

Witness Name: Andrew Hayward

Statement No.: 2

Exhibits: AH/1 – AH/36

Dated: 04/09/2023

Ref: M2/SAGE/02/AH

UK COVID-19 INQUIRY – MODULE 2

WITNESS STATEMENT OF PROFESSOR ANDREW HAYWARD

I, **PROFESSOR ANDREW HAYWARD**, of the UK Health Security Agency, Fleetbank House, 2-6 Salisbury Square, London, EC4Y 8AE and of the Department of Epidemiology and Public Health, University College London, 1-19 Torrington Place, London, WC1E 7HB will say as follows: -

1. Introduction

- 1.1. I make this statement pursuant to the Covid-19 Inquiry's Rule 9 request of 24 February 2023.
- 1.2. The matters I set out within this statement are within my own knowledge save where I state otherwise and are provided in a strictly personal capacity. Where I refer to facts that are not within my own knowledge, I will give the source of my knowledge of those facts.
- 1.3. Since providing my questionnaire response, submitted on 18 October 2022, I am now primarily employed by the UK Health Security Agency ("**UKHSA**"), with only about 20% of my professional time allocated to University College London ("**UCL**").

2. Contribution to internal UCL Covid Advisory Group

- 2.1. In my questionnaire response of 18 October 2022, I list the UCL Covid Advisory Group as among those groups I participated in during the relevant time period. I have been

asked to expand on my involvement with this group, and do so below, but I should emphasise that the purpose of this group was to advise UCL, not to advise the UK Government.

- 2.2. On 10 March 2020 I wrote to the Dean (AH/1 - INQ000211952) suggesting that UCL should move to advising staff and students to work from home and to establish online teaching. On 11 March 2020 UCL accordingly advised staff and students to prepare for the possibility of remote working and teaching. On 13 March 2020 I was asked to join a UCL Covid-9 operational group as a Public Health Representative as well as UCL suspending all face-to-face teaching on the same day. By 17 March 2020 UCL required almost all staff to work from home. The online teaching was introduced 10 days before the national lockdown and the staff work from home directive issued 6 days before the national lockdown.
- 2.3. On 14 April 2022 public health colleagues at the University submitted a document (AH/2 - INQ000211964) outlining likely future scenarios for how the Covid-19 situation would develop over the next few years to support longer term planning. UCL later established a formal internal UCL public health advisory panel on 24 September 2020 to advise on aspects of how the organisation should respond to keeping the campus safe as staff and students returned to campus. As a UCL Professor of Infectious Disease Epidemiology I was a member of this group along with four other public health colleagues who specialised in infectious diseases. The group was chaired by Graham Hart, Dean of the Faculty of Population Health, and advised the University Executive committee.
- 2.4. We advised on measures to mitigate risk of transmission on campus and in halls of residence including clear messaging, social distancing, mask use, hand hygiene, ventilation and, later, on provision of lateral flow testing and vaccination on campus. Apart from the initial decision to move to online teaching and close the campus to non-essential activities our advice was, in general, based on wider government advice to the public and higher education sector. We established a surveillance system to allow staff and students to report Covid-19 as well as an advisory and support service. We further established mechanisms to support students who needed to isolate including provision of vouchers for food delivery and advice on testing prior to returning to returning to family during holidays and advice to international students on travel restrictions.

3. The 'Virus Watch Community Cohort', 'Vivaldi' and 'SAFER' studies

3.1. I have been asked how the result of the above studies were used to inform political decision-making. As decision-makers did not provide feedback on the extent to which the results of these studies were considered or applied I cannot reach a definitive conclusion on this. Based on my involvement in these studies, I set out below where I suspect that the policies which followed the studies' findings may have been influenced.

3.2. There was a suite of studies known as the National Core Studies programme, initiated by Sir Patrick Vallance (AH/3 - INQ000211973), covering:

- i. Epidemiology and Surveillance
- ii. Clinical Trials Infrastructure
- iii. Transmission and Environment
- iv. Understanding immunity against Covid-19; and
- v. Longitudinal Health and Data and Connectivity.

3.3. This programme was brought together in September 2020 and included studies that were directly commissioned rather than through the usual process of open competition. The National Core Studies programme was designed to feed directly into policy decisions and so had a clearer route to influencing policy compared to research established earlier through the UK Research and Innovation ("UKRI") and National Institute for Health Research ("NIHR"). Vivaldi was part of this core study programme and Virus Watch analyses of occupational health risks were later commissioned by the core studies programme. Routes for influencing policy were, in general, less well developed for research commissioned outside of the National Core Studies programme.

Virus Watch

3.4. I was chief investigator of the Virus Watch community cohort study (AH/4 - INQ000211982) which aimed to provide information on Covid-19 occurrence and risk factors in a large cohort of members of the public. It was competitively funded and established prior to the National Core Studies through UKRI and NIHR emergency funding mechanisms.

3.5. Subsequently, the 'Covid Health Equity' study was established (led by my colleague Professor Rob Aldridge) as a sister study to Virus Watch which aimed to recruit more

people from ethnic minority backgrounds into the cohort to better understand why ethnic minority groups and socially deprived groups had higher rates of mortality than the general population (AH/5 - INQ000211983). The emergence of the National Core Studies, in particular the ONS 'Infection' study and the Imperial 'REACT' study, which were funded to undertake very large scale measurement of infection levels through asymptomatic testing, at a scale that was unaffordable within our study budget, led us to move away from focussing on measuring population infection levels towards a focus on measuring social risk factors (e.g. social deprivation, ethnicity and occupation) and behaviours relevant to changing control measures (including testing behaviours, isolation behaviours, contact patterns, workplace mitigations, vaccination intentions and uptake). We later received additional funding from the 'PROTECT' core study to enable us to undertake focussed data collection and analyses to support understanding of occupational risk of infection.

- 3.6. We recruited around 50,000 individuals across the country and followed them up with detailed online baseline questionnaires on clinical and social circumstances, weekly surveys on symptom occurrence and to report tests and test results, and vaccination, and monthly surveys on behaviours. The survey also included data linkage to national Covid-19 laboratory data, vaccination data and hospitalisation and mortality data. These monthly surveys included contact and activity surveys each month as well as periodic surveys on attitudes and behaviours such as occupational mitigations, vaccine intentions and attitudes. Following the introduction of the vaccination programme we were provided in-kind funding (i.e. funding provided by the Department of Health and Social Care (the "DHSC") to a third party provider of postal antibody tests rather than funding directly to UCL) to measure antibody levels in a sub-cohort of the Virus Watch cohort with monthly finger prick testing to measure antibodies derived from natural exposure to Covid-19 and antibodies derived from vaccination. These included quantitative measures of the level of antibodies allowing us to study waning immunity following different types of vaccine and different vaccine doses and how these varied in clinical risk groups. The team of analysts we developed for the Virus Watch study also responded to some requests from the New and Emerging Respiratory Virus Threats Advisory Group ("NERVTAG") for additional analyses of Virus Watch data and reviews of published literature on asymptomatic infection occurrence, risk of reinfection with Covid-19 and serial interval of Covid-19 and to collate information across studies on the symptom profiles for Covid-19.

3.7. As the study was not established as a Covid-19 core study, the mechanisms for feeding into policy decisions was less formally defined than for the National Core Studies but I utilised my position on NERVTAG to raise relevant issues arising from analyses to this group, and to other advisory groups including the Senior Medical Advisor Group (for analyses related to symptom profiles), the EMG Transmission group (for analyses related to occupational risk), to the UKHSA Vaccine Evaluation group and Joint Committee on Vaccination and Immunisation ("JCVI") (for analyses relating to antibody waning post vaccination).

3.8. It is not always possible to know exactly how specific research contributes to complex decision making alongside other information as advisory bodies consider the range of data available to them. Examples of how the Virus Watch data were used to inform decision making during the pandemic included:

- i. Feeding in data on accuracy of different symptom profiles to decision making about which symptoms to recommend testing and isolation for. This was fed into the UK Senior Clinicians Group consisting of Chief Medical Officers ("CMOs") who I believe made policy decisions on this and other evidence early in the pandemic and then reviewed this as additional data became available.
- ii. Feeding in data on occupational risk factors for Covid-19, the higher risks for those who cannot work from home and on differential contact and activity according to social deprivation into the Sage EMG Transmission Group. This may have contributed to ongoing advice about workplace mitigations and working from home where possible.
- iii. Feeding in antibody data led by my colleague Professor Rob Aldridge into JCVI and UKHSA Vaccine evaluation group showing:
 - a. Much lower levels of antibodies reached following Astra Zeneca vaccine compared to Pfizer vaccine after the first two doses of vaccine but high levels achieved when Pfizer was used as a booster dose following initial Astra Zeneca vaccine.
 - b. Lower antibody levels in people with clinical risk factors following the first dose.
 - c. Rapid waning of antibody responses following vaccination at similar rates for Pfizer and Astra Zeneca (but starting from a much higher level for Pfizer).

- d. Evidence of lower antibody levels increasing the risk of vaccine breakthrough infection.
- e. Evidence that breakthrough infections were more common in those vaccinated with Astra Zeneca than with Pfizer vaccine.
- iv. This information along with data from other studies may have contributed to decisions to bring forward second vaccine disease for clinically vulnerable groups and to recommend the Pfizer and Moderna vaccines (both mRNA vaccines) for booster doses rather than the Astra Zeneca vaccine.
- v. Contributing Virus Watch data on serial intervals for different variants of Covid-19 as part of the assessment of transmissibility of new strains.
- vi. We are currently finalising a report on Covid-19 inequalities based on the Health Equity analyses conducted during Virus Watch which we hope will inform future pandemic planning.

Vivaldi

- 3.9. I was a coinvestigator in the 'Vivaldi' nursing home core study (Chief Investigator Professor Laura Shallicross) (AH/6 - INQ000211984). We worked with Public Health England ("PHE") colleagues and the National Core Studies programme to design the study and were in a good position to do this having previously been awarded funding under the Economic and Social Research Council ("ESRC") Covid-19 emergency funding stream to conduct research on nursing homes. The project aimed to measure rates of infection in staff and residents of nursing homes through regular testing, linkage of data to national testing programmes and to measure antibody levels in staff and residents. The project also allowed rapid investigation of risk factors for high Covid-19 prevalence and outbreaks of infection through a rapid survey of care home managers across the country.
- 3.10. As a National Core Study this was well linked into policy making decisions through the Adult Social Care programme, although as a coinvestigator I was not directly involved in this group. Examples of key findings and potential influence include:
- i. Identification that in the first wave of the pandemic care homes that did not pay staff during periods of sickness absence had higher levels of Covid-19 and greater risk of outbreaks supporting funding decisions to enable nursing homes to pay staff during sickness absence.

- ii. Identification that homes which had high numbers of agency staff (who work in a variety of homes) had higher risk of Covid-19 outbreaks, perhaps contributing to advice to minimise use of agency staff and sharing of staff across sites.
- iii. These analyses also showed the importance of staff in contributing to care home transmission supporting decisions on regular testing of staff and vaccination of staff.
- iv. Identification and monitoring of rates of infection in staff and residents through the pandemic contributing to decisions about regular testing, vaccination, and infection control.
- v. Identification of the rapid spread of new variants within the nursing home setting influencing continuation of control measures.
- vi. Evaluation of vaccine effectiveness in nursing home residents and staff showing incomplete protection against infection informing the vaccination programme and ongoing control measures.

SAFER

3.11. I was a co-investigator for the 'SAFER' study (Chief Investigator Professor Eleni Nastouli) (AH/7 - INQ000211985) which was also funded through the UKRI/NIHR emergency funding scheme. This project was focussed on measuring rates of infection in frontline healthcare workers in a major London secondary care setting (University College London Hospital). The project included regular asymptomatic testing for Covid-19 as well as antibody testing. It was the first to demonstrate extremely high rates of infection and asymptomatic infections early in the first wave of the pandemic. Publication in the Lancet ensured wide readership and it was also raised at NERVTAG. This work was likely to have contributed to decisions on widening use of PPE in healthcare settings and to the scheme to regularly test healthcare workers for Covid-19 and to prioritise them for vaccination.

4. SAGE

- 4.1. I was a member of NERVTAG and, later, the SAGE EMG Transmission subgroup.
- 4.2. I think the working relationship between SAGE and its subgroups was generally good in that SAGE helped to direct the work of the subgroups to provide scientific evidence related to the advice it was providing. This led to a series of papers being brought to SAGE for consideration.

- 4.3. Members of the subgroups were represented on the main SAGE group but there was a lack of formal mechanisms to understand how scientific advice was feeding to policy decisions. For this reason, it is difficult to assess how consistently the work of the sub-groups was incorporated into SAGE advice, but I have no reason to believe that it was not. The extent to which subgroup advice was incorporated into SAGE advice became easier to follow when SAGE minutes started to be published although it remained unclear how SAGE advice was incorporated into policy decisions. In a similar vein it was difficult for subgroups to gain a good understanding of what was being commissioned from other subgroups and to identify gaps, possibilities for synergies or duplication but I understand it was the role of main SAGE to take an overview of this.
- 4.4. A key purpose of SAGE was to communicate consensus advice based on scientific knowledge to inform the pandemic response. Whilst scientific consensus is a good basis for informing policy, as it seeks to capture the knowledge and expertise of scientists across different disciplines, it has limitations in that there is a possibility that the process of achieving consensus can make it challenging for members to speak out against the consensus views and may underplay genuine uncertainties or lack of complete agreement.
- 4.5. For example, when it comes to conveying advice that may be perceived as politically unpalatable, such as the introduction of lockdown measures, it may make it difficult for individual scientists to stress the value of more immediate action if the consensus has not moved to that view. Similarly, if the scientific consensus is that aerosol-based transmission is of limited importance it may be difficult to argue an alternative view. An important part of being a member of such groups is to be able to challenge assumptions and it's important for groups to value such challenge; for example, by actively encouraging members to present views that may not be the "group view". SAGE tried to formally capture some of this through systematic classification of the level of certainty behind scientific evidence. I was not party to any of the conversations between CSA/CMO and policy makers so cannot comment on the extent to which the depth of discussion at SAGE groups and subgroups was able to be reflected in these communications. Both the CSA and CMO are expert at clearly communicating scientific evidence, so I have every reason to believe they do an excellent job of communicating this.

- 4.6. Providing advice based on scientific consensus rather than the approach used in less time pressured circumstances (such as guidance groups considering systematic reviews of evidence and views of key stakeholders – processes that often take months rather than days) does allow decision making to be made in a timely way. Scientific consensus can also be slow to shift as new information emerges.
- 4.7. As I was not a main member of SAGE I cannot comment on the relationship between SAGE and senior politicians. I believe this was mainly through CSA and CMO. There were no opportunities for sub-group members to engage with senior politicians in order to understand their positions or for them to understand our views of the evidence and its implications. There was also no way for group members to understand how senior politicians were interpreting the advice or translating this into policy and no opportunities to engage in discussions about the appropriateness of policies or areas where policies may be needed. This contributed to a lack of clarity about how scientific advice was influencing policy decisions. The main way in which we could understand how our advice was, or was not, being incorporated into policy was by listening to government announcements on the media.
- 4.8. NERVTAG members were well aware of international evidence on matters related to Covid-19 from the outset of the pandemic and to the varied policy responses that were instigated in different countries. Many members also participated in World Health Organisation meetings to discuss various aspects of Covid-19 science and response. In general, subgroups were asked to advise on the science underpinning policy rather than policy itself so, whilst international scientific evidence was incorporated into advice, comparison of international policies was not discussed in the meetings I attended.
- 4.9. While there was good clinical advice to NERVTAG, discussed below, SAGE EMG transmission group's remit did not require clinical advice. There was clinical input into the main SAGE committee, but I don't know how much. In general, public health advice to committees came from public health academics rather than those with extensive experience of service public health. I felt this was a weakness as those working in national and local public health roles have highly relevant skills to understand how control measures may work in practice and how control measures can be tailored to different communities. This may have arisen from a strict

separation of scientific advice, policy making and service delivery which I think may have been counterproductive.

- 4.10. My experience was that SAGE and its subgroups were set up to provide scientific advice and that this was largely separated from the development of operational advice. Whilst I can see some merits of dividing these activities it meant that SAGE and subgroups were not as well informed of operational constraints as they might have been and that those developing operational guidance did not have direct scientific input the drafting of such guidance. Overall, I think clearer lines of communication between SAGE and its subgroups and those developing operational advice would have been beneficial.
- 4.11. I am not aware of any formal mechanisms to challenge SAGE advice or that of its subgroups. While academic groups, media channels, Independent SAGE, and informal groups of citizens challenged the control measures that were developed following SAGE and subgroup advice, I am not aware of the extent to which these perspectives were brought before decision makers.
- 4.12. The scientific membership of groups was very broad but there could have been mechanisms developed to allow views of the general public, specific population subgroups, industry, education and others to present their views on control measures. Although I think it was the role of policy makers and politicians, not scientific advisors, to take account of and balance these broader perspectives, greater involvement of service public health colleagues in discussions might have added value in terms of thinking about feasibility of interventions, maximising effectiveness and addressing health inequalities.
- 4.13. There was an apparent absence of economists from advisory groups and I think this was related to the terms of reference of groups, which did not include consideration of economic issues. This is in stark contrast to advisory/guideline groups such as the National Institute for Health and Care Excellence who routinely consider health economics evaluations when formulating advice and guidance to ensure that proposed health interventions are both effective and cost effective. Consequently, there was (and still is) limited understanding of whether interventions were cost effective from either a health-systems or a broader societal perspective.

- 4.14. As discussed below I think there was insufficient focus and expertise on inequalities within SAGE or its subgroups. SAGE was tasked to take a primarily health perspective and membership reflecting this. This limited its ability to consider broader dimensions of the pandemic and the impact of the recommendations on different sectors. That said, I believe it was, ultimately, the responsibility of the government to ensure considerations about these other sectors were incorporated into policy making.
- 4.15. I have been asked to comment on the view of the Institute for Government that "*in the initial month, ministers put too much weight on SAGE – relying on it to fill the gap in government strategy and decision-making that was not its role to fill.*" I think SAGE and subgroups worked on the understanding that scientific advisory groups provide advice based on the best scientific evidence available and that policy makers and politicians decide on actions balancing the scientific advice with other perspectives. I do not know what processes ministers took to balance scientific advice with broader perspectives, the extent to which established public health bodies such as PHE were able to influence policy making, and it was also often not clear how scientific advice was formulated into policy. Since I cannot say how much weight ministers put on SAGE, I cannot say whether this was "*too much*", but I do think the scientific advice provided was of high quality given the information available at the time and was clear about areas of uncertainty.

5. NERVTAG

- 5.1. NERVTAG is an expert committee of the DHSC, which advises the CMO and, through the CMO, ministers, DHSC and other government departments. The role is to provide scientific risk assessment and mitigation advice on the threat posed by new and emerging respiratory viruses and on options for their management. NERVTAG is comprised of scientists with relevant expertise in human and animal infectious disease epidemiology, modelling, clinical care, virology and behavioural science. Members are appointed through national advertisement and interview. The committee meets both during non-pandemic periods and during pandemics. During the pandemic it became designated as a SAGE subgroup but continues to function now SAGE has been disbanded (AH/8 - INQ000211986). My role on the group was as a scientist with expertise in the epidemiology of acute respiratory infections.

5.2. The chair of NERVTAG stressed verbally on multiple occasions that the remit of the group was not to make policy decisions but to provide scientific risk assessment and mitigation advice that could support policy decisions. This was in keeping with the terms of the reference for the chair which include “*ensuring that the committee carries out its functions effectively and does not exceed its powers or functions*” (AH/8 - INQ000211986).

5.3. The group was careful to present evidence in this way rather than making specific policy recommendations but there were some occasions when we were asked to provide a scientific assessment of the potential impact of defined interventions/policy options which, inevitably, felt close to being asked to make a policy recommendation. For example:

- i. Early in the pandemic we were asked to advise on the likely effectiveness of border control measures and were presented with a series of very specific options (short of travel restrictions) for limiting introduction of Covid-19 into the UK. This felt like we were being asked to make specific recommendations on border control measures.
- ii. We were asked to provide evidence on the likely effectiveness of hand washing interventions and recommended that promotion of handwashing was likely to be helpful (AH/9 - INQ000211987) but did not recommend any specific policies to encourage hand washing interventions.
- iii. We provided summaries of scientific evidence on issues such as the likelihood of reinfection, the immunology of Covid-19, and the extent of asymptomatic infection and were asked to consider what implications this might have for immunity certification but did not make policy recommendations based on these (AH/10 - INQ000211953, AH/11 - INQ000211954, AH/12 - INQ000211955).
- iv. A subgroup of NERVTAG was asked to advise on approaches to develop clinical risk stratification models to identify those groups most at risk of severe consequences of Covid-19 (AH/13 - INQ000211956) and potentially guide targeting of interventions such as vaccination and shielding. Whilst I believe this was subsequently used to widen the group who would be advised to shield, we did not make any particular recommendations to that effect.

- v. When it became apparent that there were marked shortages of PPE in healthcare settings, and we were moving from a containment phase where most cases were managed in specialist units to a mitigation phase with widespread transmission and many cases in hospital, NERVTAG were asked on 06 March 2023 to comment on specific policy changes related to use of PPE in healthcare settings. These included moving away from routine use of HEFA filter masks when managing suspected, but not confirmed, cases of Covid -19 (AH/14 - **INQ00087540**). This felt like being asked to endorse a policy decision that had already been made. The group agreed the policy decision was reasonable.
 - a. I was subsequently asked to support DHSC and PHE in drafting revised guidelines around the use of PPE in healthcare settings. This draft dated 26 March 2023 proposed moving away from disposing of masks after each patient contact (which was contributing to the very rapid use of the diminishing stockpile of PPE and probably contributing very little to reducing transmission) to sessional use of masks (i.e. disposing of masks after a work session rather than after each patient). The revision also recognised the potential importance of asymptomatic transmission and proposed use of surgical masks in high throughput clinical areas and nursing homes to reduce asymptomatic transmission (AH/14A - INQ000211958). These proposals were subsequently endorsed by the UK Senior Clinicians Group and medical royal colleges and incorporated into updates of national PPE guidance. Although my involvement in this originally arose from discussions at NERVTAG it is my understanding that the support I provided in drafting these proposals was not part of my NERVTAG role and was in the capacity of a public health academic providing support to PHE and DHSC.
- vi. Early in the pandemic we were asked to prepare evidence on the implications of using different symptom profiles to identify those with potential Covid-19 infection for testing and for isolation of those with symptoms and their contacts (AH/15 - INQ000211959); this evidence may have supported policy decisions in this area but were not policy recommendations.

- vii. We were asked on two occasions early in the pandemic to review evidence on the effectiveness of community use of facemasks (AH/16 - INQ000211960, AH/17 - INQ000211961). On both occasions we concluded that the evidence base at the time was weak and the effect likely to be limited but did not make recommendations as to what policy should be followed.
- viii. When coming out of the first wave of the pandemic, in partnership with the Scientific Pandemic Influenza Group on Modelling (“SPI-M”), we were asked to advise on the implications of digital contact tracing and the impact of isolating contacts of people with Covid-19 symptoms prior to confirmation of a Covid-19 diagnosis in the index case (AH/18 - INQ000120452). This felt close to being asked to make policy recommendations on the timing of isolation in relation to test results. NERVTAG did not make any specific recommendations on this point, but did recommend that contact tracing and quarantine should be initiated on the basis of a symptomatic case and should not be delayed for laboratory confirmation.
- ix. As evidence of new variants emerged, we were asked to provide risk assessments of new variants to assess the potential threat posed by changes in transmissibility, immune escape and severity (AH/19 - INQ000211963). The implication of these risk assessments was that control measures would need to be continued or strengthened to avoid large scale mortality and the NHS becoming overwhelmed, but we did not make recommendations on which policies should be continued or strengthened.
- x. Later on in the pandemic we were asked to develop a paper on the likely future evolution of Covid-19 and longer-term implications for control measures (AH/20 - INQ000211965) but this was not linked to any specific policy decisions.
- xi. We were asked to provide evidence of the risks of coinfection and circulation of different respiratory infections alongside Covid-19 (AH/21 - INQ000211966). Again, this was not linked to any specific policy decisions, but we concluded that there would be value in strengthening surveillance and testing for other viruses.

- 5.4. Overall, on the occasions when we were asked to provide scientific advice to help understand the likely impact of potential interventions/policies, this, perhaps inevitably, felt close to being asked to make policy recommendations. The chair was consistent in seeking to ensure that we were providing advice that would help policy makers make decisions rather than making direct policy recommendations.
- 5.5. It has been put to me that NERVTAG should have adopted a more strategic approach to linking with other groups in the wider Covid community, in order to share knowledge, prioritise research questions and avoid duplication. I felt that the agenda of what NERVTAG was asked to look at was largely determined by the main SAGE group and that there were limited opportunities for NERVTAG members to prioritise questions although there were some attempts at this, for example, a call for members to highlight areas they thought needed to be considered. Some of the papers and advice we developed was in conjunction with other advisory groups (e.g. JCVI and SPI-M) and other academic groups (e.g. risk stratification work which developed methodology to analyse electronic health records to assess which groups were most at risk of hospitalisation and mortality from Covid-19). The group frequently considered evidence from the wider scientific community in formulating advice including presentations from scientific groups but there were not formal mechanisms for soliciting this input from other scientific groups. This largely relied on group members broad connections with scientific colleagues and direct approaches to the Chair from scientific groups with relevant data. On some occasions where NERVTAG was aware of other relevant unpublished science they would reach out for presentations or data. I felt it would have been helpful if there were clearer mechanisms for NERVTAG members to understand the questions that other advisory and policy groups were working on to help to identify gaps, prioritise questions and avoid duplication but that this was largely the remit of the main SAGE group.

Social distancing

- 5.6. As a group tasked with providing scientific advice to support policy, I felt that, early in the pandemic (in the absence of specific treatments or vaccination and with very limited testing capacity), general population social distancing measures were likely to be one of few options for reducing large scale mortality and that policy was needed in this area. I therefore thought that the scientific basis for social distancing measures

would be a valid area for NERVTAG to advise on. When I raised this early in the pandemic, I was told that another group, SPI-M, was advising on this. Whilst I agreed that modelling approaches were valuable in assessing the potential impact of such measures, I felt there were broader scientific issues about transmission of Covid-19, how this relates to social distance and on the potential effectiveness of social distancing that NERVTAG could have been tasked to advise on.

- 5.7. It was not until much later in the pandemic that the SAGE EMG transmission subgroup, that could consider epidemiological evidence on transmission and effectiveness of mitigations, was established. Considering this, I think it could have been valuable for NERVTAG to advise on the scientific basis for social distancing measures in advance of other groups being established and to complement advice from SPI-M and the Scientific Pandemic Influenza Group on Behaviour.

6. The national lockdown

- 6.1. In the context of a rapidly spreading highly transmissible respiratory virus with appreciable mortality and little if any population immunity, and in the absence of vaccines, specific treatments or widespread availability of testing to support identification of cases and isolation of contacts, the main intervention available to minimise mortality and prevent the NHS from becoming overwhelmed was general population social distancing measures. The national lockdown was an approach to achieving this largely through legislative means and in my view prevented much larger scale mortality and disruption of healthcare than would have occurred if the lockdown had not been introduced. Whilst it is arguable that transmission could have been slowed through voluntary measures and public health messaging, such as advice to work from home where possible and to avoid crowded spaces, I think it unlikely this would have achieved the same reductions in transmission, hospitalisations and mortality. My view is that the lockdown was necessary to reduce an unprecedented number of deaths and to ensure the NHS had capacity to treat those with severe illness. Implicit in this view is that preventing large scale loss of life was a higher priority than avoiding economic losses and broader societal impacts of the lockdown, although balancing these priorities is the role of government rather than scientific advisors.

- 6.2. The very rapid doubling time of the infection and the exponential growth that this leads to means that case numbers and associated mortality can rise very quickly. Hospitalisations and deaths rise with one- or two-weeks delay following rises in cases of infection so waiting for these indicators to rise substantially before initiating widespread social distancing measure will markedly reduce the number of deaths and hospitalisations. Also, hospitalisations and deaths will continue to rise for some weeks after the introduction of widespread control measures. These factors mean that the earlier such social distancing measures are introduced the more cases and deaths will be prevented. Even delays of one or two or weeks can make a very substantial difference to the numbers of deaths avoided. If such interventions are introduced late (at higher levels of infection) they also may need to be continued for longer to bring infection, hospitalisation and mortality rates down to acceptable levels. Consequently, early intervention is likely to be more effective and cost effective than later intervention.
- 6.3. Although NERVTAG was not involved in decision making or advice about such social distancing measures it is my understanding (from notes of SAGE and subgroup meetings and discussions in the media) that decisions about the timing of introduction of general population social distancing measures were influenced by modelling which was conducted in the context of very limited data availability about the extent of spread of Covid-19. These models therefore underestimated the extent to which Covid-19 had spread and consequently advice on the optimum timing of introducing highly disruptive control measures. This lack of reliable data on disease incidence was partly a result of limited testing capacity and partly a result of an absence of national surveillance measures to routinely measure the community frequency of respiratory infections (as opposed to infections presenting for medical care). Such surveillance systems are very challenging to set up rapidly but should arguably be a routine part of surveillance of acute respiratory infections. The absence of such systems early in the pandemic meant that data on the extent of spread was inadequate. Although attempts were made to adjust for under-ascertainment of cases, these did not adequately account for this. Community studies of respiratory infection show that the under-ascertainment of infection rates through surveillance based on those who attend health care vastly underestimates the incidence of infection so arguably more extensive correction for under-ascertainment of infections could have been made even in the absence of contemporary community level

surveillance data. I also understand there is some controversy about whether or not behavioural scientists advised that people would not comply with social distancing for long (the concept of “behavioural fatigue”) and that therefore it was important not to introduce disruptive measures too early. I think these elements of scientific advice may have contributed to the lockdown not being introduced until it became apparent that the NHS could imminently be overwhelmed with Covid-19 cases.

- 6.4. Another factor that may have delayed introduction of such measures is that pandemic plans were largely based on Influenza, which is substantially less transmissible than Covid-19 and does not have such a quick doubling time. These plans had not adequately considered the option of widespread social distancing measures as a means of control in the event of a more transmissible virus with shorter doubling times. They had also not factored in the limitations of measures based on case and contact isolation that result from difficulties identifying cases and asymptomatic transmission. A further reason for delay may have been discussions about how herd immunity derived from natural infection would eventually lead to case numbers and deaths decreasing, however I think, (based on my following of government communications in the media) that the concept of achieving control through herd immunity from natural infection was dismissed early on, before widespread social distancing measures were needed.
- 6.5. This combination of factors meant that the lockdown was introduced perhaps a fortnight too late in London (which was affected earlier than other parts of the country) and a week too late in other parts of the country. Even though these delays do not sound very long they will have had a very substantial impact on the number of deaths and hospitalisations in the first wave due to the rapid doubling time of the infection. There also could have been earlier messaging about general population social distancing measures, short of a lockdown that could have bought more time by reducing transmission rates.
- 6.6. It has been put to me that the desire of ministers to avoid a lockdown framed the advice commissioned from SAGE, and that the delay in recommending lockdown was influenced by a belief amongst scientists that this would be politically unpalatable. As I was not part of the main SAGE group and NERVTAG was not asked to consider social distancing measures, I was not party to discussions about lockdown. Whilst it

is entirely possible that scientists believed that a lockdown would be politically unpalatable, I cannot comment on whether this framed the advice they gave.

6.7. From my own perspective I did think that lockdown would be politically unpalatable, but this did not limit the advice I gave. In fact, I went outside of the committee advisory process to highlight evidence on the extent to which public activities outside the household contribute to transmission of respiratory infections with a view to allowing decision makers to understand the importance of general population social distancing measures (AH/22 – INQ000214254, AH/22A – INQ000214257). Part of my belief that lockdown would be politically unpalatable was based on earlier government communications and reassurances that we had amongst the best preparedness capability of any country (despite it being clear to me that these systems would not be sufficient to prevent a major wave of infection and mortality), the prime minister publicly ignoring advice on simple measures such as avoiding shaking hands, the failure to restrict mass gatherings such as major sports events that could amplify transmission and the continuation of all government business in person. This gave me the impression that the seriousness of the situation had not been appreciated by ministers and the measures they were prepared to take to control transmission through disruptive societal interventions that would damage the economy were limited. I also remember early informal discussions with scientific colleagues outside of the scientific advisory structure that the coercive measures used in China to control spread would not be countenanced in Western democracies. I cannot speak for other scientists, but this provides some background for how the political context may have framed advice on highly disruptive interventions of “politically unpalatable” interventions. Despite this context I think that scientists aimed to provide advice based on their scientific understanding rather than these political considerations.

7. The quality of decision making by UK government during the Covid-19 pandemic.

7.1. I have been asked to set out my views as to the quality of decision-making by the UK government during the Covid-19 pandemic, including details of any shortcomings. I have described above why I think that underestimation of the spread of Covid-19 and political unpalatability of disruptive interventions may have influenced delays in lockdown leading to higher levels of mortality and hospitalisation than could have

been achieved through an earlier lockdown. I describe other potential shortcomings below.

Underestimation of longer-range transmission.

- 7.2. I think that the importance of longer-range transmission in public spaces as opposed to transmission through close contact was underestimated. Early control measures were largely based on isolation of cases and close (mainly household) contacts but did not involve wider measures to reduce transmission in public spaces due to longer-range or more fleeting contact.
- 7.3. Whilst it is widely appreciated that close contacts of respiratory infections are at highest risk of acquiring infection, transmission can also occur to people at greater distances and with shorter contact. Whilst the risk to individuals exposed through longer distance or fleeting contact is lower than for those individuals who are exposed through prolonged close contact, in normal times the number of people exposed through distant or fleeting contact far exceeds the number exposed through close contact. This means that a high proportion of transmission likely occurs through this more distant or fleeting contact outside the home.
- 7.4. Whilst transmission to close contacts is relatively easy to measure, as these contacts can be readily identified and followed up, it is much harder to gain evidence of the extent of transmission that is due to more distant contact in public, work or social spaces. Furthermore, wider measures to reduce transmission in public spaces are highly disruptive and therefore potentially politically unpalatable. That is why I thought it was particularly important to bring my research on the contribution of exposure to public spaces and activities on risk of acquiring acute respiratory infections to the attention of colleagues at DHSC and the Chief Scientific Advisor even though this was not an area under consideration by NERVTAG.

Aerosol vs droplet transmission

- 7.5. Based on my following of scientific discourse in published literature and at relevant scientific conferences and meetings in the years prior to the pandemic I think there was also a prevalent belief that respiratory infections mainly spread through droplets

(large particles that cannot travel more than a metre or two) rather than by aerosol (very small particles that remain suspended in the air for long periods and travel longer distances). I think this is because it is scientifically challenging to determine the relative contribution of droplets and aerosols to transmission, for example it is easier to collect and analyse large droplets to show they contain infectious particles than it is for much smaller bioaerosols.

- 7.6. I think this difficulty in measuring transmission related to aerosols had led to scientific opinion focussing on the role of droplet-based transmission and underestimating the importance of aerosol transmission. These views shifted during the pandemic, but early control measures were based around identification of cases and isolation of household contacts which would not have made much impact on more long-distance transmission. This is further complicated by most respiratory infections having a wide spectrum of clinical presentation ranging from asymptomatic infection to minimally symptomatic infection, which will often not lead to people seeking testing and makes identification and isolation of infectious cases and their close contacts challenging. Because of these factors, any strategy predicated on the identification and isolation of cases and close contacts is likely to have a limited impact and be insufficient to control transmission of an infection which can spread through more distant contact and where many infectious cases have minimal or no symptoms.

Test and Trace

- 7.7. This strategy of identifying and isolating cases and close contacts also underpinned the very extensive investment in Test and Trace and an overreliance on the ability of this approach to control transmission when population immunity rates were low.
- 7.8. I thought this overreliance on the potential effectiveness of Test and Trace led to lockdown being lifted when rates of disease remained high contributing to further high levels of infection. Further policies, such as 'Eat Out to Help Out' further compromised the ability to control infection levels. This policy is considered in more detail below.

- 7.9. I thought that after the first wave of the pandemic it was virtually inevitable that without widespread social distancing measures there would be a very sizeable winter wave. This view was informed by modelling predictions of repeated waves, studies showing that the great majority of the population had not been infected in the first wave, and therefore remained susceptible, limitations of Test and Trace strategies to control infection, and the fact that respiratory viruses display marked winter seasonality.
- 7.10. Consequently, I thought that plans to reintroduce such social distancing measures over the winter period should have been made much earlier so they could be introduced in a timely and planned way. The Academy of Medical Sciences report – “Preparing for a challenging winter 2020/21” [AH/23 - INQ000211967] went some way towards warning of this scenario but plans to reintroduce more stringent control measures in a timely way did not seem to arise. Indeed, the opposite seemed to be the case with social distancing policies being relaxed to allow families to gather for the Christmas period despite low levels of immunity and the high risk of resurgence of the virus over this period.
- 7.11. I think this lack of appreciation of the extent of risk of a severe winter wave meant that intensification of control measures was again introduced late resulting in more avoidable deaths and hospitalisations. This was further exacerbated by the emergence of a more infectious and severe variant in the run up to winter

The tier system

- 7.12. The principal of the tier system was to base the level of restrictions on the intensity of transmission in local areas and to wait to introduce these more intense restrictions to other areas once there was evidence that cases had reached a high level (levels at which high hospitalisation and death rates were likely to occur). As the tier system was in operation during a period when the great majority of individuals had not acquired immunity through infection or vaccination, continued increases in cases in areas with lower levels of intervention were inevitable, such that areas of low incidence would become areas of high incidence. Waiting for those areas to reach high levels of infection before reintroducing more intensive control measures likely meant that hospitalisations and deaths associated with high transmission were not avoided.

7.13. These limitations in the effectiveness of the tier system in preventing cases, hospitalisations and deaths needed to be balanced with the societal and economic benefits of areas having restrictions lifted. However, when intense restrictions are introduced at high levels of infection, they are likely to need to be more intense and of longer duration than if they are introduced at lower levels of infection. The existence of different control measures in different places at different times also made it hard to give clear consistent national messaging about the importance of voluntary measures to maintaining social distancing, avoid crowded places, work from home where possible and other measures to reduce transmission. Reliance on the tier system also arguably delayed the introduction of national intensification of measures when this needed in the second wave.

7.14. I thought that following the second lockdown government decision making on the gradual relaxation of control measures through the “road map” was generally proportionate and scientifically informed, although at times, relaxation decisions were taken in advance of being able to fully assess the threat of new variants. For example, in the Omicron wave “Freedom Day” – (the lifting of all legal measures) was announced in advance of being able to form a full assessment of how much vaccine immune escape of this variant would lead to spikes in severe disease. Fortunately, the characteristics of the virus (decreased severity) and immunity (providing much stronger protection against severe disease than against infection) were such that these spikes in severe mortality did not occur but I don’t think we had a high degree of scientific confidence that this would be the case.

Eat Out to Help Out

7.15. Based on first principles of transmission of respiratory infections any initiative that would be expected to increase the extent of social mixing, particularly in indoor settings or for long periods such as during a meal would be expected to increase the transmission of Covid-19. The measure was introduced in a period of low population immunity. The measure restricted the people with whom you could eat out to members of your social “bubble”, which may have reduced the impact on transmission. However, this limitation would not have reduced the impact on longer range aerosol transmission, particularly in indoor spaces. Mask using during meals

is not practical so whilst staff wearing masks will have helped, the fact that customers could not practically wear masks during a meal will have contributed to some extent.

7.16. The measure was introduced without government warnings that this could be a particular risk for clinically vulnerable or elderly people who were at higher risk of serious consequences of infection. Early in the pandemic, prior to restriction of hospitality in many countries there were multiple published examples of Covid-19 outbreaks in indoor hospitality settings including transmission to those who were not sitting at the same tables as the index case, providing evidence of the risk associated with this activity. Incentivising this activity therefore seemed very likely to increase transmission and contribute to rising caseloads. The measure seemed beneficial from the perspective of the hospitality industry (who understandably lobbied for their businesses to be allowed to operate) but was obviously going to be at the expense of more cases, hospitalisations, and deaths. It is also likely to have contributed to public perceptions about the role of social mixing in Covid-19 transmission as the campaign potentially reassured people to think that social contact in all settings was safe.

7.17. I am not aware of SAGE or its subgroups being asked to comment on this measure although it is possible that SAGE EMG may have been asked to comment. If I had been asked to provide advice it would have been along the lines of explaining the science behind the likely implications of this measure as described above.

7.18. The Warwick University approach to assessing the impact of this measure is reasonable but limited by the fact that the researchers did not have access to individual data on people's use of the scheme and their infection levels. I helped conduct analyses of Virus Watch data involving detailed individual level measures of contact patterns and non-household activities as well as outcome data on whether or not people were infected based on results of the Test and Trace programme (AH/24 - INQ000211698). This allowed us to estimate the relative contribution of different non-household activities to overall Covid-19 transmission during the second national lockdown and during the period following lifting of these restrictions. Although this does not relate to the period when Eat Out to Help Out was operating, it provides

insight into the role of attending hospitality venues on Covid-19 transmission in later periods.

7.19. We estimated that during the period of the second national lockdown, when non-household activities were restricted, that leaving home for work and using public transport were the main non household activities contributing to transmission but that (unsurprisingly) attending hospitality and indoor leisure venues, which were severely restricted, did not contribute significantly to transmission. Following the lifting of restrictions, leaving home for work, and using public transport remained important and use of indoor leisure and hospitality venues became important contributors to infection.

7.20. We initially conducted these analyses and published these estimates separately for these time periods using slightly different analytical approaches. A manuscript comparing the relative contribution of these activities at different stages of the pandemic (including during the Omicron wave) using the same analytical approach across all periods is currently under review. The figures below are based on this as-yet unpublished manuscript (AH/25 - INQ000211969).

7.21. The estimates of the proportion of cases attributable to leaving home for work during the period of restrictions was 30% and for public transport was 5%, use of indoor hospitality and leisure facilities did not contribute significantly during this period (as these were highly restricted). Following the lifting of restrictions, the proportion of infections attributable to leaving home for work was 17%, for public transport was 12%, for indoor leisure activities was 10%, and for indoor hospitality was 7%. Use of outdoor leisure and hospitality facilities was not associated with significant transmission. Whilst these figures relate to a different time period than the University of Warwick analysis and our analyses do not cover the period of the Eat Out to Help Out initiative, they demonstrate the likely scale of the contribution of attending hospitality venues on transmission and are consistent with the estimates produced in the University of Warwick analysis.

Exiting the first national lockdown

7.22. I have been asked for my views on the Institute for Government finding that there was a “*lack of joined-up thinking*” in government as the UK exited the first national lockdown. Although not party to government thinking and, therefore, the extent of “*joined up thinking*”, there was a clear tension between maintaining restrictions on industries and activities likely to increase social mixing, which would be expected to keep transmission at low levels, and the economic and social benefits of easing such restrictions.

7.23. I have been provided with a quote from the then-Chancellor of the Exchequer that we would be able to “*stay ahead of the virus*” after lifting restrictions. In my view, it was unrealistic of the treasury to think that. My view is based on:

- i. The extreme transmissibility of the virus
- ii. The low levels of population immunity to the virus at the time
- iii. The fundamental importance of population mixing patterns to transmission of the virus
- iv. The fact that the virus could transmit from asymptomatic people and people with minimal symptoms
- v. The clear limitations of strategies to identify and isolate cases and contacts through the Test and Trace programme which was only able to identify a minority of infections despite having huge investment and capacity, and
- vi. An overestimation of the ability of mitigation measures including mask use and social distancing whilst using workplace and public spaces to interrupt transmission.

7.24. The legislative nature of restrictions on particular sectors of the economy led to the need to make decisions on which sectors should be restricted at different times. Since there was limited opportunity to measure transmission in these different sectors during periods when they were intensely restricted, there was a lack of empirical data to inform decisions when coming out of the first wave. The easing of restrictions allowed collection of more detailed data on settings where transmission occurred, but information systems were not generally set up with a view to assessing the impact of exposure to different settings, limiting the ability to draw robust conclusions.

Analyses of occupational mortality following the first wave of the pandemic provided strong indications that key worker occupations, where it was not possible to work from home were at higher risk of mortality, which provided evidence that working from home was an effective intervention and that opening up additional workplaces would increase transmission. Opportunities for systematic collection and analysis on exposure to different settings could have been planned as part of routine programmes and large-scale data collection projects. For example, measurement of exposure to different settings could have been a routine part of the Test and Trace data collection but, as the primary purpose was to identify infections and close contacts, was only introduced for a subset of users in periodic case control studies led by UKHSA. The ONS Infection Survey and the REACT study were funded to accurately measure the prevalence of infection according to age, gender and geographical location, with identification of settings for transmission not being a core part of their role. Virus Watch attempted to systematically assess the role of exposure to different settings but, in comparison to other National Core Studies, had substantially less funding and was comparatively small, so it took time for sufficient cases to accrue to enable such analyses to have sufficient statistical power. Arguably there was a missed opportunity to plan for the need to be able to assess the importance of different settings in large scale data programmes and surveys. The SAGE EMG did systematic work on developing risk assessment profiles for different settings based on mechanistic understanding of factors likely to increase risk. It was quite late in the pandemic (January 2021) that the SAGE EMG Transmission subgroup was established with part of its role being to systematically assess the epidemiological evidence for transmission risk in different settings. Advice from this group contributed to more evidence-based sequencing of lifting of restrictions for the “Road map” to lift restrictions coming out of the second lockdown. The high coverage of vaccination also made such decisions somewhat less critical than at earlier stages of the pandemic although this was complicated by the emergence of new variants with differing transmission potential, severity and immune escape.

7.25. I do not know how decisions were made on the sequencing of lifting of interventions following the first wave of the pandemic but surmise that this was likely based on a combination of theoretical considerations about which settings were highest risk, economic considerations, broader assessments of the comparative societal value of being able to use different settings, political considerations about the unpopularity of

restrictions, and, perhaps the ability of different sectors to lobby for restrictions to be lifted. Balancing these considerations may have led to decisions on the sequencing of which sectors should have restrictions lifted seeming arbitrary. The same was arguably true for the reintroduction of restrictions in the tier system. It may have also compromised the ability to give consistent, simple and easily understandable public health messaging to work from home where this was possible, to avoid crowded indoor spaces where possible, to maintain social distance and mask use where possible, and to take particular care if you are clinically vulnerable or elderly.

Clarity and transparency

7.26. It has been put to me that the UK government did not see transparency of evidence as an integral part of managing the Covid-19 crisis and I think it is true to say that. In particular, I think the decision not to publish contemporaneous minutes of SAGE meetings until later on in the pandemic inhibited transparency. I think later publication of these minutes was very helpful as were the regular television events to explain the situation and the reasoning behind decisions.

7.27. I have been asked to comment on the Institute for Government's finding that government decision making was "*chaotic*", that ministers "*failed to clearly communicate their priorities to science advisers*", and whether this "*delayed decisions and made it harder for scientific advisers to provide useful advice*". I cannot really comment on whether central government decision making was chaotic as there was very limited, if any, communication between central government and advisory groups and a lack of transparency in the process of how scientific advice was translated into policy decisions.

7.28. On occasions it was clear from advisory group commissions that government was interested in the effectiveness of different interventions such as border screening, the test and trace programme, digital contact tracing, community mask use, use of symptomatic and asymptomatic testing and vaccination (primarily technological rather than societal solutions), which gave an indication of governmental priorities. There appeared to be less government interest in arguably less palatable societal interventions which may have led to delays in their introduction when there were limited other options, due to the impending emergency.

7.29. There was also no clear framework for how health considerations should be balanced with economic and wider societal and political considerations. Whilst advisors were very aware of the high cost and negative consequences of interventions their main remit was to advise on the implications for Covid-19 related health consequences rather than broader societal issues. Balancing and considering the wider implications of interventions was mainly the role of policy makers and politicians and there was limited transparency in how scientific advice was balanced with these broader considerations.

Communicating the boundary between scientific advice and decision making

7.30. Policy decision making is rarely, if ever based purely on scientific advice and neither should it be. There are always considerations about the relative priority of different implications of decisions such as balancing the impact on health and impact on the economy, whether interventions are affordable, acceptable, feasible and equitable. There are also uncertainties in scientific evidence and in predicting future scenarios as well as decisions to be made about how much risk it is acceptable to take given these uncertainties. Scientific advisory groups were primarily asked to provide evidence that would help decision makers think about the likely implications of potential interventions on minimising harm directly due to Covid-19.

7.31. In addition to this, despite processes to generate scientific consensus through advisory groups, the results of science are often conflicting, particularly in a rapidly emerging health hazard and consensus often hides diverse scientific views. Evidence synthesis and policy generation that would normally take many months or years to develop and implement is compressed into very short time scales in the context of a rapidly spreading pandemic. Scientific advice included assessments of uncertainty, but this was rarely communicated by politicians. Scientific advisors were working on the basis that scientists *advise* and policy makers and politicians *decide* based on this advice and broader considerations.

7.32. In the early days of the pandemic, I think the mantra that politicians were “following the science” provided false reassurance that everything was under control even as it

became increasingly obvious that this was not the case and that a major health disaster was imminent.

- 7.33. I think the term “following the science” did blur the boundaries between scientific advice and policy making and make it appear as though scientific advisors were making policies, which was not the case. It also perhaps had the effect of making it seem as though all policy was based on recommendations made by scientific advisory groups whereas some policy did not appear to arise from or follow this advice.
- 7.34. The regular televised co-presentation of policy decisions by the prime minister, data by CMO, and explanation of scientific issues by GCSA had the benefit of providing important context to policy decisions but may have further perpetuated the public perception that scientific advisors were responsible for making policy. This public perception was apparent from numerous social media attacks on scientists involved in advisory groups blaming them for the negative impact of policy decisions, particularly following media appearances to explain the science.
- 7.35. I felt that the complexity of the different legislative components of the response, particularly during periods when some but not other restrictions were being relaxed or introduced at different times and different places (the tier system) meant that it was hard for the public to understand what restrictions applied. More importantly this complexity of rules detracted from clear messaging about the simple things people could do to reduce risk e.g. Working from home where possible, avoiding crowded indoor settings where possible, maintaining social distance where possible, seeking testing and isolating when ill, taking up vaccines, wearing masks and taking particular care if you were clinically vulnerable or elderly. Some initiatives such as Eat Out to Help Out, discussed above, and plans to relax restrictions for Christmas gatherings directly conflicted with these simple messages further confusing communication of simple principles of protection.
- 7.36. I felt that, particularly early in the pandemic, there were limited approaches to ensure that information was communicated in a way that would resonate with, or was tailored towards, different populations including those in low paid jobs not covered by the furlough scheme, key workers who could not work from home and ethnic minority groups.

7.37. I have been asked to comment on the Institute for Government's view that communication was "*confusing*", and that ministers "*switched back and forth between alarm and reassurance, while failing to drive home key messages*". As described above, a more consistent approach to communicating the simple messages about what people can do to protect themselves and others rather than seeking to communicate complex and regularly changing rule-based mandates might have been more effective.

8. Lessons learned

Myself and my team

- 8.1. The main lessons myself and my research team learnt were approaches to rapid generation of evidence through a team-based approach, the timely dissemination of this evidence firstly in the form of policy briefings, secondly as pre-print publications to allow wider rapid access to the scientific community and thirdly through more formal peer reviewed publication.
- 8.2. We also learnt about the value of including additional approaches to recruit minority populations as these were underrepresented in many Covid-19 studies.
- 8.3. I felt that it would have been of value if there were more coordination between studies funded through the responsive UKRI/NIHR channels and the National Core Studies programme particularly in order to better plan and ensure all relevant aspects were covered across studies working in similar areas (in my case community studies of Covid-19 occurrence).
- 8.4. We learnt that given the rapidly evolving nature of the pandemic and the changing policy context and information needs in different stages of the pandemic it was helpful to be able to design research in a way that could respond to these changing requirements. Building in this flexibility into the design of research is helpful and should be encouraged.

8.5. I learnt that advisory group members were well placed to provide clear communications of the science and of the simple steps that people could take to protect themselves and others but that this could be a delicate path to tread as advisory members were asked to comment on science, not policy, but the media were often seeking views on the appropriateness of policy decisions.

Communication with the public

8.6. Prior to the pandemic I had expected that PHE would play a key role in communicating policy but that the transfer of many responsibilities away from this body to other government and commercial bodies may have prevented PHE from being extensively involved in public communication, which I thought was damaging as PHE were experts in communication about infectious disease risk and mitigation strategies. In my new role at UKHSA I am aware that there is a process to carefully plan communication strategies for future pandemics in partnership with other government departments and the NHS taking account of lessons learnt during the pandemic.

8.7. There was a huge need and demand for clear explanations of the pandemic and measures people could take to protect themselves and others, outside of the formal televised regular events. Much of this need was met by academic advisors and other scientists rather than by statutory public health bodies. Official communications, largely through these regular televised events, did a good job of explaining the situation to individuals with a high degree of health literacy but may have been less accessible to other groups. It is challenging to tailor messaging to diverse groups and specific strategies to access communication channels used by subgroups of the population including young people, ethnic minority communities could have been more widely exploited. This was not addressed to any significant extent until after the first lockdown when reports of high mortality in socially disadvantaged and ethnic minority groups were published. Subsequent to the first wave there were much more active approaches to tailor messaging and use multiple channels of communication to reach different groups. This is a lesson that needs to be remembered for future pandemics.

8.8. Most importantly, more clear and consistent messaging about the main actions individuals can take was needed, whereas due to the complexity and the number of rules communication often focussed on trying to explain these rules rather than the basic principles of protection. As rules changed frequently this further compromised the ability to give clear and consistent messaging. This is a lesson that needs to be learned for future pandemics.

Modelling

8.9. Modelling is a statistically complex and hard to explain methodology even to other scientists who are not modellers. Simplified communication of the results of modelling may overestimate the certainty of modelling estimates. Explaining transmission and the likely effect of interventions in simpler terms for example using appropriate metaphors about the spread of infection can help to make this clearer. Acknowledgement and clear communication of uncertainty is important. It is challenging to introduce public scrutiny of the mathematics used in models but may be more feasible to introduce scrutiny of the main assumptions used in models, for example on the likely uptake of proposed interventions. Clear explanations of why a range of modelling groups are engaged in providing advice (so that advice is not based on single studies), the processes modellers use to explore and communicate uncertainties, what is meant by the concept of a “reasonable worst case scenario” and how modellers are involved in the scrutiny of other modellers’ work may help. It may also be helpful to develop wider approaches to allow scrutiny of model parameters and assumptions by non-modelling scientific and public health colleagues, accepting that they may have limited insight into the mathematics of models.

8.10. Outside of pandemics, mathematical modellers, epidemiologists, and economic modellers are familiar with working together to assess the likely effectiveness and cost effectiveness of different interventions to control infections. However, the economic implications of control measures appeared to be outside of the scope of what advisory groups were asked to advise on. Consequently, I saw no cost effectiveness models developed to inform policy making. There may have been governmental economic forecasting of the implications of interventions, but I never saw this. A further complication is that most economic models of infectious disease are based on establishing the cost effectiveness of relatively simple technological

health approaches such as vaccination and are limited to considering costs and benefits from a health service perspective. As many of the interventions used had very broad societal and economic implications there would have been major challenges in incorporating all of these different perspectives as the methodology to do so is not well developed. Methodological development is needed in this area.

Scientific policy advisory mechanisms

8.11. I think despite assertions that policy was following the science, most scientists on advisory groups did not have opportunities to engage with policy makers or politicians either individually or collectively. Scientific advice was largely communicated through the CMO and CSA. Whilst their role was essential, complementary approaches to allow scientific advisory groups and individual scientists from different disciplines to directly engage with, and, be questioned by policy makers and politicians may have strengthened decision making. The House of Lords Science and Technology committee helped but seemed to take an inquisitorial, scrutinising role rather than one that encouraged dialogue between advisors and policy makers.

8.12. Health protection experts within the civil service can also be a valuable conduit for communication but they were not routinely represented on scientific advisory groups, perhaps because of an overly strict separation between scientific advisory groups and policy makers. There also appeared to be a side-lining of PHE and it was eventually dissolved and many of its responsibilities given to other government organisations and commercial bodies. This limited the extent to which PHE could act as an intermediary for scientific advice.

8.13. In general, there was a lack of clarity about who was making policy decisions, how these decisions were arrived at and very limited opportunities for constructive dialogue between advisors, policy makers and politicians. I think there would be value in re-evaluating science-policy mechanisms for public health emergencies to address these communication issues. For example, whilst it may not be feasible for politicians and policy makers to liaise directly with the large number of scientists on advisory groups it may be valuable for them to have regular meetings with chairs of SAGE and its subgroups rather than the responsibility for this communication being placed mainly on the CSA and CMO.

9. Diversity and Equality

- 9.1. Marked inequalities in Covid-19 risk, hospitalisation and mortality occurred throughout the pandemic in areas of high deprivation, in ethnic minority groups and other socially vulnerable groups. This is a fundamental issue that needs to be planned for and addressed better in future public health emergencies. People in these groups were less able to comply with protective measures such as work from home orders due to being more likely to be in public facing occupations, in occupations that were less likely to be covered by the furlough scheme or provide access to sick pay or from living in poverty meaning that they could ill afford to suffer financial losses. They were more likely to live in overcrowded accommodation conducive to spread and in urban areas where disease rates are highest. They are more likely to need to use public transport. They were more likely to live in multigenerational households with vulnerable elderly people. They were more likely to have chronic illnesses placing them at higher risk of severe Covid-19 and more likely to have contacts who were vulnerable. They suffer barriers to accessing health care and delays in care, worsening outcomes.
- 9.2. The negative impact of interventions also fell hardest on these groups, for example: stay at home orders with restrictions on use of public outside space, where transmission risk is low, is particularly problematic for those in overcrowded accommodation with no outside space; those who cannot afford unlimited internet access will have not benefited from the ability to work from home or to engage in education online, widening inequalities, this will also have limited access to online health care and other services; those in low paid zero contract hour jobs with no access to sick pay will have incurred unaffordable financial costs through needing to isolate; similar groups were also not covered by the furlough creating financial pressures to work outside the home.
- 9.3. It is my view that the response to mitigating inequalities in Covid-19 risk and outcomes was, in general too little and too late and that future pandemic planning and response, as well as health programmes in non-pandemic periods need to need to systematically address multiple dimensions of inequalities.

Data and surveillance

- 9.4. Co-CIN produced a report for SAGE and NERVTAG highlighting differences in ICU admission and survival across ethnic groups in May 2020 (AH/26 - INQ000211970). PHE/ has produced a report summarising marked inequalities according to ethnicity and social deprivation (in June 2020, updated September 2021) (AH/27 - INQ000101218). It wasn't until this PHE report was produced that inequalities began to be considered to any meaningful extent.
- 9.5. Any data that includes the post-code of the individual affected can be readily reported according to the level of social deprivation by assigning the Index of Multiple Deprivation based on this postcode. Routine surveillance reports and presentations of these in national media briefings did not include social deprivation but focussed on rates in different geographical areas and age groups, limiting early awareness of social disparities or thinking about how to address this. Ethnicity data is more complex to report, was not part of death certification or laboratory reporting and often requires time-consuming data linkage activities. This contributed to the high risk in ethnic minority groups not being reported until after the first wave of the pandemic. Virtually no data were available for other vulnerable groups including migrants, asylum seekers, refugees, homeless, Gypsy Roma and Traveller communities.

Working groups and advisory groups

- 9.6. Although it is well established that the majority of communicable and non-communicable diseases have a strong social gradient and affect ethnic minority groups differentially, working groups and advisory groups to address inequalities in Covid-19 were not convened until after the June 2020 PHE publication "Disparities in the risk and outcomes of Covid-19". Thus, considerations of how to mitigate inequalities were generally not thought about until the second and later waves of the pandemic.
- 9.7. Following publication of this report, the Equalities Minister established cross government, cross agency working to inform action to address inequalities. They worked closely with the race disparity unit to review current evidence of actions, address research gaps, make recommendations for improving data quality, improve

stakeholder engagement and communications and produce quarterly reports on progress. They produced quarterly reports in October 2020, February 2021 and May 2021 and a final report in December 2021. The primary focus of actions was on addressing race and ethnicity related disparities with little focus on socioeconomic inequalities despite there being clear evidence of wide socioeconomic disparities in risk.

9.8. Key aspects of the response highlighted in the final report include, publishing guidance to make workplaces “secure” for those not able to work from home (not specifically targeted at inequalities but thought to be particularly relevant for those in ethnic minority groups who could not work from home), guidance on preventing transmission in households (not specifically targeted at inequalities but thought to be particularly relevant for those in overcrowded households), measures to protect taxi drivers (over 50% of whom were from ethnic minority groups) and a series of measures to increase uptake of vaccine in ethnic minority groups (AH/28 - INQ000211972). These included: using places of worship as vaccination centres and pop-up venues; use of vaccination buses; targeted campaigns to address vaccine concerns and uptake; over £7 million of funding to support community engagement; working with trusted voices including faith leaders, celebrities and social media influencers; tackling misinformation about vaccines; and, in January 2021, supporting a Community Champions programme to increase uptake with £23 million. They also highlighted investment in research and in improving data quality to enable better understanding of ethnicity related differences.

9.9. The SAGE Ethnicity subgroup (AH/29 - INQ000211974) reported in September 2020 on factors underlying increased risk including social deprivation, occupation, high levels of chronic disease in some groups, poor access to health services, differential access to PPE, and appropriateness of public health communications (AH/30 - INQ000211975). They highlighted that lack of relevant data on ethnicity and other social variables in key datasets at different stages of the Covid-19 pathway limited the ability to produce quantitative analyses to understand the mechanisms of increased infection risk, hospitalisation and mortality. They made recommendations on communication including tailoring of communications, translation of materials and community engagement to improve targeting of public health messaging.

9.10. No similar SAGE sub-group was convened to address broader socioeconomic influences on Covid-19 risk and outcomes, despite their being extensive academic expertise in inequalities research in the UK, longstanding understanding of social disparities in infection risk and expertise on Inclusion Health Populations (populations characterised by social exclusion, extremely high morbidity and mortality, high levels of stigma and poor access to health services – examples include vulnerable migrants, people experiencing homelessness, drug users, prisoners, sex workers and Gypsy Roma and Traveller groups).

Local public health and inequalities

9.11. Local public health teams are best placed to know their vulnerable populations and support initiatives to tackle local inequalities. They were at the frontline of engaging with local communities and leading the local response to Covid-19 to support control and address inequalities. A Health Foundation report highlights that their ability to do this was constrained by chronic underfunding and staff shortages, the government not engaging with local public health to design the response, and insufficient information-sharing on cases and vaccination uptake to help them target effective responses (AH/31 - INQ000211976). The King's Fund and the Health Foundation calculated that, given population increase and inflation, the like-for-like purchasing power of the public health grant fell by almost a quarter per head of population between 2015/16 and 2020/21 and that an extra £1 billion a year would be required to fill the gap. These sustained pre-pandemic decreases in funding came at a time of widening inequalities in health. Local Directors of Public Health reported that they were not well engaged by government to shape the testing strategy. The centralised nature of the Test and Trace programme and the failure to share individual level data on cases with local public health teams restricted their ability to support contact tracing, identify and respond to local outbreaks or to identify the vulnerable groups most affected in their area. Directors of Public Health reported that insufficient data on vaccine uptake was provided at a local level restricting their ability to target community interventions to increase uptake in vulnerable communities. Despite these limitations local public health teams played a critical role in control and in leading interventions to address inequalities.

Financial support

9.12. There was extensive funding provided through furlough and the Self Employment Income Support Scheme (SEIS) however those who recently became self-employed and therefore had insufficient records of income and low paid workers on zero hours contracts were not covered by furlough. Universal Credit was increased by £20 per month. Around two million of the lowest paid workers were not eligible for statutory sick pay and levels of statutory sick pay are amongst the lowest in the OECD covering only around ¼ of the average weekly wage. The Test and Trace payment support scheme aimed to fill some of these gaps for the lowest paid workers by compensating them £500 for self-isolating. However, this was not introduced until September 2020, application procedures were complex and nearly two thirds of applications were rejected. (AH/32 - INQ000211977)

9.13. Those with the lowest income were therefore least able to take up opportunities to work from home and financial precarity would have made self-isolation following infection or contact very challenging. These financial issues are likely to have contributed to high transmission in poorer communities.

Vaccination

9.14. With the exception of people experiencing homelessness, no socially vulnerable groups were prioritised for vaccine eligibility despite those in poorer areas, those in certain ethnic minority groups, and those who could not work from home being at significantly higher risk. There was JCVI advice to intensify efforts to vaccinate socially vulnerable groups who were already eligible (AH/33 - INQ000211978).

9.15. The Community Vaccines Champions scheme received £22.5 million to target the 60 local authorities with the lowest vaccine uptake with most initiatives focussing on uptake in ethnic minority groups. Despite pre-pandemic evidence of low vaccine uptake in ethnic minority groups this initiative was not announced until 21 December 2021 (AH/34 - INQ000211979), 12 months after the first published reports of high levels of Covid-19 vaccine hesitancy in ethnic minority groups, 11 months after high-risk groups became eligible for vaccine and 6 months after all adults aged over 18 years became eligible.

Inclusion Health Populations

- 9.16. There was an extensive and coordinated response in the homeless sector including the 'Everyone In' scheme, outreach testing and wrap around health services. This is estimated to have prevented 266 deaths (226–301), 1164 hospital admissions (1079–1254), and 338 ICU admissions (305–374) among the homeless population during the first wave of the pandemic alone. JCVI prioritised people experiencing homelessness for vaccine before all adults became eligible based on the high risk of outbreaks and high levels of undiagnosed chronic disease (AH/35 - INQ000211980).
- 9.17. There was a coordinated response in the prison sector which was effective in preventing deaths but at the cost of ceasing visiting, educational and recreational activities and prisoners being confined to cells for up to 23 hours a day. Although prisoners had very high risk of outbreaks and evidence of increased Covid-19 related mortality they were not prioritised for vaccine (AH/36 - INQ000211981).
- 9.18. In communal asylum seeker accommodation, there were challenges in overcrowding leading to outbreaks, poor access to testing and challenges in outreaching vaccination.
- 9.19. There was minimal targeted action to support Gypsy Roma and Traveller groups despite longstanding health inequalities, poor access to health care and anecdotal reports of high mortality.

How future pandemic preparedness and response can be improved to mitigate inequalities

- 9.20. Key learning points include:
- i. Developing health and surveillance data systems to routinely capture and report on multiple dimensions of inequalities including protected characteristics, ethnicity, migration, social deprivation and membership of vulnerable groups such as Inclusion Health populations. It is important that these systems are developed for use, both in pandemic and non-pandemic times, so that inequalities can be

measured and acted on promptly. UKHSA is developing a Health Equity and Inclusion Health Surveillance Strategy to address these gaps for communicable diseases.

- ii. Inclusion of Health Equity and Inclusion Health considerations in pandemic planning – all pandemics and major public health emergencies are likely to have important inequalities implication which need to be a part of planning.
- iii. Early standing up of advisory groups to consider how best to mitigate inequalities in the event of future public health emergencies.
- iv. Ensuring that planning and response are not limited to addressing inequalities based on a single dimension of inequality. Although clearly important, attempts to address inequalities were largely based on ethnicity related inequalities with substantially less attention to socioeconomic inequalities or specific vulnerable groups such as migrants, asylum seekers, refugees, Gypsy Roma and Traveller groups.
- v. Political commitment to address inequalities in health.
- vi. Development of groups within NHS, DHSC, OHID, UKHSA to lead on developing approaches to address health inequalities. The NHS Core20PLUS5 initiative is leading NHS inequalities work, the DHSC Office for Health Improvement and Disparities have a major focus on inequalities and UKHSA Health Equity and Inclusion Health division are leading work across UKHSA in this area. It is important that such groups are resourced to tackle inequalities both in pandemic and non-pandemic times.
- vii. The importance of providing resources to undertake community engagement to help inform pandemic response, support vulnerable communities and address long standing health inequalities. There is need to develop mechanisms to listen to the views of groups experiencing high levels of inequality to inform planning and response.
- viii. The importance of outreach to reduce inequalities in uptake of interventions. This is needed both in pandemic and non-pandemic periods. For example, to address well recognised disparities in uptake of other vaccines and poor access to health services in vulnerable groups. Such outreach work is generally minimal and poorly funded

but can make a major difference to reducing inequalities in uptake of health interventions.

- ix. The importance of adequately funding local public health who are best placed to lead local action to address health inequalities.
- x. The importance of involving local public health leads in advising on national pandemic plans and decisions about pandemic response.
- xi. The importance of providing detailed local data on inequalities in disease rates, testing and vaccine uptake to guide local response.
- xii. The importance of commissioning research to understand inequalities in impact of pandemics.
- xiii. The importance of ensuring that financial protection measures that enable people to participate in protective policies consider the needs of the most vulnerable groups.
- xiv. The importance of reducing inequalities through broader fiscal, political and societal measures.

Statement of Truth

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

Personal Data

Signed: _____

Dated: _____ 04/09/2023 _____