apply here. SPI-M-O also ran on goodwill, and many participants never expected their efforts to be recompensed. The GCSA attended SPI-M-O meetings to thank participants and that was very good for morale. SPI-M-O was superbly served by its civil service secretariat who worked extraordinarily

effectively throughout the pandemic period. I want to take this opportunity to pay tribute to the generous efforts of those members of SPI-M-O and its secretariat whose contribution often came at significant personal and professional expense throughout what was already a long and challenging period for everyone. They were not alone in this respect; we owe so much to both the scientific community and those members of society more generally who lost their lives, or put their lives on hold, to help others.

General observations

51. My impression in respect of the advisory groups in which I participated was that personal working relationships were constructive and positive, and this was very helpful throughout the pandemic. Working relations across the sub-groups was assisted by the fact that members often worked in more than one sub-group, and I think we would have benefitted from even more of this cross-working. SAGE and SPI-M-O engaged well and the process of feeding in consensus statements to SAGE was effective. Later in the pandemic, the working relationship between SPI-M-O and the COVID-19 Taskforce developed into a constructive ongoing dialogue, which was also very helpful.

52. Regarding the effectiveness of structures and policies, I think it was beneficial to have had SPI-M as a standing group ready to be converted to SPI-M-O, during the pandemic. If anything, I think more use could be made of work, like that of SPI-M, namely modelling and data analysis, during 'peace time'. I am supportive of the SAGE model and the process by which it is activated during a civil emergency.

SECTION 6: My views as to any lessons that can be learned from the UK's response to the Covid-19 pandemic, in particular relating to the work of the above-mentioned groups. Please describe any changes that have already been made, and set out any recommendations for further changes that you think the Inquiry should consider making.

53. From my own experience in the groups discussed in this response, I think the following are important points of learning.

54. First, the importance of reaching a consensus in modelling. Early in the pandemic, SPI-M-O placed significant reliance on the work of the Imperial College research group. This was a natural result of the fact that Imperial College very quickly produced

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the earliest models. SPI-M-O output was much improved when we had three or four research groups addressing the same policy questions with largely the same data.

55. <u>Second</u>, the response to the pandemic highlighted the supremacy of data, and how much work it takes to make appropriate data available to independent research groups. I am aware that this is an area of improvement which has been highlighted by witnesses to the Inquiry during Module 1, and I endorse their comments on the need for better data and data processes.

56. <u>Third</u>, the extent of the pandemic showed that real life can be worse than the "reasonable worst-case scenario". We need to find good ways to manage our own optimism bias and find ways to prepare for civil emergencies that we can afford.

57. <u>Fourth</u>, there is a need for focused and coherent commissioning of science advice, and some means of oversight of this, right from the start of any emergency response.

58. <u>Fifth</u>, advisory groups such as SAGE and SPI-M-O can work most effectively in the context of a clearly defined strategic plan. This requires decision makers to formulate and then clearly articulate their strategic aims.

59. Dr Wainwright's fourth statement [**INQ000148406** – paragraphs 11-33] describes how the effectiveness of SAGE has been studied by individuals and groups. I defer to other witnesses about the work that has been done, and continues to be done, to address learnings from these studies in relation to the SAGE model.

60. I would like to pay tribute to the work of the National Academies, who were fantastically helpful in many ways. I was personally particularly grateful for the Royal Society's Rapid Assistance in Modelling the Pandemic 'RAMP' Rapid Review group who did an excellent job of reviewing unsolicited help that poured in from multiple sources.

SECTION 7: A brief description of documentation relating to these matters that I hold.

61. Most of the documents I have referred to in this response are available online and links have been provided in footnotes. Other documents have already been provided to the Inquiry and where this is the case I have referred to their 'INQ' number.

62. My emails have been archived and I retain access to the IT system used during this period.

63. Data from the SPI-M-O slack channel for the period January 2020 to May 2022 have also been retained electronically and are held by DHSC.

64. I do not hold any hard copy materials related to these matters.