Witness Name: Declan Bradley
Statement No. 1
Exhibits:
Dated: 10th April 2024

UK COVID-19 INQUIRY

WITNESS STATEMENT OF DR DECLAN BRADLEY

I, Declan Bradley, will say as follows: -

Background and qualifications

1. I took up post as Deputy Director of Public Health in the Public Health Agency (PHA) in Northern Ireland on 1 May 2023.

2. I hold a medical degree (MB ChB) from the University of Aberdeen, having graduated in 2004. I also hold a Master's degree in Healthcare Ethics and Law (Distance Learning) with Merit from the University of Manchester, a Master of Public Health degree with Distinction from Queen's University Belfast (QUB) and a PhD in genomics from QUB. I secured Membership of the Royal College of Physicians, MRCP(UK), by examination. I am a current Fellow of the Faculty of Public Health of the Royal College of Physicians, secured by passing membership examinations and completing specialist training. I am a registered doctor with a license to practice and am on the GMC specialist register for public health medicine.

3. I worked in junior doctor posts in Health and Social Care Trusts in Northern Ireland following graduation for four years, before moving into public health medicine in August 2008. I joined the public health training programme in August 2009 and completed a PhD during the training programme. I joined the GMC specialist register on 4 August 2016 upon completing the training programme.

4. I took up my first consultant post on 1 September 2016 as a consultant in health protection in the PHA (at first in a locum and later in a substantive position). My main

duties during that time included contributing to health protection work such as supporting management of cases and outbreaks of infectious diseases, supporting adult vaccination programmes and subsequently leading on antimicrobial resistance programmatic work, including developing a new surveillance programme for antimicrobial use and resistance.

5. On 1 May 2018 I changed roles to take up a joint role with QUB as a clinical lecturer, and as a consultant in public health in the service development division in PHA, with half of my time for each role. In my QUB role, my main duties as an early career researcher were teaching, supervision of students and to develop and conduct research. In my PHA role, my main duties involved supporting information management and intelligence related to a patient recall and providing public health intelligence support to the Western Health and Social Care Trust's Pathfinder programme.

Roles during the COVID-19 pandemic response in Northern Ireland

6. From March 2020, in my PHA role, I was approached by the Department of Health's Chief Scientific Advisor (CSA) with a request that I become involved in supporting the Department of Health (DoH) COVID-19 modelling group and I contributed to the development of a surveillance system for hospitalisations with COVID-19. From this, I supplied aggregate (i.e. count) data to the DoH modelling group and to the Scientific Pandemic Influenza Group on Modelling, Operational sub-group (SPI-M-O) for use in modelling. In this capacity, I later took on a wider remit to support PHA's COVID-19 surveillance programme in January 2022. I will elaborate on these contributions below.

7. In my QUB role as a clinical lecturer, I contributed to several research projects related to COVID-19, some of which used anonymised, routine healthcare data through the Business Services Organisation (BSO) Honest Broker Service (HBS) trusted research environment to investigate factors affecting COVID-19 vaccination uptake and effectiveness. In 2021 and 2022, my teaching duties were taken over by QUB colleagues due to my reduced availability.

8. I contributed in my QUB and PHA roles to the publication of scientific articles concerning COVID-19-related behaviour, vaccination and genomics. These articles do

not directly address the response of the Northern Ireland or United Kingdom governments. A list of my scientific publications that relate to COVID-19 is exhibited [DBR/1 – INQ000458887], and those that I (or others, where I know this) shared with advisers in Northern Ireland or UK governments are exhibited.

9. From 20 January 2021, I was seconded to the DoH as Deputy Chief Scientific Adviser (DCSA) (Interim) to support the work of DoH, initially for a period of three months with the option of extension upon review. I continued my PHA and QUB roles as outlined above at the same time.

10. My secondment to DoH finished on 19 April 2022. I left QUB at the end of September 2023 to take up a full-time position at PHA on 1 October 2023. QUB conferred on me a title of Honorary Senior Lecturer for a period of three years from 27 September 2023.

My role as Deputy Chief Scientific Adviser (Interim)

11. In my DoH role, I deputised for the CSA when he was not available and covered some of his duties. My secondment agreement indicated that I was professionally and managerially accountable to the Chief Medical Officer (CMO). During my secondment, I reported to the CSA when he was available, and when deputising for him, I reported to the CMO. I covered some of the CSA's responsibilities from the start of my secondment on 20 January 2021 to the end of March 2021 (excepting periods of annual leave), and three further weeks of planned leave in September 2021 and February 2022.

12. My secondment agreement states that my responsibilities were: To provide expert scientific advice and support to the work of the Health Minister and officials; To provide expert scientific advice and support to influence and inform Departmental policies, strategies and communications; To provide expert advice to the Department on the developmental and other needs of current and future health and social care professionals in respect of research and skills and competencies; To provide expert advice and input to the development and implementation of the Department's Research and Development strategy; To build an effective network with senior staff and researchers based in HSC Trusts, universities and other organisations; and to comply with Departmental corporate policies. Due to the nature of the pandemic situation, the provision of advice and support was the main part of my role.

13. When deputising for the CSA, one of my weekly duties was to prepare a draft 'R Number Paper' and accompanying slide set for consideration by CMO. When finalised, these were submitted to the Health Minister. It is my understanding that they were provided by the Health Minister to the Northern Ireland Executive through Departmental processes and the paper was published on the Department's website. I attended Northern Ireland Executive meetings by videoconference with CMO and the Minister to present and explain the R number report, using the slides.

Attendance at groups that advised the UK Government

14. When deputising for the CSA, I attended Scientific Advisory Group for Emergencies (SAGE) and associated planning meetings (the COVID-19 Science Coordination Group) and meetings with the SAGE secretariat. I attended some meetings of some SAGE subgroups (including the Environmental Modelling Group's Transmission Subgroup and the SAGE Vaccines Group). Many of the SAGE subgroups were attended by other colleagues. In my PHA role, I attended several meetings of a SAGE subgroup that was initially known as the Care Home Working Group (later the Social Care Working Group) on 15 May 2020, 3 July 2020, 24 July 2020, a subgroup on data on 20 May 2020, and a subgroup on risk on 16 June 2020. I was an observer on SPI-M-O from 26 March 2020. During the time of my secondment to the DoH, I was a member of SPI-M-O. I was a member of the Cabinet Office Vaccine Effectiveness Expert Panel, which, I believe commenced on 8 October 2021.

15. A significant part of my role on SPI-M-O was (alongside a departmental official) to be a point of contact for the SPI-M-O secretariat in Northern Ireland to arrange for the supply of aggregate data to SPI-M-O so that Northern Ireland would be included in the work of SPI-M-O and the evidence that it produced. I also observed presentations and discussion, and shared information about these with the CSA. I conveyed relevant evidence from the work of SPI-M-O to the CSA, members of the NI COVID-19 Modelling Group and the to the Strategic Intelligence Group. CSA also received information about SPI-M-O work through SAGE. I believe that later in the pandemic CSA could also receive SPI-M-O documents directly through a secure online file store. I contributed information about context or data availability from Northern Ireland to SPI-M-O members and I facilitated or directly supplied aggregate data for modelling. I met

several times with the SPI-M-O secretariat and modellers outside the main meetings to discuss data provision from Northern Ireland. There were, at some time points, other observers and members from DoH, before and during my involvement with SPI-M-O. To the best of my knowledge, attendance was recorded by the SPI-M secretariat. The operating model of SPI-M-O changed during the relevant period. There were separate meetings during which there was discussion about the R number and forecasts in advance of the main meeting, some of which I also attended and participated in. This provided an opportunity to identify any issues with data provision and interpretation, or with estimates or projections that had any technical issues. Later in the relevant period, a DoH analyst attended SPI-M-O as well, or sometimes instead, of me, and summarised the meeting to myself and CSA by email. The Joint Biosecurity Centre (JBC), later part of the United Kingdom Health Security Agency (UKHSA), took over responsibility for some routine functions of SPI-M-O in the Epidemic Modelling Review Group (EMRG), which I also attended. One SPI-M-O modelling group from London School of Hygiene and Tropical Medicine did an analysis of the impact of the 'firebreak' intervention in Northern Ireland, which was shared with CSA [**DBR/2 – INQ000458888**].

16. I attended SAGE on 21 January 2021, 2 February 2021, 11 February 2021, 25 March 2021 and 9 September 2021 when deputising for the CSA. My main role with respect to the SAGE meetings was to review the evidence presented in meetings and understand nuances that were explored in discussion by members. I note that my status at SAGE meetings is inconsistently recorded as observer or a scientific expert. I believe that the latter was the categorisation consistent with the definitions described in the Addendum to the note of the fourth SAGE meeting, and categorisation of the CSA in previous minutes. I have noted that I was given an opportunity to speak in the meeting of SAGE 79, so I do not believe the mis-classification had any impact. I conveyed a summary of key evidence to CMO by email and in meetings. The evidence produced by SAGE was used to inform advice to policy-makers in Northern Ireland. Evidence presented at SAGE was often later discussed at the DoH Strategic Intelligence Group (SIG). The main opportunity to engage with SAGE agenda planning was in a series of meetings associated with SAGE, including the Science Coordination Cell and SAGE Devolved Administration Meetings. I highlighted areas where I believed evidence could support policy-making in Northern Ireland during one SAGE meeting and more often liaised with the SAGE secretariat during planning meetings to highlight areas of specific interest.

17. I attended a meeting of a group convened by JBC analysts on 22 June 2021 to investigate the effect of school holidays on the reproduction number. I contributed information and some preliminary analyses to this work, which was carried forward by JBC analysts [**DBR/3 – INQ000458899**].

18. I was a member of the Vaccine Effectiveness Expert Panel, which I believe was initially convened by the Cabinet Office. My main role in this was to identify any new evidence that needed shared with CSA or CMO Group about the effectiveness of COVID-19 vaccines. The group met fortnightly from 18 June 2021 onwards.

19. In my QUB role, I contributed to the Northern Ireland element of a series of UK-wide COVID-19 vaccine effectiveness and uptake studies and took part in their steering groups. The first of these studies was known as Data and Connectivity Vaccines Pharmacovigilance (DaC-VaP). The studies were led by Professor Sir Aziz Sheikh of the University of Edinburgh.

Attendance at groups that advised policy-makers in Northern Ireland

20. In my PHA and DOH roles, I participated in groups that aimed to support advisers or decision-makers in Northern Ireland with public health and scientific evidence. I was a member of the Strategic Intelligence Group (SIG) and of the Department's COVID-19 Modelling Group. I took part in meetings between the DoH and PHA known as the 'Clusters and Outbreaks' Group. I was a member of The Executive Office's Adherence Group, and a Ventilation Group. I was a member of the PHA Behaviour Change Group. I was asked to chair a subgroup of the DoH Nosocomial Support Cell in my PHA capacity and therefore also to be a member of the parent group, the Nosocomial Support Cell. While deputising for the CSA, I attended one meeting of the Department's SMART (Systematic, Meaningful, Asymptomatic, Repeated Testing) testing programme steering group. I was also involved in work related to a Health Data Research UK-funded programme that was one of the National Core Studies. I was a member of the Northern Ireland Trusted Research Environment (NITRE) Strategic Board. I attended some groups by invitation for specific agenda items, including the

Expert Advisory Group on Testing. I will elaborate on the dates of these and my role in them below.

21. I was a member of SIG from its first meeting on 27 April 2020 onwards. To my understanding, the group existed to support CSA and CMO assess evidence related to COVID-19 to inform their policy advice. I believe I attended 47 meetings. I believe that my membership of SIG was because of my attendance at SPI-M-O. The format of the meeting was an introduction on the position of the epidemic and the reproduction number by the CSA followed by a discussion about evidence that would support CSA and CMO providing advice. I contributed to discussions about interpretation of published evidence and SAGE papers, along with other members.

22. I was a member of the Department's COVID-19 Modelling Group since its first meeting on 24 March 2020, initially in my PHA role, and when on secondment, in my DoH role. The meeting was initially twice-weekly, later reducing in frequency. I attended the great majority of meetings, missing it only in exceptional circumstances such as when on leave. I do not have the entire set of minutes in my possession at this time to allow me to confirm the exact number of meetings I attended. I understand the Department may have already supplied these documents to the Inquiry. It is my understanding that the group reported to CMO as Senior Responsible Officer, and that CSA was the commissioner of the modelling. CSA chaired the group. To my understanding, SIG and the modelling group both reported to the CMO group in DoH, and neither was a subgroup of the other and their governance structures did not refer to each other. There was substantial overlapping membership of both groups, with around five individuals at any time who were members of both groups. Information from the modelling group was, I recall, the first item on the agenda of SIG. My main role in the modelling group was the provision of aggregate COVID-19 hospitalisation data to modellers for them to use in their work, which I elaborate on below. I was (and am) a public health medicine consultant with experience of epidemiology, and I was not a mathematical modeller.

23. I believe that it was due to my involvement in creating processes that were used for hospital-acquired COVID-19 surveillance that I was asked to chair a subgroup of the Department's Nosocomial Support Cell concerned with epidemiology and intelligence. The last draft terms of reference that I have access to is exhibit [**DBR/4 –**

INQ000458910]. DoH offered data engineering consultant resource to support the work programme, which we directed towards automating the data flows for the programme and creating a dashboard for users. I attended meetings of the Epidemiology and Intelligence subgroup on 5 January, 12 January and 19 January 2021 and the main Nosocomial Support Cell meeting on 22 December 2020 and 6 January 2021. I supported work to secure information governance approvals so that this planned work could commence. In January 2021, however, early in the development of this work, I was seconded to DoH and was no longer able to contribute. Responsibility for carrying forward this work was handed over to a PHA colleague. The product of the work was a dashboard accessible to Trust infection control teams that supported them in their monitoring of transmission of COVID-19 in their inpatient facilities.

24. I was a member of The Executive Office's COVID-19 Adherence Group in my DoH role from 19 March 2021 until its final meeting on 11 March 2022. This was a multi-agency group concerned with measuring and making recommendations about behaviours related to the advice and restrictions, chaired by the Permanent Secretary of the Department of Justice. My role on that group was to share information about the pandemic, and to convey information to and from DoH CMO Group relating to the group's activities. I contributed to work supporting a survey of public behaviour relating to COVID-19 along with other members of the group.

25. Discussion at the Adherence Group led to the creation of a Ventilation Group that considered information and evidence about the value of ventilation in indoor spaces in public buildings. I was a member of this group from its inception on 1 October 2021 to its final meeting on 14 January 2021 and attended five meetings. This multi-agency group prepared and issued information for businesses about the use of ventilation to reduce risk of infection associated with indoor spaces [**DBR/5 – INQ000458913**].

26. I attended the first meeting of the SMART Programme Board on 5 March 2021. From my recollection and the records available to me, I believe that was the only meeting of that group that I attended. This was an introductory meeting about the programme. I note from the minutes that the agenda and discussion focused on organisational aspects of the programme. In brief bullet points that I noted in the meeting, I noted some discussion of the programme aim, eligible groups and health inequalities, which

I participated in, but I cannot now recall more detail of the content of the discussion [**DBR/6 – INQ000458914**]. The meeting took place at the same time as the Adherence Group each week, and I attended the Adherence Group routinely, as I believe would have been agreed within the CMO Group when we regularly discussed representation at meetings. I do not know whether CSA attended the SMART programme board subsequently.

27. I participated in meetings of the Departments 'Clusters and Outbreaks' meeting during my secondment, at which I presented the R paper slides each week when deputising for CSA. PHA presented information about specific incidents that were being managed, epidemiology and contact tracing activity. In my PHA role, from mid-December 2021 onwards, I contributed to redesigning and automating COVID-19 reporting and integrating surveillance indicators to present to this meeting on a regular basis, starting 12 January 2022 [**DBR/7 – INQ000458915**].

28. In my PHA role I was a member of the Behaviour Change Group from its inception on 7 April 2020. Many of its members were academics interested in health behaviour or psychology. I provided public health input into several initiatives that stemmed from this group, resulting in several publications related to understanding or influencing behaviours related to COVID-19 transmission [**DBR/8 – INQ000458916**]. I also communicated with colleagues in PHA to highlight the availability of this group and its members to support their work. I was unable to continue attending regularly after I went on secondment to DoH.

29. In my PHA role, I became a member of the COG-UK Health Informatics Subgroup on 5 May 2020. The meetings were initially twice weekly, with one meeting focusing on England's participation and one focusing on Scotland, Wales and Northern Ireland. I attended this latter meeting regularly before responsibility was passed on to PHA colleagues during my secondment to DoH. I was initially approached to support navigation of information governance processes related to this project, having established some new public health surveillance programmes in the past. I supported planning of some data-related aspects of Northern Ireland's participation in the COG-UK programme. I will elaborate further below.

The COVID-19 Modelling Group

30. To the best of my understanding, the first priorities of the COVID-19 modelling group were to create or adopt one or more epidemic models and to secure reliable data with which to fit the model(s). There was a need to measure epidemic growth (including the effective reproduction number, R), to provide short-term forecasting, and to undertake scenario modelling to explore the impact of changes in policy and behaviour on the epidemic. I believe that the most important indicators were cases, hospital admissions, hospital inpatients, critical care occupancy and deaths, though I believe others were also used at times.

31. A briefing note issued by the CMO to Trusts stated the aims of the group were: "To provide 'reasonable worst case' estimates of the potential course of the epidemic which will be used to inform surge planning, public health policy and risk management decisions in Northern Ireland", and "[t]o collaborate with ROI colleagues to model the epidemic on an all-Island basis." [**DBR/10 – INQ000458917**].

32. In the early stages of the COVID-19 Modelling Group's work, I recall, I was asked by CSA to implement a statistical tool provided by NHS England (*CovidUsageR*), which I did. The tool used epidemic curves produced by the Imperial University modelling team. It applied assumptions about the healthcare demand that would be associated with the scenarios. The epidemic curves were not specific to Northern Ireland, but to the England population. I scaled them to the Northern Ireland population. I believe that a tool like this to implement emerging evidence about healthcare demand could be useful during future pandemics if applied to modelling on an ongoing basis, and could be considered as part of pandemic preparedness. I believe it was a limitation that the scenarios were static and were not specific to the situation in Northern Ireland.

33. In the early stage of the pandemic, while the modelling group was becoming established, I explored the use of simple exponential projections as a tool for short term forecasting (I do not recall that this was specifically requested by the modelling group). Prior to involvement in the modelling group, I supported creation of a simple compartmental model by a healthcare systems engineer (referred to as the Dodds model in [**DBR/10 – INQ000458917**] and documented in [**DBR/11 – INQ000458880**]). Neither of these were adopted by the modelling group, because the mathematicians on the Modelling Group were able to meet the need for suitable models and expertise soon after the group was formed.

34. The COVID-19 Modelling group had three mathematicians on it, one from QUB, one from Ulster University and one from the Strategic Investment Board. To my understanding, they were mathematicians or analysts who turned their wider knowledge to this topic. To my knowledge, though I was not working in health protection at the time, the PHA health protection team did not have sufficient in-house mathematical modelling expertise to do this work themselves. I believe the knowledge and skills required for epidemic modelling depend on the type of model used but would require knowledge of calculus, model structures and mathematical methods for fitting models to observed data. I believe it should be a lesson from the COVID-19 pandemic that such advanced mathematical skills should be established in public health epidemiology departments in future, so that expertise is already integrated.

35. Along with some other members of the COVID-19 Modelling Group, I joined an exploratory meeting with some modellers from the Republic of Ireland on 27 March 2020. There was some further communication afterwards by email between analysts who shared statistical code [**DBR/12 – INQ000458879**]. I have no further information related to this. While deputising for CSA on 9 February 2021, I met with a member of the Irish Epidemiological Modelling Advisory Group by videoconference, who, to the best of my recollection, sought an update on the work of the Northern Ireland COVID-19 Modelling Group, as the Irish group was taking stock and considering its future plans. The possibility of future collaboration was mentioned. I do not know of further discussion of this.

36. In the early stages of the work of the Modelling Group, to my knowledge the key sources of data were deaths (as reported by PHA and subsequently via DoH), hospitalisations (which I will elaborate on below); critical care occupancy, which I believe was reported by HSCB to DoH); and cases (which I think came initially from PHA and later DoH). Critical care data was generally supplied as occupancy rather than admissions, which made it more difficult to determine what proportion of hospitalised cases required critical care. Between June and November 2020, a social contact survey, based on the London School of Hygiene and Tropical Medicine CoMix survey and methods, was conducted to support estimation of R in Northern Ireland. I think the rationale for this was that when prevalence was low, estimating R was more uncertain. I was not directly involved in conducting the work and do not believe I have access to results from the surveys, of which I understand at least six were undertaken. A student working under supervision of analysts from the modelling group wrote up

some of the analysis [**DBR/13 – INQ000458881**] and presented this to the Behaviour Change Group on 24 September 2020 [**DBR/14 – INQ000458882**].

37. The roles of people on the modelling group became established, with two analysts usually providing estimates of R, from which a range was agreed by consensus. Consideration was given to SPI-M-O information. The analyst from SIB undertook forecasting and scenario modelling. There were presentations of any new analyses or modelling and discussion of any contextual factors that needed to be taken into account in interpretation. With respect to limitations, for example, as incidence fell, statistical power reduced, estimates of R would become less precise and some sources of data stopped being a suitable basis for estimating R. I believe this was the reason for the social contact survey being conducted to supplement other data sources when incidence was low in the summer of 2020. In the earlier versions of the model, I believe the assumption of homogeneous mixing was used. That means that it did not take into account the extra complexity that, for example, people were more likely to mix with people of their own age. I believe this was a reasonable assumption at first because the model performance was acceptable without additional complexity. During later periods, such as when modelling sought to investigate the effect of schools, it was important that the model included the age-specific mixing patterns, and further complexity was added to the model for this purpose at my request when I was deputising for CSA and chairing the modelling group.

38. I do not recall when I first knew of the possibility of transmission by people who were asymptomatic. I believe that by the time I began to be involved in mid-March 2020, this possibility was known. A document titled "Covid-19 RWCS Planning Base Parameters" dated 9 March 2020, was forwarded to me on 12 March 2020 by Dr Joanne McClean [**DBR/15 – INQ000458883**]. It noted "It is likely a mildly symptomatic person can transmit the virus and current evidence cannot rule out transmission by a totally asymptomatic person." I do not know when CMO and CSA first became aware that asymptomatic transmission was possible.

39. There were challenges getting data about hospitalisations with COVID-19 in March and April 2020 for epidemiology and modelling purposes. To my knowledge, this was because the data did not yet exist in the form required at that point rather than because of barriers to data sharing. The COVID-19 modelling group and SPI-M-O both requested hospitalisation indicators to support modelling for Northern Ireland. I believe

that DoH Information Assets Directorate (IAD) convened a group to implement a manual coding process in Trusts to record suspected or confirmed COVID-19 status on the Patient Administration System. This group was called the "Covid-19 Data Coordination Group", which I was not a member of. I did attend a teleconference convened by DoH IAD with Trust and PHA colleagues on 18 March 2020 about coordinating sitrep data feeds. There were potential limitations to this approach for modelling. This included, for example, that people who tested positive for COVID-19 during their hospital admission would be counted by their date of admission rather than the date of the disease onset or test, resulting in the retrospective addition of admissions to datasets. This effect could tend to make the latest growth rate appear artificially low.

40. To help meet the information needs of the modelling group and SPI-M-O, I worked in PHA to arrange for the supply of COVID-19 hospitalisation data. I recognised that combining data from positive COVID-19 test results with Patient Administration System (PAS) hospital admission and discharge events would provide useful estimates of admissions and occupancy with COVID-19. This would allow admissions with community-acquired and hospital-acquired infections to be distinguished on the basis of time from admission at the point of the first positive test, and could form the basis for a surveillance programme for hospital-acquired COVID-19 infection. I explored whether relevant teams in PHA, the Health and Social Care Board (HSCB) or DoH IAD were already planning or conducting such work. I concluded that they were not. I sought and gained approval in PHA to conduct this work myself. I did so, starting on 22 April 2020. I circulated a preliminary analysis to modelling group members on 24 April 2020 [**DBR/16 – INQ000458884**] and began daily reporting of counts of admissions to members of the COVID-19 Modelling Group routinely on 4 May 2020 and I believe a departmental official who was supporting the modelling group shared the file with SPI-M-O soon afterwards, but I do not know the exact date. Thereafter, from my perspective, it became my main contribution to the Modelling Group (with the exception of chairing the meeting when deputising for the CSA from late January to March 2021) to supply this intelligence. I shared methods for the analysis with PHA colleagues, which they adapted to form the basis of their COVID-19 hospital-acquired infection surveillance programme.

41. The methods for my report evolved over time in response to changing circumstances and need, such as adding new columns with the data counted by different definitions; the adoption of UK agreed case definitions for hospital acquired infections; the

implementation of an agreed definition of a COVID-19 infection episode duration (allowing re-infections to be counted); adapting to include Pillar 2 testing and later to the COVID-19 Central Test Register; adding time series charts summary charts to accompany the report; separating counts of emergency and other modes of admission; removing 'day cases' after new therapeutics were introduced to avoid people being treated with new therapeutics being counted as COVID-19 admissions; reducing the time window during which a pre-hospital test would be used to signal a COVID-19 admission from 28 to 14 days following the emergence of Omicron and high levels of community testing to make the indicator more specific; resolving issues with the timing of a scheduled data warehouse query that occasionally resulted in the report running on an incomplete PAS dataset when the query was timetabled for the early morning, and creating fail-safe processes for this; adding steps to manage situations where it appeared that patients who had been transferred between hospitals arrived in one hospital before being discharged from the previous hospital; I identified on 20 October 2020 that I had unintentionally omitted the indeterminate category from an inpatients count, resulting in a relatively small undercount (14 to 19 people out of approximately 278, or 6%) in the inpatients in one column. I believe this had no material impact on estimates of R or on advice to policy-makers. The process was automated by data engineers in early 2021 as part of the dashboard created under the Nosocomial Support Cell, and in a later form in NIHAP during 2022, and now forms the basis of the PHA COVID-19 surveillance programme, which was particularly important when DoH discontinued its COVID-19 dashboard in May 2022.

42. Around 1 February 2022 DoH stopped producing some aggregate data that it previously supplied to SPI-M-O and I facilitated replacement of this from PHA [**DBR/17 – INQ000458885**].

43. It is my understanding that the count data that I supplied was used as one of several inputs to epidemic models to estimate the effective reproduction (R) number by the modelling group and SPI-M-O modellers. The information was also used in the R number paper.

44. The Office for National Statistics Coronavirus (COVID-19) Survey was an extremely useful source of information about positivity (a proxy for prevalence) in Northern Ireland. The survey was launched in England on 26 April 2020 and was expanded to include Wales on 29 June 2020, Northern Ireland on 26 July 2020 and Scotland on 21

September 2020. In any future similar pandemic, I believe a similar survey would be a valuable source of intelligence.

45. I believe that members of the modelling group were expected to explore and challenge our understanding of the situation and the evidence that we relied on. I took part in such discussions during my participation in the group. I accepted, as with SPI-M-O, that there was a process of reaching consensus that gave voice to a range of views about interpretation of evidence. In the COVID-19 Modelling Group meeting of 30 September 2020 it was noted that I "highlighted that an earlier comprehensive intervention would be of shorter duration than if there was a delay in implementing the required actions" **[INQ000353668].** I believe that this was in the context of SPI-M-O work in the period leading up to this time, summarised in their consensus statements of 16, 23 and 30 September 2020, and the 'Circuit Breaker' paper from the Warwick University modelling team that was tabled at SAGE on 24 September, which stated that "[a]nalytical theory shows that the optimal timing for any circuit breaker intervention is as early as possible", and presented simulations of the timing and extent of changes in R [**DBR/19 – INQ000458886**]. I believe I may have also conveyed the principle that that the longer epidemic growth persisted, disproportionately more time would be required for the epidemic to fall to the same level. This is demonstrated by Brooks-Pollock *et al*. in *Modelling that shaped the early COVID-19 pandemic response*, figure 3 [**DBR/20 – INQ000458889**]. It was well-understood that hospital admissions and deaths would continue rise for a period of weeks after a change in R as people who were infected before any change would take some time to become seriously ill. I do not recall having a specific intervention in mind and was more likely conveying general principles. The information that I highlighted would have been received in the context of existing awareness of the situation and evidence previously discussed at SPI-M-O, SAGE, SIG and the COVID-19 Modelling Group. The SIG minutes for the meeting of 21 September 2020 noted that CSA and CMO were minded to advise restrictions for all of Northern Ireland, and that "CMO commented that there is a need for a major reset with a circuit-breaker type approach for 2 weeks, hard, deep and impactful." I was not involved in DoH processes outside the Modelling Group and SIG at that time and I do not believe I have seen what information was presented to the Executive at that time, or and I do not know whether my statement influenced this.

46. I believe the modelling of the Northern Ireland modelling group adapted to the circumstances in terms of assumptions, inputs, structure (for example, the introduction of vaccination) and outputs. One of the three modellers published a paper describing

the novel methods applied as part of this work [**DBR/21 – INQ000458890**]. The SPI-M-O modelling was also extremely agile and responsive, in my view, producing new work at an extraordinary pace to consider new scenarios as the situation changed continuously.

Data systems in place prior to the COVID-19 pandemic

47. It was not part of my roles prior to the COVID-19 pandemic to be involved in work related to data or data sharing for pandemic preparedness, and I would not have been, aware of any concerns among senior government decision-makers or senior advisors should they have had any. I think the programmes of work to modernise electronic healthcare records and laboratory information systems indicates that there must have been a recognition that the multiplicity of information systems in HSC, many of which were older, was inefficient, though I do not know of pandemic preparedness being a factor that led to the programmes.

48. I was newly in post as a locum consultant in health protection in October 2016 when Exercise Cygnus was conducted. As part of that, I prepared a briefing for PHA leadership to support their participation, derived from exercise 'injects' (vignettes of information that advance the exercise scenario), and took part in at least one exercise incident management team. To the best of my understanding, the exercise included (fictional) Northern Ireland epidemiological data and modelling from SPI-M-O and Public Health England within the exercise, and did not exercise arrangements for producing either data or modelling. I do not believe I have seen any information about any data issues identified in the exercise in Northern Ireland. I understand that any actions resulting from the exercise were to be taken forward through a group called the Joint Emergency Preparedness Board.

49. I had experience of using some Health and Social Care (HSC) data in my role as a consultant in public health medicine with an interest in epidemiology. I was not responsible for the development, management, operation or commissioning of health and social care information systems in any role, with the exception of a very small number of bespoke small-scale databases for specific purposes, such as when I supported the management of a patient recall. I do not have experience of software development nor digital healthcare. In none of my roles did I have oversight of the full extent of HSC information systems. For a comprehensive and authoritative view of these systems, I would suggest that those who are responsible for digital and data

systems in DoH and HSC would be able to provide more information. Through awareness of the ongoing work to implement the new electronic healthcare record, I know that there are several hundred information management systems in use in HSC and I have experience of only a few of these. I can only offer my own perspective on those that related to my work prior to and during the pandemic. Immediately prior to the pandemic, I did not work in health protection surveillance, so my knowledge of many systems and processes in the team at that time is limited.

50. In PHA, the health protection service used HP Zone, an outbreak and case information management system, which was also widely used by health protection services in the UK and, I believe, also in some other countries. HP Zone has been in use in Northern Ireland since 2011, to the best of my knowledge, and has provided a reliable platform to support the work of that service. I have used it in my work in PHA health protection, including when supporting contact tracing early in the pandemic. As implemented in Northern Ireland, it did not benefit from integration with other information systems, such as notifications, relevant laboratory results, or the patient index. It also did not directly integrate into systems for surveillance or business intelligence.

51. A surveillance system for primary care consultations for influenza and influenza-like illness called Apollo was in use by PHA for surveillance. I believe it had been in place since the 2009 influenza pandemic. PHA had access to summary reports from this system, which I understand were produced from pseudonymised data from primary care information systems, which PHA could not directly access. Summary information from Apollo was included in public PHA surveillance reports.

52. I am aware of a work programme in HSCB called the General Practice Information Platform (GPIP), having been involved in some meetings about it in 2018. I do not have knowledge of the maturity of the system immediately prior to the COVID-19 pandemic.

53. I know that GPs used various electronic record systems, such as EMIS, and I know that GP out of hours centres used a system called Ad Astra, which was later also used for the primary care COVID-19 centres and became a source of intelligence for HSCB. I have no direct experience of working with primary care data and suggest that where information is required about this, those with responsibility in primary care would be able to provide this.

54. I have limited knowledge of HSC Laboratory Information Management Systems (LIMS), except where I have analysed extracts from these for surveillance or in approved research projects with anonymised data in the BSO HBS. I believe that prior to the pandemic, the system used in Belfast Trust was different to the systems used in Northern, South Eastern, Southern and Western Trusts. A new single regional LIMS system is currently being implemented to replace these systems.

55. PAS for all Trusts were available in the Business Services Organisation (BSO) Regional Data Warehouse (RDW) in a single database. These recorded the dates of arrival and discharge from hospital, and other contextual information, such as the ward, specialty and consultant. There was a time lag between discharge and a diagnostic code being assigned to a hospital admission. A practical limitation from my point of view during the pandemic, was that it was difficult to confidently infer from the data whether a patient was in critical care on the basis of ward or specialty, making it difficult to identify the subset of patients who had more severe illness. To my understanding, PAS did not include information about which bed space, side room or bay a patient was in, and Trusts supplemented PAS with several other information systems for this extra detail. PAS is in the process of being replaced by the new regional electronic healthcare record.

56. Two emergency department information management systems were in use in different hospitals in Northern Ireland. One was called Symphony and one I understand to be known as The Electronic Emergency Medicine System. I have limited experience of working with these. The main limitation from my point of view is that having two systems with non-identical structure and data items increases complexity for analysts attempting to provide a regional view. Both datasets were in the BSO RDW. Both systems will be replaced by the new regional electronic healthcare record.

57. I understand that the adult critical care units in Northern Ireland used a system called WardWatcher to record information about their patients, and to submit information to the Intensive Care National Audit & Research Centre (ICNARC). I understand that this has since been replaced by a system called MedICUs.

58. The Northern Ireland Maternity System (NIMATS) provided a comprehensive source of intelligence about pregnancy and the characteristics of pregnant women. It was available in the BSO RDW. NIMATS is in the process of being replaced by the new regional electronic healthcare record.

59. There was no single record of vaccinations for adults prior to the pandemic, such as was the case later for COVID-19 on the Vaccine Management System (VMS). Childhood vaccines were recorded on the Child Health System (CHS), which is an older system with limited documentation. I understand that there are plans to replace it as part of the new regional electronic healthcare record in future.

60. I have limited knowledge or experience of social care information systems. I sought information from several sources about the use by Trusts of an accounting software package called Abacus, which I understand Trusts used for financial management of social care that they commission. I was not able to establish whether it would have been suitable for use in surveillance or research as a means of identifying care home residents or those who were in receipt of domiciliary care services. I believe it was an important gap in intelligence that social care data was generally unavailable or inaccessible. I understand that some care homes use electronic systems of their own, but I do not have any more information about this.

61. If Epic, LIMS and GPIP systems existed and were fully functional before the pandemic, I believe that data about the impact of the epidemic would have been available more quickly and easily, and in richer detail. I understand that LIMS is integrated in Epic, and so it is my understanding that it would have been easier to create new surveillance reports for people who attended emergency departments or were hospitalised, by using reporting tools in Epic. I do not know whether this would have made a difference to political and administrative decision-making.

62. Early case definitions, to my understanding, resulted in limiting testing to people who had travelled to affected areas. I believe this provided limited insight into whether there was community transmission beyond this group at the start of the pandemic. Given the limited testing capacity, I can understand the rationale for this approach, but I think for future planning, testing outside a narrow case definition should be considered to provide wider intelligence. Northern Ireland had a primary care sentinel surveillance programme for influenza-like illnesses (where GPs offer a test for viruses to some patients), but to the best of my knowledge, swabs from this would not have been tested for SARS-CoV-2 in the early days of the epidemic, and then attendance in primary care became very limited with reduced face-to-face care, limiting the reach of the sentinel programme. In a future emergency situation, I believe that including a new test for an emerging infection as part of the sentinel surveillance programme or another

community testing programme would be valuable. Northern Ireland did not have a formal Severe Acute Respiratory Infection surveillance programme in hospitals (involving testing and collection of information about symptoms and severity in hospitalised patients) or an Emergency Department Syndromic Surveillance System (which would have reported on the number of people attending emergency departments with different types of symptoms) at the start of the pandemic. Both systems could provide useful indicators about respiratory infections in normal situations, such as with seasonal respiratory infections, and during emerging infectious disease outbreaks and pandemics. I believe that consideration should be given in future to the value of creating such new systems. In future, wastewater-based epidemiology (testing sewerage for viruses) and air sampling in crowded indoor spaces may provide early indicators of the presence of emerging infectious diseases. I do not know whether there would have been any different political or administrative decisions if the timing and extent of infection was in evidence earlier.

63. Northern Ireland did not have a mature pathogen genomics infrastructure at the start of the COVID-19 pandemic. I understand that DoH is undertaking policy development relating to pathogen genomics. I believe this will be important for outbreak investigation and control, and detecting novel and imported variants during a future pandemic.

Information Sharing Arrangements

64. At the beginning of the pandemic, the PHA health protection division had a memorandum of understanding (MOU) with Trusts, BSO and HSCB, which outlined the general principles and purposes of data sharing for health protection, with an annex listing specific programmes or datasets and purposes for which they would be used [**DBR/22 – INQ000458891**]. Adding new items was done by securing the approval of the data controllers and the organisations' information governance leads. It is my experience that preparing information governance documentation can require significant time and I believe this is a function that should be factored into the resourcing of new data-related work. Moving from a proposal to gaining new approvals with respect to complying with the data protection legislative framework was something that, in my experience, could take several weeks or longer.

65. Prior to the pandemic, I understand that the BSO HBS had a MOU with Trusts to use routine data for research that was approved by the HBS Governance Board, after de-identification and with statistical control processes in place. HBS also provided a service for internal HSC users conducting work that was not considered research. I have some experience of these processes as an applicant but others would be better placed to provide information about these arrangements. These services provide *ad hoc*, static datasets that are not suitable for ongoing surveillance or intelligence.

66. Prior to the COVID-19 pandemic, PHA did not have access to technical infrastructure or expertise in-house to build and maintain reproducible analytical pipelines. These are coded, documented and usually scheduled data processes that reduce the need for manual processing of data. They have been highlighted as good practice by the Office for National Statistics and Professor Ben Goldacre's independent report to the UK Government, *Better, broader, safer: using health data for research and analysis* [**DBR/23 – INQ000458892**]. I understand that PHA generally relied on the BSO Information Technology Service to supply or contract for such information technology services. The PHA health protection surveillance team did have capability in statistical programming in the R language and access to the ability to host Microsoft PowerBI dashboards, both of which were used for surveillance.

67. Prior to the pandemic, data about health and social care of individuals were spread across many separate information systems. I hope that the ongoing replacement of many of the information systems with the single electronic healthcare record will improve the ability to provide insight about health and care. In my view, it will be important in future to be able to combine information from sources that are not integrated, such as primary and secondary care.

68. I was involved in a HDR-UK-funded programme known as the Northern Ireland Trusted Research Environment, which I understand is now part of the work of the DoH Digital Health and Care Northern Ireland (DHCNI) department. To my understanding, it aims to build on the existing BSO HBS to bring about change in how routine HSC data are accessed for research and service uses, through improvements in technology and processes. This has potential to create deeper insights and timely intelligence using anonymised data, which I believe could be beneficial in normal business and future pandemic responses.

69. To my understanding, DoH initiated most or perhaps all of the main new information systems related to COVID-19, and was responsible for the public COVID-19 dashboard and official statistics. I believe that information about these systems and processes would be best provided by DoH. Some information systems, such as VMS, changed ownership during the pandemic as work was handed over to PHA and/or SPPG, with changes in agreements, access and reporting as a result.

70. During the COVID-19 pandemic, the DHCNI team provided a resource now known as the Northern Ireland Health Analytics Platform (NIHAP), which facilitates the analysis of data directly from databases and the design of automated reports and dashboards. This process has been adopted more widely in PHA now, and I believe it is a significant improvement in terms of speed, reliability and safety. I was not involved in the creation of NIHAP, though I and my team are now users of it.

71. On 9 March 2024, the BSO website listed the HSC Organisations as: Belfast Health and Social Care Trust, Northern Health and Social Care Trust, South Eastern Health and Social Care Trust, Southern Health and Social Care Trust, Western Health and Social Care Trust, Business Services Organisation (BSO), Strategic Planning and Performance Group (Formerly HSCB), Northern Ireland Blood Transfusion Service (NIBTS), Northern Ireland Medical and Dental Training Agency (NIMDTA), Regulation and Quality Improvement Authority (RQIA), Public Health Agency (PHA), Patient and Client Council, Northern Ireland Practice and Education Council for Nursing & Midwifery (NIPEC), Northern Ireland Social Care Council (NISCC), Children's Court Guardian Agency for Northern Ireland, Northern Ireland Fire and Rescue Service (NIFRS) and Northern Ireland Ambulance Service (NIAS). I believe that virtually all HSC organisations hold information assets that could be used to support a deeper understanding of population health or of the health and social care system. I do not have an overview of these in any of my roles. I do not have knowledge of the information sharing arrangements between organisations other than with PHA in instances where I was directly involved because of my work.

72. On 9 March 2024, RQIA listed 99 Independent Hospitals registered with them, including Hillsborough Private Clinic, Kingsbridge Diagnostic and Treatment Centre, Kingsbridge Private Hospital, Kingsbridge Private Hospital North West, Marie Curie Hospice, Northern Ireland Hospice, Northern Ireland Hospice Adult Community Services, Southern Area Hospice Services and Ulster Independent Clinic. I do not have

information about data capture or sharing with these organisations related to COVID-19.

73. RQIA created a portal for the manual submission by registered care homes of information about their situation with respect to staffing, cases and outbreaks of COVID-19 and vaccination. I had very limited involvement with this, was on the distribution list for an automated daily report from this system from 10 July 2020, which listed the status of each home that day. I believe the PHA health protection surveillance team used it as a source of intelligence to triangulate other information they received about care home outbreaks and to alert the health protection service to any outbreaks that had not been reported through normal channels. The record did not include personal data about care home residents. Further information about this would be best provided by PHA or RQIA, as I do not have comprehensive knowledge of this system or its limitations.

74. I understand that a number of organisations in Northern Ireland outside HSC contributed to testing clinical samples for specific purposes, including Lighthouse laboratories, Randox, Queen's University Belfast and Agri-Food and Biosciences Institute. I had very little involvement in this aspect of PHA's work and do not recall having sight of data sharing arrangements for these.

75. Pathogen genomics became an important part of surveillance and response to the COVID-19 pandemic. The UK's SARS-CoV-2 sequencing programme was known as COG-UK. At first, it was difficult to gain clarity about whether it was acceptable for Northern Ireland to participate due to the data sharing involved. I brought this to the SIG meeting of 29 June 2020, seeking consideration of Northern Ireland's participation in the sequencing programme. The COG-UK sequencing programme leveraged the expertise and infrastructure of a large number of laboratories, many of which were in academic contexts. The funding for the programme was through research funding to the University of Cambridge and the data were to be held in a specialised academic data centre known as CLIMB-COVID. The programme used pseudonymised data with limited demographic and location data, but the draft consortium agreement stated that the data should be considered personal data despite the pseudonymisation, and it categorised the work as research. From the perspective of the pandemic response, the sequencing was a potentially very important surveillance and operational tool. CSA sought an opinion from the DoH Data Protection Officer, who was supportive of

participation on the basis of a public interest justification. The PHA Agency Management Team approved participation. I presented the proposal to the DoH Privacy Advisory Committee, which supported the proposal, noting that the risks to patient confidentiality was exceedingly small [**DBR/24 – INQ000458893**]. The chair wrote that "[c]onsidering the relevant risks and potential benefits in the present proposal, we are of the view that there is a strong overall public interest in NI participating through the inclusion of the proposed sets of pseudonymised patient data." I supported completion of a Data Protection Impact Assessment and secured information governance approvals. I worked to secure PHA's participation in the consortium and the consortium contract was signed by PHA. Participation in CoG-UK was the basis for Northern Ireland's SARS-CoV-2 pathogen genomics programme. This allowed the monitoring the emergence of new variants, monitoring their growth and severity, and using genomic data in outbreak risk assessment and risk management.

76. Data sharing frameworks that I am aware of are: the health protection MOU, the BSO HBS MOU (to which PHA is a signatory), the COG-UK consortium agreement and a DAA between BSO HBS, PHA and SPPG (who were joint data controllers at that time) to cover the use of de-identified VMS data for approved research use through the HBS processes. The Health Intelligence department of PHA also had data access agreements with Trusts for purposes related to public health. I understand that there was a data sharing arrangement involving DOH and PHA that permitted NHS Digital to process results of lab tests conducted in the rest of the UK on behalf of Northern Ireland relating to Section 255 of the Health and Social Care Act (2012), but I was not involved in this work and have little information about it. I understand that PHA had other data sharing arrangements related to their operational work during COVID-19 that I was not involved in and do not have knowledge of. Others in DHCNI, PHA and other HSC organisations could provide more comprehensive information about data sharing arrangements.

77. It is my understanding that there is no equivalent to a Notice under Regulation 3(4) of the Health Service (Control of Patient Information) Regulations 2002 (COPI) in Northern Ireland, and to my understanding, regulations and structures to bring into effect the Health and Social Care (Control of Data Processing) Act (Northern Ireland) 2016 are not yet in place. I do not know whether these circumstances affected individual data sharing decisions, though I think it is possible that it may have affected the ability of some studies such as ISARIC4C (International Severe Acute Respiratory

Infection Consortium- Coronavirus Clinical Characterisation Consortium) to include Northern Ireland fully in their work. It was my impression that information from ISARIC4C could have provided additional useful intelligence to understand the impact of COVID-19 on patients, and for future pandemic preparedness, I believe it would be important that Northern Ireland should be able to participate in this programme.

78. It appeared to me that there were sometimes overlapping roles between the various organisations that were reporting on COVID-19 activity and its impact. I think that coordination and prioritisation of information requests and response should feature strongly in future pandemic and emergency plans. I believe the availability of modern infrastructure and improved datasets will need to be complemented by effective and efficient processes for setting priorities, allocating responsibility and resourcing the work.

Digital Healthcare

79. I had no significant involvement with the digital health work led by DHCNI during the COVID-19 pandemic. On 9 March 2024, their website listed their products of their COVID-19 work as: Enabling home working for DoH & HSC staff members; The development of a COVID-19 web presence for healthcare advice; The development of a telephone helpline; Development of a capability to carry out remote consultations; The CovidCare App (symptom checker app providing immediate advice and links to trusted information on COVID-19); StopCovidNI (an app to alert users if they have been in close contact with other users who have tested positive for COVID-19); Digital Self Trace (an automated system to enhance the contact tracing process operated by the PHA telephone Contact Tracing Centre); Vaccinations Management System (digital processes to help manage the delivery of the COVID-19 vaccines); COVID Certification Service (CCS) a multi-channel service to facilitate international travel providing, by virtue of vaccination or COVID testing, documentation meeting EU and WHO requirements; Data analytics platforms such as the Covid Dashboard (digital systems to assist in the analysis of data to produce information which could help the HSC and other public bodies to respond more effectively to the spread of the virus).

80. From my perspective for public health epidemiology, surveillance and research, the VMS has been a useful population health intelligence resource. It supports operational

management of the vaccine programmes, and can provide insight into vaccine uptake, inequalities and effectiveness, resulting in decisions and actions. The NIHAP data analytics platform has been beneficial in the ability of PHA to conduct efficient communicable disease surveillance and will significantly improve the capability of PHA to monitor and respond to emerging situations in future. If the NITRE project progresses and provides a means of accessing anonymised routine data for research, it should open up potential for more timely and comprehensive population health insights and actions. I contributed to a manuscript that reporting on work that QUB colleagues conducted using symptom tracker app ([**DBR/25 – INQ000458894**]), but did not directly work with the data.

81. I have no significant experience of the other systems, other than as a citizen user of some of them. I have received communication in my PHA role, which stated that the COVIDCare NI symptom checker app was among the first in the world to be released and was delivered in two weeks [**DBR/26 – INQ000458895**]. I understand that the STOPCovid NI proximity app was the first in the UK and was compatible with the Republic of Ireland's proximity app **DBR/27 – INQ000458896**]. I have been told that the COVID Certification Service delivered its digital solution in three weeks, and that it was regarded as successful. Those who had responsibility for these services would be better placed than I am to provide information about them.

82. With respect to symptom tracking, I had very limited involvement in this. I know that PHA took part in the First Few Hundred study, which captured symptom information. The DoH symptom tracker app collected some information, though I do not know the detail of this. When the Contact Tracing Centre was established with its new information systems, I believe it also captured symptom information. I believe that the Zoe App was useful in identifying changes in symptoms. I think there would be significant merit in capturing symptom information in emergency departments as part of a severe acute respiratory infection surveillance programme. I hope the implementation of the new electronic healthcare record may facilitate this in future. I do not feel that I am sufficiently knowledgeable about the symptom tracking to reach a view about whether or how these processes could have been improved.

Sharing of information between primary care, secondary care and care homes

83. I understand that GPs can see information about their patients' hospital admissions and laboratory results through Northern Ireland Electronic Care Record (NIECR). I have never used NIECR and others would be much better placed than I am to provide information about this.

84. I do not know of any other information system that would allow primary care, secondary care and care homes to exchange information with each other. I do not know whether HSC staff in Trust-operated care homes may have access to NIECR or any Trust information systems.

Visibility of information by government decision-makers

85. I have limited knowledge of what information government decision-makers could access relating to primary care, secondary care and care homes, and whether they could directly interrogate systems. I know that DoH IAD had access to information systems and deaths data provided by PHA for producing their statistics, but I was not involved in those processes and do not know who had access to what information in DoH. Information about this would be best provided by those decision-makers or officials. To my knowledge, the DoH Public Dashboard was the main source of intelligence about the epidemic for most audiences. The UK Coronavirus Dashboard was also useful for making comparisons between UK nations. I am aware that there were also various surveillance reports from PHA prior to, and during, my involvement in COVID-19 surveillance, which provided summary intelligence about elements of healthcare activity and care home outbreaks. In my PHA role, I provided intelligence (count data) for modelling about hospitalisations to CSA, DoH Gold Command and the modelling group. I know that summary reports of activity from various elements of HSC were produced by HSCB/SPPG and shared with DoH directly or through the Silver and Gold processes. I understand that DoH IAD had capability to undertake analysis. DoH Gold forwarded The Executive Office's 'NI SitRep' to me, as well as the Health Silver SitReps [**DBR/28 – INQ000458897**]. I was granted access to a Cabinet Office dashboard about COVID-19 but I did not use it regularly. I believe others would have had access to it but I do not have further information about this.

86. Though I was not involved at the time, I am aware that PHA commenced reporting case numbers when the first positive tests were detected and I believe they also reported this to DoH. I do not know if there were any challenges with this. I am aware

that PHA established a mechanism for deaths with COVID-19 to be reported to PHA by clinicians, and possibly also from care homes. I was not involved in this work at the time and do not know the detail of challenges with this.

87. The availability of information evolved over the duration of the pandemic, but the DoH IAD public dashboard was, to my knowledge, the key resource, and once it was in place, it provided open and equal access to the public and policy-makers to a shared understanding of the situation.

88. I do not know whether intelligence about COVID-19, such as the public dashboard, was effectively used to inform the Northern Ireland Government's response, but my impression is that it was, insofar as decision-makers had transparent and timely access to information that they were able to consider as part of their decision-making process, which may also have been informed by other factors.

Intelligence about primary care and care homes

89. I joined several meetings with HSCB general practice advisors, who, I believe, were able to supply intelligence about primary care COVID-19 centre activity from the Ad Astra information system to the CSA and others to support situational awareness. I do not recall the data being used in modelling. They also collected intelligence about primary care activity related to COVID-19 through repeated surveys of practices. I understand that GPs referred their patients to COVID-19 centres (as they do for outpatients referrals) through an electronic system called Clinical Communication Gateway. I was not involved in creating this process and have limited information about it except that the referral activity was noted as a potential source of intelligence early in the pandemic. I was not involved in this process but received some of the outputs of primary care activity by email, along with CSA, approximately weekly between April and October 2020. Those responsible for primary care could give a more comprehensive and precise view of the intelligence produced for and by them.

90. I understand that PHA used Apollo for surveillance of primary care consultations with suspected COVID-19 for a time and subsequently discontinued it when the Northern Ireland General Practitioners Committee of the British Medical Association argued that this use case was not within the original scope of the project. I was not involved at the time. I do not know of this intelligence being reported anywhere other than in PHA

surveillance bulletins, and I do not know of its absence causing any issues in policy-making. Influenza consultation reporting previously provided by Apollo has been replaced by SPPG's GPIP system for PHA's influenza surveillance programme.

91. To my knowledge, the main sources of information about care homes were the notifications of care home outbreaks to PHA health protection service and the information reported by care homes through the RQIA portal. I understand that the PHA outbreak information did not include information about individual residents or staff affected by an outbreak, and so analysis could only be conducted at group (care home) level, rather than individual level. When I became involved in COVID-19 surveillance in PHA in January 2022, I explored the possibility of creating new indicators using information submitted with COVID-19 tests about care home residence status. There was variation in the reliability of data entry about care home residence status, which limited the validity of indicators based on this approach. I believe that if HSC held an up-to-date list of identifiers of people in receipt of social care, as it does for those receiving healthcare, insights about transmission infection in care homes and those receiving domiciliary care could be provided more effectively, perhaps using anonymised data through NITRE.

92. I understand that PHA colleagues conducted work to investigate transmission in care homes, which I was not involved in [**DBR/29 – INQ000458898**]. To the best of my knowledge, a key source of intelligence about transmission in care homes was known as the Vivaldi study, which I believe to have been led by Professor Laura Shallcross. I contributed to a review article that investigated the role of viral genomics in understanding COVID-19 outbreaks in long-term care facilities [**DBR/30 – INQ000458900**]. I understand that the COG-UK consortium work included reports from several groups that investigated transmission in care homes, though I was not involved in these.

93. I know that in PHA a modelling exercise focusing on care homes was conducted by a colleague, Dr Damien Bennett, at the request of the Director of Public Health, Professor Hugo van Woerden. The paper was submitted to DoH through Silver and directly to CMO and CSA on 17 April 2020 [**DBR/31 – INQ000458901**]. CSA thanked Professor van Woerden, recognising that the report highlighted the "urgency of the situation" with regard to care homes and highlighting some potential intervention approaches, including testing before entry, whole-home testing on detection of one

case, and the use of infection prevention and control measures [**DBR/32 – INQ000458902**].

94. On 29 April 2020, the SPI-M-O secretariat wrote to Professor Ian Hall to ask him to consider inclusion of Scotland, Wales and Northern Ireland in his analyses related to Care Homes. On 1 May 2020, Professor Hall's team produced some geospatial maps of care home outbreaks in Northern Ireland using a data extract that I supplied, but I do not know of any mathematical modelling conducted as a result.

95. I attended a small number of meetings of the SAGE Care Home Working Group (later called the Social Care Working Group), as detailed above. I believe members of this group worked on modelling related to care homes. I believe that Professor Ian Hall from the University of Manchester led much of this work, and that relevant papers were presented at SPI-M-O or SAGE.

96. CMO forwarded an email to me on 21 January 2021 that included a draft proposal for care home surveillance analyses related to the implementation of the vaccine programme, titled "Learning from COVID-19 vaccination rollout in the care home sector in NI. Proposals for immediate and longer term public health analysis of the impact of COVID-19 vaccination across the NI care home sector" [**DBR/33 – INQ000458903**]. I believe this relates to work published by that team later [**DBR/34 – INQ000458904**]. I was not involved in this work.

97. In my own research, I explored the relationship between the prevalence of COVID-19 in the community and the number of care home outbreaks notified. I found that there was linear relationship between these measures and the frequency of care home outbreaks with no time lag, which could be used to infer the expected number of outbreaks from the community prevalence. Care home outbreaks decreased by two-thirds and were shorter (a proxy for outbreak size) after the implementation of the vaccine programme [**DBR/35 – INQ000458905**]. I observed that in the SPI-M-O consensus statement of 22 December 2021 [**DBR/36 – INQ000458906**] it is noted that the Social Care Working Group reported a similar reduction of outbreaks by 75%, and a 50% reduction in outbreak size. I believe this kind of modelling was useful for evaluating the impact of the vaccine programme, alongside vaccine effectiveness studies.

98. I do not know whether the need for compliance with data protection legislative frameworks affected availability related to care homes. It is my impression that no centralised list of people in receipt of social care exists to be accessed, should permissions be granted. I do not know whether the implementation of the Epic electronic healthcare record may help address this in future.

99. I am not aware of whether or how core political and administrative decision-making was affected by the relatively limited data and intelligence about transmission in care homes as I had only limited insight into political and administrative decision-making processes.

The use of data in public messaging

100. I believe that the Northern Ireland public was well-informed about the spread of the virus and about the protective effect of the vaccination and I do not think there was much more that could or should have been done in this regard. Well-publicised evidence of the real-world effectiveness was produced by a Scottish team led by Professor Sir Aziz Sheikh early in the implementation of the programme and this provided useful information to support public messaging (I was involved in this work as a co-author) [**DBR/37 – INQ000458907**]. VMS data were not immediately available for research through the BSO HBS, which slowed progress of the Northern Ireland component of the UK-wide, HDR-UK-funded Data and Connectivity Vaccines Pharmacovigilance study, which I was involved in through my QUB role. Though I believe it was important that Northern Ireland participated in such studies I do not believe that 'local' evidence of vaccine effectiveness was necessary to support public messaging, since generalisable estimates of vaccine effectiveness from other comparable areas could be applied to Northern Ireland, and larger countries or pooled estimates from multiple studies would provide greater precision.

101. I believe it would also hold true that evidence created elsewhere that identified groups of people at increased risk of harm due to COVID-19 could be applied in Northern Ireland. In the vaccine research that I was involved in using anonymised data through BSO RDW, we did not have access to data from primary care systems, and so had to rely on inferring information about health conditions from the medicines dispensed in primary care. This limited our ability to infer information about many conditions, including learning disabilities. It is possible that SPPG's GPIP programme may provide a means of addressing this kind of limitation in future. Information from

NIMATS was available for research through BSO HBS and has also been used by PHA to measure vaccine uptake in pregnant women.

102. With QUB colleagues, I conducted research into vaccine uptake among people who had mental health conditions and shared results with HSC mental health service leaders showing that people who were prescribed medicines that are used to treat anxiety and psychosis were less likely than the rest of the population to have been vaccinated [**DBR/38 – INQ000458908**].

103. I was involved in a qualitative study of the facilitators and barriers for pregnant women to be vaccinated against COVID-19 **[DBR/39 – INQ000458909**]. The study "highlighted that the choice to accept a vaccine during pregnancy generates internal conflict and worry." It concluded that "[h]ealthcare professionals (HCPs) play a significant part when it comes to decision making about COVID-19 vaccines among pregnant women. HCPs and pregnant women should be involved in the development of interventions to improve the delivery and communication of information." I believe that as well as reliable evidence about which groups are less likely to be vaccinated, HSC services need to make better use of an understanding of psychology or behavioural science in designing their services and interventions to support informed decision-making. Understanding the problem alone is insufficient; we also need to be know how to bring about change effectively.

104. Though I have not been involved, I believe PHA has issued communications directly to people who are eligible for some vaccines during and since the pandemic. In future, I believe this kind of direct communication could be evaluated, and if effective, used more widely. It offers potential to ensure that people who are eligible for vaccines are aware of their eligibility and how to get vaccinated.

My interaction with the CSA, CMO and senior decision-makers

105. My interaction with the CSA, CMO and senior decision-makers was mainly by emails, videoconference meetings and contributions to submissions. During the establishment of the modelling group, I exchanged emails with CSA numerous times each day while conducting work in preparation for, or behalf of, the modelling group. I worked from home for almost all of the relevant period following the first restrictions and did not attend any meetings in person. I met with CSA by videoconference during modelling group and SIG meetings, which were frequent early in the pandemic. I had a small number of *ad hoc* videoconference meetings or telephone calls with CSA, for

example to hand over information after a period when I had been deputising for him. I met with CMO and/or his officials several times each week when deputising for CSA. I did not meet CSA, CMO or the Minister in person during the relevant period.

106. While deputising for CSA, I joined several *ad hoc* videoconference meetings with CMO, officials, the Health Minister and Ministers from other departments as requested by CMO to support their discussions.

107. From 5 February 2021 onwards, when I was deputising for the CSA, there was a weekly 'catch up' videoconference meeting at the end of each week with CMO Group and officials, sharing updates and taking stock, which I attended regularly.

108. When I deputised for the CSA, I attended the Executive on 4 February, 11 February, 18 February, 4 March, 11 March, 16 March, 25 March and 9 September 2021. The presentations that I gave to the Executive when deputising for CSA were primarily based on the same sources used for the R Number Paper, which were: the agreed R number ranges from the COVID-19 modelling group; a time series of R as calculated by the SIB modeller; COVID-19 tests and cases and critical care occupancy, from information collated by DoH IAD; Hospitalisations from the system that I established in PHA; the Office for National Statistics Coronavirus (COVID-19) Infection Survey; a DoH IAD analysis of Google Mobility trends; and COVID-19 cases from England, Scotland and Wales from the UK Government Coronavirus Dashboard and similar information from a Republic of Ireland official website. Projections were produced by the modelling group. On one occasion, when vaccination was discussed, I presented early analyses of work that was later published as **DBR/35 – INQ000458905**

109. Though I attended eight meetings of the Executive, and answered questions from some individual ministers during meetings, I had limited opportunity to gain knowledge of their individual understanding of the data and modelling. I answered their questions to the best of my ability to support their understanding. To my recollection, I found that Ministers were generally attentive to the information that I provided in those presentations and asked questions afterwards. During my time deputising for CSA, I came to believe that the Health Minister understood the data and modelling well.

110. I understand that it was the role of advisers to present evidence to Ministers about the expected outcomes from various policy choices, and the uncertainty inherent in projections and outcomes. Ministers would consider this evidence, weighed among other factors in their decision-making, for which they were responsible and accountable. I do not feel that the phrase 'follow the science' reflects this process, as it could suggest that policy-decisions were, in effect, made by advisers, which was not the case, in my experience.

Cooperation with the Republic of Ireland

111. As I mentioned previously, at the formation of the Modelling Group, there was a stated intention to work more closely with the Republic of Ireland than became the case. I do not know why this did not proceed as originally envisaged.

112. During my secondment at DoH, when deputising for the CSA, I joined CMO and officials at a weekly meeting with the Republic of Ireland CMO, Deputy CMO and colleagues. My role in these meetings was primarily to present the R number and epidemiology to the group. The corresponding epidemiology in the Republic of Ireland was also presented. I observed that there was a frequent (at least weekly, to my knowledge) exchange of information about policies and plans with respect to COVID-19. My role in this was relatively limited and I would find it difficult to offer a view about whether this was appropriate cross-border working.

113. I know that health protection teams from both jurisdictions met frequently and regularly to share situational awareness. I was not involved in discussions between Northern Ireland and the Republic of Ireland public health leaders and I do not know if any took place.

114. I was a scientist and public health doctor, with no prior experience in policy before January 2021. I did not have full sight of the extent of joint working with the UK and Republic of Ireland governments at any time and I do not feel I can offer a useful view on how this could be improved.

115. I believe it would have been very difficult to treat the island of Ireland as 'one epidemiological unit' for practical reasons, such as the different healthcare systems,

which would result in different healthcare-seeking behaviour, different testing access and policies, and different processes and timelines for registration of deaths. It was still possible for us to have an overview of the epidemic through data that was shared openly on public-facing websites and the meetings in which intelligence was shared between officials. The technical arrangements for producing and sharing intelligence in both areas, in my view, marked an increase in accessibility and timeliness of open data. I do not recall any public-facing dashboard with such extensive and timely HSC summary data as that the DoH IAD dashboard supplied. Some of this data was also supplied to the UK Government's COVID-19 dashboard, which made it easy to download data in machine-readable format, which was useful for integrating into other reports. Though I have limited experience of the Republic of Ireland's surveillance reports, it is common for such reports to be in 'pdf' format, which are useful for reading by people but not for extracting data by computers for comparative analysis. The Republic of Ireland's COVID-19 reporting included an online table of indicators that I could download using the same link each week to integrate into the R paper, which was very valuable. I contributed to a report of an all-island analysis of SARS-CoV-2 genomic data, which used open data and statistical approaches that I believe could be used in future. The project took place later in the pandemic and built on knowledge gained during it, including gathering data and developing appropriate statistical methods. Now that this foundational work has been done, it could be deployed more quickly in a future situation, as long as the current capability is maintained and built-upon [**DBR/42 – INQ000458911**]. Infectious disease surveillance in Northern Ireland would benefit from being able to provide intelligence that is compatible with both the rest of the UK and with the Republic Ireland. It may not always be possible to align precisely on case definitions, processes and timing of reporting, but ongoing engagement with other public health organisations as part of pandemic preparedness and in routine surveillance should work towards this where it is possible, which should facilitate situational awareness with greater certainty for decision-makers. I was not aware of any issues or barriers to sharing intelligence between Northern Ireland and the Republic of Ireland.

The use of data and modelling in decision-making

116. Before the period when I deputised for the CSA, as I was primarily undertaking a technical role on behalf of the modelling group, I was not involved in discussions with policy-makers and politicians. I was not sure how discussion and evidence from the

COVID-19 modelling group and SIG were linked to the Executive's decisions about restrictions. I understood, however, that policy-makers and Ministers considered other social and economic factors in their decisions. I gained some more insight into this process when I deputised for CSA. I believe that the decision-making was influenced to some extent by factors relating to: the risk of transmission associated with some activities or settings; the personal, social and economic value associated with those activities; the context of the epidemic, such as the disease prevalence and R number at the time the decision was to be made, and their practical feasibility. I know that SAGE produced a document outlining the different non-pharmaceutical intervention options [**DBR/43 – INQ000458912**], and I think it would be useful to incorporate this into future pandemic planning, perhaps including elements of public consultation during preparation, as well as evaluation of the impact of historic interventions, to have a framework that make these factors more explicit, which could help with the making and communication of decisions in future.

117. With regard to 'Eat Out to Help Out', I did not have knowledge of the policy in advance, and when I learned of it I had reservations that it was not consistent with public messaging about reducing indoor social contact to reduce transmission, or consistent with the policy aim to suppress transmission. I believe any modelling of such a scheme beforehand would have had broad uncertainty. I think it could be inferred without modelling that a policy aimed at increasing indoor social contact would, if successful in its aim, be expected to result in increased transmission.

Lessons learned

118. I believe that maintaining sufficient expertise and resource in mathematical modelling, data science and infectious disease epidemiology in PHA will be important for pandemic preparedness and response in future. Maintaining the technical infrastructure for this, such as with NIHAP, is a necessary foundation, in my view. Having this expertise in-house support ongoing engagement with SPI-M, and the capability to do modelling independently if required. It would also increase PHA's capacity to undertake new analyses and reporting. Changes in UK health protection

through the Health Protection Committee and related work may facilitate this in the UK in future.

119. In light of the movement of people between Northern Ireland and the Republic of Ireland, I believe it will be important that there is ongoing collaboration between public health authorities in Ireland and Northern Ireland in infectious disease surveillance and modelling work, as a matter of routine practice. In the last year, I have experienced several examples of building relationships and collaborations between the public health authorities through shared events and meetings, including relating to antimicrobial resistance and respiratory infection surveillance.

120. The ongoing modernisation and centralisation of HSC data systems, when the work is completed, will improve access to timely intelligence. Creating responsive governance processes to provide safe access to anonymised data through a secure data environment (such as is proposed for NITRE) by analysts engaged in emergency response could improve the quality, depth and timeliness of evidence that epidemiologists and modellers can provide to policy-makers and decision-makers.

121. I identified earlier in my statement a need to strengthen respiratory surveillance systems, including syndromic surveillance, severe acute respiratory infection surveillance and pathogen genomics.

122. In the case of a future emergency or pandemic, coordination of the design and delivery of intelligence should be an important function that should exist from the start of an incident.

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: _____

10th April 2024

Dated: _____