THE UK COVID-19 INQUIRY: MODULE 2

CLOSING SUBMISSIONS OF THE GOVERNMENT OFFICE FOR SCIENCE

INTRODUCTION

1. These closing submissions are made on behalf of the Government Office for Science (GO-Science) at the conclusion of Module 2. They address the relevant aspects of the evidence relating to the provision of science advice to decision-makers during the pandemic and are intended to be read alongside the detailed witness statements of Sir Patrick Vallance, Professor Dame Angela McLean and Dr Stuart Wainwright, all of whom also gave oral evidence, the statement of Dr Edward Hayden, and GO-Science's oral opening and closing submissions.

Section 1 – Structure of Science Advice

2. The first section addresses the structural framework for the provision of science advice during the pandemic and how that structure operated in practice. In summary, it is the view of GO-Science that the structure, which consists of the Scientific Advisory Group for Emergencies (SAGE) and a number of bespoke sub-committees providing advice which is communicated to central government by the Government Chief Scientific Advisor (GCSA) and (in a health emergency) the Chief Medical Officer (CMO), is sound and effective.

3. The Inquiry has a complete evidential picture, including the minutes of all the relevant meetings, on which to base its own view but, in general terms, advice based on the input of the country's leading scientific experts was formulated quickly and communicated effectively. The SAGE model (including sub-committees) was sufficiently flexible to enable the most relevant expertise to be assembled to address the specific questions posed by decision-makers and the process of debate and challenge in which SAGE engaged ensured that the advice was as robust as realistically possible given the urgency and limitations of the data.

4. It is submitted that the Inquiry has not been presented with a convincing alternative to the SAGE model for the provision of science advice in a pandemic and that such reservations as may have been expressed as to its efficacy have often been based on misunderstandings as to its role, remit and operation. The role of SAGE and the GCSA is to provide advice, not to make decisions or to tell decision-makers what they should do. The evidence heard by the Inquiry in this module makes quite clear that taking decisions as to how best to respond to a pandemic such as Covid-19 requires a difficult balance to be struck between a range of competing considerations. That is the job of

elected politicians, and to the extent that the mantra of 'following the science' serves to obscure that fundamental distinction it is unhelpful.

5. Once this distinction has been properly understood there can be no real argument with the approach of full transparency adopted by SAGE through the publication of its minutes and the evidence upon which its advice was based. Science advice is only part of the decision-making picture and Ministers ought not to feel that the publication of that advice will constrain their ability to make decisions based on the full range of relevant factors. Transparency is also the best way to avoid the danger of group-think, and to encourage the type of 'tell me why I am wrong' challenge on which science thrives.

6. There has also been a degree of misunderstanding, running through some of the evidence, as to the meaning of 'consensus' advice in the SAGE context. The essential task of SAGE is to provide decision makers with a clear and accurate distillation of the current state of scientific knowledge on the relevant issue in a form that will be useful to them when making difficult and often urgent policy choices. In many cases that will require an explanation of the level of certainty with which that advice can be expressed, what causes the uncertainty and that it may change as more evidence becomes available. The operation of this process does not require the suppression of dissent and the Inquiry has received evidence from many SAGE participants who described the robust and constructive process by which advice was produced in practice.

7. There are, no doubt, a number of respects in which the operation of SAGE may be improved. The SAGE Development Programme[1] has been a valuable exercise in this regard and the Inquiry may identify other areas of improvement. It is clear that the model relies on the goodwill of the scientific community to provide its resources and expertise without financial reward and that may constitute a vulnerability in long running emergencies, particularly if steps are not taken to ensure that individuals and their institutions are adequately supported. There may also be scope for refining the composition of SAGE, the integration of its sub-committees, and the participation of the Devolved Administrations, which may not (in all cases) have made the most effective use of invitations to participate. GO-Science would welcome any views the Inquiry may have on these (or any other) issues relating to the future operation of SAGE. Fundamentally, however, it is submitted that the overall evidential picture is one of a structure that is fit for purpose and effective, with scope for refinement but no need for fundamental changes. It is noteworthy that the model has been and is being explored for use by other countries.

[1] INQ000142161

Section 2 – Chronology of Advice and Decision-Making

8. The second section addresses a number of the key milestones in the chronology relating to the provision of scientific advice, including the run up to first lockdown, the easing of the first lockdown and the events of Summer 2020, and the sequence of events leading up to the second and third lockdowns. This overview of the chronology illustrates the importance of viewing the timeline as a whole and not focussing narrowly on the early period leading up to the first lockdown. The overall picture demonstrates clearly how the quality and precision of scientific advice improved as more data became available. For the purposes of learning valuable lessons for the future, the better informed and more sophisticated advice and decision-making evident in the latter stages of the pandemic is more useful than the shortcomings of the initial period.

9. That is particularly evident when it comes to the analysis which, in GO-Science's submission, should be at the heart of this module, namely the consideration of whether the resources discussed in the course of Module 1 would have had a beneficial impact had they been available from the outset. For example, if the UK had the benefit of a sophisticated and established data-gathering process and/or developed test, trace and isolate infrastructure in place at the start of 2020 how would these resources have affected the decision making relating to the suppression of the virus in the early stages and with what impact? A comparison with countries that did have the benefit of resources of these types is likely to be helpful in this regard. The major impact of a strong test and trace system is the breaking of chains of transmission through the isolation of cases and their contacts. South Korea, for example, was able to pursue those activities early and with notable vigour which had a clear impact on that early response.

10. Similarly, how would a better developed, better funded public health system, including a large cohort of community health workers capable of being deployed immediately to testing and tracing have benefited decision making during 2020 (in particular)? How would a resource of this nature have helped in identifying and mitigating the impact of the pandemic on vulnerable and marginalised groups? How would the establishment of a multi-disciplinary academic institute for pandemic preparedness of the type proposed by Sir Patrick have served to provide decision makers with a valuable source of expertise and research when it came to predicting the impact of certain measures and the balancing of competing considerations? How would the objectives of the G7 100 Days Mission relating to diagnostics, vaccines and therapeutics have assisted decision makers in managing the course of the pandemic?[2]

[2] INQ000064663

11. Whilst GO-Science understands the need for accountability, the value of second-guessing specific decisions taken during the course of the pandemic for the purposes of identifying whether, with the benefit of hindsight, they could or should have been taken differently will inevitably be limited. The only thing that can be said with certainty about the next pandemic is that it will involve a different infective agent to SARS-CoV-2 (probably with very different properties) and the individuals with responsibility for dealing with it will also be different. It is critical, therefore, that the opportunity is taken to ask not simply whether a particular decision, or piece of advice, was good or bad, but whether it is likely to have been improved had the advisor or decision maker had available to them resources of the types considered in Module 1. It is through this integration of the Module 1 and Module 2 evidence that the Inquiry will be able to identify the steps that need to be taken to ensure that decision making in the next pandemic is optimised, through the implementation of broad planning that can be scaled and tailored rapidly to the demands of the specific emergency, and the running of practical real-world exercises that accurately anticipate the type of challenges that are likely to be faced.

12. In general terms, GO-Science considers that the Module 2 evidence has served to illustrate and confirm the value of the recommendations it proposed in Module 1. The course of decision making over the whole the pandemic illustrates that better data result in more precise advice which facilitates better and more sophisticated decision making. A developed test, trace and isolate capability that can be rapidly scaled and is supported by a trained workforce is fundamentally important. The importance of a developed diagnostics, vaccines and therapeutics infrastructure is also clear so as to provide a clear set of objectives and a route to achieving them; as is the need for a well-developed research base so that difficult questions such as the impact of NPIs on different groups within society, and how best to mitigate that impact, are not being grappled with for the first time during the pandemic itself.

Section 3 – Specific Aspects of Science Advice

13. The third section seeks to address, in summary form, a number of the specific issues raised by Counsel to the Inquiry (CTI) in opening, or during the course of the evidence of a number of the witnesses, which relate directly to the provision of scientific advice during the pandemic.

14. There are a number of respects in which the evidence has been inconsistent as to both the identification of certain concepts and the interpretation of the scientific advice given in relation to them. In particular, there has been a perhaps understandable tendency

amongst some witnesses not directly involved with SAGE to assume that the fact that a particular approach was not taken indicates that it was not adequately considered.

15. For example, contrary to some of the evidence heard by the Inquiry, careful consideration was given in February and early March 2020 to the efficacy of voluntary measures (NPIs) in achieving the policy objective of reducing R below 1, and the available evidence as to the likelihood of voluntary measures achieving that objective was reasonably clear. Similarly, consideration was given to the option of different forms of shielding as a means of controlling the impact of the pandemic, and to the considerable and important competing considerations relating to school closure. There is plainly scope for legitimate debate in respect of the advice given on these issues, and the decisions taken in light of that advice, but it is important to be clear as to the extent to which they were considered and the extent of the evidence available at the time.

16. There are also a number of issues which serve to illustrate the process by which scientific knowledge, and the advice based on that knowledge, developed during the course of the pandemic. There is an inevitable tendency in a retrospective review of an extended period of the type undertaken in this module to concertina the chronology and apply knowledge obtained in the latter stages to decisions taken early on. Some of the evidence given on issues including face coverings, mass gatherings and modes of transmission suffers from this tendency and insofar as the Inquiry considers it necessary to analyse the quality or accuracy of particular pieces of advice, and/or decisions taken in light of that advice, it will wish to keep clearly in mind the state of scientific knowledge at that time. There are a number of instances, in Sir Patrick's evidence and elsewhere, where reference is made to advice given by international organisations such as the WHO which may serve as a useful corrective in this regard.

STRUCTURE OF SCIENCE ADVICE

17. SAGE is activated by COBR in support of collective cross-government responses to serious or catastrophic emergencies. Its role is to provide coordinated, independent science advice to support decision makers. SAGE provides an assessment of science advice and information relating to the specific emergency, including but not limited to providing advice on scientific and technical concepts and processes, scenarios and their implications, risks and scientific and/or technical mitigations, the degree of consensus among experts, and the degree, causes and nature of uncertainty and what could be done to decrease the uncertainty.

18. SAGE is not a permanent body. It does not have members, rather it is attended voluntarily by expert participants, who are invited to meetings relevant to their expertise

and background. Along with participants, who contributed to the scientific analysis, various government officials from departments including HM Treasury, Cabinet Office, Department for Health and Social Care (DHSC) and No. 10 attended SAGE as observers during the Covid-19 response. This had been the case with other activations, and allowed these officials to observe the scientific analysis and debate first-hand, ask any clarificatory questions, and provide useful policy perspectives.[3]

19. As the Covid-19 pandemic was a public health emergency, SAGE was co-chaired by the GCSA and the CMO. The CMO brings a specialist medical and public health background to SAGE, while the role of the GCSA does not require public health or epidemiological expertise, and the GCSA can be a scientist of any discipline. Other activations (for example, in climate-related emergencies or malicious threats) will require very different science input and advice, and this is permitted by the flexibility of the SAGE structure.

20. The Inquiry has heard in detail about the sub-groups which fed into SAGE. Some were new groups, established ad-hoc to deal with particular topics, such as behavioural science, ethnicity, viral transmission and environment, and children, while others were existing groups established in other departments, which fed into SAGE only for the duration of the pandemic, such as the Scientific Pandemic Infections Group on Modelling (SPI-M, later SPI-M-O). Finally, other specialist groups, such as the New and Emerging Respiratory Virus Threats Advisory Group (NERVTAG), were operationally outside of the SAGE structure but worked closely with SAGE and the GCSA. There was a significant degree of cross-participation, and sub-group Chairs attended SAGE.[4] A full list of the sub-groups and key associated groups has been provided to the Inquiry.[5]

The Remit of SAGE

21. Decision making during the pandemic fell to democratically elected representatives. It was not the role of SAGE or the GCSA to make decisions, nor were they responsible for the operational delivery of policy decisions taken in light of the science advice provided. As set out in more detail below, the role of SAGE and the GCSA was to provide advice. Whether that advice turned into policy, and if so, how that policy was put into practice, are matters which fell to decision makers and to other departments and organisations.

22. Decision makers received advice across many disciplines – economic, legal, ethical, political – from inside and outside of government. Science was but one part of this. Nor

[3] INQ000252449/12 § 2.13
[4] INQ000252449/7-8 §§ 2.6-2.7
[5] INQ000252449/9-11, Table 1

did SAGE have – or wish to have – a monopoly on science advice. DHSC, as the lead government department for pandemics, had its own network of scientists, clinicians and public health experts. Most government departments have their own CSAs, and their own structures and processes by which science advice is provided internally to senior civil servants and Ministers. Organisations such as Public Health England and later the United Kingdom Health Security Agency (UKHSA) provided both operational science and advice to DHSC.

The Devolved Administrations ("DAs") and SAGE

23. SAGE is not, and is not intended to be, a geographically representative body but it has a UK-wide remit. It is constituted to bring together the requisite scientific expertise needed to provide advice.[6] Dr Wainwright (former Director of GO-Science), in his evidence to the Inquiry, discussed the involvement of individuals from the DAs in SAGE.[7] The issue is also covered by Sir Patrick in his second statement,[8] and in a statement from Dr Hayden, current Director of GO-Science, which includes details of DA invitations to SAGE and participation at SAGE.[9]

24. SAGE invitations took the form of "calling notices" – emailed invitations to join SAGE meetings. Individuals from each of the DAs routinely received calling notices, inviting them to all SAGE meetings, from SAGE 6 on 11 February 2020,[10] with each nation choosing its attendees.[11] The calling notices informed invitees of their options for attendance (initially, by phone or in person), how to submit questions or comments to attendees, and how non-active participants (observers) could contribute to the discussion. Invitees were sent a provisional agenda and were informed of how to nominate other individuals who may wish to attend.

25. As a result of being invited to attend, all the DAs would have received SAGE minutes from SAGE 6 onwards.[12] SAGE minutes from all of the meetings would also have been circulated to the DAs via a number of other routes, including via COBR 'CRIPs', and through the CSA network for those DAs with a CSA.[13] Further detail of the four nations'

[6] INQ000238826/213-214 § 661
[7] [8/46/5-20]; [8/58/18-23]
[8] INQ000238826/213-214 § 661-663
[9] INQ000274125/2-7, §§ 4-13 and Tables 1 and 2
[10] A number of DA representatives attended SAGE meetings from the outset in January 2020
[11] The Inquiry has been provided with, by way of example, INQ000274126, for SAGE 6 on 11.02.20.
[12] INQ000252449/29 § 6.3
[13] INQ000274125/3 § 7

joint working on the Covid-19 response is found in Dr Wainwright's first witness statement.[14]

26. Insofar as it has been suggested that individuals from the DAs were not invited to SAGE until "*early March*",[15] the contemporaneous evidence, in particular the calling notices, shows that to be inaccurate. A surprising criticism made during closing submissions (although not put to any witness) was that there was a lack of "*curiosity… about why no scientists from the north of Ireland had turned up, had taken up the invitation*",[16] among other apparent criticisms on the basis of non-attendance by individuals from Northern Ireland at SAGE.[17] All invitees were free to attend, decline, or nominate others. It cannot be fairly suggested that the small SAGE secretariat, dealing with an unprecedented crisis at pace, could or properly should have policed and directed attendance by DA participants beyond ensuring they were invited, which they were. It was the job of the GO-Science secretariat to bring together the experts best able to provide high quality science advice on the issues under consideration, not to regulate the extent to which the DAs responded to invitations to participate in the process. GO-Science makes no submissions on the involvement of the DAs in the formulation of government policy or decision making, but the evidence relating to participation in SAGE is clear. It is also important to note that the CMO called regular meetings of the CMOs of the DAs from a very early stage.

SAGE Participants

27. SAGE participants are identified by the GCSA, any co-chair, and the SAGE secretariat for their expertise and willingness to advise on a specific emergency. SAGE met on 105 occasions during a two-year period to provide advice on Covid-19. The identity of 150 SAGE participants who attended meetings during the pandemic have been published, which does not include participants in sub-groups and a small number who requested that their identities be withheld from publication. The breadth and depth of expertise deployed by SAGE, and the range of opinions sought, was very extensive indeed. As with other SAGE activations, participants gave their time and the invaluable benefit of their expertise voluntarily.

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[14] INQ000252449/28-30
[15] [34/27/1-6]
[16] [34/27/7-14]
[17] [34/27/3 – 34/28/17]; [34/105/16-25]

28. Guidance on participation is found in the publicly available 'Enhanced SAGE Guidance' document.[18] This was circulated to invitees, along with a copy of the Code of Practice for Scientific Advisory Committees. Participants were required to declare any relevant conflict of interest.[19]

29. An unfortunate consequence of the profile of SAGE during the pandemic was that some criticism of the participants crossed the line from legitimate scrutiny, and became abusive and threatening. A survey conducted by the press of SAGE, SPI-M-O, SPI-B, NERVTAG and JCVI participants in late 2021 found that three quarters had received significant abuse, with incidents ranging from online attacks to death threats.[20] The Inquiry heard the effects of such abuse directly from several witnesses.[21] GO-Science is grateful for the Chair's supportive remarks on this issue. For its part, GO-Science put in place communication and wellbeing and psychological support and gave security advice and provided support.[22] Such considerations are likely to be required in future emergencies.

30. On a practical level, the country's ability to call upon experts will also require that financial support is provided to their academic institutions. During the pandemic, the time commitment and high level of engagement that was required from SAGE participants who would otherwise have been working within universities necessitated some reimbursement to those institutions. Institutions were eligible for payment to back-fill teaching and administrative duties, where their staff met a minimum threshold of hours spent working on SAGE and were therefore unable to carry out their regular duties.[23]

SAGE minutes and the Consensus Statement approach

31. The written output of SAGE meetings during the pandemic took the form of a consensus statement, as is now standard practice for scientific advisory committees. The genesis of the consensus statement approach was the Hine Review into the response to the Swine Flu pandemic, which recommended that a process should be devised, by the Cabinet Office, the GCSA and the four CMOs, "*through which UK government ministers*

[18] INQ000036127
[19] See e.g. the Calling Notice in relation to SAGE 6 on 11.02.20 INQ000274126
[20] Guardian, 31 December 2021, *UK Government's Covid Advisers enduring 'tidal waves of abuse*'; see also INQ000273955/2
[21] [8/38/17-20]; INQ000251645/22 § 2.50; [24/162-163/14]; INQ000273955/1-4
[22] [8/39/24 – 8/40/3]
[23] INQ000148407/23

and the devolved administrations are presented with a unified, rounded statement of scientific advice".[24]

32. The Inquiry has heard how the consensus approach enabled SAGE and its subgroups to function effectively and to produce useful and useable output at speed.[25] In light of the inherent emergency nature of SAGE activations, the speed at which this advice is produced and provided to decision makers is crucial. A more detailed and complex minute of SAGE meetings would take longer to produce yet would not necessarily provide more or better information to decision-makers, nor would it be more likely to be read in an emergency situation.[26] The practical use of SAGE output must be borne in mind. During the Covid-19 response, the GCSA and CMO frequently walked out of SAGE and directly into COBR (or its successor committees). They had to communicate advice quickly, clearly and accurately. This verbal advice was provided along with the written minutes which quickly followed. GO-Science respectfully suggests that the consensus approach, reflected in concise minutes, coupled with the publication of the underlying detailed papers considered, is the most appropriate. Further consideration of the drawbacks of alternative approaches is set out in Dr Hayden's statement.[27]

33. The advice reflected levels of certainty and confidence, by providing a numerical range where appropriate (e.g. with regard to the R number); by using language which reflected the level of certainty to the reader, such as being clear what was an "*estimate*" or distinguishing what "*could be*" or "*may be*" correct with what was "*certain*"; and by explicitly identifying the confidence attached to various statements using a standardised approach such as the Professional Head of Intelligence Assessment (PHIA) yardstick. The minutes sought to explain the reasons for uncertainties where possible, and to set out these concepts in non-scientific language. See for example, the follow extract from the SAGE 57 minutes (17.09.2020):[28]

> "***Situation Update***
> *8. Incidence across the UK continues to increase rapidly, and data now show clear increases in hospital and ICU admissions (high confidence). Transmission has changed from localised hotspots to a more generalised epidemic (high confidence). It is certain that increases in infections will lead to further increases in hospitalisations and deaths (high confidence) …*
> *10. As previously noted, these estimates do not fully reflect recent changes from the last 2 to 3 weeks such as the reopening of schools in England and SAGE expects the current growth rate and R to be higher than this (moderate confidence) …*

[24] INQ000035085/14, Recommendation 10
[25] See e.g. Professor Sir Graham Medley, [8/108/13-109/5]; Dr Wainwright [8/13/20-14/8], and below.
[26] INQ000274126/9-11 §§ 18 and 22; Professor Sir Graham Medley, [8/109/14-21]
[27] INQ000274126/10-11
[28] INQ000061565

11. Operational issues in the testing systems mean that there is greater uncertainty in these estimates than usual. Delays in testing have increased and may be different for positive and negative results, which makes the data harder to interpret.
12. Data from the ONS infection survey and the REACT survey, which are not affected by such issues, also indicate rapidly increasing incidence in line with that modelled."

34. The consensus approach struck an appropriate balance between reflecting a range of evidence and ensuring the advice was accurate and useable. A number of witnesses explained the process by which apparent outliers in data were challenged, in effect a real-time peer review process by an eminent expert committee. Professor Sir Graham Medley gave the example of SPI-M-O's work on assessing the R number. On interrogation, anomalous findings may in fact be explained by a different data stream being used, or a different set of assumptions. After that process, if a finding remained at variance with others but scientifically sound, that was reflected in the confidence and certainty levels attached to the output.[29]

35. Professor Sir Chris Whitty described the communication of consensus, confidence and uncertainty as a process of advising Ministers *"at this point in time here's the mid-point, and also at this point in time here's the spread"*.[30] He too emphasised that it would not have been realistic or sensible to attempt to record every variant of opinion within the SAGE minutes.[31] Nevertheless, should any decision maker wish to understand in more detail the debate preceding the production of the consensus advice, they were welcome to send observers to SAGE, which many did, and/or to read the minutes of the relevant meeting.

36. As Dame Angela put it, the mantra of SPI-M-O during the pandemic became "*tell me why I am wrong*".[32] Sir Patrick previously told the Inquiry that scientists encourage being told their previous assumption was not true, and having their views challenged.[33] This is how science works and advances. This desire to interrogate and question, fundamental to the scientific discipline, which flowed through SAGE and its subgroups, is anathema to any suggestion of group-think. Most participants considered that the groups worked

[29] [8/104/21 – 8/105/10]
[30] Professor Sir Chris Whitty, [23/53/24-54/3]
[31] Professor Sir Chris Whitty, [23/61/10-13], see also e.g. the Rt Honourable Dominic Raab MP, [28/225/7 – 28/226/10], from the perspective of a recipient of consensus advice.
[32] [25/25/13-15]
[33] Module 1, [8/137/4-14]

well, with an appropriate diversity of participation, and that the debate underlying the production of science advice was robust, effectively serving as real-time peer review.[34]

Transparency

37. During the pandemic, led by Sir Patrick, SAGE published its minutes and papers, a process that required Cabinet Office approval. GO-Science has since introduced new internal guidance to ensure that in future emergencies, SAGE papers and in particular minutes will be published as soon as is practically possible, from the outset.[35] During his Module 1 evidence, Sir Patrick highlighted the importance of this transparency, including to encourage further scientific scrutiny of the advice.[36] Other areas of advice were not made public during the pandemic and thus were not subjected to the same level of debate and scrutiny. This is likely to have contributed to science advice provided by SAGE being given particular prominence in the minds of the media and the public in relation to policy. This is, however, no reason to reduce the transparency of science advice.

38. During the pandemic, a small minority of SAGE participants gave interviews or wrote articles for the media. All participants were free to speak publicly about their own research and their area of expertise, but they were asked not to comment on the details of discussions that took place within SAGE meetings, because specific comments from SAGE meetings were not attributed to individuals, and in order to avoid the contents of a SAGE discussion reaching the media before it had reached those who had commissioned the advice. Participants were also asked to avoid seeking to draw policy conclusions from the SAGE minutes. However, SAGE participants were independent scientists and Sir Patrick's view, as expressed to the Inquiry, was that as long as individuals kept their responses to any requests to comment within the boundaries of their scientific expertise, it was helpful and appropriate for them to speak with the media and therefore increase public understanding of science issues.[37]

The Remit and Limitations of Science Advice

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[34] Including in the evidence of Professor Kamlesh Khunti (SAGE, Chair of SAGE Ethnicity sub-group) INQ000252609/9-10; Professor James Rubin (SAGE, SPI-B) [12/21/15-22/3]; Professor John Edmunds (SAGE, SPI-M) INQ000273553/20. See also the Rule 9 questionnaire from participants in SAGE and its subgroups, e.g. Professor Ian Hall (SAGE, SPI-M-O, SCWG, EMG, HOCI) INQ000056544/37; Professor Julia Gog (SAGE, SPI-M-O, TFC, NERVTAG) INQ000056475/10; Professor Chris Bonell (SAGE, SPI-M-O, SPI-B, EMG, TFC) INQ000056508/11; Professor Brooke Rogers (SAGE, SCG, SPI-B, TFC) INQ000221773/33; Professor Timothy Sharpe (SAGE, EMG) INQ000056612/9; Professor Henry Potts (SAGE, SPI-B, SAGE Ethnicity sub-group) INQ000056538/30-31
[35] SAGE Development Programme, March 2023, INQ000142161/4 § 2
[36] Module 1, [8/140/15 – 8/142/23]
[37] INQ000238826/230 § 721-722

39. As GO-Science submitted in its opening to the Module 2 hearings, the 'A's in GCSA and SAGE stand for 'adviser' and 'advisory' respectively. It is the clearly defined role of both to provide advice on relevant scientific matters, not to make policy. Nothing, including the mantra of politicians 'following the science', should be permitted to blur that fundamental distinction. The GCSA and SAGE provided advice to the Government on scientific issues relating to the pandemic. The policy decisions that were taken in light of that advice were taken by Ministers and officials. Operational implementation of those policies was undertaken by specialist bodies and services.

40. Four brief examples from the Covid-19 response suffice to illustrate the remit and limitations of science advice, and the delineation between advice and action.

41. <u>The 2-metre social distancing guidance</u>.

    a. SAGE 40 on 4 June 2020[38] considered the social distancing guidance then in place, that where possible, individuals should be 2 metres apart. SAGE recorded that a reduction to a guidance distance of 1 metre carried two to ten times the risk of 2 metres. It noted, however, significant uncertainty on his issue, and that 2 metres should not be treated as an absolute rule, given the continuum in risk. SAGE noted that other mitigation could reduce risk and should be considered if closer contact is required. On this topic, SAGE had endorsed a paper produced by the Environmental Modelling Group on environmental transmission of SARS-CoV-2 and mitigating measures.

    b. Sir Patrick gave science advice to the Government consistent with the work done by the Environmental Modelling Group and the consensus view agreed by SAGE, as set out in the minutes.[39] It would not have been appropriate, or possible, for SAGE or the GCSA to attempt to assess all of the various impacts of a reduction from 2 to 1 metre, nor to attempt to weigh up the broader benefits and risks of such a change.

    c. On 23 June 2020, the Prime Minister announced the relaxing of restrictions, and a reduction in social distancing guidance from 2 to 1 metre. This was followed on 26 June by the publication of a *"Review of two metre social distancing guidance"*.[40] This made clear that the decision makers had taken into account *"the scientific evidence, the economic impact of social distancing, behavioural responses and international comparators"*. It recorded the increased risk of closer contact, but

[38] Minutes of SAGE 40, 04.06.2023 INQ000061548/3-4
[39] INQ000238826/111-112
[40] Available at gov.uk

also the *"severe economic costs to maintaining 2 metre distancing"*, and the effect on the viability of businesses.

42. Eat Out to Help Out and the Tier System.

a. On 8 July 2020, the 'Eat Out to Help Out' discount scheme for hospitality was announced in Parliament. Neither SAGE nor the GCSA was informed of the scheme prior to the decision to adopt it, nor asked to give advice on its likely impact in advance of the announcement. Contemporaneous science advice around the time the policy would have been under consideration made it very clear that any measure that increased social contacts between different household groups, particularly in enclosed indoor spaces, would increase the risk of increasing the rate of infections.[41] This is the advice which would have been given. If no specific advice is sought during the development of a new policy behind closed doors, none can be provided.

b. As Sir Patrick explained to the House of Commons Science and Technology Advisory Committee on 16 July 2020, shortly after the announcement, it was not for SAGE to give economic advice on the impacts of measures to reduce Covid-19 transmission. Insofar as it has been suggested that the GCSA, CMO or SAGE could or should have objected to the policy once it had been approved by Ministers (including, it appears to be suggested, during the course of meetings unrelated to the policy),[42] this too would be improperly to overstep the boundary between scientific advisor and elected decision-maker.

c. On 14 October 2020, a three-tier system of Covid-19 restrictions was introduced in England. SAGE was not asked to give advice on the system in advance. The GCSA and CMO were informed of the policy shortly before it came into effect, and gave their views to the Cabinet Secretary by email on 9 October.[43] They advised that two options had a chance of successfully meeting the strategic goals set by the Prime Minister at that time: a package of interventions sufficient to reduce R to 1 or below in areas with rapidly rising transmissions (which, they advised, would not be achieved by the minimum Tier 3 measures), or a national 'circuit break'. Sir Patrick advised that "*with this proposal I think we are likely to see increasing*

[41] INQ000238826/115-116
[42] [33/119/18 – 33/121/6]; INQ000263374/90
[43] INQ000229676

numbers of cases". Similar advice was repeated by Sir Patrick on 11 October 2020 in response to a draft policy paper on the tier system, and reiterated verbally.[44]

d. Sir Patrick in his email to the Cabinet Secretary had explicitly recognised *"the difficult decision that ministers face … it is important that they have seen and understood the implications of the choice".*[45] Having received advice that the three-tier strategy was likely to cause increasing numbers of cases, the decision was made to proceed with that strategy.

43. Behavioural science advice and Government messaging

a. The Inquiry has heard from SPI-B participants, a number of whom perceive their work on effective public health messaging was on many occasions not adopted by the Government, which pursued strategies which did not align with SPI-B advice.[46] While it is not straightforward to ascertain which aspects of SPI-B's advice, if any, were adopted, the view of Professor Lucy Yardley, for example, was that "*communications tended to go ahead with very little input from SPI-B, even though we were very happy to advise*".[47] At the time, there was no real attempt to inform SPI-B or SAGE why its advice was apparently not being followed.

b. The Inquiry has now heard from the then Director of Communications for No. 10 that the Government preferred to use its own political campaign research base, for example in respect of the "Stay Home, Protect the NHS, Save Lives" slogan and other key messaging.[48] As above, departments and decision-makers receive advice (scientific and otherwise) from a wide range of sources, and SAGE and its sub-groups has no monopoly on science advice. SPI-B was certainly available to Government as a source of advice on matters of behavioural science and Sir Patrick introduced James Rubin and Brooke Rogers to Alex Aiken and Dominic Cummings in order to encourage best use was made of this valuable resource[49].

44. The Roadmap out of the Third Lockdown

a. In early 2021, SAGE was commissioned to produce advice on the scientific basis for a safe roadmap out of lockdown.[50] This process, and the ultimate policy product, represent a good example of how science advice can feed into a long-

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[44] INQ000062726, INQ000238826/128-129
[45] INQ000062726/1
[46] [12/35/20 – 12/36/12], [12/143/4 – 12/144/11]
[47] [12/149/23-25]
[48] [15/24/1-15]; [15/44/20 – 15/45/8]
[49] [22/69/24-25]
[50] INQ000238597

term plan, and what can be achieved with an appropriate commission, and the benefit of good data and an understanding of the need for ongoing scientific input.

b. The commission represented an opportunity to learn from the past year, incorporating for example the knowledge that approximately five weeks would be needed between each step to observe how rates of infection responded, with ongoing scientific review. It was produced with the input of much better data on hospitalisation and mortality rates by age, *"a good understanding about what the government wanted to achieve, and a good ability to monitor the effects of each stage of 'unlocking'."*[51]

CHRONOLOGY

January to March 2020

45. The contemporaneous evidence overwhelmingly shows that the then GCSA and GO-Science were alive to the risks posed by the emerging coronavirus in January 2020 and took all reasonable steps in response. Sir Patrick asked for the situation to be monitored on 3 January 2020 and was informed that GO-Science officials had already taken steps to this end, including establishing contact with the Cabinet Office Civil Contingencies Secretariat (CCS) and the DHSC.[52] When the virus was discussed at NERVTAG on 13 January GO-Science sent two observers.[53] Sir Patrick, on his own initiative, activated a Precautionary SAGE meeting on 22 January 2020.[54] This was three days before the email exchange between Professors Woolhouse, Farrar and Ferguson that CTI identified as one of the earliest expert forewarnings of the potential significance of the new virus.[55] By 27 January, again at Sir Patrick's instigation, the first meeting had taken place to consider the funding and arrangements for vaccine and therapeutic research.[56] This was the origin of the UK's pre-eminent contributions to the worldwide response to Covid-19: the UK vaccine programme and the coordinated, national approach to therapeutic research (including the RECOVERY Trial). Together, these helped to save

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[51] INQ000309529/46-47
[52] INQ000228603, INQ000238826/24 § 63
[53] INQ000238826/25 § 69; INQ000230973/1
[54] INQ000061509; INQ000238826/26 § 74. This was the same day as the WHO Emergency Committee met for the first time to discuss the emerging virus: INQ000238826/28-29 § 80
[55] INQ000103227
[56] INQ000063572; INQ000238826/30 § 84. Further meetings took place on 4.02.20, 17.02.20, 28.02.20 and 13.03.20. While the Inquiry has, entirely reasonably, determined that therapeutics and vaccines should be considered in a separate module, it is important to take into account that this work was being undertaken in parallel to the matters under consideration in Module 2.

millions of lives. Work on them started before the WHO had declared a Public Health Emergency of International Concern.[57]

46. By the end of January early and effective science advice had contributed to the following position being reached. The relevant emergency apparatus then employed by the UK Government had been engaged: SAGE and COBR (M) had been convened and met twice by the end of the month.[58] SAGE and COBR meetings would become commonplace in the months that followed, but familiarity should not obscure how unusual, and how significant, it is to convene these bodies. It is only done in the face of serious, national emergencies that require a cross-government response and the Inquiry has heard why there is understandable reluctance to take those steps.[59] But they were taken and were taken appropriately early.

47. By 29 January 2020, COBR(M) had adopted a RWCS of more than 800,000 deaths, had advised all government departments and Devolved Administrations to begin planning their responses, and had decided that a ministerial table-top exercise should take place.[60] According to its agenda that exercise was intended to *"expose the potential scale and range of impacts"* arising from the RWCS, to *"work through some of the most difficult decision that would need to be made by Ministers at key points during a pandemic"* and to *"rehearse strategic decision making."*[61] It was reasonable for the GCSA and GO-Science to conclude that their well-founded concerns about SARS-CoV-2 had been heard and were being taken seriously in the appropriate forums: COBR(M), the DHSC as lead Government department for pandemics, the CCS as the coordinating body for emergency planning, and more widely across government. However, this did not breed complacency. When Sir Patrick had concerns that No.10 might not be sufficiently engaged he raised them with the Prime Minister's Chief Adviser, someone known to have the PM's ear and significant influence over policy. A briefing was arranged for the next working day, a highly unusual outcome that again reflected that the GCSA was effective in communicating the urgency and severity of the situation.[62]

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[57] INQ000238826/28-29 § 80
[58] INQ000087535 (22.01.2020), INQ000106061 (24.01.2020), INQ000061510 (28.01.2020), INQ000056226 (29.01.2020)
[59] See the evidence of Lord Sedwill, INQ000250229/21 § 80, and more generally at INQ000250229/14-15 §§ 50-53
[60] INQ000056226/2 §§ 1-6; INQ000056166/7-9 (CRIP 2, considered at the COBR(M) meeting, 29.01.20)
[61] INQ000052022/3
[62] INQ000238826/39 §§ 113-114

48. As was discussed earlier, the role of SAGE – a pro tempore group of scientific experts comprised in large part of academics – was not to formulate Government policy or strategy. Nor was it to check or operationalise the plans being drawn up by the various Government departments. GO-Science, an organisation then numbering around 70 people, was not expected to undertake those functions and did not have the capacity to do so.[63] SAGE's role, supported by GO-Science, was to provide science advice and to answer the science questions posed of it. This it did. In particular, it continued to draw on worldwide data and research to examine the characteristics of the virus and its transmission. It considered where those characteristics were similar to pandemic influenza and where they differed and were more like MERS or SARS, so as to inform how existing plans should be adapted to meet this novel threat.[64] It engaged leading behavioural scientists to add their important perspective on how the population might respond to threats and countermeasures.[65] And it identified, modelled and developed the non-pharmaceutical interventions (NPIs) that were the only immediate protections available.[66]

49. Work on NPIs had begun in January and led to a SPI-M-O statement on 3 February.[67] Further modelling was undertaken and was discussed at SAGE 4 on 4 February,[68] and SAGE 7 on 13 February.[69] At SAGE 10 on 25 February,[70] a package of measures was presented that it was thought, based on international experience, stood a realistic chance of reducing R to approximately 1.[71] This was accompanied by the advice that these measures would slow but not halt an epidemic and that NHS needs must be considered. While research and modelling would continue on refining the assessment of the NPIs, policy makers were expressly told through the SAGE minutes that: *"SAGE agreed that further work is unlikely to generate different conclusions in the short term and that policy decisions would need to be based on the currently available modelling*

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[63] Third witness statement of Dr Wainwright, 13 April 2023, INQ000187617/29, § 97. By way of contrast, Public Health England, the statutory body whose remit included protecting the nation's health, had more than 5,000 staff INQ000238826/10 § 17, and the lead government department for a pandemic response, DHSC, had more than 3,000 full time staff as of December 2020 according to its website.
[64] See, for example, INQ000238826/40-41, §§ 117-118
[65] SPI-B was re-convened as a sub-group at SAGE on 13.02.20, INQ000238826/45 § 134. A behavioural scientist has sat on SAGE from SAGE 1 and it had been envisaged from an early stage that a behavioural science sub-group might be required: INQ000238826/32 § 91.
[66] As has been noted, work on therapeutics and vaccines had already been instigated by the GCSA and GO-Science but was taking place elsewhere.
[67] INQ000213043
[68] INQ000087457; INQ000238826/37-38 §§ 107-109
[69] INQ000052045; INQ000238826/43-45 §§ 127-134
[70] INQ000087503
[71] INQ000087503/2-3 §§ 9-15, see also the discussion of behavioural considerations at §§ 26-19

outcomes and the experience from other countries."[72] A wide suite of measures had been identified which, when taken together, came close to what would later be termed "lockdown".[73] Whether these measures should be voluntary or mandatory was a matter of policy and not science, as is discussed further below.

50. It has been suggested that there was a "lost February" in terms of the response to the pandemic in the UK and elsewhere. If that is so, it was not lost on account of the UK science advice. That advice had been formulated and informed by experts in the appropriate disciplines who were rightly recognised as world-leaders in their fields. The advice was communicated through the then-available channels and identified the tools that were available. It was not, however, for the scientific advisers to determine which of the tools should be selected and how they should be used in practice. That was for democratically elected decision-makers, assisted by large government departments, and informed by all relevant advice, including economic, legal and political considerations.

51. In broad terms, the policy decision that was taken was to protect the most vulnerable, manage the epidemic curve to prevent the collapse of the NHS and keep wider society open.[74] This was indicated by the Prime Minister at the time when he took over leadership of the pandemic response from the Secretary of State for Health and Social Care on 2 March 2020. The readout from the morning meeting that day recorded: *"Develop top line broadly as 'taking all steps possible and reasonable, driven by the science, with an emphasis on protecting the vulnerable' while keeping as liberal an approach for others as we can."*[75]

52. When considering how effectively the science advice was conveyed to Ministers, the Chair may wish to consider the clarity of thought and expression displayed by those on SAGE from whom she heard, notably Sir Patrick, Dame Angela, Sir Chris, Professor Sir Jonathan Van-Tam, Professor Catherine Noakes, Professor Sir John Edmunds and Professor Neil Ferguson. This, taken with the contemporaneous documentary record, points strongly to the fact that the message was explained effectively and clearly, notwithstanding the inherent uncertainties and complexities involved. The Director

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[72] INQ000087503/3 § 15
[73] See the table setting out the various measures (considered individually and in combination) in CRIP 22 (08.03.2020) INQ000230991/4. The measures included: home isolation, household isolation, shielding for the elderly, closing schools, *"social distancing for all"* and stopping large events. See Sir Patrick's second statement, INQ000238826/64-66 §§ 200-205
[74] INQ000238826/47-49 §§ 141-147 and /54 § 164; [22/29/8 – 22/30/17]
[75] INQ000061636

General of the Security Service, Sir Andrew Parker, would later state that he heard what Sir Patrick and the CMO had to say in a Whitehall meeting in February 2020 and acted upon it *"pretty much that day."*[76]

Myths around the first lockdown

53. Several myths have developed about this period. One is that by the end of January, when the R number and mortality rate had been identified with a degree of confidence, it was obvious and inevitable that the virus would rampage through western Europe and could only be stopped by a full, mandatory lockdown. This is incorrect on three counts. First, the contemporary records show that there was still a possibility, albeit a receding one, that the outbreak would be contained in China – notably the WHO did not declare a pandemic until 11 March.[77] As Sir Chris said in his witness statement, there had been five Public Health Emergencies of International Concern from 2005 to 2020, only one of which (influenza H1N1) posed a significant threat to the UK.[78] Second, retrospectively identifying the "inevitability" of an uncontrolled pandemic overlooks the role of NPIs short of lockdown that – it was hoped – would allow for R to be reduced and the virus to be managed.[79] Third, it misunderstands the role of the RWCS, which was an unmitigated scenario intended as a planning tool and not a prediction of what would happen.[80] In the UK neither the original RWCS (over 800,000 deaths), nor the revised RWCS that had emerged by end of February (over 500,000 deaths)[81] transpired.

54. A second myth is that the UK adopted a plan of not imposing or easing NPIs so as to achieve "herd immunity" in as short a time as possible. There is an abundance of evidence to show that this is simply wrong.[82] The broad policy goal remained to protect the most vulnerable and manage the epidemic curve to prevent the collapse of the NHS

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[76] INQ000238826/42 § 124

[77] INQ000238826/69 §19. See also, among other evidence, the minutes of COBR(M) 2 on 29 January 2020, INQ000056226/5 §3 and the email sent by the CMO to the No. 10 health special adviser, William Warr on 28 January 2020, INQ000047585.

[78] INQ000251645/78 § 7.46

[79] Oral evidence of Professor Sir John Edmunds [13/38/18-21]

[80] See the explanation in the fourth witness statement of Professor Whitty, INQ000251645/86 § 7.74

[81] INQ000238826/51-52 §§ 153-155

[82] See, among much other evidence, the fourth witness statement of Professor Sir Chris Whitty, INQ000251645/83 § 7.63 and /106-111 §§ 7.143-7.160 and his oral evidence [24/7/5-24/23/17]; the second witness statement of Sir Patrick Vallance, INQ000238826/48 § 144 and /72-75 §§ 231-239; witness statement of Professor Dame Angela McLean, INQ000309529/35-36 §§ 117-119; witness statement of Professor Graham Medley, INQ000260643/44-46 §§ 4.15-4.23; witness statement of Boris Johnson, INQ000255836/40-412 §§ 169-172; second witness statement of Matt Hancock, INQ000232194/89 § 370 and /66 § 277; witness statement of Lord Sedwill, INQ000250229/28 § 109. It is also clear from the amount of work done on modelling and refining NPIs in February and March 2020 that the policy was to use NPIs to slow the spread of the virus and manage the epidemic curve, rather than seeking to achieve population immunity as quickly as possible.

while keeping wider society open. A *degree* of population immunity was an inevitable consequence of that policy choice, and one that had to be factored into planning and modelling.

55. A third myth is that the UK response was somehow delayed or hamstrung by a "doctrinal" debate on whether to contain, delay or mitigate the epidemic.[83] In fact, these are points on a continuum rather than distinct policy courses.[84] Containing the few early cases that emerged would serve to delay the spread of the virus even if it could not stop it. Mitigation, in the form of advice on avoiding transmission, could (and did) take place at the same time as efforts were being made to "contain" the virus. The NPIs identified by SAGE were always intended to be introduced as and when necessary to meet the policy goal set by Ministers. The events of and following the weekend of 14/15 March represented an acceleration and intensification of an existing plan, not the adoption of a new plan.[85]

56. A fourth myth is that SAGE and science advisers ignored or were indifferent to the harms caused by NPIs and lockdowns in this period. This is demonstrably untrue, as shown both by testimony to the Inquiry and the contemporary records. Sir Chris explained that his role was always *"to provide advice on the full spectrum of public health concerns"* in order to *"minimise mortality and morbidity in both the short and longer terms"*.[86] He identified what would be termed the *"four harms"* of lockdown at an early stage, which included concerns about mortality and morbidity associate with NPIs (e.g. postponing elective care, loneliness, mental health and social issues) and with the impact of pushing those on marginal incomes further into deprivation, as well as overall effects on the economy.[87] On 10 March 2020, Professor Ferguson wrote in an email to Ben Warner that *"the cure (e.g. massive social distancing, shutdowns) could be worse than the disease."*[88] There are numerous other examples of the negative consequences of NPIs being raised by SAGE, scientists and science advisors before the first lockdown.[89]

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[83] The then Prime Minister, Boris Johnson, rejected the idea that a doctrinal debate somehow *"blindsided"* the Government and delayed the first lockdown: [31/144/2-31/145/1]
[84] INQ000238826/69 § 220
[85] As was correctly stated in oral evidence to the Inquiry by the most senior political and civil service figures at that time, Boris Johnson [31/120/23 – 31/121/15, Lord Sedwill [20/73/20 – 20/74/13] and Sir Christopher Wormald [17/139/22-17/140/14]
[86] INQ000251645/115 §§ 8.3-8.4; see more generally INQ000251645/105-106 §§ 7.139-7.142 /115-118 §§ 8.2-8.12, /95 § 7.109, /112 § 7.164
[87] INQ000251645/105 § 7.140. See also INQ000068683/1 ("Possible Pathways to the End of C19 Pandemic") from 5 April 2020 – see INQ000238826/104 § 317.
[88] INQ000196055/2
[89] See, among others: CRIP 17 (2 March 2020) INQ000056224/4 *("such measures will also have economic and social impacts"*); email exchange (21-22 February 2020) INQ000236382/2 (Professor

Lessons from the first lockdown

57. While SAGE had identified and modelled NPIs by the start of March 2020, the critical unresolved issue was when they should be implemented. The Inquiry has heard a consensus emerge that, with hindsight, the measures should have been introduced earlier, though with two important caveats. First, the most common view expressed was that – judged on what was known at the time – this was a question of days rather than weeks (Mr Hancock's evidence being an outlier in this respect).[90] Second, it was not always clear if witnesses were referring to earlier implementation of a *mandatory* lockdown (i.e. what happened on 23 March), or the voluntary measures that began to be introduced from 16 March. In any event, the Inquiry may consider the more pertinent questions are *why* the lockdown took place when it did, and *what lessons* are to be learned from this. Two themes emerge from the answers to both questions: the importance of real-time data and the need for public health infrastructure – particularly test, trace and isolate ("TTI") – to be in place in advance of a pandemic.

58. In the week preceding the 16 March, three factors combined to demonstrate that the UK was further along the epidemic curve than had been thought. First, there was a greater appreciation of the lag time between the data and the real-world position. Second, data from hospital and GP surveillance revealed a higher prevalence of Covid-19 cases than had been expected. Third, modelling of NHS data – which had been sought by SAGE modellers for some time – showed that critical care capacity would be exceeded unless urgent measures were taken.[91] This was in the context of a largely hidden mass-seeding

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Ferguson's reference to the *"enormous cost"* of implementing strict NPIs as had been done in China); email exchange (24 February 2020) INQ000146563/2 *("It is important not to implement ineffective measures that then cannot be easily undone and can have very significant consequences"*); SAGE 14 (10 March 2020) INQ000061522/5 § 27 (*"Long periods of social isolation may have significant risks for vulnerable people."*) See also Sir Patrick's second witness statement INQ000238826/78 § 246

[90] Oral evidence of Sir Patrick Vallance [22/49/1-22/51/11]; oral evidence of Professor Sir Chris Whitty (16 March measures *"not a long time earlier but several days earlier"*) [24/33/7-11]; oral evidence of Professor Sir John Edmunds (it took until 13 March to have enough evidence to back up the lockdown decision) [13/126/7-20]; oral evidence of Professor Sir Jonathan Van-Tam *("I'm pretty aligned with Sir Chris on this"*) [24/188/20-24/190/7]; oral evidence of Boris Johnson (stressing that data was the key determinant of the timing of the first lockdown, not other debates) [31/144/2-31/145/1]. Mr Hancock's evidence is at [29/129/5-10] and was expressly stated to be given with the benefit of hindsight; he also stated that he could: *"defend the actions that were taken by the government at the time knowing what we did."*

[91] Witness statement of Professor Sir John Edmunds, INQ000273553/45-46 § 8.13; witness statement of Dame Angela McLean, INQ000309529/34 §§ 114(b), 116; second witness statement of Sir Patrick Vallance INQ000238826/79 § 247; SAGE 15 (13 March 2020) INQ000212212; oral evidence of Professor Neil Ferguson [11/179/5-9]; oral evidence of Sir Patrick Vallance, [22/32/2 - 22/36/22]; INQ000196863.

event over the February half-term.[92] The timing of society-wide NPIs would always have been difficult to judge given the acknowledged harms associated with lockdown, the unprecedented nature of the measures in the UK, the likelihood of a second wave once released, and legitimate questions about the degree and duration of public willingness to comply. However, the science advice and the policy decision were both made immeasurably harder by the paucity of data at that time. As Sir Patrick said, *"We were, to a significant extent, flying blind."*[93] He also candidly accepted that SAGE was *"trying to be too precise in terms of the idea of an optimal timing of interventions,"* a lesson that he learned ahead of further waves.[94] The mantra of needing to go earlier, harder and broader than you would like remains valid.[95]

59. The other vulnerability exposed in this period was the lack of sufficient public health infrastructure. As has been discussed, this affected many elements of the response, from surveillance to communication with minoritised ethnic or marginalised communities. Of most consequence to the timing of the lockdown decision was the absence of a scalable TTI capacity. As the South Korean example showed, early and rapid expansion of TTI – together with vigorous imposition of isolation for cases and their contacts – may allow for a country to contain the virus and maintain control. This was possible in South Korea because an infrastructure had been developed after SARS and MERS. By contrast, testing capacity in the UK could not be expanded quickly enough and missed that opportunity. What matters is not so much the absolute number of tests and contact tracers, but the number when compared to the prevalence of the virus, particularly at the very start of the epidemic. If the ratio is favourable, as it was in South Korea, the virus can be contained with far fewer tests than the UK ultimately deployed. As was repeatedly shown in the UK, TTI is only effective and sustainable in containing an epidemic when the virus is at low prevalence.[96]

60. It is not suggested that issues over real-time data and public health structure were the only vulnerabilities the UK had in this period. Several others were discussed in Module 1, including the pattern of running the NHS at or near 100% capacity in "peacetime", an approach not taken in other nations. However, weaknesses in data and TTI are

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[92] See the evidence of Sir Mark Walport [7/128/17 - 7/129/22]: *"The UK was hit in a very widespread way, very early."*
[93] INQ000238828/98 § 303; see also /20 § 47; see also the comments of Professor Dame Angela McLean on 28 March 2020 about the poor quality of NHS data flows [25/33/4-25/34/22]
[94] INQ000238828/98 § 302]; see also his oral evidence at [22/40/17 - 22/41/10] and [22/38/2-6]
[95] See discussion of this lesson in the oral closing submission of GO-Science [35/18/13 – 35/19/19]
[96] See Sir Patrick's second witness statement, INQ000238826/100 § 308, /109 § 331, /113 § 340, /119 § 358, /133-134 § 399, /165-170 §§ 496-510 and /179 § 550; evidence of Sir Mark Walport [7/126/19 – 7/129/4]; evidence of Professor Thomas Hale [7/102/24 - 7/104/21]

particularly important in understanding the timing of the decisions on the first lockdown. Addressing those weaknesses and maintaining progress made over the pandemic will be vital to improving resilience in the future.

Events leading to the second lockdown

61. Several aspects of the science advice before the second lockdown are considered elsewhere in these submissions and are not repeated here. These were the central themes in this period.

    a. The importance of establishing extensive, reliable and accessible testing and data in order to understand the epidemic curve and advise accordingly.[97]

       Data provision improved markedly in this period, notably through the ONS' Covid-19 Infection Survey that had emerged as a result of requests from Sir Patrick and SAGE once it was clear that PHE was unable to deliver what was required.[98] This allowed for more precise advice to be given and for the development of new means of communicating data to assist in decision making, such as the use of ready reckoners.[99] It also meant that more advice and decisions could be based on data rather than modelling.[100] Testing increased and informed surveillance, while the NHS Test and Trace service improved over time but, as has been discussed, was of limited effect in times of high prevalence.[101]

    b. The need for an approach based on data not dates when easing lockdown restrictions and the need for caution and monitoring when removing NPIs.[102]

       This was clearly articulated but Ministers, taking into account other factors, regularly chose to proceed notwithstanding the science advice. The CMO, Deputy CMOs and Sir Patrick expressed their concerns in a letter dated 26 May 2020 to Simon Case, then taking up his role as head of the Covid Task Force.[103] The CMO and Sir Patrick also warned COVID-S in blunt terms on 23 June 2020 that it was *"treading the line between high risk and being foolhardy."*[104] This was plainly understood in the Treasury, where the internal read-out of the SAGE meeting held

[97] INQ000238826/102 § 313
[98] INQ000238826/18-21 §§ 45-50 and /102-103 § 313
[99] Oral evidence of Dame Angela McLean [25/11/5 – 25/19/18]; INQ000216286
[100] INQ000238826/22 § 59
[101] INQ000238826/179 § 550
[102] INQ000238826/104-105 §§ 316-317 and /106-107 §§ 323-326; INQ000068683
[103] INQ000069418; oral evidence of Professor Van-Tam [24/203/13 – 24/206/18]
[104] INQ000062348; INQ000238826/108 § 329

on the same day read: *"[Vallance] and Whitty had made clear to the policy makers that this package was at the riskier end of the spectrum (with the potential to increase R above 1), and that they needed to be prepared to re-impose measures if necessary"* (emphasis in the original).[105]

c. The broad options available to Ministers to run the pandemic "hot" or "cold" depending on the balance they wished to strike between prevalence of the virus and the level of NPIs.[106]

Ministers proved willing to set a general strategy – avoid overwhelming the NHS and protect the vulnerable – but did not establish specific targets for levels of infection or other possible metrics.[107]

62. Throughout this period, the concepts of a "Covid Budget" or "headroom" were used to explain the need to view the lifting of measures holistically. This was plainly understood in No. 10,[108] and by the Treasury.[109] By the end of July, it was evident from the improved data that infections were increasing and would likely increase further when schools and universities reopened. In an email to colleagues on 28 July 2020, Sir Patrick stated that the PM was *"very clear that numbers are increasing and action needed now rather then 2-3 week wait."*[110] On 30 July 2020 SAGE warned that R was likely to be >1 in England given the data lag, and in the days and weeks that followed SAGE stated with increasing confidence that incidence was increasing rapidly.[111] The press conference given by Sir Patrick and the CMO on 21 September – for which they received ill-informed and unjustified criticism – contained accurate and prescient warnings about the consequences of an inadequate response to the impending second wave.[112] SAGE continued to advise in the clearest possible terms on the risks of a second wave and the options available to policy makers.[113] These included a circuit breaker lockdown, though this was not the only option. As ever, it was for the policy makers to determine what should, and should not, be done. It is evident that the policies that were adopted –

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[105] INQ000232181
[106] INQ000238826/104-105, § 317
[107] Oral evidence of Dame Angela McLean [25/60/1 – 25/67/12]; INQ000212100; INQ000238826/49 § 146
[108] See the evidence of Lee Cain, INQ000252711/27 § 121(a)
[109] See email of 23 June 2020, INQ000232181 – *"[Vallance and Whitty] noted also that this package reduces the space for doing other things, like bringing schools back in September"* (emphasis in the original).
[110] INQ000148981
[111] INQ000238826/117-119 §§ 352-358; see the terms of SAGE 57 (17 September 2020) quoted above.
[112] INQ000238826/120-122 § 361-366
[113] INQ000238826/119-120 §§ 358-360 and /123-124 §§ 368-370

including the three-tier system, which is discussed further below – were insufficient to prevent a second lockdown. This outcome was consistent with the science advice. It was not the result of a single policy, but a realisation of what Sir Patrick and the CMOs had described as their "*biggest concern*" in their letter of 26 May 2020: *"that the combination of multiple small decisions across government, all made in good faith and if taken in isolation, unlikely to push R above 1, do not lead in aggregate to a significant risk of a return to exponential growth."*[114] For Dame Angela "*the worst moment of the pandemic was September and October 2020; we could see what lay ahead, the epidemic was growing at pace, we were giving science advice that reflected that, and I could not understand why the government did not act upon that advice to make an effective intervention earlier."*[115]

The Third Lockdown and Omicron

63. The emergence of the Alpha variant would always have made a third lockdown of some form difficult to avoid. The science advice was again clear and consistent,[116] and the early identification of the variant through surveillance and the work of COG-UK (a group set up early in response to requests from Sir Patrick) was, in the words of Dame Angela, *"a triumph of science."*[117] The lesson for the future lies less in the decisions taken and not taken at the turn of the year than in the position in which the country found itself at that time. The continued high prevalence of the virus after the first lockdown and the pre-determined decision to lift the second lockdown after a relatively short period meant that, by the time Alpha arrived, there was little left in the Covid budget. By not going harder, earlier and broader than they would have wished, decision-makers had limited their later options. The roots of the school closures in January 2021 can be traced back to the summer and autumn of 2020.[118] In contrast, and as is discussed above, the roadmap out of the third lockdown, informed by science advice and following data not dates, marked arguably the most successful use of science advice in the policy response to the pandemic outside of the vaccine programme.

64. The response to Omicron has not been considered in detail in Module 2, and the Inquiry is respectfully directed to the relevant sections of the witness statement of Sir Patrick.[119]

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[114] INQ000069418
[115] INQ000309529/46 § 153
[116] INQ000238826/142-143 §§ 428-434
[117] [25/117/9 – 25/118/9]
[118] See, for example, the views of Professor Sir John Edmunds and Dame Angela McLean that the failure to lockdown in the autumn half term was a missed opportunity: [25/119/2-20]
[119] INQ000238826/146-157 §§ 442-470

The Inquiry is also invited to consider the risks of hindsight bias when analysing the relevant events. When properly assessed, against the data and evidence available at the time, it is evident that the science advice and the procedures from which it was formulated were robust and commendable. When Omicron emerged, it was far from clear that pre-existing immunity would be maintained and this would have been an exceptionally dangerous assumption to make. The experiences of previous waves taught that early decisions made on the then-available data were critical and that NPIs and pandemic-management were more effective at low prevalence. SAGE put forward a nuanced set of options for consideration – it was not a case of lockdown or nothing, as some have erroneously suggested. The models that were produced were not predictions or forecasts and they are not invalidated by the fact that the characteristics of Omicron, happily, proved more benign among the UK population than might otherwise have been the case. This was a direct consequence of the vaccine programme that, as we have seen, began at the Sir Patrick's instigation in late January 2020. The example of China, where there was immune escape and an unknown, immense death toll, demonstrates how devastating Omicron could be.

SPECIFIC ASPECTS OF SCIENCE ADVICE

65. The witness evidence submitted by GO-Science, and the statement of Sir Patrick in particular, provides a comprehensive and detailed chronological account of the science advice given to decision makers during the pandemic. The substance of that advice is also to be found in the published minutes of the 105 SAGE meetings and the meetings of its various sub-committees.

66. However, notwithstanding the comprehensiveness and transparency of the documentary record, there were a number of respects in which the evidence of some witnesses betrayed a degree of misunderstanding or confusion as to the substance and/or timing of particular aspects of the scientific advice provided by SAGE. Any evaluation of the science advice requires a clear understanding of the relevant concepts and the extent to which they bear on the questions posed by the Inquiry as to whether different approaches may have been feasible and/or preferable at various points in the chronology.

67. The following section addresses a number of issues in respect of which the Inquiry may be assisted by a clear statement of the scientific position, as it is understood by GO-Science, relating to a number of key concepts explored during the course of Module 2.

Zero Covid / Elimination

68. In opening submissions, CTI observed that one issue to be resolved is whether, had a complete elimination or a 'zero Covid' policy been pursued in the United Kingdom, would general elimination have been possible?[120] An elimination or zero Covid strategy is an extreme suppression strategy, which aims to reduce human to human transmission in a country to zero. As CTI noted in opening,[121] this was a strategy adopted in New Zealand and Australia, although of course Covid did spread widely in their populations later. In the UK, a zero Covid strategy was impliedly rejected by decision-makers in favour of a "*contain, delay, research and mitigate*" framework published on 3 March 2020,[122] and it never subsequently became a policy objective.[123]

69. The Inquiry has before it considerable evidence that zero covid would not have been a realistic strategy for the UK to pursue in light of its geography, connectivity, the widespread mass-seeding even that took place in the February half-term and the absence of data and public health infrastructure at the start of the pandemic. Sir Patrick is of the view that the only way in which zero Covid could have been feasible is if it were initiated by the end of February through a range of stringent NPIs to continue indefinitely in the hope that a transmission-blocking vaccine became available.[124] Given the spread of the virus in the UK by the beginning of March 2020 at the latest, the scientific consensus is that zero Covid would not have been a realistic strategy for the UK to adopt thereafter.[125] The science advice on this question, and some of the literature underpinning it, is set out in Sir Patrick's statement.[126] The transmissibility of Covid meant that it could not be eliminated in the way MERS was.

70. Dame Angela was asked about conversations she had in April 2020 with Professor Medley[127] and Sir Patrick where she asked whether the view that Covid-19 could not be eliminated should be challenged, in the context of Australia pursuing an elimination strategy. Dame Angela explained to the Inquiry that at that point it was "*very clear*" elimination was not feasible, but her view was "*let's challenge that a bit, let's make absolutely clear* […] *why we think it's not going to be possible*" and that there was a concurrent discussion about whether it was worth SPI-M-O spending time producing a model to show elimination to be unrealistic.[128] This is a good example of the application

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[120] [1/72/15-19]
[121] [1/72/19-20]
[122] INQ000087573
[123] INQ000238826 §§ 145, 281; INQ000251645 § 7.63
[124] INQ000238826 § 240
[125] See, for example, [25/69/22-23], INQ000238826 § 240, INQ000251645 §§ 7.134-7.137, and INQ000250231 § 126
[126] INQ000238826 § 244
[127] INQ000215682
[128] [25/68-/12-25/69/5]

of the scientific method to test the consensus to aid understanding and explanation, but it should not be misunderstood as an argument for an alternative strategy.

Voluntary Measures vs Mandatory Restrictions

71. One question that emerged over the course of the hearings was whether the voluntary measures announced by the Prime Minister on 16 March 2020 would have been sufficient to bring R below 1, in the hope of avoiding the NHS becoming overwhelmed. The Inquiry also explored the question of whether more thought and time should have been given to this question, before the introduction of lockdown on 23 March 2020. It was not SAGE's role to advise on the policy question of how NPIs should be implemented and the extent to which mandating action was either necessary or appropriate but the scientific evidence does provide some assistance in assessing whether voluntary measures alone would have been adequate to meet the policy objective of effective suppression of the virus at this early stage.

72. Modelling suggested that a 75% reduction in social contact outside the home was required to bring R below 1.[129] In the week between voluntary and mandatory measures being announced, survey data relating to adherence to voluntary measures was collected, see for example YouGov data collected on 17 and 18 March.[130] Dame Angela explained the data showed that there had been around a 40% reduction in social contacts, so it was apparent that voluntary reduction in contact was not enough to bring the R below 1, although significant voluntary behavioural change was already occurring.[131] SAGE 17, on 18 March, considered the adequacy of the measures already announced, noted that the degree of compliance was key, and advised that national school closures would be required.[132] Survey data on compliance were then reviewed in a SPI-B paper dated 22 March,[133] which was considered at SAGE 18 the following day. SAGE concluded "*high rates of compliance for social distancing will be needed to bring the reproduction number below one and to bring cases within NHS capacity*".[134] From a scientific perspective, therefore, specific and detailed consideration was being given to the question of whether voluntary measures alone would be sufficient to meet the policy objective of suppression of the spread of the virus at this stage.

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[129] See e.g. INQ000236282
[130] INQ000343849
[131] [25/52/1-20]
[132] INQ000061525/4-5
[133] INQ000196761
[134] INQ000061526

73. Although the data was relatively limited, and a more developed test, trace and isolate capability would have been of enormous assistance in obtaining a more accurate picture of the extent to which the virus had become seeded within the population at this stage, it nonetheless pointed clearly to the need for a greater level of compliance than had been achieved through voluntary measures, and to the need for significantly increased levels of compliance to be achieved quickly. With the benefit of hindsight, peak hospital admissions data confirms that the voluntary measures would not have been sufficient to bring the R below 1. As Dame Angela explained to the Inquiry "*there are other data streams that tell us that the voluntary measures weren't enough, and in particular the fact that hospital admissions peaked on April 2nd, and that's ten days after March 23rd. If* […] *16 March had been enough to get R below 1, we would have expected hospital admissions to peak ten days after that*".[135]

74. Advocates for the use of voluntary rather than mandatory measures often look to Sweden's experience of the pandemic. International comparisons can often be helpful and appreciation of the international context, and science input from overseas, was key given the global nature of the pandemic. From an early stage, SAGE accordingly assessed its ability to obtain quality overseas data and analysed the impact of other nations' interventions, for example at SAGE 10 on 25 February 2020, which considered evidence from social distancing and school closures implemented in Hong Kong, Wuhan and Singapore.[136]

75. However, when comparisons are being made with other countries it is important to ensure both that an accurate account is given of the measures adopted by the comparator country, and that any relevant social, demographic and/or geographic differences are taken into account. In the particular case of Sweden, the following considerations are relevant when seeking to draw a comparison with the UK:

    a. First, it is not the case that Sweden did not implement stringent NPIs. To support his view that the UK government should intervene in September 2020, by comparison with the Swedish experience, Dr Anders Tegnell, Swedish state epidemiologist, observed "*The myth that Sweden did nothing during the pandemic is false. We have initiated a wide range of activities not least in the area of communication* […] *I believe there is a strong consensus that with a pandemic a*

[135] [25/53/7-13]
[136] INQ000087503/3-4

government need to be active…".[137] Dr Tegnell provides more detail of the measures taken by Sweden in his witness statement to the Inquiry.[138]

b. Second, direct comparison between Sweden and the UK should be treated with caution due to demographic and social factors. To take one obvious example, the population densities of the two countries differ enormously. More generally, the fact that the laws, mores and norms of a particular society makes voluntary measures effective there does not mean that the same approach will translate effectively elsewhere.

c. Third, on reflection, Dr Tegnell notes that during the first wave Sweden had a very high incidence and mortality which he said showed that the Swedish response was not totally successful.[139]

76. Mandatory enforcement of NPIs is a tool that can be used to increase compliance and thereby reduce contacts. Science advice can inform whether voluntary measures are likely on their own to have had sufficient effect to achieve a given policy goal. Such advice relies on the data available. In the week before 23 March that data was limited and patchy, and hence the science advice inevitably contained uncertainties. To wait for better data was a choice to delay taking further measures at a time when it was thought highly likely that the virus was still growing exponentially. The consequence of gambling that R was already below 1 and getting it wrong would be many thousands more deaths. That was the unenviable choice for the decision-makers. Any retrospective analysis to the effect that voluntary measures would have been preferable to the mandatory approach that was ultimately taken would need to grapple with these implications and take account of the state of knowledge at the time rather than that which has been revealed by hindsight.

The Role of Children in Transmission and Schools

77. The Inquiry has rightly explored the disproportionate impact of the pandemic on children, and the consideration given by decision-makers to the effect of NPIs on children, such as school closures. The role that children played in the transmission of the virus was a crucial question which needed to be asked, so that the impact of choices concerning them could be better understood.

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[137] INQ000146608
[138] INQ000283502
[139] INQ000283502 § 27

78. In the lead up to the second lockdown, SAGE considered in detail the role of children in transmission, as set out by Sir Patrick in his witness statement.[140] On 17 October 2020, Dame Angela and Professor Edmunds wrote a self-commissioned paper on this issue, reviewing population-based swabbing and serological data.[141] This was evidence that was not available when this question was first considered in detail by SAGE sub-groups in April 2020.[142] Their paper highlighted ONS data which suggested that children may play a significant role in bringing infection into the household and transmitting to others. Dame Angela confirmed to the Inquiry her view that children do contribute to transmission.[143] This paper did not suggest that schools were driving the pandemic. SAGE discussed this paper on the 22 October,[144] which prompted a further paper from the Children's Task and Finish Group, which was endorsed by SAGE on 4 November.[145] Importantly, this work confirmed that the relative rate of external exposure (i.e. bringing infection into the household) for children aged 12-16 was found to be higher than for adults. Again, these minutes highlight the complexity of considering the role that school settings play, as distinct from age groups under 18, in the transmission of Covid-19.

79. Following the arrival of the alpha variant in December 2020, which was significantly more transmissible than the initial strain of Covid-19, the science advice was clear that, if the policy was to avoid exponential growth, schools would need to remain closed after the Christmas holidays. On 22 December 2020, SAGE took the view that it was highly unlikely that measures adopted in November 2020 (meaning keeping schools open) would be sufficient to maintain R below 1, whilst still acknowledging that it is difficult to ascertain exactly where transmission between children takes place.[146] This advice was also communicated in a COVID-O meeting on 29 December 2020.[147]

80. It was not for SAGE or the scientists to determine policy on school closures. It was their role to give the science advice that informed that policy. That advice was clear that keeping schools open would contribute to a higher level of transmission. If schools were to be kept open, and R was to be kept below 1, other NPIs would be required elsewhere in society to allow these policy goals to be achieved. SAGE repeatedly emphasised the

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[140] INQ000238826 § 396
[141] INQ000207121
[142] INQ000061534
[143] [25/123/12-19]
[144] INQ000061571
[145] INQ000061573
[146] INQ000061582/2; INQ000238826 § 434
[147] INQ000146632/10-14; INQ000091113/7

negative consequences (both short and long term) of school closures and commissioned expert papers on the subject.

Shielding, Super Shielding, etc

81. During the course of the evidence given in this module the terms shielding, super shielding, cocooning and segmenting have been used interchangeably to refer to a range of targeted NPIs which aim to protect vulnerable and at-risk groups within the wider population. GO-Science's understanding of these different concepts is as follows

    a. Shielding, or cocooning, refers to identifying vulnerable individuals and attempting to keep their social contact limited, and managing the infection risk posed by their 'protectors' i.e. carers or members of their household. Vulnerable groups were shielded from early 2020.

    b. Super-shielding is a heightened form of shielding, which requires that all essential contact with vulnerable people is managed through a significant testing regime and enhanced infection control measures, and possibly even shielding those protectors entirely as well.

    c. Segmentation refers to broadly dividing the population into distinct groups, for instance by age or vulnerability, and applying different policies (like lockdown, shielding, or super-shielding etc) to each. As Dame Angela explained, "*Segmentation can be used in several different ways. One way of thinking about it would be simply on age. Should we have let the […] under 40s or the under 45s live a normal life whilst everybody else was in lockdown?*"[148]

82. The idea of targeting measures to protect vulnerable groups was frequently raised and considered by SAGE and its sub-groups. As Sir Patrick told the Inquiry "*the idea of having one part of the population heavily shielded in some way, was inherent right from the very beginning*".[149] The Inquiry heard similar from Professor Ferguson.[150] In February and March 2020 thought was given to shielding vulnerable groups such as the elderly with additional measures, which was then quickly implemented. Once in lockdown, the idea of super-shielding and segmentation in the context of easing lockdown was considered. In her statement, Dame Angela describes efforts made to put Professor Woolhouse in touch with Dr Ben Warner and civil servants in the Cabinet Office and the

[148] [25/92/14-18]
[149] [22/121/10-12]
[150] [11/152/1-5]

DHSC to discuss super-shielding.[151] These ideas were revisited later in 2020 and were considered in detail by SAGE and its sub-groups, see for example SAGE 48 and SAGE 62, and the summary of SAGE advice on segmentation given on 15 October 2020.[152]

83. The Inquiry has heard extensive evidence on why segmentation through super-shielding was a flawed approach in the circumstances of the pandemic. Dame Angela's view on segmentation through super-shielding the vulnerable was that although "*intuitively appealing",* the policy "*probably needed to work in a context of very low infection in the community".*[153] Sir Patrick made the same point to the Inquiry observing that "*we never found a form of shielding that meant that the prevalence didn't increase in that population at the same time that it increased in the general population"*, and added that if such a policy were pursued as an alternative to any population wide measures, or less stringent population wide measures, then the general population would experience higher rates of Long Covid, and an increased viral mutation rate.[154] Sir Patrick further observed that super shielding "*would place most burden on multigenerational households, very often in poor situations and, indeed, ethnic minorities".*[155] In his evidence to the Inquiry, Sir Chris gave detailed consideration as to why he thought the policy was flawed.[156] This view was also shared by Professor Edmunds.[157] The matter was considered on its merits and was raised with senior policy makers and – through the SAGE minutes – the academic community and the wider public. It may be that further work in "peacetime" will allow for refinements and improvements to shielding measures that can be implemented in the next pandemic. But in 2020 and 2021, super-shielding and segmentation were not viable options for pandemic management in the UK without very serious negative consequences.

Modelling

84. In his opening submissions CTI posed the following question: "*were the limitations of that modelling properly understood by decision-makers, particularly at the beginning, when many of the assumptions upon which the models were based were not yet supported by data?* […] *was there an over-reliance on epidemiological modelling? Was*

[151] INQ000309529 §§ 104-105
[152] INQ000061556; INQ000061570; and INQ000074986 respectively
[153] [25/93/7-14]
[154] [22/121/15-20] and [22/122/1-5] respectively. See also INQ000238826 § 240
[155] [22/123/5-7]
[156] [24/12/12 - 24/16/18]
[157] [13/125/14-15]

too much time spent analysing even the differences between the various types of models?"[158]

85. On the question of over-reliance on modelling, it is not surprising that epidemiological modelling, through the work of SPI-M-O and others, played a central role in the science advice given to decision-takers during the pandemic, and the inquiry heard evidence from a number of modellers about their significant contribution to the science advice given to decision-makers. On this point, Dame Angela observed "*If you want to think about the future in a quantitatively consistent way, you need to use a model. This is especially true when confronted with an unprecedented situation with no historical data to guide you*".[159] Extensive NPIs like lockdowns and school closures had not been imposed on the UK in living memory, so models were required to better understand the effectiveness of such measures.

86. The Inquiry has also explored the question of whether the limitations of modelling were properly understood by decision-makers. Professor Medley's warning that "*models are tools to aid understanding and not a panacea to resolve policy problems*"[160] is pertinent; it is not surprising that the climate of uncertainty, modelling outputs were often seen as tempting 'answers' to seemingly unnavigable problems.[161] This question was raised specifically in relation to the distinction between forecasts and scenarios. The Inquiry heard an extensive explanation from Professor Edmunds on the conceptual difference between the two modelling outputs.[162] When asked whether the distinction was properly understood by the government and the public, his view was that it was not, and at times "*it may have been deliberately misunderstood* […] *very frequently our scenarios about what might happen were afterwards treated as a forecast*".[163] The Inquiry may consider this to be one of a number of the aspects of the evidence which illustrate the value of promoting science literacy in government, including through the recruitment of more STEM graduates into the civil service fast stream.

87. The epidemiological modelling done by SPI-M-O participants throughout the pandemic was world-leading. Faced with unrelenting commissions from across government and difficulties accessing timely, good quality data, modelling groups worked non-stop to produce frequent modelling outputs, found innovative ways to present and communicate their work, made clear what modelling could and more importantly could not achieve, and expressed in clear terms where uncertainty lay. The prominence of epidemiological

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[158] [1/51/4-19]
[159] INQ000309529 § 76
[160] INQ000260643 § 10.1
[161] See, generally, Chapter 5 of the Technical Report at INQ000220213.
[162] [13/77/3 - 13/82/20]
[163] [13/82/3-4]

modelling in the Inquiry's exploration of the quality of science advice given to government is appropriate. However, the Chair may feel that its complete transparency and therefore relative visibility in comparison to other forms of advice, may overexpose this discipline to criticism, which has not been possible to any meaningful extent for other forms of advice, and in particular other forms of modelling output in government.

Asymptomatic Infection vs Asymptomatic Transmission

88. There is an important difference between asymptomatic infection, i.e. where an infection is not clinically apparent, and asymptomatic transmission, i.e. where an asymptomatic individual may infect another person. A useful explanation is set out in the statement of Sir Chris,[164] who noted in evidence that the concepts can become conflated.[165] Nonetheless, any tendency to use one term in the place of the other is important to identify in the witness evidence,[166] and avoid.

89. The Inquiry has explored in depth the scientific understanding and advice about the risk of asymptomatic infection from the outset of the pandemic, including that at the first "full" SAGE meeting on 28 January 2020 (known as SAGE 2) recorded that there was *"limited evidence of asymptomatic transmission, but early indications imply some is occurring"*, with PHE tasked to produce a paper on this matter.[167] Such advice was reflected in CRIP prepared in advance of a COBR meeting the following day, chaired by the Secretary of State for Health and Social Care.[168] The impression on the part of any decision-maker that there was ever a scientific consensus to the contrary should be considered against that background, together with evidence from other sources as to the decision-makers' understanding of the risk of asymptomatic transmission from the earliest weeks of the pandemic.[169]

Modes of Transmission

90. The Inquiry heard detailed evidence from Professor Catherine Noakes about the differences between fomite (i.e. object) transmission, airborne (or aerosol) transmission, and droplet transmission.[170] The possibility of each route of transmission was identified from the outset of the pandemic, albeit that the relative contribution of each route was

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[164] INQ000251645 § [5.14]
[165] [24/71/21 - 24/72/3]
[166] As particularly present in the evidence of Matt Hancock [29/44/12 – 29/73/18]
[167] INQ000061510. See also the second statement of Sir Patrick Vallance: INQ000238826 § 85-86
[168] INQ000056166. See also the second statement of Sir Patrick Vallance: INQ000238826 § 513
[169] See the witness statement of Matt Hancock, INQ000232194 § 37. See also the evidence of Ben Warner [18/137/2-6], the evidence of Dominic Cummings [15/190/6 – 15/191/3]
[170] [13/8/27 - 13/11/12]

unknown.[171] As explained by Sir Patrick, it was considered that transmission was most likely by respiratory droplet, with some fomite and limited aerosol spread, whereas data emerged later to show that aerosol transmission was capable of playing a more significant role, especially with emergent viral variants.[172]

91. While the scientific assessments necessarily changed in view of a shifting evidential base, the Inquiry has before it substantial evidence that the issue of transmission routes was consistently evaluated by SAGE. A review by PHE of the available data was discussed at SAGE 8 on 18 February 2020,[173] and the Environmental Modelling Group was established in April, chaired by Professor Noakes, to provide science advice to SAGE on modes of transmission. The important work of that sub-group was reflected in the discussions at, and advice given by, SAGE, particularly where at SAGE 42 on 18 June 2020 SAGE endorsed its findings as to the risks of both aerosol and droplet spread.[174]

Face Coverings

92. Science advice through SAGE on the topic of face coverings reflected the evidential picture. Sir Patrick explains that as early as SAGE 4 on 4 February 2020, advice from NERVTAG on the topic was considered and approved, to the effect that while there was some evidence that the wearing of face masks by symptomatic individuals may reduce transmission to others, there was little to no evidence that mask-wearing offered protection to the uninfected.[175] Accordingly, it was not considered at SAGE that the wearing of face coverings by the general population would meaningfully reduce transmission. Nonetheless, steps were taken to improve the evidential base for decision-making, including through the commissioning of reports through NERVTAG.[176] SAGE agreed on 21 April 2020 (SAGE 27), in the context of a potential lifting of restrictions, that there was sufficient evidence to recommend that cloth face masks be used for short periods in enclosed spaces, where social distancing was not possible.[177] It is to be noted that this recommendation preceded any recommendation by the WHO, which advised

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[171] See the second statement of Sir Patrick Vallance: INQ000238826 § 339
[172] INQ000238826 § 399
[173] See the relevant paper at INQ000074913, and the second statement of Dr Stuart Wainwright INQ000252450 § 2.19-32 and Annex B
[174] INQ000042929. See the second statement of Sir Patrick Vallance [INQ000238826] § 337
[175] See the second statement of Sir Patrick Vallance: INQ000238826 § 563
[176] See the report of NERVTAG in advance of SAGE 25 (14.04.20): INQ000074913; the relevant SAGE minutes at INQ000061533, and the second statement of Sir Patrick Vallance: INQ000238826 §§ 566-7
[177] INQ000061535

until 5 June 2020 that the use of masks by healthy individuals was unsupported by evidence.[178]

93. However, any consideration of the merits of face coverings must include its downsides. It would be simplistic to conclude that, because a measure is considered to bring some benefits in certain situations, the precautionary principle would mandate its use at the soonest possible moment.[179] It was recognised by SAGE participants, including behavioural scientists, that the wearing of face coverings carried potential drawbacks, including among others a risk of confusion among the population, the depletion of stocks required in high-risk environments, and potentially an increased infection risk through increased contact with the wearer's face. Such risks were discussed in particular at SAGE 26 on 16 April 2020.[180] They had to be weighed against any evidence of potential benefit, as such evidence emerged.

94. Finally, the limit of SAGE's role in providing science advice to Ministers, discussed above, must be kept in mind. Its role was properly limited to the assessment of the scientific evidence, and to make reasoned recommendations where that evidence permitted. The question of whether masks should be worn in the community, or in any particular setting, and whether to achieve that outcome by way of recommendation or mandate, was never a matter for SAGE and must only be one for Government. Nonetheless, Sir Patrick welcomes the ongoing reviews into the subject, and asked the Royal Society to undertake work examining the effects of masks and other NPIs.[181]

Mass Gatherings

95. The Inquiry has heard evidence as to the limited effect of restrictions on mass gatherings at population level, described by Professor John Edmunds as *"tiny"*.[182] As described by Sir Patrick, the question was considered by SAGE and its sub-groups on several occasions from the earliest days of the pandemic, and those instances are not repeated here.[183] However, it is acknowledged that population-wide effect, e.g. the impact of any such restriction on R, is but one factor which must be considered when evaluating the effectiveness of advice in this area. The reflection of Sir Patrick is that, in view of the

[178] See the second statement of Sir Patrick Vallance: INQ000238826 § 576
[179] See the evidence of Sir Chris Whitty as to this *"misunderstanding"* of the precautionary principle among some of the evidence to the Inquiry [23/30/7-25]
[180] INQ000061534
[181] See the second statement of Sir Patrick Vallance INQ000238826 §§ 577-8, and the report at INQ000250983, and as discussed throughout the evidence of Sir Mark Walport.
[182] [13/96/16]
[183] See the second statement of Sir Patrick Vallance: INQ000238826 §§ 579-594

importance of public confidence in restrictions, mass gatherings ought to have been stopped earlier, together with instructions to mitigate the corollary risks associated with smaller indoor gatherings which may occur as a result of restrictions on mass events and would have a yet more significant spreading effect.[184]

The Care Sector

96. GO-Science is conscious that the Inquiry will consider the care sector in Module 6 and that it was not a focus of evidence in Module 2. For those reasons the comments here are brief. The issue of how the virus would affect the care sector was an early and consistent concern for SAGE, GO-Science and Sir Patrick. A chronological account of discussions at SAGE and beyond on issues relating to care homes is contained in the latter's statement.[185] By SAGE 7 on 13 February 2020 a paper had been prepared on how to address the spread of Covid in closed environments; while the paper considered prisons, the Chair's brief confirms that the principles that were discussed at the meeting were understood to apply to care homes as well.[186] Thereafter, SAGE regularly returned to matters relating to the care sector and Sir Patrick raised his concerns with leading figures within the Government. Dominic Cummings noted the emphasis Sir Patrick and the CMO were putting on the care sector on his return to work from illness in mid-April 2020.[187] When it became apparent the DHSC and PHE were unable to take work forward in this area with sufficient urgency, SAGE stepped in and established a sub-group to help.[188] This was not a case of a delayed response by SAGE, as some have suggested. Instead, it is an example of it taking on additional responsibility in order to fill a gap left by others, just as the ONS had done in respect of the Covid-19 Infection Survey.[189]

CONCLUSIONS

97. From GO-Science's perspective, the essential conclusions to emerge from the evidence presented to the Inquiry in Module 2 are relatively straightforward and unsurprising. They are consistent with the evidence given in Module 1 and include the following:

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[184] See the second statement of Sir Patrick Vallance: INQ000238826 §§ 577-8
[184] See the second statement of Sir Patrick Vallance: INQ000238826 §§ 595-597
[185] INQ000238826/45 § 133 and /173-176 §§ 524-540
[186] INQ000238826/45 § 133
[187] INQ000238826/174 § 528
[188] INQ000238826/174 § 528
[189] See above at § 61(a)

(i) The UK's structure for the provision of science advice in an emergency such as a pandemic is fundamentally sound and effective. It is capable of refinement and improvement but fundamental change is not required. Care should be taken to ensure that the country's scientists are not discouraged from providing their time and expertise when they are next called upon to do so.

(ii) The distinction between the provision of science advice and the taking of policy decisions is fundamental and needs to be clearly understood by scientists, decision makers and the public. Science advice should be transparent and open to constructive challenge. Decision makers should make clear that it is not the only relevant consideration and that they have responsibility for making decisions by balancing the full range of relevant considerations.

(iii) The provision of precise and accurate scientific advice in the early stages of a developing pandemic, and the early adoption of the optimum set of interventions, is entirely dependent upon the quality of the available data which includes indicators of the incidence of disease, hospitalisation, admission to intensive care and mortality.

(iv) Even with better data it is unlikely to be possible to identify the correct time to implement the correct package of measures with absolute precision and if you wait until the data clearly supports the necessity to adopt a particular intervention then you will almost certainly have waited too long. You need to go earlier than you would like, harder than you would like and geographically more broadly than you would like.

(v) It is extremely difficult to assess the disparate impacts of particular measures on different groups within society, and balance those impacts, in real time and there would be considerable value in undertaking research into these issues in an integrated manner, whether through the establishment of an academic institute for pandemic preparedness or otherwise.

(vi) Inequalities of impact and the perennial problem of pandemics having a disproportionate effect on disadvantaged and marginalised groups cannot be effectively addressed from scratch during the course of the pandemic itself. It requires a long-term public health strategy and a public health and policy infrastructure that is capable of mitigating the effects of a pandemic when it arrives.

(vii) Pandemic preparedness planning should be practical and detailed with a clear understanding of the objectives and a commonly understood framework for assessing risk. More attention needs to be paid to operationalisation of policy.

(viii) There needs to be a better grasp of scientific concepts within Government. Science advisors have an obligation to communicate science advice in an accessible, straightforward and useful manner and the recipients of that advice have a corresponding obligation to ensure that they have a baseline level of scientific literacy and/or a team of officials and advisers who can understand and interpret the advice they are given.

(ix) The UK achieved notable successes in developing capabilities during the pandemic, virtually from scratch. These capabilities should not be lost and, where appropriate, should be built on to ensure that diagnostics, vaccines and therapeutics are even more efficiently delivered in the future and the UK should continue to play a leading role in the 100 Days Mission and its implementation.

98. GO-Science is grateful to the Inquiry for the opportunity to participate in Module 2 and to make these closing submissions. It is hoped that they will assist the Inquiry in its consideration of the evidence and its analysis of how decision making, and the provision of science advice to decision makers, can be improved in the event of a future pandemic.

15 January 2024