Witness Name: Dr Jim McMenamin
Statement No.: 1
Exhibits: 142
Dated: 29 November 2023

UK COVID-19 INQUIRY

WITNESS STATEMENT OF DR JIM MCMENAMIN

I, Jim McMenamin, will say as follows: -

A: SOURCES OF ADVICE; MEDICAL AND SCIENTIFIC EXPERTISE; DATA AND MODELLING

1. My roles and responsibilities

1.1. My main responsibilities as the Head of Infections Service and Strategic Incident Director at Public Health Scotland have been previously documented along with dates (Please see my Questionnaire Response dated 03/07/2023 (JM/1 - INQ000130152)[1] paragraphs 1.1.4 and 1.1.5. I confirm that I have not held any ministerial offices prior to being appointed as the Head of Infections Service and Strategic Incident Director at Public Health Scotland.

1.2. I will across this statement make reference to a number of acronyms which will be written in full the first time of use and I have provided a table of these abbreviations in this final submission (see Additional Information pages 161-162). This statement is written to the best of my recollection and in light of access to the material I have available to me as on 7th November 2023.

[1] PHS. Jim McMenamin answers to questionnaire by Module 2A. February 2023.

1.3. It is important to provide further context regarding my role as this has a material impact on what I can then say in response to the questions addressed to me in this Rule 9 request. This is offered to explain why I may have detailed direct knowledge for some aspects of what has been asked or why in some circumstances I have had to signpost to others or to give my understanding of the situation from my recollection of discussions with colleagues or review of evidence identified.

1.4. Prior to the first cases of COVID-19, I along with my colleagues, Professor David Goldberg and Dr Colin Ramsay, were in interim Clinical Director (Me) and Interim Deputy Clinical Director roles (Professor Goldberg and Dr Ramsay) respectively, nominally in a single session of four hours each per week, to support the Assistant Director Kate Harley in delivering the work of HPS. The creation of the new Public Health Scotland in April 2020 was scheduled to deliver an increase in the clinical leadership contribution to health protection but the process was stalled by the onset of the pandemic itself. In the period January 2020 until the end of March 2020, I clinically reported to the Medical Director of the NSS Public Health Intelligence, Professor Mahmood Adil. On 1st April 2020, the creation of PHS meant that I then reported to a new interim Medical Director/Director of Clinical and Protecting Health, Dr Mary Ethna Black. This arrangement continued until the appointment into the substantive post of Medical Director/Director of Clinical and Protecting Health, Professor Nicholas Phin on 4th January 2021.

1.5. Recognising that no single person could cover the entirety of COVID-19 across the response, myself, Dr Ramsay and Professor Goldberg assumed the roles of Strategic Incident Directors (SIDs) being later joined by Professor Black. From early in the response (January 2020) we developed a cell structure which adapted over time supported by the SIDs that allowed us to primarily allocate tasks whilst respectively continuously updating each other. This latter practice was critical to allow cross cover as required and remained in place for the period up to October 2020;

- Dr McMenamin – Surveillance, the National Incident Management Team, relationship with Scottish Government (this became shared with Professor Black following her appointment) and external relationships with SAGE, DA's, PHE/UKHSA and WHO;

- Dr Ramsay – Continual review of guidance and 3rd Sector relationships, coordination of HPS/PHS support to incident response;

- Professor Goldberg - Enabler for collaboration to commence and run studies, coordination of commissioning and review of output for peer review submission, co-opting secondment and recruitment of senior staff

- Professor Black - Immunisation programme, internal PHS relationships and relationship with Scottish Government.

1.6 Responding to an extended period of sickness absence and the subsequent retirement (in December 2021) of Dr Ramsay, Dr Maria Rossi assumed a similar role to that which Dr Ramsay had discharged which was later reflected in her appointment into interim and later substantive medical management within PHS.

1.7 The roles of other key individuals in PHS following its creation are important to be clear about; Phil Couser, (supported as I understand it by Fiona Russell) had a key role in setting up the relationship with NSS which would see the provision of the Test & Protect offer. The then Chief Executive of PHS, Angela Leitch, played a pivotal role in the set-up of the service that followed. The role played by Phil Couser would later move to George Dodds (as Chief Officer for testing from January 2021). In late December 2021, Professor Goldberg entered an extended period

of sickness absence before subsequently retiring from PHS (In December 2022).

2. CMO/CMOD advice and medical/ scientific advisory bodies

2.1 Advisory bodies

2.1.1 With respect to advisory bodies of relevance, their role and any changes over time, I have previously outlined this in my Questionnaire Response dated 03/07/23 (JM/1 - INQ000130152)[2] (paragraphs 3.5.2 and 3.5.4 respectively). I have also already outlined my response re the Scientific Advisory Group for Emergencies ("SAGE"); New and Emerging Respiratory Virus Threats Advisory Group, ("NERVTAG"); and the Scottish Government Covid Advisory Group ("SGCAG"), including its sub-groups.

2.1.2 In relation to the other groups I would make the following response:

- 4 Nations' Chief Medical and Scientific Officers; I had no involvement;
- Scientific Pandemic Influenza Group on Modelling ("SPI-M"); I had no involvement;
- Scientific Pandemic Insights Group on Behaviours ("SPI-B"); I had no involvement

2.1.3 Joint Committee on Vaccination and Immunisation ("JCVI"); whilst listed as an observer I did not attend these meetings as the main representative on behalf of PHS was Dr Claire Cameron. I was occasionally co-opted as an attendee to contribute to the discussion on the effectiveness of the COVID-19 vaccination

[2] PHS. Jim McMenamin answers to questionnaire by Module 2A. February 2023.

programme once this was operational and population observations became possible from either EAVE-II or from PHS.

2.1.4 Joint Biosecurity Centre (JBC); I was invited to specific meetings representing PHS, a list of which has been provided to the inquiry (I assume that a list of JBC meetings to which I and the representatives of the Devolved Administrations has been provided).

2.1.5 UK Health Security Agency ("UKHSA"); I was invited to specific meetings representing PHS a list of which have been provided to the PI (I assume that a list of JBC meetings to which I and the representatives of Devolved Administrations has been provided).

2.2 The predecessor to JBC and UKHSA was Public Health England. This was the principal provider of intelligence on the COVID-19 situation as it emerged either in England directly or through information exchange with the National health protection teams in each of the Devolved Administrations. PHE provided the National Focal Point for information exchange with the WHO and ECDC and other international organisations. On behalf of HPS & thereafter PHS I attended a sequence of meetings with PHE on COVID-19 which were then succeeded by the new JBC & UKHSA organisations as they came into being.

2.3 Please see the Corporate Narrative (JM/2 – INQ000108544)[3] and Corporate Statement for Module 1 (JM/3 – INQ000183410)[4] which outline the respective roles of HPS/PHS and Scottish Government – see paragraph 3.5.2 and 3.5.4 - with respect to the overarching principles which guided core political and administrative decision-making within the Scottish Government during the pandemic, in particular with regard to the way that medical and scientific advice was factored into it and the respective roles of ministers and their advisors.

[3] PHS. COVID-19 Public Inquiries: PHS Corporate Narrative. January 2023.
[4] PHS. COVID-19 Public Inquiries: PHS Module 1 Statement. May 2023.

2.4 During the first wave and preceding the first lockdown an early decision was made by Scottish Government that they should assume leadership of COVID-19 as an emergency response in line with the Management of public health incidents: guidance on the roles and responsibilities of NHS led incident management teams (JM/4 - INQ000147512)[5]. This guidance was updated in July 2020 to reflect the creation of PHS.

2.5 The focus of HPS and PHS was then the provision of advice to the CMO either directly or through the Scottish COVID-19 NIMT. From my personal perspective this was an essential step in ensuring that the maintenance of public confidence was best supported.

2.6 The key policies which underpinned the Scottish Government's approach to the management of the pandemic were set by Scottish Government. I, HPS and thereafter PHS do not set policy but rather provided advice either directly to the CMO or through the National Incident Management Team (NIMT). Prior to and following the creation of PHS my Antimicrobial Resistance and Healthcare Associated Infection (ARHAI) colleagues as part of Health Protection Scotland provided advice directly to the Chief Nursing Officer. From my personal perspective the principle of all such advice being considered through a "Four-Harms" lens within Scottish Government was appropriate (I will cover this in later sections). I cannot comment on any additional considerations. During the first wave of infection the SG approach was part of an elimination strategy for COVID-19 in Scotland (JM/5 - INQ000347495)[6]. Within this context, one interpretation would be that this may be consistent with the reference by Professor Woolhouse to "the idea that no death from novel coronavirus is acceptable" (JM/6 – INQ000273891)[7].

[5] PHS. Management of public health incidents: guidance on the roles and responsibilities of NHS led incident management teams Version 12.1 14 July 2020.
[6] Scottish Government. COVID-19 in Scotland. March 2022. [Accessed November 2023].
[7] Woolhouse, M. The Year the World Went Mad. Sandstone Press, 2022. pp. 64.

2.7 From my personal perspective this could also be consistent with a more pragmatic view of minimising severe illness and consequent deaths rather than preventing all deaths.

2.8 Advice was offered in particular through membership of the COVID-19 NIMT to the Scottish territorial health boards, Scottish local authorities (through COSLA & SOLACE). Primary Care services, OOH, NHS 24 and NHS Inform were also part of this NIMT arrangement.

2.9 In my capacity as Strategic Incident Director (SID) either I or my other SID's (Professor David Goldberg, Dr Colin Ramsay or post 1st April 2020, Professor Mary Ethna Black, or post 1st January 2021, Professor Nicholas Phin) coordinated a number of HPS/PHS functional cells to allow provision of advice in particular to:

2.9.1 Early Years, Primary & Secondary School and Further Education;

2.9.2 Independent sector care providers; and

2.9.3 Other major public authorities or sectors e.g. Scottish Prison Service.

2.10 The role of the NIMT was to coordinate requests for specific advice, to meet in subgroups where necessary and, where appropriate, offer advice to the CMO for consideration by Scottish Government. In parallel health protection matters could be discussed with Public Health England/UKHSA and the other Devolved Administrations (DA's) through our existing structural meeting arrangements or, if appropriate, from the escalation to the UK CMO and Senior Clinician view groups for a view. The latter group's membership was restricted to Medical Director level (Professor Mary Ethna Black and Professor Nick Phin for PHS) and I had no role in this discussion.

2.11 The nature of the personal and working relationships between medical and scientific advisors/advisory bodies and its relationship to the effectiveness of the response has been covered in the Corporate Narrative (JM/2 – INQ000108544)[8] and Corporate Statement for Module 1 (JM/3 – INQ000183410)[9] which outline the respective roles of HPS/PHS, Scottish Government and the role of the PHS chaired NIMT.

2.12 My role and that of my team in providing advice to Cabinet meetings was indirect either through my role as the chair or my team's role as members of the PHS led NIMT

2.13 Through my role or that of my other Strategic Incident Director colleagues we made contributions to briefing papers led by Scottish Government officials for the Scottish Cabinet. It is difficult to assess the effectiveness of the interaction with these groups other than by observing what subsequently was announced ministerially. My observations are that Scottish Ministers carefully considered contributions from myself or my team and frequently Scottish Government announcements on policy corresponded with this advice. NIMT advice (which was limited to the direct harms of COVID-19, that is to say Harm 1 of what became known as the Four Harms consideration by Scottish Government) was however only one of the Four Harms being considered (the other three being indirect consequence of COVID-19, financial and economic consequences) and there were occasions where NIMT advice, whilst considered, was not taken. The Scottish Government were provided with 'Scottish Government Situation Reports', by SGoRR. I, along with my PHS colleagues, provided a raft of materials for Scottish Government consideration – please see Corporate Statement (JM/7 - INQ000300280)[10] and Corporate Narrative (JM/2 - INQ000108544)[11]. It is routine that fact checking by SG of PHS data would be undertaken by SG staff but to my recollection there were no contested issues.

[8] PHS. COVID-19 Public Inquiries: PHS Corporate Narrative. January 2023.
[9] PHS. COVID-19 Public Inquiries: PHS Module 1 Corporate Statement. May 2023.
[10] PHS. COVID-19 Public Inquiries: PHS Module 2A Corporate Statement. October 2023.
[11] PHS. COVID-19 Public Inquiries: PHS Corporate Narrative. January 2023.

2.14 In the Corporate Statement provided by PHS (JM/7 - INQ000300280)[12], at paragraph 3.3.3 it states:

"Dr Jim McMenamin gave evidence on 19th May 2020 to the Justice Committee to support their consideration of the challenges in restarting jury trials in Scotland's courts. The Committee's questions focussed on the science and risk assessments behind the current social distancing advice given to public bodies" (JM/8 - INQ000235156)[13].

Please see the transcript of the proceedings (JM/9 – INQ000354105)[14] as this documents the advice offered. I understand that my advice and that offered by my PHS colleagues was followed on this occasion. However there were other occasions when a decision made by Scottish Government did not concur with my advice or that of PHS.

2.16 In the Corporate Statement provided by PHS (JM/7 – INQ000300280)[15], at paragraph 4.2.8, it states:

"On occasions a decision might be made by the Scottish Government that did not reflect all aspects of the advice provided by PHS. Inevitably, in addition to advice from PHS, Scottish Government had to take account of the impact on the Four Harms and other factors and to balance these in determining the most appropriate course of action for Scotland".

I will return to this theme in the section on Care Homes.

2.17 In the Corporate Statement provided by PHS (JM/7 – INQ000300280)[16], at paragraph 4.3.4 it states: *"The language of 'recommendations' was latterly removed from the vocabulary of the NIMT on the request of the*

[12] PHS. COVID-19 Public Inquiries: PHS Module 2A Corporate Statement. October 2023.
[13] Scottish Parliament TV. Justice Committee 19th May 2022. Accessed March 2023.
[14] Scottish Parliament. Justice Committee Tuesday 19 May 2020. May 2020.
[15] PHS. COVID-19 Public Inquiries: PHS Module 2A Corporate Statement. October 2023.
[16] PHS. COVID-19 Public Inquiries: PHS Module 2A Corporate Statement. October 2023.

Scottish Government. The Chair provided written advice to the Scottish Government via email following the meetings."

My recollection re this was this change followed a request made at a "Gold command"/SGoRR meeting on 20th October for the NIMT to offer advice (as Harm one of the Four Harms consideration) rather than recommendations. SG officials then made this request which NIMT accepted in this context.

3. Informal Decision Making and communication

3.1. There were a limited number of WhatsApp groups or text exchanges with Scottish Government colleagues on an informal basis with relevance for medical or scientific underpinning of key decisions. Transcripts of all of these exchanges have been provided to the Inquiry.

3.2. All of the WhatsApp groups were set up by Scottish Government and control of the settings were then within the control of SG. There are some of the WhatsApp exchanges that are not available due to the "Disappearing Messages" function within WhatsApp which only retain some of the messages for a limited time period.

3.3. In the Corporate Statement provided by PHS (JM/7 - INQ000300280)[17], at paragraph 4.1.4 it states:

"Colleagues in PHS and the Scottish Government had frequent informal discussions about the optimal response to the challenges presented by COVID-19. During the height of the pandemic these discussions took place with great frequency and enabled PHS to contribute timely public health perspectives and expertise to the advice provided by civil servants to Ministers and therefore to support decision-making. This included being part of WhatsApp groups with senior civil servants."

[17] PHS. COVID-19 Public Inquiries: PHS Module 2A Corporate Statement. October 2023.

3.4. This was limited to senior civil servants and never involved ministers. All such material has been provided to the Inquiry.

3.5. In my view the informal communications were an essential component of ensuring the optimal efficacy of the decision-making by providing timely opportunity for verification of factual information, interpretation of urgently requested data and mutual understanding on the impact of language used in communication of key findings.

3.6. I understand that although Microsoft Teams was used for its videoconferencing capability, no informal decision making was utilised from this system as action lists were used supported by advice notes, PowerPoint slides and minutes for example from NIMT meetings.

3.7. HPS and PHS have clear data retention policies within PHS and its predecessor organisations.

3.8. To the best of my knowledge these appear to have adhered to in relation to my evidence. A specific corporate request would need to be made to the rest of the organisation to allow an assessment of whether this was generalisable across the whole organisation or its predecessors.

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

4.1. Constitution, membership and role

4.1.1. On 25 March 2020, the First Minister confirmed that the Scottish Government would establish a COVID-19 Advisory Group to supplement the advice it received from the UK-wide SAGE. It was to be chaired by Professor Andrew Morris of Edinburgh University, the Director of Health Research UK, with support from vice chair David Crossman, Dean of Medicine at the University of St

Andrews and Chief Scientific Advisor for Health at the Scottish Government (JM/10 - INQ000354101)[18]. The secretariat should be able to provide the Terms of Reference for this group.

4.1.2. My recollection of the circumstances leading to its creation were that detailed consideration of Scotland specific issues reflecting our devolved health care delivery could not be encompassed with the SAGE arrangement. This likely led to what for me was a sensible conclusion that SGCAG should be established. I am unclear what if any delay there was in establishing SGCAG. From my perspective the scientific and expert advisory structures available to the Scottish Government, including SAGE/SGCAG, and advice received by it were sufficiently representative of the various competing interests which would be affected by core-decisions relating to the management of the pandemic in Scotland. This may also be covered within the Corporate Narrative and Statement.

4.1.3. Expertise was available within these advisory structures to take account of a wide range of disciplines. The secretariat would be able to provide the names and disciplines represented. I had no concerns regarding the adequacy or sufficiency of scientific and other expert advice to inform decisions by the Scottish Government's response to Covid-19.

4.2. **Operation of advisory structures**

4.2.1. Please see the PHS Corporate Narrative (JM/2 - INQ000108544)[19] and Corporate Statement (JM/7 - INQ000300280)[20]. I attended many but not all of these SGCAG meetings. I and my PHS/HPS colleagues provided interpretation

[18] Scottish Government. Coronavirus (COVID-19) update: First Minister's speech 25 March 2020. [Accessed November 2023].
[19] PHS. COVID-19 Public Inquiries: PHS Corporate Narrative. January 2023.
[20] PHS. COVID-19 Public Inquiries: PHS Module 2A Corporate Statement. October 2023.

of surveillance information and offered commentary on modelling output within SGCAG. I and my PHS/HPS colleagues contributed to discussion on all aspects of the work of SGCAG.

4.2.2. In my personal opinion the advice was well presented under the leadership of Professor Andrew Morris.

4.2.3. The overall role of the CSA, CMO, NCD & DCMO's was of facilitation in bringing relevant, often hot off the press, new information to the attention of the SGCAG and requests to SGCAG for urgent consideration as potential amendment to policy advice for ministerial consideration. All members of the SGCAG were encouraged to offer views and there was very effective chairing of this with the provision of a verbal summary in the meeting by the chair. Draft outcomes of the meetings were shared with the members for subsequent consideration and suggested amendment prior to issue. In the event of differences of opinion rather than consensus, these views were reflected in the advice offered.

4.2.4. I and my PHS colleagues provided information for inclusion in situation reports about the state of the pandemic to SG statistical colleagues. The format of these "State of the pandemic" reports was dynamic and initially shaped by SG with little direct input from PHS. This however rapidly evolved through constructive dialogue with experts within PHS on various subjects with greater opportunity thereafter for PHS to co-create and shape output (JM/11 -INQ000354100)[21]. SG compiled the distribution lists for these state of the pandemic and other advice notes. From my own perspective these were very effective in communicating relevant medical and scientific information when considered against the

[21] Scottish Government. Coronavirus (COVID-19): state of the epidemic. [Accessed November 2023].

entirety of the information outputs being produced by PHS, SG and UKGOV.

4.2.5. Dashboards took time to develop and compile and by their nature had to evolve over time as new information sources were developed to encompass the dynamic challenge of the pandemic e.g. there were no initial pages on Test & Protect or Covid-19 vaccination which were only available once these system components were developed. These proved to be incredibly successful in creating a single site for data for the whole population. In the setting of the Scottish Covid-19 dashboard the Office for Statistics Regulation (JM/12 - INQ000235148)[22] and a number of researchers were particularly effusive in their praise for the open platform allowing citizens access to data and allowing academics free access to data for tracking the impact of the pandemic on the Scottish population. This also provided the basis for international comparison with other Nations.

4.2.6. Transparent, clear and comprehensible communication was of paramount importance throughout the pandemic and was integral to all agencies in generation of output. It is difficult and probably impossible to get this right every time but incredible efforts were expended in trying to achieve this.

4.2.7. My understanding is that the mechanisms for core decision-makers to assess and challenge medical/scientific advice was multi-faceted; e.g. this could be through the Office of the First Minister making direct contact with myself or other PHS staff to clarify factual information; through feedback from the Four-Harms group; through direct interaction with Ministers in a number of "Deep-dives" on selected topics across the course of the pandemic.

[22] Humpherson, E. Ed Humpherson to Scott Heald: Rapid review of weekly COVID-19 and winter statistical report. 10 February 2022. [Accessed November 2023].

4.2.8. There was an iterative process for conducting meetings and formulating advice. In many instances the mechanics of setting and responding to agenda items was set by urgent SAGE business or the need to develop a view on forthcoming policy review. In other circumstances the CMO/DCMO would table a specific set of questions with a particular Scottish dimension. My understanding is that this would be in the main through items submitted to the secretariat for consideration by the chair. In the event of new items arising immediately before, or even in, the meeting there was opportunity to incorporate these items under AOB signalled at the start or part way through the meeting.

4.2.9. I would contend that there was a balanced consideration of advice provided within the SGCAG rather than there being undue prominence given to the epidemiology/modelling. There was scope for further balance by the Four-Harms process. In retrospect whilst inequalities in prevention or impact were considered across the pandemic more could have potentially been considered here – see written closing statement to Module 1 from PHS, Page 1 bullet 2 *"PHS considers the inadequate consideration of inequalities in pandemic planning during the relevant period to be one of the most significant areas for learning."* (JM/13 - INQ000235089)[23].

4.2.10. I have outlined above the consideration given to the handling of conflicting advice from SGCAG. When a range of views was possible the CMO and NCD (and on occasion the DCMO) led the presentation of views within the Four-Harms sessions and invited myself or other PHS representatives or members of the SGCAG to add to their statements. These were well presented and summarised and then it was for SG advisers to present for ministerial consideration. Re this latter point I understand that the

[23] PHS. COVID-19 Public Inquiries: Module 1 Closing Statement. August 2023.

CMO and NCD would then be invited, as required, to make a contribution on this in these ministerial meetings.

4.2.11. With regard to medical or scientific advice or data modelling being provided but not having advice followed the context needs to be understood.

4.3. First lockdown

4.3.1. It is important to understand that particularly in relation to the package of measures and the timing of the measures to be introduced in response to the pandemic which we then witnessed for the First lockdown there were significant scientific and modelling uncertainties considered by SAGE/SGCAG. This reflected the paucity of hard data or limitations on modelled output on which to make clear recommendations. Faced with such uncertainties there are inevitable judgement calls to be made re any change in government policy in terms of content and timing. In retrospect and from my perspective the lockdown measures instituted for the first wave from a purely Harm-1 perspective could have been instituted at least one or perhaps two weeks earlier.

4.3.2. I am unaware of any circumstances where there were any decisions in relation to medical and scientific information or advice or data modelling which was not sought but which ought to have been sought.

4.3.3. Medical and scientific advisers weighed medical and scientific advice with other considerations (such as the likely impact of decisions on the economy, non-Covid related illness and on its treatment, education, inequalities, vulnerabilities, mental health and societal issues) when advising on key strategic decision-making in response to the pandemic. This process became known as the Four-Harms consideration.

4.3.4. I am not aware whether there was any consideration by decision makers of the patient experience within the healthcare system during the pandemic. However, I can offer that I understand there was limited engagement directly by PHS with patient groups in some aspects of the work undertaken in response early years, schools and Further and Higher Education or the Scottish COVID-19 Immunisation Programme.

5. Mechanics of the provision of SGCAG advice

5.1. The purpose of the "Deep Dive" SGCAG meetings which were held with ministers was to provide expert interpretation and advice and address specific questions from Ministers to assist them in their deliberations.

5.2. From time to time this also included invited international experts such as Sir Jeremy Farr (see the Scottish Government Covid-19 Advisory Group corporate statement (JM/14 - INQ000215468)[24] at paragraph 20 re his attendance at the SGCAG Deep Dive meeting on 16 December 2020) to offer his expert view on the global current situation, important challenges to address and future issues to begin to think about.

5.3. SGCAG can I am sure provide a listing of advice provided to SGoRR (see the Scottish Government Covid-19 Advisory Group corporate statement (JM/14 - INQ000215468)[25] at paragraph 16).

5.4. With regard to the extent that advice from the SGCAG was made available to the Four Harms Group this is an item for the SGCAG secretariat to provide. For clarity my role within the Four Harms Group was to present the advice offered from the Scottish National Incident

[24] Scottish Government Covid-19 Advisory Group. UK COVID-19 Public Inquiry Module 2A Corporate statement. June 2023.
[25] Scottish Government Covid-19 Advisory Group. UK COVID-19 Public Inquiry Module 2A Corporate statement. June 2023.

Management Team in my capacity as the chair of this NIMT and as Strategic Incident Director for HPS/PHS.

5.5. I concur with Professor Andrew Morris (see the Scottish Government Covid-19 Advisory Group corporate statement (JM/14 - INQ000215468)[26] at paragraph 13) when he states that advice was sometimes requested and sometimes provided on the Group's own initiative. This is my recollection too but I would defer to my SGCAG secretariat colleagues for details of such circumstances.

5.6. I am unaware of any instances where particular SGCAG participants were not invited to attend SGCAG meetings due to concerns that they would disagree with the consensus view.

5.7. I agree with Professor Andrew Morris (see the Scottish Government Covid-19 Advisory Group corporate statement (JM/14 - INQ000215468)[27] at paragraph 29), when he states that the remit of SGCAG was to focus on scientific and technical aspects of the pandemic and broadly on the health impacts. I would offer that the SGCAG secretariat would be best positioned to provide specific advice and its sources on items on the impact of the virus, or the actual/contemplated counter-measures taken to combat it, on the medically vulnerable, or the definition of vulnerable groups, or the impact of the virus, or such countermeasures on groups with protected characteristics and any advice on NPIs including in connection with lockdowns, school, care homes, face coverings and physical distancing (see the Scottish Government Covid-19 Advisory Group corporate statement (JM/14 - INQ000215468)[28] at paragraph 32).

[26] Scottish Government Covid-19 Advisory Group. UK COVID-19 Public Inquiry Module 2A Corporate statement. June 2023.
[27] Scottish Government Covid-19 Advisory Group. UK COVID-19 Public Inquiry Module 2A Corporate statement. June 2023.
[28] Scottish Government Covid-19 Advisory Group. UK COVID-19 Public Inquiry Module 2A Corporate statement. June 2023.

5.8. I am not aware of any difference in the tenor of the advice provided by the Group across the pandemic. Nor can I offer specific response on travel and borders on 28 January 2021 (see the Scottish Government Covid-19 Advisory Group corporate statement (JM/14 - INQ000215468)[29] at paragraph 35) and why this was commissioned at that time and not at other points during the pandemic.

5.9. I have no recollection of any contribution to the impact assessment referred to (see the Scottish Government Covid-19 Advisory Group corporate statement (JM/14 - INQ000215468)[30] at paragraph 34).

6. SAGE

6.1 SAGE was a very complex group which was chaired incredibly well by its co-chairs (Sir Patrick Valance and Sir Christopher Witty) bringing together experts from a variety of fields to offer their views. At various stages I was listed either as a member or observer but attended a large number of these meetings. I was supported by the offices of the CMO/DCMO in Scotland in achieving initial attendance and subsequent re-invitations when I was no longer invited by SAGE. Ultimately there was a strong attendance by PHS and SG representatives at SAGE resulting in a resilient representation.

6.2 Inevitably there were communication issues re inclusion in invitation (Please see the Corporate Statement (JM/7 - INQ000300280)[31] and Corporate Narrative (JM/2 - INQ000108544)[32]) but there were likely many possible reasons for this for example

[29] Scottish Government Covid-19 Advisory Group. UK COVID-19 Public Inquiry Module 2A Corporate statement. June 2023.
[30] Scottish Government Covid-19 Advisory Group. UK COVID-19 Public Inquiry Module 2A Corporate statement. June 2023.
[31] PHS. COVID-19 Public Inquiries: PHS Module 2A Corporate Statement. October 2023.
[32] PHS. COVID-19 Public Inquiries: PHS Corporate Narrative. January 2023.

- At the point of stand-up of groups (incomplete list provided to the secretariat, email addresses being wrong or inadvertently missing out invitees through human error),

- At moments of change over in technology (e.g. from audio conference alone to audio-visual Microsoft Teams),

- At moments when the chairs reflected on the constituent membership - as there is a tendency for groups to become so large that they threaten to become less manageable or

- At significant moments of revision should there be concerns re compliance/adherence with confidentiality

6.3 When considering whether in providing advice, SAGE sufficiently considered the specific circumstances of Scotland I have concluded that there is no simple answer to this. In many if not most circumstances the answer could be regarded as yes as much of the advice would be equally applicable across the whole of the UK. The advice, which was offered from Scotland was I believe considered to be high quality scientific evidence. Such evidence was welcomed either as validation of output from England or in its own right (e.g. output from Scotland from EAVE-II). However in some circumstances the answer would be no e.g. when special consideration would need to be made to the Devolved Administrations and their Health and Social care arrangements or where specific issues pertaining to the Scottish population needed to be covered. My understanding was that the safety net for this was the creation of the SGCAG.

6.4 From my perspective the sense of the advice emanating from SAGE and its sub-groups was in a similar continuum to that of SGCAG. Any variation likely reflected the wording of specific requests as broadly there was agreement on the scientific interpretation of evidence. Translation into advice from SGCAG then considered the Scottish public health context of our collective deliberations.

6.5 I am not a member of Scottish Government so my observations are limited to those occasions that I interacted with them or occasions reported to me by my PHS/HPS colleagues. Data, modelling and advice was the subject of forensic consideration by civil servants in Scottish Government and their ministers in any data considered by SAGE or in any data, modelling or advice emanating from SGCAG submitted either directly by me or by my team. Following this forensic consideration and exploration of the strengths and limitations these findings were presented in summary e.g. "state of the pandemic" slides with accompanying detailed documentation. A limited number of "deep dives" were also undertaken to allow ministerial questions on key topics.

6.6 I am unclear whether there were any conflicts in data or modelling. Any differences in advice may have reflected the devolved administration health and social care policies applicable at the time.

6.7 I agree with Professor Andrew Morris (In the Scottish Government Covid-19 Advisory Group corporate statement (JM/14 - INQ000215468)[33] at paragraph 20) that the principle and practice of reciprocity enabled good access to SAGE papers and minutes in Scotland. I am unaware of any circumstances in which access was limited in Scotland which it would have been helpful to have in relation to data, information or advice.

6.8 In relation to the Initial SAGE consideration that the UK Government should continue to plan using influenza pandemic assumptions I would make the following points. It is always easier to retrospectively consider whether extant plans were on balance reasonable or not. I would contend that on reflection the approach of using influenza pandemic assumptions proved incorrect but these were a useful starting point for

[33] Scottish Government Covid-19 Advisory Group. UK COVID-19 Public Inquiry Module 2A Corporate statement. June 2023.

the response to begin. In retrospect, but not known at the time, a significant challenge was the degree of asymptomatic transmission occurring. This meant that modelling assumptions were incorrect re the speed and degree with which societal controls needed to be implemented to reduce impact on the community.

6.9 When considering specific assumptions and the quality of Scotland's response to the pandemic, particularly as regards the approach to lockdowns and the identification of those who would be vulnerable to Covid-19, I consider identification of those most at risk of infection or likely to suffer severe disease or death is difficult when faced with a pandemic. The principal assumptions however appeared most valid for those most elderly with multiple morbidities. These assumptions were responsibly adapted over time as new information became available.

6.10 I do not recall any substantive change in the role of the two advisory bodies and their sub-groups in the provision of data, modelling and advice to the Scottish Government during the course of the pandemic.

6.11 In my individual capacity I was able to contribute to the discussion when appropriate e.g. in offering commentary on the situation in Scotland or on early observations on the effectiveness of the COVID-19 vaccination programme. My recollection of many of these meetings is that such data, information and advice were welcomed by the chair as either, evidence to validate or challenge findings in England or the rest of the UK, or provide novel findings from Scotland that could have a UK bearing.

6.12 I do not think that the epidemiology/modelling played too prominent a role in the advice provided by SAGE.

6.13 Scotland is currently engaged in determination of what a Centre for Pandemic Preparedness may look like and this may have some observations on how, in the event of medical emergencies, it could be reconstituted from a peacetime role into a SGCAG role. SAGE and SGCAG should continue to directly involve the clinical and scientific lead

in health protection as at least observers if not members of SAGE in a parallel arrangement to that with which UKHSA (or its successor) is regarded by the SAGE.

7. Data and modelling

7.1 General

7.1.1 All of the available information on transmission, infection, mutation, re-infection and death rates in Scotland was made dynamically and reciprocally available in a timely manner either in the submissions by/to HPS/PHS by/to SG or by/to SPI-M and in parallel by/to SAGE and SGCAG as well as within PHE/UKHSA led NIMT arrangements supplemented by JBC.

7.1.2 Initially there was a paucity of data with wide confidence intervals around any estimates on transmission, infection, mutation, reinfection and death rates which hampered modelling and consequent advice to Scottish Government. This is a common feature when dealing with initial response to major incidents and was anticipated for early periods of the pandemic in which there is a lag between initial cases and our understanding of their likely impact. A number of the pandemic hibernation projects instituted following the 2009 swine influenza pandemic were specifically set-up to overcome some of this lag and potentially address issues like this. The FF100 approach (JM/15 - INQ000256608)[34] and ISARIC-4C (JM/16 - INQ000354104)[35] adopted across the UK and the EAVE-II project (JM/17 - INQ000354102)[36] were activated to address concerns re data reliability and improve UK data provision for modelling.

[34] Boddington, N; Charlett, A.; Elgohari et al. COVID-19 in Great Britain: epidemiological and clinical characteristics of the first few hundred (FF100) cases: a descriptive case series and case control analysis. Bulletin of the World Health Organisation, 2020. [Accessed November 2023].
[35] UKRI/ISARIC4C. The RECOVERY trial. May 2022. [Accessed November 2023].
[36] EAVE II. EAVE II Project. [Accessed November 2023].

7.2 Data

7.2.1 I can only offer a view as an external observer from HPS and PHS about the effectiveness of the digital systems in assisting the management of the pandemic by the Scottish Government. My view is mainly confined to the use of the PHS Covid-19 Dashboard as this was pivotal to my role as HPS/PHS Strategic Incident Director and as Chair of the Covid-19 NIMT.

7.2.2 Initially information was restricted to key information on the number of laboratory confirmed cases, hospital cases and deaths against a backdrop of existing respiratory surveillance measures extant for the winter season. This however rapidly expanded to provide a more informative picture of the impact of Covid-19 across Scotland and by NHS board and by local authority.

7.2.3 From my perspective the HPS/PHS dashboard which was developed (This dashboard went live on 22/04/2020) provided an excellent method to convey information dynamically to present near real-time data on the impact of the pandemic on Scotland. The dashboard was open to professionals and the public alike to allow them to assess the impact at their local level across a range of surveillance sources. The dashboard was refined over time to take account of increased understanding on new and emerging challenges from variants, and the uptake and impact of vaccination on the health of the population. The data was also provided on an open access basis to allow intercountry comparison and allow researchers to assimilate information into data for their own modelling purpose (please see my earlier comment from the Office for Statistical Regulation).

7.2.4 I have limited views on the NHS Scotland Covid status app (JM/18 - INQ000354107)[37], the Protect Scotland app and the Check In Scotland app. My view is limited to the important intelligence that the output from the recorded data from the app made in contributing to the modelling, the interpretation of incidents and outbreaks, including the effect of travel and the working environment to these incidents and outbreaks, and assisting in the interpretation of mass gathering events. Modellers are perhaps best placed to answer the respective roles in refinement of modelled output and utility.

7.2.5 I am unaware of any data source that was available to core decision-makers that was not available to me.

7.2.6 I understand through examination of lessons learned (JM/19 - INQ000187754)[38] feedback provided to PHS that the system for collection and dissemination of data worked very well but I can also understand that the enormity of the assembled data meant that "information overload" was an important issue for some whilst "we can never have enough data" was the perspective of others. One important area that was time consuming to deal with was the process for obtaining consensus on when to stop the submission of information output to Scottish Government when HPS/PHS viewed its utility to be limited or made redundant by other output.

7.2.7 Achieving uniform case definition to allow inter-UK comparison of data was challenging across the pandemic but improved incrementally as refinement of data sharing was achieved. There were and remain however intercountry data sharing challenges that the UK Health Protection Oversight Group are continuing to address.

[37] NHS Inform. COVID Status app. 2023. [Accessed November 2023].
[38] PHS. Learning lessons from COVID-19. May 2023.

7.2.8 Feedback from core decision-makers through SG policy leads and by our constituent membership of our NIMT is to the effect that data visualisation improvement was helpful for many.

7.2.9 Data was examined forensically to assess any relationship between the impacts and effectiveness of non-pharmaceutical interventions by PHS, as part of the normal deliberation of the NIMT, within individual NHS boards and as reported by these boards or through the Four Harms group with Local Authorities. The attempt to balance local needs with national Scottish or UK NPI's involved considerable communication challenge.

7.2.10 My understanding was that the preparatory work for the Four Harms approach (including any advice from the NIMT provided by me or by SG Statistical team/PHS for the state of the pandemic) allowed consideration of movement, compliance and contact patterns when taken in tandem with deliberation of the SAGE/SGCAG.

8. Modelling

8.1 Modelling data was prepared for and by the SPI-M group. Additional PHS and SG data was also provided with significant contribution by many colleagues including Professor Mark Woolhouse and in particular by Professor Chris Robertson as our representative from a PHS perspective.

8.2 I do not know why SGCAG had no remit to commission its own modelling (see Scottish Government Covid-19 Advisory Group corporate statement (JM/14 - INQ000215468)[39] at paragraph 25).

8.3 My understanding is that as expert modelling advice from Professors Woolhouse and Robertson (members of SPI-M themselves) was

[39] Scottish Government Covid-19 Advisory Group. UK COVID-19 Public Inquiry Module 2A Corporate statement. June 2023.

available either to SGCAG, SG modelling team or to PHS that there was little if any call for additional sources of modelling advice.

8.4 My understanding from the outputs I have seen is that the modelling was comprehensive.

8.5 The assumptions behind models and the precision of the output generated may be profoundly affected by data lack/lags and this was certainly the case for the initial months of the pandemic. Initial and repeated requests for information on excess all cause mortality rates, cause specific mortality rate and rate of hospitalisation from China were not forthcoming. This meant that there was a significant gap in understanding until those more cooperative countries had time to accrue their own experience e.g. in Italy or SE Asia outwith China e.g. from a Japanese Cruise ship (JM/20 - INQ000347522)[40].

8.6 Incrementally there were significant improvements in confidence in epidemiological outcome over time.

8.7 From my limited contact with SG decision makers my recollection was that any difference in projections generated by different models were reconciled/their differences and limitations explained to decision-makers in the Scottish Government. From my own perspective and notwithstanding the limitations of modelling I have covered in my prior answer re the initial modelling period, overall I had adequate and timely access to clear, relevant and reliable modelling.

8.8 Accepting limitation for each model there was an extensive and in my eyes appropriate emphasis on a consensus approach to modelling adopted throughout the pandemic to avoid over-reliance on one model.

8.9 From my own perspective and my recollection of conversations with colleagues the models used were sufficiently transparent, including in

[40] Nakazawa, E; Ino, H; Akabayashi, A. Chronology of COVID-19 cases on the Diamond Princess cruise ship and ethical considerations: a report from Japan. Disaster Med Public Health Prep, pp1-8, 24 March 2020.

respect of the key assumptions included in the model and the sensitivity to errors in those assumptions. That being said, I and my colleagues were heavily involved in the health protection response so had a deeper understanding of the strengths and limitations of these models. This may have been less so for others without this level of pre-existing expertise.

8.10 With respect to whether the models used to inform advice to core decision-makers have been more widely shared from the outset, this is a difficult question to answer. Plain English output of complex scientific data takes time to craft thus delays which may and often do occur mean that there is difficulty in making this synchronous with the pressing need for a policy decision announcement. I would then think it is important to share widely but acknowledge the practical difficulties that this represents.

8.11 Different scenarios were modelled each with their relative strengths and weaknesses. I assume that a detailed explanation of the range of scenarios has already been provided by SPI-M and or the PHS/SG modelling team. I assume that a table must exist that describes this and I would suggest that you cross reference this. All modelling focuses on specific components in which bias is routinely acknowledged.

8.12 From my limited contact with key decision makers it is clear that First Minister and CSH had an excellent grasp of the strengths and limitations of modelling.

8.13 I recognise that whilst I was leading on the PHS response re the advice on measures to reduce the direct impact of COVID-19 (i.e. Harm 1 of the Four Harms) and having access to SPI-M, SAGE & SGCAG output that other factors, such as economic, societal, educational, non-Covid health related and mental health impacts may also have been modelled. The extent to which SPI-M were requested to consider these latter parameters is unknown to me.

8.14 My understanding is that some of the models considered included output which may have described impacts on vulnerable and at risk groups allowing modelling output..

8.15 A great deal of effort was made by PHS to enable academic researchers/modellers both throughout Scotland and internationally to have access to data (JM/21 - INQ000347451)[41].

9. Conclusions

9.1 With respect to what can be done to improve data collection, sharing and linkage by PHS I would make the following points regarding the following.

9.1.1 Data Collection

9.1.1.1 The current system of data collection is built on a suite of older technologies and could be significantly improved to increase resilience within and across health and care. An example of this is the Scottish national laboratory system for reporting on microbiology and virology results, ECOSS. This provided a critical role during the pandemic but was prone to failure due to the volume and speed of data transactions. Whilst interim solutions developed to improve this, there is a need for longer term solutions to ensure these problems are addressed for the future.

9.1.2 Sharing & Linkage

9.1.2.1 Routine sharing of data with and by trusted NHS authorities under updated Information Governance arrangements for surveillance and health service evaluation are essential. There is a risk that progress made during the pandemic may be slipping back e.g. in provision of primary care data that can be linked using the Community Health Index (CHI) number (A unique number for all individuals allowing all patient episodes across their patient journey

[41] PHS. ARCHIVED – COVID-19 Statistical data in Scotland. 12 October 2023. [Accessed November 2023].

to be linked) with other NHS datasets including hospitalisation, treatment and vaccination and information held by the National Records of Scotland on deaths. To illustrate this, a significant development during the pandemic was the rapid assessment of risk and demonstration of effectiveness from COVID-19 vaccines as provided by the EAVE-II programme. This was only possible through the Information Governance (IG) arrangements in place for the pandemic. From my own perspective these arrangements are now essential for routine respiratory infections and may be generalisable where the public may have a reasonable expectation that data about them is used to inform them of the success or otherwise of public health programmes like vaccination or to influence future government policy.

9.1.2.2 Stepping beyond the request in this is a separate but related issue regarding the data exchange between the nations of the UK to support management of incidents and outbreaks and spread of infectious disease or to manage environmental challenge. This is significantly challenged and in my view is yet to be satisfactorily addressed across the UK. Steps are in hand to address this through the Common Framework Agreement led by UKHSA on behalf of the DA's.

9.1.2.3 I would make some final observations in this section. The SPI-M modelling team and their resultant output worked very well. Similarly the SG led modelling team to which PHS contributed much data and output worked well. They investigated the use of data for service provision and may be in a position to advise how this correlated with observed activity.

10. Other sources of information and advice

10.1 International sources of information/advice

10.1.1 In addition to what was discussed in SAGE/SGCAG/NERVTAG, I and my PHS colleagues were regular attendees at WHO or joint WHO/ECDC regular meetings to discuss epidemiology, the impact of new variants, the implementation of COVID-19 immunisation programmes and the impact of these programmes.

10.1.2 I additionally attended joint regular meetings with UKHSA, CDC & Israeli colleagues once vaccines became available for deployment.

10.1.3 I was, along with WHO and a number of co-authors, involved in the description of the impact of the COVID-19 vaccination programme in averting deaths from COVID-19 across more than 30 countries included in the analysis from the European region (JM/22 - INQ000347499)[42]. Such information showed that the early offer of vaccination in Scotland and the high uptake of COVID-19 vaccine averted proportionately more deaths that any other country bar Iceland amongst those 33 countries reviewed by WHO. This was important in reinforcing the advice to core decision makers.

10.1.4 My advice was important to the CMO & NCD and the SG Policy leads either from the provision of surveillance and intelligence on trends in COVID-19 or in my role as the chair of the Scottish NIMT. Such advice likely contributed to the decisions on nature and timing of the NPI's following the institution of the societal measures put in place for the first wave of COVID-19.

[42] Mesle, M; Brown, J; Mook, P. et al. Estimated number of deaths directly averted in people 60 years and older as a result of COVID-19 vaccination in the WHO European region, December 2020 to November 2021, EuroSurveillance, 2021.

10.1.5 In the period January 2020 to March 2020 access to the response from other countries for example, Taiwan, Singapore, New Zealand was in the main through communication with the PHE National Focal Point who relayed information direct or through National UK NIMT arrangements to HPS, our predecessor organisation to PHS. The UK SAGE across this period (and latterly the SGCAG once stood up in March 2020) was the main provider of advice on what measures could or should be considered during this period.

10.1.6 The invitation of international experts such as Andreas Poensgen, a Norwegian public health official, and David Nabarro of the WHO offered direct experience from other nations. These, and in particular for me the contribution by David Nabarro, were useful in broadening our collective outlook and influencing the future direction of Scotland's COVID-19 response. I am unaware why the giving of such invitations to external experts was infrequent but I think this would likely align with themed issues as they arose requiring such input. I would refer you to the SGCAG secretariat for the contribution to these meetings by any of the named individuals.

10.1.7 With respect to whether my view on whether core decision-makers in the Scottish Government followed WHO advice during the pandemic I have a limited view to offer here as a more extensive view would require comparative examination of the entirety of WHO advice with that of SG. In general, the advice in Scotland appeared closely aligned. I have no immediate recollection of any examples to offer of any instance where WHO advice was not followed but do note that the Four-Harms approach could have led to some differences.

10.1.8 Lessons from the experience of other countries was critically important across the pandemic and obtained from a variety of sources; e.g. through:

- PHE/UKHSA National Focal Point;
- UK PHE/JBC/UKHSA led meetings;
- WHO/ECDC and other international groups;
- Peer reviewed publication;
- SAGE/NERVTAG/JCVI/SPI-M/SPI-B through discussion and commentary.

10.1.9 From my perspective there was a limited consideration made of the work of the International Comparators Joint Unit (ICJU) against the backdrop of the raft of information sources considered above.

10.2 Other sources of information/advice

10.2.1 Advice to decision makers was grounded at all times in the best available sources. Early in the pandemic such evidence was limited. At all times appropriate caveats were placed around the advice offered by myself or my HPS/PHS colleagues re strengths and limitations of any findings and conclusions.

10.2.2 I, and in particular my colleague Professor David Goldberg (a fellow Strategic Incident Director) recognised early on the unique and privileged position that HPS and PHS were in to work with our Scottish University partners and with UK and international partners to meet the current and future information needs to address identification of risk groups, determinants of health service utilisation and describe the impact of interventions to advice policy makers of next steps.

10.2.3 I would like to record my profound sincere thanks to all of my HPS/PHS, NHS board, SG, academic colleagues in Scotland, the Scottish Universities along with PHE/UKHSA, Epiconcept and WHO colleagues who united to invaluably contribute to the herculean efforts to generate such an important set of outputs which ultimately informed not only our Local Authorities, NHS boards, 3rd Sector, Scottish and UK Governments but added to the collective knowledge base internationally. Above all else I would like to thank the people of Scotland, on whom all of these observations were made, for the positive way they engaged with the NHS and service providers which allowed myself and my colleagues to generate the information for action which followed.

10.2.4 I would reference all of the 63 Scientific outputs submitted for peer review by EAVE-II along with 200 submissions by REACT-SCOT and UK and international colleagues to which I and my team have made significant contribution to the scientific understanding on Covid-19. The full listing of these is included in Appendix A (please note these are in the main for the reference period of the UKPI). These encompass the initial description of what we hoped to describe through data linkage (the EAVE-II protocol), description of risk factors for Covid-19 and determinants of outcome (EAVE-II & REACT-SCOT), describe changes in health service utilisation during Covid-19, description of investigation of associations of rare medical conditions with vaccination (EAVE-II & REACT-SCOT) and effectiveness of societal public health interventions (Nike conference) or the effectiveness of Covid-19 vaccination programme (EAVE-II) or impact on deaths averted (WHO led programme published in the publication Eurosurveillance). I will return to many of these in my statement to further expand on this.

10.2.5 Any information on location of deaths can be obtained from the National Records of Scotland. PHS have offered a limited commentary on this either in our routine surveillance output

(JM/23 - INQ000233600)[43] or in our Care Homes report (JM/17 - INQ000101020)[44]. Commentary on nosocomial deaths are provided by ARHAI.

10.2.6 Symptom profiles for inclusion in case definitions is a complex issue which is difficult to address simply. The case definition used across the UK was proposed by the Public Health Agencies and agreed by the CMO's of the UK. This allowed consistency of case reporting and international comparison of cases. This is different from recognising that some individuals may have had no symptoms/the listing of "classical" symptoms as above/some but not all "classical" symptoms/different symptoms with no "classical" symptoms. Dialogue between the Health Protection agencies of England and the Devolved Administrations continued across the course of the pandemic involving discussion of these issues with each wave of infection. The increased availability and use of Lateral Flow Devices to assist in the diagnosis dramatically added to the potential to identify an increased proportion of infected people with or without symptoms.

10.2.7 From my own perspective, there was appropriate access to and the use of medical and scientific advice from bodies external to government structures.

10.2.8 The PHS led NIMT that I chaired took this information into account when considering the impact of counter measures and offered advice to the CMO and SG for inclusion in consideration from a Four Harms perspective.

10.2.9 I have no suggestions about additional advice, evidence or data that could have been provided to inform decision making.

[43] PHS. Covid-19 Wider Impacts dashboard. [Accessed November 2023].
[44] PHS. Discharges from NHS Scotland hospitals to care homes between 1 March and 31 May 2020 (Revised). April 2021.

11. Intergovernmental working

11.1 I have nothing to offer regarding whether there was effective communication between core decision-makers in the UK Government and the Scottish Ministers or amongst the medical and scientific advisers of the 4 nations of the UK co-ordinated. (124)

11.2 Nor do I have anything to offer regarding what was done to ensure proper coordination and communication on medical advice and information underpinning core decision-making amongst the Scottish Government, the UK Government and the devolved administrations in Wales and Northern Ireland (125)

11.3 Or what the objectives of the intergovernmental medical and scientific advisors meetings and initiatives were.

11.4 Or how the discussions and outcomes of those meetings were communicated to key decision-makers in the Scottish Government.

11.5 Or how effective any such meetings amongst medical and scientific advisers of the 4 nations were in assisting the Scottish Government in managing the pandemic in Scotland.

11.6 My understanding of when and why the other devolved administrations were taking steps in their management of the pandemic was through the filter of what was presented to me through UK Public Health Agencies, through SAGE/SGCAG, NIMT and the Four Harms group.

11.7 I have nothing to comment regarding either the role, if any, that government medical and scientific advisers played in efforts to coordinate matters which involved both devolved and reserved competencies or the role medical and scientific advisers played in the working relationship between the Scottish government and the Office of the Secretary of State for Scotland (but I can state that I have no recollection of any input with the latter).

12. Funding and competence

12.1 In relation to any issues faced by the medical/scientific advisory structures available to the Scottish Government (including SGCAG) in relation to resources and funding during the pandemic I would say the following. I have previously stated that my experience and that of my senior health protection colleagues is the culmination of decades of training. The limitation on the expenditure on public health over many decades in my view limited the number of colleagues with this depth of knowledge to meet the needs of SGCAG amongst other structures. A practical example of this is that competing immediate response pressures sometimes led me or my colleagues to miss part or all of SGCAG meetings when ideally my and the focus of my PHS colleagues should have been to make a full contribution to all SGCAG meetings. Whilst measures to offset this risk and reduce the issue were put in place by NSS and thereafter by PHS this offset rather than solved the difficulty of competing demands of Covid-19 response and servicing the needs of SGCAG.

12.2 Otherwise I have no recollection of any issues arising in connection to any limitation due to resource or funding mentioned in SGCAG. The SGCAG gave freely of their time without mention of funding.

12.3 I note in the corporate statement of the Director General Strategy and External Affairs on behalf of the Scottish Government (**JM/17** - INQ000215495)[45], it is said at paragraph 161, that if the Scottish Government considered that the epidemiological situation in Scotland merited furlough funding when it was not in place (e.g. because prevalence were significantly higher in Scotland than in England), then it did not have the financial means to do so. All of the SGCAG were aware that general financial issues could have a bearing in any Four

[45] Director General Strategy and External Affairs. COVID-19 Public Inquiry Module 2A Corporate statement. June 2023.

Harms discussion but I have no further comment to make in relation to this specific item.

13. Conclusions and lessons learned

13.1 It is my view that the creation of a Covid-19 NIMT, SGCAG and their subgroups to support the communication of medical and scientific advice was of paramount importance to ensuring that the core decisions could be fit for purpose.

13.2 I would advocate that the continued publication of minutes of such bodies would be essential.

13.3 I do not consider that it would have been beneficial, in the interests of transparency, for advice to core decision-makers to have been published (as well as any other sources of advice received by core decision-makers) during the pandemic if this was to be synchronous. This is not to say that a plain English version of advice could not have been useful if distilled and made available even if asynchronous (i.e. later) compared with the decision announcement.

13.4 I had no concerns regarding the performance of the First Minister, any Cabinet Secretary, Minister, senior civil servants, or any special advisor or individual in charge of a significant aspect of the Scottish response to the pandemic between January 2020 and April 2022, in particular as regards their understanding and appropriate use of medical and scientific advice provided to them.

13.5 Overall I had no concerns regarding the performance of any of my counterparts in the UK Government or the devolved administrations with whom I had dealings between January 2020 and April 2022. On specific issues regarding guidance and care homes I will later offer a more qualified response. In addition, I would note that this is not to say that I agreed with all of their conclusions which had to be weighed against a Four Harms consideration.

B. INITIAL UNDERSTANDING AND RESPONSES TO COVID-19 IN THE PERIOD FROM JANUARY TO MARCH 2020

14. Initial understanding of the nature and extent of the threat

14.1 My first awareness of the clinical illness that was later termed Covid-19 and of the causative organism that we have come to label as SARS-CoV-2 was from international reporting of such cases from China in early January 2020 (The dates have been covered elsewhere in the PHS corporate narrative/statement which document the HPS briefing note to the NHS on 08/01/2020 – see (JM/26 - INQ000188991)[46]).

14.2 My awareness of advice offered to SG was limited to that offered by HPS or by SAGE/SGCAG.

14.3 My view of the threat posed to Scotland was that Covid-19 posed a potential pandemic threat and should be managed as such. This required the Health Protection teams of our NHS board Public Health department to initiate rapid investigation and management of returning travellers from any affected countries with coordination of this activity and provision of guidance by HPS.

14.4 I was provided indirectly either from PHE (both from their National Focal Point and by PHE led Incident Management team (IMT)), through ECDC or WHO, by SAGE or NERVTAG with any available information from China and, later in this period, from other affected countries. This was very useful in assessing the deduced escalating threat posed by Covid-19 and of the need to appropriately prepare in Scotland for the identification and management of cases in returning travellers from affected countries. It was difficult to assess the reliability of the information from China directly, but some assessment and comparison were possible from the reports from other countries affected by early spread. A particular aspect of the data that I expressed concern about, and repeatedly requested that the PHE NIMT Incident Director or the

[46] HPS. Briefing note to the NHS. 8 January 2020.

National Focal Point should contact WHO about, was a request to contact China about the absence of any data on mortality data (numbers and rates by age groups and by all ages) either by all cause or cause specific data. Such information would have allowed a clearer understanding by modellers of the likely impact of the virus on the UK and Scottish population. In contrast Europe in the pre-pandemic era has for some time produced routine monitoring of excess all cause mortality through a standardised method which proved useful for the COVID-19 pandemic – EuroMOMO (JM/27 - INQ000354103)[47]. Scotland has been a strong supporter of this initiative since its early days.

14.5 There was an extensive set of documents inventoried by PHS and already provided to UKPI team.

14.6 I am aware that SGoRR were involved in advising on the first Scottish case at the end of February 2020 (please see SGoRR for their meeting log and record).

14.7 In reference to the specific questions you have asked re when did I become aware of the following and how did my understanding evolve over this period of:

a) How Covid-19 was transmitted, including respiratory and fomite transmission and the contributions of close range and longer distance spread;
b) That Covid-19 could be spread person-to-person, pre symptomatically asymptomatically and the significance of that;
c) The fact and significance of community transmission;
d) The significance of exponential growth in transmission
e) The significance of the R-rate, in particular the need to keep the R-rate below 1;
f) The incubation period of Covid-19;

[47] EUROMOMO [website]. [Accessed November 2023].

g) The duration of infectivity of Covid-19;
h) The doubling time of Covid-19 (in the absence of and with NPIs);
i) The infection fatality rate of Covid-19;
j) The potential severity of the consequences of infection; and
k) The groups most likely to suffer serious consequences as a result of infection.

14.8 I would reference the Module 1 PHS corporate statement (JM/3 - INQ000183410)[48] and my Module 2a questionnaire response (JM/1 - INQ000130152)[49] re this. All of the above questions were of critical importance to myself, my colleagues in national public health bodies like HPS (and following the creation of our subsequent body, PHS) and Public Health England and the Devolved Administrations (DA's). Our collective experience and views on these criteria evolved over time.

14.9 Initially we were entirely reliant on the experience of other countries, e.g. as provided by WHO, from China and elsewhere, until the first cases began to be described in the UK. Thereafter our NHS board health protection team colleagues on behalf of their departments of Public Health were critical is pooling collective initial experience as HPS/PHS coordinated the surveillance and response through our National Incident Management Team activity.

14.10 Initial scenario output from the SPI-M teams was limited by the paucity of factual information on which to build their models. This was restricted to initial observations and the small number of cases on which these were based generated a wide range of values for estimates. This reflected the fact that all such models produced statistical output with little precision. This lack of precision is often referred to as results having wide confidence intervals – the range of estimates includes the likely true value but may be considerably less or more than this value. These factors limited understanding of the realistic expectations of the likely

[48] PHS. COVID-19 Public Inquiries: PHS Module 1 Corporate Statement. May 2023.
[49] PHS. Jim McMenamin answers to questionnaire by Module 2A. February 2023.

impact of the emerging pandemic. In practice this meant that there would be a number of weeks or months before the international or UK data had improved to allow more accurate scenarios to be generated. It is against this setting that the prior scenario planning for reasonable best worst case (for influenza) was provided by the pandemic influenza plan for consideration until this could be better represented by actual observations in real life experience of the Covid-19 pandemic.

14.11 I led the HPS/PHS strategic response and chaired the PHS led NIMT to describe the first Scottish cases, worked with UK colleagues to describe our unified experience in the First 100's, worked with ISARIC-4C (The RECOVERY trial – a UKRI pandemic hibernation project reactivated at the start of the COVD-19 pandemic (JM/16 - INQ000354104)[50]) to describe clinical experience of cases particularly in hospital settings, described mortality and established the funding route to underwriting the EAVE-II platform for describing detailed epidemiology of cases, their risk factors for severe disease and ultimately the risks and benefits of vaccination.

14.12 In my SAGE, SGCAG and NERVTAG roles I facilitated understanding through contribution of the data from Scotland throughout this process.

14.13 Initial data, either pooled across the UK or validated for England by comparison with Scottish or the other DA's led to an initial conclusion and subsequent refinement on incubation period; duration of infection; routes of transmission; relative risk by social distance; unusual distance of transmission in some settings (e.g. choir events (JM/28 - INQ000347517)[51], (JM/29 - INQ000347447)[52], (JM/30 -

[50] UKRI/ISARIC4C. The RECOVERY trial. May 2022. [Accessed November 2023].
[51] Reichert F.; Stier O.; Hartmann A. et al. Analysis of two choir outbreaks acting in concert to characterize long- range transmission risks through SARS-CoV-2, Berlin, Germany, 2020. PLoS One. 2022 Nov 17;17(11).
[52] Lanier W.A.; Palmer D.K.; Willmore D.K. et al. Investigation of SARS-CoV-2 Transmission in The Tabernacle Choir at Temple Square in the Context of Prevention Protocols, Utah, September-November 2021. Health Rep. 2023 May-Jun;138(3):416-421.

INQ000347505)[53] confirmed the fact and significance of community transmission; confirmed exponential growth in transmission; the consideration and routine communication of the significance of the R-rate, in particular the need to keep the R-rate below 1; the doubling time of Covid-19 (in the absence of and with NPIs) within a modelling context; the infection fatality rate of Covid-19 by consideration of NRS data; the potential severity of the consequences of infection by providing the proportion of cases admitted and of those what proportion ended up in ICU or died (in particular from CO-CIN and ISARIC-4C – e.g. The RECOVERY trial – a UKRI pandemic hibernation project reactivated at the start of the COVD-19 pandemic (JM/16 - INQ000354104)[54]; and described the groups most likely to suffer serious consequences as a result of infection from Scottish data (through EAVE-II) and through validation of English data using a similar approach.

14.14 Once output became available on the effectiveness of the Covid-19 vaccination programme from EAVE-II, I worked with the Principal Investigator, Professor Sir Aziz Sheikh, to facilitate the dissemination of key findings of public health importance on the profound positive impact of such vaccination on reducing the impact of mortality, hospitalisation and ill health within the Scottish population.

14.15 In the early months of the pandemic, all information was shared by me or by my HPS/PHS team to the CMO and SG policy colleagues for consideration against a Four Harms perspective. The daily surveillance data, results of analysis of ongoing incidents and outbreaks, output from SAGE, SGCAG, NERVTAG, SPI-M and Deep-Dive on specific topics was communicated through SG officials and led to "state of the epidemic" outputs summarising the dynamic understanding of the evolving pandemic. (JM/11 - INQ000354100)[55]).

[53] Hamner L.; Dubbel P.; Capron I. et al. High SARS-CoV-2 Attack Rate Following Exposure at a Choir Practice - Skagit County, Washington, March 2020. MMWR Morb Mortal Wkly Rep. 2020 May 15;69(19):606-610.
[54] UKRI/ISARIC4C. The RECOVERY trial. May 2022. [Accessed November 2023].
[55] Scottish Government. Coronavirus (COVID-19): state of the epidemic. [Accessed November 2023].

14.16 I led the strategic incident response for health protection to the pandemic for Health Protection Scotland from January to March 2020 and thereafter for PHS. In retrospect my view is that Scotland was underprepared in terms of resource and people expertise for the Covid-19 pandemic either within my own organisation or in the territorial or special NHS boards. Such a pandemic response requires sufficient number of personnel to provie an in depth defence but also sufficient public health leaders to marshal and thereafter sustain the response and generate recovery.

14.17 This should not be confused with the superlative sustained effort made by all of the HPS & NSS staff, the health protection teams of the NHS boards, the local authorities and the special NHS boards who attempted to overcome this issue by working at above and beyond what could ever be expected of them to deliver for such a sustained period. All of these teams are to be congratulated on the achievements that they made during an incredibly difficult time.

14.18 Early in the response HPS moved to an emergency footing and instituted their Emergency Response Plan. Sustaining the response over the initial short period of months significantly taxed the capability of HPS to near breaking point despite the best efforts of our parent organisation, National Service Scotland, and the able assistance provided by our ARHAI colleagues (ARHAI would on 1st April 2020 be retained within NSS whilst the rest of HPS would move into a new body Public Health Scotland).

14.19 HPS are aware that the territorial NHS boards instituted/involved their own emergency plans.

14.20 In retrospect the essential asymptomatic nature of transmission as a significant contributor to cases was not accepted early enough nor reflected in modelled output as little was available in scientific literature during this period. It is understandable then that core decision makers

had a more difficult task of having to make definitive determinations on available data whilst specific studies were awaited.

14.21 At the time despite the limitations of the data, all conclusions appeared valid though my recollection at the time was that the sustained community transmission demonstrated from Scottish and UK data was argued as strong evidence that an earlier introduction of a suite of measures should be considered than was the actuality. Since this was being done under a Four-Harms consideration it was accepted that such decisions needed to be balanced. In retrospect additional weighting of evidence to take account of the uncertainty re asymptomatic infection could have potentially brought additional pressure to bear on UK Government that may have led to early introduction of lock-down measures. The earlier lockdown measure would likely have reduced the magnitude of the first wave but I understand would have needed the financial backing of the treasury to allow this to be done.

14.22 Scotland had no initial locus by itself to influence the deliberations of the WHO. The single representation to influence this rested with PHE and subsequently UKHSA through the National Focal Point arrangements.

14.23 With reference to the three specific points you have requested (namely the guidance issued by WHO on 9 January, 4 February and 28 February 2020) my understanding of the guidance at each of these points comparing the UK and Scotland – was that each nation was in broad alignment.

14.24 By the end of January 2020 it remained unclear whether there were any cases of Covid-19 in Scotland. This is not to say that there was not potential for such cases to occur. This was clearly described to SG and the UK Government through the SAGE arrangements.

14.25 During February 2020 I was aware of the SPI-M data provided to and considered by SAGE. My understanding is that such output was at the request of UK Government supported by the DA's.

14.26 It is my understanding that all SAGE papers and summaries produced by the SG Policy team would have been shared with the First Minister and Cabinet.

15. COBR/SGORR

15.1 It is my understanding that COBR is a UK level of discussion and I have had no involvement in this.

15.2 However, in relation to SGoRR I would refer you to the PHS Corporate Narrative (JM/2 - INQ000108544)[56] and PHS Corporate Statement (JM/3 - INQ000183410)[57] which make reference to the SGoRR meetings and attendance. Such meetings allowed dynamic assessment of risk, discussion of their implication and mapping out a response, either by officials for presentation to Ministers for consideration, or in Ministerial attended sessions, and decision on next steps.

15.3 With reference to the respective decision-making responsibilities of Scottish and the UK Government in relation to the management of the pandemic within Scotland it is my understanding that this is a UK/SG level of discussion and I have had no involvement in this.

16. Pre-lockdown response

16.1 My recollection of the discussion across the UK (at SAGE, NERVTAG and with PHE & DA colleagues, with IPC colleagues and from international colleagues) was that such a suite of respiratory and hand hygiene measures would have a likely small/modest impact in reducing the reproductive number. The national impact of this could be to blunt

[56] PHS. COVID-19 Public Inquiries: PHS Corporate Narrative. January 2023.
[57] PHS. COVID-19 Public Inquiries: PHS Module 1 Statement. May 2023.

the rate of increase in cases and potentially the magnitude of the epidemic curve. I understood that other measures could be considered and implemented (as was later the case for this suite of "Lockdown" measures) but at a significant fiscal cost which could only be borne by contribution from UK Treasury.

16.2 I and my team coordinated surveillance of Covid-19 during the period January to March 2020. Limitation in widespread availability of testing and knowledge about the risk of asymptomatic/pre-symptomatic spread limited the degree to which the spread throughout the UK was appreciated. It took time to demonstrate through detailed epidemiological consideration that chains of sustained community transmission of symptomatic infection were occurring.

16.3 In addition to our contribution to the FF100 study (COVID-19 in Great Britain: epidemiological and clinical characteristics of the first few hundred (FF100) cases: a descriptive case series and case control analysis (JM/15 - INQ000256608)[58]), a suite of surveillance measures was introduced to consider the impact on national triage through the telephony service offered by NHS24 (calls for respiratory complaint by age group & by NHS board), GP acute respiratory infections (trends by age group and by NHS board), trends in newly identified laboratory confirmed cases (numbers and positivity rates), hospital cases, ICU cases and deaths. In addition, overall impact on trends in mortality was provided in real time by considering trends in excess all-cause mortality.

16.4 I had initiated scaling up of the EAVE-II surveillance programme (see (JM/17 - INQ000354102)[59] and Appendix A) led by Professor Sir Aziz Sheikh (activating one of the pandemic hibernation projects put in place following the 2009 Swine flu pandemic) to provide epidemiology of

[58] Boddington, N; Charlett, A.; Elgohari et al. COVID-19 in Great Britain: epidemiological and clinical characteristics of the first few hundred (FF100) cases: a descriptive case series and case control analysis. Bulletin of the World Health Organisation, 2020. [Accessed November 2023].
[59] EAVE II. EAVE II Project. [Accessed November 2023].

cases in the community and through appropriate information governance arrangements data linkage to allow determination of risk groups for adverse outcome and when they became available allow the national estimation of the effectiveness of the Covid-19 vaccine and demonstration of its safety profile. Using similar approaches we planned and undertook analysis in pregnancy and infants with particular input from Dr Rachael Woods in PHS.

16.5 In a similar way working with Honorary staff across the Scottish Universities we collaborated to set up and demonstrate risk groups through data linkage (the REACT-SCOT studies) – see Appendix A.

16.6 I and my Public Health Microbiology team in collaboration with the MRC-CVR (Glasgow), Edinburgh University, St, Andrews University and other collaborators set up the whole genomic testing for Covid-19 that was critical for demonstrating the multiple introductions of Covid-19 into Scotland and the investigation of important incidents and outbreaks (including that associated with Nike staff early in the pandemic).

16.7 I facilitated the set-up of the Scottish arm of the ISARIC-4C The RECOVERY trial – a UKRI pandemic hibernation project reactivated at the start of the COVD-19 pandemic (JM/16 - INQ000354104)[60] programme to examine the profile of risk for hospitalised cases.

16.8 I and my team set-up plans for serological analysis of cases from examination of residual sera from patients in Scotland

16.9 I and my team established the ground work for the set-up of a Scottish arm to the UK SIREN study to examine health care associated Covid-19 risk and commissioned Glasgow Caledonian University as lead investigators of this.

16.10 I and my team were passive recipients of the ONS UK study that was ultimately set up and were frustrated that we could not have output that

[60] UKRI/ISARIC4C. The RECOVERY trial. May 2022. [Accessed November 2023].

could be linked to our other datasets. The COVID-19 ONS infection study was coordinated on behalf of UK Government by researchers based in Oxford. The principal survey fieldwork for the pilot study began in England on 26 April 2020. Fieldwork began on 29 June 2020 in Wales, 26 July 2020 in Northern Ireland, and 21 September 2020 in Scotland (JM/31 – INQ000360967)[61]. The population of Scotland directly submitted data to the study coordinated by Oxford. Funding for the study was provided on a UK basis top-sliced from the budgets of each administration thus Scottish Government rather than PHS had relationship with the study coordinators. This status left PHS feeling that this arrangement limited the weight of any request from PHS in generating any speedy resolution on data sharing or to influence output.

16.11 When the methodologies became available, we were co-opted by Scottish Government to assist the interpretation and correlation of waste water with the suite of surveillance to assess its added utility.

16.12 During this period FF100 (COVID-19 in Great Britain: epidemiological and clinical characteristics of the first few hundred (FF100) cases: a descriptive case series and case control analysis (JM/15 - INQ000256608)[62]) was very helpful as were the other surveillance and studies as they came on stream in understanding the nature of the spread of Covid-19. The EAVE-II and REACT-SCOT studies (see Appendix A) were of particular importance utilising data from the whole of Scotland in data-linkage to maximise the secondary use of collected data.

16.13 I was aware of the planning by other parts of the PHS team for the testing and tracing of infected persons. My particular focus in relation to this was on the potential benefits of this in population terms in reducing

[61] Office for National Statistics (ONS), released 24 March 2023, ONS website, statistical bulletin, Coronavirus (COVID-19) Infection Survey, UK: 24 March 2023.
[62] Boddington, N; Charlett, A.; Elgohari et al. COVID-19 in Great Britain: epidemiological and clinical characteristics of the first few hundred (FF100) cases: a descriptive case series and case control analysis. Bulletin of the World Health Organisation, 2020. [Accessed November 2023].

the overall number of cases and blunting the spread of infection, but also in assessing its role in assisting the interpretation of epidemiology of cases and the effectiveness of societal measures to reduce cases.

16.14 SAGE and SGCAG did consider preparing for the reasonable worst case scenario and supported that such an approach was useful until better data became available to modellers to allow refinement of this approach.

16.15 28 February 2020 (the date that the WHO increased the global risk level to 'very high') coincided with the investigation and the report the next day of the first Covid-19 case in Scotland. This WHO global risk level was an incremental response but one which I understand had already been appreciated by HPS and other national agencies in advance of this determination and by the CMO's. It consolidated advice for decision makers.

16.16 There were to my knowledge no differing views between myself and my HPS colleagues and Scottish Government medical/scientific advisors in January and February 2020 about whether to take a proactive approach or a more cautious approach to responding to Covid-19.

16.17 HPS provided a raft of guidance for health and social care providers. This was led by colleague Dr Colin Ramsay (one of the three HPS Strategic Incident Directors along with Professor David Goldberg and I at this time) and supported by a HPS cell of core staff.

16.18 To my knowledge there was no direct reach out to colleagues in Iran, South Korea and Italy by my HPS colleagues. Rather, we relied on the UK National Focal Point provided by PHE to undertake such activity.

16.19 In relation to face coverings including masks, Infection Prevention and Control colleagues within HPS led on this work in collaboration with other colleagues across the UK and would, through Dr Lisa Ritchie, feed into the UK NERVTAG group along with input from Professor Tom Evans (Chair of the Advisory Committee on Dangerous Pathogens

(ACDP)). My recollection is that the view during this period, February and March 2020, was that the evidence base on the contribution to reduction in the reproductive number by the public use of face coverings was limited or near non-existent. I recall there being much discussion about whether any advice to use face coverings on a precautionary basis would jeopardise the UK stockpile. I understood then that there was no HPS/ARHAI/PHS evidence based advice that could be made other than a permissive one – that is to say we were neither for or against it.

17. Flattening the curve

17.1 In relation to the strategy of 'flattening the curve' and the extent to which and when was this a policy which was part of the Scottish Government's response strategy I would make the following comments.

17.2 The coordinated UK policy was documented in 'Coronavirus action plan: a guide to what you can expect across the UK' (JM/32 - INQ000280815)[63]. The phasing of the UK plan meant that action was already taken to identify all initial cases as part of the "contain" phase whilst the next phase of "Delay", which would include the concept of flattening the curve to reduce peak impact on the NHS, was being enacted across March 2020. This advice stemmed from SPI-M, SAGE & NERVTAG initially and latterly was supplemented by SGCAG.

17.3 The strengths and limitations of the data were in my opinion well understood as I have documented in my responses to prior questions.

18. Herd immunity

[63] Emergency and Health Protection Directorate. Coronavirus: action plan: a guide to what you can expect across the UK. 3 March 2020.

18.1 Please see the Addendum to the PHS corporate statement for Module 2A (JM/33 - INQ000320632)[64].

18.2 My understanding of the term herd immunity is as is covered in the UK pandemic influenza plan that was extant at the time of the Covid-19 pandemic – namely that when a sufficient number of the population had either developed immunity as a consequence of natural infection, or through response to vaccination (once available), that those not infected or vaccinated may themselves be less likely to become exposed to infection being protected to some degree by the population already exposed to this natural infection or vaccinated.

18.3 Whether it would be possible to shield the vulnerable from severe infection as part of such a 'herd immunity' strategy was I understand considered by SAGE and SGCAG. Early on in the pandemic scientifically this was consistent with the theoretically possible outcome for Covid-19 during the Detect and Contain phases of the UK response. That is to say that if successful in the UK and globally successful during the early months of the pandemic that containment was a possibility. During such a detect and contain phase of the response this was from my perspective a viable proposition and was worthy of the extensive and intensive effort by public health teams early in the pandemic on the assumptions of limited importation of cases, their rapid identification, isolation and testing of these suspect cases **IF** there was little asymptomatic/pre-symptomatic transmission **BEFORE** a threshold of sustained community transmission. Application of strict Infection Prevention and Control by those who were shielding complemented these actions. However, it quickly became apparent from description of sustained community transmission, consequent impact on hospital services and increasing numbers of deaths that further public health measures (the suite of Lockdown measures) was necessary to control

[64] PHS. COVID-19 Public Inquiries: PHS Module 2A corporate statement – Addendum. October 2023.

the spread of COVID-19 – thus we were entering the delay phase. Email review from 05/03/2020 documents the proposition to gradually move from "detect and contain" to "delay" phases - likening this to akin to a dimmer switch. Continued shielding of the vulnerable in this delay phase became even more important to minimise the impact of COVID-19. I was a co-author of a paper published in October 2020 examining the potential role of electronic health data to assist risk prediction to assess shielding (JM/34 - INQ000147574)[65]. Additional analysis from QCOVID (JM/35 - INQ000283181)[66] and subsequent revisits of this in June 2021 by both McKeigue et al (JM/36 - INQ000147576)[67] and in November 2021 by Simpson et al (JM/37 – INQ000360965)[68] further advanced our understanding on this.

18.4 I would suggest that details on what SAGE/SGCAG covered in relation to this and other aspects re mass testing or toleration of strict NPI's are best addressed by the secretariat and or chairs of both groups. I understand that all SAGE papers and those of SPI-B where available to SG.

18.5 In relation to the determination on 15 March 2020 by Scottish Government in which it is stated that they judged that containment of the virus was no longer possible and that the country should be moving into the delay phase and asked about the rationale for the change in strategy at that time and upon what advice this change was based. I understand that this would have been based on the epidemiological

[65] McKeigue PM, Weir A, Bishop J, et al. (2020) Rapid Epidemiological Analysis of Comorbidities and Treatments as risk factors for COVID-19 in Scotland (REACT-SCOT): A population-based case-control study. PLOS Medicine 17(10): e1003374. https://doi.org/10.1371/journal.pmed.1003374.

[66] Clift A K, Coupland C A C, Keogh R H, et al. Living risk prediction algorithm (QCOVID) for risk of hospital admission and mortality from coronavirus 19 in adults: national derivation and validation cohort study BMJ 2020; 371 :m3731 doi:10.1136/bmj.m3731.

[67] McKeigue, P.M., McAllister, D.A., Caldwell, D. *et al.* Relation of severe COVID-19 in Scotland to transmission-related factors and risk conditions eligible for shielding support: REACT-SCOT case-control study. *BMC Med* **19**, 149 (2021). https://doi.org/10.1186/s12916-021-02021-5.

[68] Simpson CR, Robertson C, Kerr S, et al. External validation of the QCovid risk prediction algorithm for risk of COVID-19 hospitalisation and mortality in adults: national validation cohort study in Scotland. Thorax 2022; 77:497-504. http://dx.doi.org/10.1136/thoraxjnl-2021-217580.

picture presented by myself from HPS of Scottish data demonstrating the sustained community transmission and similar, PHE data for the rest of the UK and on modelling scenarios considered by SAGE from SPI-M with input from NERVTAG.

18.6 I acknowledge that Scotland, like the rest of the UK, locked down two weeks later than Italy (which instituted a national lockdown on 9 March 2020 having promptly placed the most affected areas under quarantine during February), nine days later than Spain (14 March 2020) and six days later than France (17 March 2020). From my perspective the reason why each country instituted their own measures reflected their local epidemiology - the epidemic curves of each country would be dependent on when they had their first cases and thereafter a number of chance factors about how the infection spread in a nation. It is entirely expected that the timing will be different and that some countries then reported sufficient data to come to conclusion on when they had reached a threshold for instituting their own lockdowns. This then is one likely explanation of why the medical/scientific information and advice on which a decision was based was arrived at slightly different calendar dates in each of the countries.

18.7 From a Harm 1 consideration (of the SG Four Harms consideration), the earlier the lockdown was implemented the greater the blunting in magnitude of Wave 1 would be expected in terms of cases/hospitalisations and deaths. This is a complex area as Scotland, and indeed the rest of the UK, had not ever instituted such measures.

18.8 The adoption of a consistent approach amongst the four nations of the UK in the strategy in the communication and institution of the measures announced for the first lockdown from my perspective was the preferable position in terms of ease of communication.

18.9 However greater fiscal autonomy could have led to greater flexibility in Scotland within the Four Harms consideration and would have at least allowed a choice on earlier timing of first lockdown if Ministers were

accepting such advice to have this earlier timing from HPS advice in relation to Harm 1.

19. Super-spreader events

19.1 I understand that the Inquiry is interested in understanding the significance of the certain key events which played or had the potential to play a part in the spread of the virus in the period between January and March 2020:

19.1.1 The NIKE Conference in Edinburgh, 26 to 27 February 2020;

19.1.2 Men & women's international rugby

- Women's - Italy and Scotland international rugby match cancellation (was due to take place on 23 February 2020); and
- Men - Italy v Scotland international rugby match held on 22 February 2020 in Rome
- Men - Scotland v France rugby international at Murrayfield, Edinburgh on 8 March 2020; and
- Men - Wales v Scotland rugby international due to be held on 14 March 2020.

19.2 In addition to the timeframe above there was significant learning available from the delayed UEFA Euro 2020 championships played in June/July 2021 for subsequent waves of infection.

19.3 **Nike Conference**

19.3.1 This conference (in Edinburgh on 26 and 27 February 2020) was not a mass gathering but rather a business meeting of

NIKE staff at a conference event held in Edinburgh. The event was held in accordance with the guidance of the time.

19.3.2 Whilst the conference was held over specific dates the first and subsequent cases were a number of days after the conference itself reflecting the incubation period for Covid-19. The IMT report documents the timeline for the conference, the identification of cases and the investigation and successful public health management of the incident which resulted in the elimination of the strain associated with the conference itself.

19.3.3 HPS led an Incident Management Team to investigate the event and through Whole Genomic Sequencing demonstrated that initial public health measures instituted in response to the event supplemented by later lockdown measures eliminated the strain responsible for the incident – see (JM/38 - INQ000147544)[69]. Further WGS sequencing demonstrated that this was just one of hundreds of different introductions of novel strains to Scotland during the first wave of infection rather than as portrayed by media the "Ground zero event" for Covid-19 introduction into Scotland – see (JM/39 - INQ000347524)[70].

19.3.4 The rationale about why the public were not informed about the emergence of information about the nature and significance of the NIKE conference in the spread of the virus until the public were made aware in the BBC disclosure documentary series broadcast in May 2020 was as follows.

[69] PHS. COVID-19 Conference outbreak March 2020 incident management team report. 5 October 2021. [Accessed November 2023].
[70] Da Silva Filipe A, Shepherd JG, Williams T et al. Genomic epidemiology reveals multiple introductions of SARS-CoV-2 from mainland Europe into Scotland. Nature Microbiology 1 January 2021;6(1):112-122.

19.3.5 The standard advice for the investigation and management of incidents of public health concern is that of non-disclosure of the identity of cases and where it is possible the non-disclosure of the identify of businesses concerned. The latter facilitates the engagement and cooperation of the business in openness and transparency in assisting the incident management team and has implication for continued engagement and cooperation from such businesses in the future. In this instance the excellent cooperation of the business in the identification of the close contacts of the index case, the cooperation of the local venue, the take up of the offer of testing by close contacts and compliance with self-isolation led the multinational IMT to conclude that there was no reason to disclose the name of the business.

19.3.6 In this specific event these decisions appeared justified as evidenced by the results of whole genomic sequencing which demonstrated that the measure instituted by the incident management team had the desired effect of controlling the risk in the Scottish population. These measures (and the later lockdown measures instituted for wave 1 across the UK and internationally) led to the complete elimination of the variant from the Scottish population.

19.4 Women's - Italy and Scotland international rugby match cancellation (was due to take place on 23 February 2020) and Men's – Italy v Scotland international rugby match held on 22 February 2020 in Rome.

19.4.1 Whilst you specifically asked about the cancellation by the Italian government of the women's international rugby match between Italy and Scotland, due to take place on 23 February 2020 and the fact that the equivalent men's international rugby match went ahead on 22 February 2020 in Rome and its potential impact on transmission in

Scotland, I would remind you that policy is a matter for Scottish Government. I returned from bereavement leave on February 22nd 2020 and had no direct discussion re either of these Women's Rugby events but I understand that HPS did not identify any strong association between a single event like the match in Rome. Rather investigation would later demonstrate the multiple importations of different viral strains (JM/39 - INQ000347524)[71].

19.5 **The Scotland v France rugby international at Murrayfield, Edinburgh on 8 March 2020 and The Wales v Scotland rugby international held on 14 March 2020 Scotland International rugby matches –**

19.5.1 It is important to note that laboratory testing availability and laboratory capacity were limited so interpretation is difficult but neither of these matches appeared to make a significant contribution to the detected case numbers identified in Scotland. Scottish Government Advice and guidance in place at the time did not preclude outdoor events.

19.6 **Euro 2020 championship played in June & July 2021**

19.6.1 In contrast, in the setting of widespread availability of testing and capacity backed up by Test and Protect and review of cases and contacts there **was** in my view a significant impact of the UEFA 2020 championship to increase the number of cases identified in Scotland in the third wave of infection. The greatest contribution to these cases was **not** in those attending the official ticketed Scotland games at

[71] Da Silva Filipe A, Shepherd JG, Williams T et al. Genomic epidemiology reveals multiple introductions of SARS-CoV-2 from mainland Europe into Scotland. Nature Microbiology 1 January 2021;6(1):112-122.

Hampden or Wembley stadia but in surrounded domestic and other settings associated with unofficial gatherings (with consumption of alcohol) – see (JM/40 – INQ000280918)[72]. Interestingly the signal of significant association with the event was initially provided by a simple observation that cases in young men suddenly increased requiring further investigation.

19.6.2 The role that the Scottish Government played in the management of the rugby and football events to try to minimise the spread of the virus is a question for Scottish Government re conditions for these events going ahead. It is however likely that this would have been informed by existent guidance and advice from HPS and the current knowledge and general rather than specific advice from SAGE and SGCAG.

19.7 **Effectiveness of adopted strategies.**

19.7.1 **Wave 1.** My assessment of the strategies supported by surveillance evidence including whole genomic sequencing is that the combination of measures instituted to reduce the impact of Covid-19 across Scotland and the rest of the UK (and short handed to "Lockdown-1" measures) were very effective in reducing the impact of the first wave of infection. Not only did cases reduce but there was clear evidence of reduced impact on hospitalisation and deaths which lagged behind the reduction in cases. In addition there was clear evidence (from later analysis across June 2020) that most of

[72] Marsh K.; Griffiths E.; Young J. et al. Contributions of the EURO 2020 football championship events to a third wave of SARS-CoV-2 in Scotland, 11 June to 7 July 2021. Euro Surveillance. 2021;26(31). August 2021. [Accessed November 2023].

the variants that had been described in Scotland prior to the implementation of lockdown died out and did not return once the measures were relaxed (see (JM/39 - INQ000347524)[73].

19.7.2 **Wave 2**. Following wave 1 there was a more nuanced set of measures that were incrementally introduced by SG using a consideration of the 4 harms approach. PHS and the PHS led NIMT offered advice to the Four Harms group through the CMO and SG policy team. These appeared less successful in effectively controlling the spread of Covid-19 than that achieved in national lockdown.

19.7.3 These new measures were introduced following the late summer increase in cases which led to the announcement of a suite of measures on October 7th 2020 (JM/41 - INQ000360966)[74]. However in light of the increase and potential for further increase these were followed on 29th October by a more comprehensive tiering of escalating response measures designed to reduce the impact of COVID-19 (JM/42 - INQ000235175)[75]. This tiering approach was a purposeful attempt to deploy additional measures in response to the epidemiological picture from week to week. The content and extent of the measures within each tier had not been tried before as a population based approach to control COVID-19 but were being applied in an attempt to achieve a balance between the direct harms of COVID-19 (a number of cases manageable by the NHS) and the other three harms (indirect health harms, societal and economic). I on behalf of the Scottish COVID-19 NIMT provided advice on the impact of

[73] Da Silva Filipe A, Shepherd JG, Williams T et al. Genomic epidemiology reveals multiple introductions of SARS-CoV-2 from mainland Europe into Scotland. Nature Microbiology 1 January 2021;6(1):112-122.
[74] Scottish Government. Coronavirus (COVID-19): additional measures – 8 October 2020. October 2020. [Accessed November 2023].
[75] Scottish Government. Scotland's Strategic Framework. October 2020.

these instituted tiers and on any required further escalation of them for consideration within this four harms approach. These advice notes, and their accompanying slidesets and minutes document the details of the practical issues encountered in applying the guidance and the impact of these tiered measures. It was evident from the NIMT review that whilst this approach had an impact in limiting the number of cases and subsequent hospitalisations and deaths for the period in which the Kent variant was dominant in the late summer and early autumn this mainly required the restrictions from higher tiers to generate an arrest of increase in cases and had to be in place for a number of weeks before cases began to reduce. The granular nature of the response down to local authority levels proved difficult in metropolitan areas were measures applied led to communication and compliance challenges. Application of tiers in Scotland had less than expected effect at Tier 3 or below.

19.7.4 **Wave 3.** The increase in cases approaching the festive period of 2020/21 required imposing the suite of second lockdown measures to institute control. This coincided with the deployment of the first dose of the Covid-19 vaccine initially given to the most vulnerable and this along with the very high uptake i.e. acceptability of the vaccine to the population thereafter had a significant bearing on the course of future pandemic waves by significantly blunting the most severe outcomes of hospitalisation and deaths.

C. TESTING

20.1 Whilst I had an understanding of the overall testing and tracing strategy this area was not one I covered in my duties as strategic incident director nor as chair of the NIMT.

20.2 In retrospect the guidance only to test individuals with symptoms was wrong – the extension of testing to all was very important as asymptomatic or pre-symptomatic transmission made a significant contribution to cases. This was initially poorly understood. The whole of the UK took our lead from SAGE with SGCAG providing additional advice in Scotland. I and my HPS/PHS colleagues were continually updated by this SAGE discussion which included consideration of WHO advice as to the importance of testing. Detailed consideration of alignment of UK/Scotland & DA advice with such WHO advice is perhaps best addressed to SAGE and the SGCAG.

20.3 I and my HPS and PHS colleagues had no involvement in the development of diagnostic tests and I expect that a timeline for the development and deployment has been provided elsewhere. The net effect of this was there was very limited availability of tests in January and February 2020.

20.4 The background to this is important to consider. There had been limited investment over decades in NHS laboratory testing for microbiology and virology and very limited investment in Scotland in whole genomic testing. There was no pre-existing UK or DA plan for mass testing of the population in the event of a pandemic unlike the situation in some countries that had experienced prior SARS epidemics.

20.5 This is not a criticism of the incredible efforts of my NHS colleagues during this Covid-19 pandemic. The quality assurance and roll out of testing to NHS laboratories of PCR testing which was rapid but initially limited by reagent availability. Testing systems had to be developed by PHE and the sharing of tests developed that then had to be rolled out from PHE Colindale to regional tests centres in England and to the DA's. Thereafter nominated laboratories in Scotland (initially Glasgow then Edinburgh and others thereafter) had to assess the test performance against quality control materials before safely deploying the tests for use. Initial categorisation of the virus responsible for Covid-19 was as an HCID that placed restriction on the laboratory setting and handling

of samples to ensure the safety of the laboratory staff too. NHS laboratories (which are not under the control of HPS or PHS as its successor) then developed their own operational plans for scaling up capacity to deal with the tests that would be expected to be performed. HPS and our NSS colleagues assisted with the coordination of the consumables supply (swabs, tubes for samples with viral transport medium to inactivate the virus, packaging and request forms etc.) to enable such testing to take place. These NHS laboratories worked very hard to then turn around received samples and deliver results to clinicians caring for individuals being tested as quickly as possible and share these results with local public health teams for immediate action and contact tracing purposes.

20.6 Mass testing was discussed frequently in SAGE, SGSAG and by DA Health Protection teams but the initial focus was on symptomatic individuals requiring testing. Roll out of NHS testing and the gradual incremental increase in capacity was built to this model. I understand that discussions at a UK level were held re the potential and ultimately with the formulation of a plan for mass testing.

20.7 In my capacity as strategic incident director for Covid-19 and as chair of the Scottish Covid-19 NIMT my role was to develop and ensure a flexible surveillance programme that would describe the epidemiology of those affected by the pandemic. This programme needed to set the requirements for, and receive the output from, the Test and Protect programme that developed to channel test results and patient profiles to allow HPS and thereafter PHS to describe the direct impact of Covid-19 on the population of Scotland. Achieving these outcomes required HPS and thereafter PHS to develop a supportive cell structure to compartmentalise tasks to specific teams to work collaboratively with their NHS colleagues in other special NHS boards and territorial boards (in particular NSS who were commissioned to develop the Test and Protect programme).

20.8 Tracing of close contacts was the responsibility of our territorial NHS board colleagues (and once T&P was developed became a shared responsibility). HPS and thereafter PHS used the information collected from cases and contacts to build up and refine a picture on the reproduction number, incubation period, symptom profile, contribution of international travel etc. to wave 1 of the pandemic. This information was then beneficial to modelling teams for refinement of their output.

20.9 With regard to the rationale behind the Test and Protect scheme launched on 26 May 2020 and why was it not launched until that date I would refer you to the stated aims as posted by SG - Please see (JM/43 - INQ000347531)[76] - from this date. My understanding is that the date of implementation for the "Lighthouse" labs reflected the time from decision to establish the following: logistics re the test themselves, UK national roll out required capacity building across the UK re having PCR machines in place to do the tests and the supporting infrastructure to ensure throughput. The latter included reading samples and data entry, robotic handling of specimens, testing, reagents, software development for communication of the results etc., quality assurance of the test methodologies and interlaboratory arrangements for sample handling and securing data transfer to individual patients and to health protection teams of results.

20.10 The reason why it developed and launched separately from the UK Government managed Test and Trace scheme is a question for Scottish Government but likely reflected the different devolved health arrangements, surveillance requirements and infrastructure for reporting. Similarly, that is why the contact tracing systems went live in England and Scotland on 28 May 2020 along with subsequent operational queries. In addition, I would suggest contacting the PHS and NSS leads for the commissioning and operationalisation of this (George Dodds and Martin Morrison respectively).

[76] Scottish Government. Test and Protect rolled out nationally. May 2020. [Accessed November 2020].

20.11 My understanding is that there were teething difficulties for the programme that were to be expected for a system developed and rolled out at pace, which were incrementally addressed by the phenomenal commitment of both the National Testing Programme and liaison with the Test and Protect team. There were, from time to time, profound slow-downs in turnaround time from patients presenting for tests or self-sampling and submitting such tests and the results being communicated to patients or allowing contact tracing to be initiated for patients with positive results. These delays severely threatened the credibility of the T&P service and likely shook public confidence in the service which may have had knock on effects. T&P meticulously documents all of these and other incidents and NSS would provide detailed information re this and other events that arose as significant challenge. From my perspective the delays encountered certainly affected the ability to reliably interpret trend data and presented a communication challenge for SG led daily media briefings.

20.12 All of this being said, overall T&P and the National Testing through the Lighthouse laboratory network were a fantastically successful joint endeavour and served the population of Scotland and the rest of the UK extremely well.

20.13 Scottish Government set targets for testing and gave progress reports to milestones in Scotland and these were publicised as part of the Scottish Government communication strategy. Any queries on COVID testing backlogs are best addressed by Scottish Government with additional request to George Dodds as PHS Test & Protect lead and Martin Morrison NSS Test & Protect lead. My understanding however is that the public health impact of testing delay at a population level was limited **IF** individuals who were awaiting test results adhered to the public health advice they must self-isolate until their result was known. Assuming adherence was less than 100% it is the likely that inadvertent transmission continued for some of these individuals.

D. DECISIONS IN RELATION TO NON-PHARMACEUTICAL INTERVENTIONS ("NPIS")

21.1 Overview

21.1.1 I understand that you wish me to focus on Scottish Government decisions concerning the imposition of, easing of, or exceptions to the following NPIs:

- The two national lockdowns (March 2020 - July 2020; and January 2021 - April 2021) including the reasons why lockdowns did not take place in Scotland at other times when they did in other parts of the UK;
- Local and regional restrictions (including the tiered system);
- Working from home;
- Reduction of person-to-person contact/social distancing;
- Self-isolation;
- The closure and opening of schools;
- The use of face-coverings;
- Testing;
- The certification and app systems rolled out by the Scottish Government, including Protect Scotland launched on 10 September 2020;
- Travel in and out of Scotland (including any consideration of the border with England as well as travel to and from the other devolved nations and international travel);
- Repatriation; and
- Public transport closure.

21.2 General questions about NPIs

21.2.1 The SAGE & SGCAG deliberations on NPIs were to my recollection focussed on direct harms of COVID-19 (Harm 1 of the 4 harms). This also covered input from SPI-B (to both

SAGE & SGCAG) and additional expert view in relation to the latter on determinants of compliance. In a similar way, I and my PHS colleagues made a direct contribution to guidance groups and, on behalf of PHS, I chaired the NIMT to offer specific advice on Harm 1. I was present at many of the SG chaired Four-Harms meetings at which the wider health and social and economic impacts of measure were discussed.

21.2.2 My recollection of what extent consideration was given when making decisions about NPIs throughout the pandemic can be summarised as follows:

21.2.2.1 **Risk groups** - Initial identification of those at most risk of Covid-19 was derived from those countries experiencing the first wave in advance of the UK experience. The international sharing of such information fed into the modelling and planning for service provision and was the subject of SAGE & SGCAG scrutiny. Early on in the pandemic response, HPS discussed options for surveillance development and identification of risk groups. Identification of clinical risk groups and refinement of this over time was a key deliverable tasked for the FF100 with additional information provided by CO-CIN, ISARIC-4C (The RECOVERY trial – a UKRI pandemic hibernation project reactivated at the start of the COVD-19 pandemic (JM/16 - INQ000354104)[77]) and EAVE-II programmes (JM/17 INQ000354102)[78]. Whilst all provided important insights, EAVE-II not only fulfilled this and produced refinement over time but it should also be noted it served as a validation tool for risk group analysis in England (JM/17 NQ000354102)[79].

21.2.2.2 **Risk of long-COVID** – The joint working with the EAVE-II team also allowed long term plans to be put in place to address the

[77] UKRI/ISARIC4C. The RECOVERY trial. May 2022. [Accessed November 2023].
[78] EAVE II. EAVE II Project. [Accessed November 2023].
[79] EAVE II. EAVE II Project. [Accessed November 2023].

constellation of longer term symptoms that would compose the suite of likely conditions covered by Long-Covid. In addition, PHS supported the work of Glasgow University for their longer term study of this condition. I understand that both teams have already produced output covering this and producing regular updates on their findings (JM/46 - INQ000347534)[80] and (JM/47 - INQ000347504)[81].

21.2.2.3 **Asymptomatic transmission –** Whilst always regarded as a possibility the evidence base around the potential for asymptomatic transmission took some time to develop. SAGE considered this in April 2020 (JM/48 - INQ000347520)[82] and found "currently available data is not adequate to provide evidence for major asymptomatic/subclinical transmission of 2019nCoV. Detailed epidemiological information from more cases and contacts is needed to determine whether transmission can occur from asymptomatic individuals or during the incubation period on a significant scale". The evidence base there after became much clearer that such events were common – there is now a much more extensive literature around this subject e.g. (JM/49 - INQ000347454)[83].

21.2.2.4 **Airborne infection –** Infection prevention and control advice in Scotland is offered by ARHAI and through their liaison with their UK IPC colleagues is standardised across the UK. The ACDP in the first wave advised on an initial precautionary basis managing Covid-19 as an HCID. The 4 nations public health HCID group had made an interim recommendation in January 2020 to classify Covid-19 as an HCID. This was based on consideration of the UK HCID criteria about the virus and the

[80] University of Glasgow. First results from largescale long-COVID study. 2021. [Accessed November 2023].
[81] EAVE. Long Covid. 2023. April 2023. [Accessed November 2023].
[82] Virology Cell PHE. Are asymptomatic people with 2019nCoV infectious? 28 January 2020. [Accessed November 2023].
[83] Pollock, A. M.; Lancaster, J. Asymptomatic transmission of covid-19. BMJ, 371. 2020. [Accessed November 2023].

disease with information available during the early stages of the outbreak. As of 19 March 2020, Covid-19 was no longer considered to be a high consequence infectious disease (HCID) in the UK. This meant that within health care settings, that with the exception of aerosol generating procedures, that standard infection precautions could be used to manage suspect or confirmed cases.

21.2.2.5 The evidence base for this has greatly expanded over time and is influencing what the guidance should be in the future.

21.3 **Seriousness & Spread –** Covid-19 represented the most significant challenge to the public health in certainly my professional working life in terms of potential deaths and hospitalisation as typified by modelled outputs and I was strongly supportive of the lockdown measures that were introduced. The reduction in the spread of cases over the ensuing weeks was very welcome and release of lockdown measures was then undertaken in expectation that further measures could be instituted should case numbers significantly increase. Whole Genomic Sequencing ultimately allowed the description of the multiple importations of Covid-19 across the First Wave with greater than 200 different strains introduced by April 2020 (JM/39 - INQ000347524)[84].

21.3.1 The result of the first lock-down was that the greatest majority of these strains appear eradicated as they have not been detected in the intervening period to date.

21.3.2 **Lessons –** we are still learning through contrasting and comparing Scottish & UK experience with that of other countries. It is expected that this evidence base will expand as a centre for pandemic preparedness in Scotland is formed and the contribution from other such initiatives globally will look at learning lessons. The Scottish pandemic

[84] Da Silva Filipe A.; Shepherd J.G.; Williams T.; et al. Genomic epidemiology reveals multiple introductions of SARS-CoV-2 from mainland Europe into Scotland. Nature Microbiology 1 January 2021;6(1):112-122.

preparedness centre will incorporate the lessons described to the UK & Scottish PI's.

22. **Long-Covid**

22.1 The risk of long-COVID became increasingly recognised across April 2020 as it was recognised that some individuals had persistence of a range of symptoms beyond weeks into months. We are still learning about the potential consequences of Long-COVID as the studies in UoG and EAVE (JM/46 - INQ000347534)[85] and (JM/47 - INQ000347504)[86] continue and this will expand our knowledge over the coming years.

22.2 With regard to the extent to which, I was involved in any assessment of how emergency response measures, including NPIs, would impact upon those likely to suffer from long term sequelae, including the condition known as Long Covid, arising from Covid-19 infections and the nature of any information and advice provided to the Scottish Ministers in that regard I would make the following response;

22.3 I had a limited contribution to make other than supportive activity; either in facilitating the set up and promotion of the UoG and EAVE-II studies and through signposting through the NIMT that our assessment of Harm-1 did not include the assessment of impact of Long-COVID as there were significant uncertainties about the nature and duration of sequelae.

23. **Specific measures**

23.1 All infection prevention and control (IPC) advice re the use of face-coverings in health and social care settings was provided by my colleagues in ARHAI who were initially part of HPS and, following the creation of PHS, remained within our prior parent organisation NSS on

[85] University of Glasgow. First results from largescale long-COVID study. October 2022. [Accessed November 2023].
[86] EAVE. Long Covid. 2023. April 2023. [Accessed November 2023].

1st April 2020. I understand that my IPC ARHAI colleagues liaised extensively with their UK counterparts to come to a consensus on all aspect of their advice. SAGE and NERVTAG were from time to time consulted on such topics and it would be important to cross check with them what advice had been offered in this context. The advice on use of facial coverings outwith the clinical setting above was offered by Scottish Government rather than by myself or my HPS/PHS or ARHAI colleagues.

24. **NHS capacity**

24.1 From my perspective the priority was minimising the impact of Covid-19 particularly for the most severe outcomes of hospitalisation, admission to ICU and of deaths. The creation of additional capacity to manage patients during the pandemic was very welcome in this regard but as such capacity was still finite there were genuine concerns of the NHS in Scotland being overwhelmed on the basis of scenarios generated in modelling output by SPI-M. I understand from the consideration by SAGE, SGCAG and the Scottish NIMT that this was central to consideration of the suite of measures to be deployed to counter this threat.

24.2 The key decisions particularly in relation to the national lockdowns were effective in protecting the NHS from being overwhelmed during the pandemic.

24.3 In relation to the rationale behind the construction of the NHS Louisa Jordan at the SEC in Glasgow, a 300-bed capacity hospital, but expandable to 1,000 if required in my view the mismatch between potential demand and capacity explains that there was a clear rationale for the creation of additional capacity to manage patients.

24.4 I was, along with the general public, struck by media reporting of the impact of the first wave in China and, then closer to home the incredible

pressure on Italian health care. This along with SAGE and SGCAG deliberation and professional briefings from international colleagues were very strongly supportive of the creation of such additional space as a contingency.

24.5 It is my understanding that the NHS Louisa Jordan was not needed in the end for this additional capacity. This could be viewed as a success of the implementation of the suite of measures introduced during either the Lockdowns or in the intervening periods whilst the Covid-19 clinical treatment and, in particular, vaccination programme when launched, had a profound impact on reducing severe morbidity and in particular in reducing mortality (cross reference the deaths averted reported in the WHO paper).

25. Schools

25.1 My involvement in the strategy relating to the role of schools, colleges and universities in the management of the pandemic was limited to the provision of information on the evaluation of the surveillance data on the contribution of infection in individuals affected in these settings to the overall impact of Covid-19 in Scotland. Such data allowed an evidence base for policy, or adjustment of policy, over time. My PHS colleagues (and in particular Diane Stockton) provided input to the PHS led NIMT and through attendance and participation schools, colleges and university colleagues provided direct advice on such measures to DCMO.

25.2 My understanding was that the advice re school closures as part of Lockdown 1 and 2 was from SAGE and SCSAG.

25.3 It is my understanding that there was a correlation between school closure and reduced transmission of Covid-19. This is difficult to separate however from the contribution made to reduction in R by other

components of the suite of measures introduced at the same time as lockdown measures.

26. Vulnerable and at risk groups

26.1 For most infectious diseases it has long been understood that there is a disproportionate burden of illness for those in lower socioeconomic groups. Covid-19 was no different in this respect. The EAVE-II programme (see Appendix A) offered insight dynamically across the pandemic re this. What became more evident from the ISARIC-4C (JM/16 - INQ000354104)[87] and CO-CIN (JM/50 - INQ000308733)[88] was differences in outcome by ethnicity and the contribution to adverse outcome in those defined to be grossly obese. In a similar way outcome post vaccination has provided useful insights into continuing challenges with respect to vaccine uptake for different ethnic groups and socioeconomic groups. The PHS led Scottish Vaccination and Immunisation Programme is actively involved in working with stakeholders to prioritise and address these and have produced output on differences in uptake by risk groups (Please see the publication (JM/51 - INQ000147517)[89] and our published data on the PHS website (JM/52 - INQ000347510)[90]).

26.2 The impact on those with vulnerabilities or at risk in Scotland was an area of work led by Scottish Government which considered advice from JCVI, SAGE and SCSAG.

[87] UKRI/ISARIC4C. The RECOVERY trial. May 2022. [Accessed November 2023].
[88] Docherty, A; Harrison, E and Semple, C. Covid-19 n-patient demographics after 1st August 2020 compared with whole CO-CIN cohort. 16 September 2020.
[89] PHS. Factors affecting uptake of the Covid-19 vaccine: learning from the flu and COVID-19 vaccination programme evaluation. 29 June 2022.
[90] PHS. Public Health Scotland – vaccination surveillance. [Accessed November 2023].

26.3 I am unable to comment on any Equality Impact Assessment but understand that the PHS corporate statement for Module 2A (JM/7 - INQ000300280)[91] deals with this.

26.4 From my observations of topics covered in the SAGE, SCSAG and Four-Harms meetings the impact of NPIs on 'at risk' and other vulnerable groups in light of existing inequalities had limited deliberation.

26.5 In relation to consideration of whether *social care "was a secondary concern for the Scottish Government when compared to the* NHS" I have limited comment to make - I had an indirect view on this as my other Strategic Incident Director colleague Dr Colin Ramsay initially led on this area of work before other colleagues assumed this role. My observation however was that social care was not a secondary concern. HPS and PHS made a considerable contribution to the guidance provision for social care and could see the intensive involvement of our Scottish Government colleagues and other stakeholders. It would be fair however to say that there were multiple groups with overlapping interests and that led to considerable difficulty in achieving unity of messaging. These coordination issues were considerably assisted by the designation of lead roles to the Directors of Public Health in May 2020 and I will cover more on this in the section on care homes.

26.6 I accept that my HPS and PHS Covid-19 team dealing with the pandemic were focussed on the direct consequence of Covid-19. However all Four Harms were considered by Scottish Government thus direct and any indirect harms as potential issues were covered.

[91] PHS. COVID-19 Public Inquiries: PHS Module 2A Corporate Statement. October 2023.

E. Decisions relating to the first lockdown

27.1 I understand the principal sources of advice regarding the national lockdown were SAGE (informed by NERVTAG), SCSAG and modelling data from SPI-M using UK and international surveillance data.

27.2 I very much supported this decision. My view was then and remains now that in the absence of a vaccine to protect the population or of proven treatment the modelled data on scenarios and the possible impact of the pandemic threatened to overwhelm NHS capacity and result in a large number of deaths particularly in the elderly and in those with underlying medical conditions. The Lockdown measures averted many of these deaths at this time.

27.3 Regarding your question on the extent to which economic considerations influenced the Scottish Government's decision on the first lockdown this is more a question for Scottish Government within a Four Harms consideration. However from my perspective fiscal issues would likely have been a significant determinant of timing as would the need to ensure public confidence from unified messaging across the UK.

27.4 It is easier to look in retrospect knowing what we know now and question the relative timing and ask why this decision was not made earlier. This was at the time a very difficult decision to make. The nature of this difficulty centred around the significant uncertainty around the likely trajectory of the pandemic wave due to the limitations of international and UK data with resultant wide confidence intervals on scenario output from the SPI-M team for consideration by SAGE and SCSAG and the national Health Protection agencies of each country.

27.5 There is an argument that from a purely Harm 1 consideration the decision could have been made a little earlier (by a week or so) but at the time it is possible this was not a consensus view.

27.6 The timeliness of the implementation once decided was very swift.

27.7 It is unlikely that a national lockdown could have been avoided but not impossible within the scenarios that could be considered. The suite of measures introduced in the lockdown were instituted with the consensus of the population and with the full weight of the UK and Devolved Administrations and anything less than this would likely not have been as successful as these proved to be.

27.8 Regarding the consideration of the adoption of strategies other than lockdown in March 2020 this is mainly a question for Scottish Government. My understanding of the evidence available to SAGE and SCSAG at the time was that the overall assessment was that it was difficult to estimate the effect of any more limited lockdown (like limitation to those most medically vulnerable) measures when compared against the full lockdown measures. This was because of the limitations regarding

- the extent of knowledge at that time
- whether risk groups were inclusive enough to ensure success and
- the limitation about whether numbers of cases in the rest of the population not in medically vulnerable groups would generate the greatest contribution by absolute numbers of cases, hospitalisations and deaths in the scenarios.

27.9 My understanding was that the SAGE and SCSAG consideration informing any decision was made against a variety of combinations/bundles of measures. These bundles or combinations formed the basis of measures given consideration by SPI-M. This would

include the work of Ferguson et al (JM/53 - INQ000049647)[92] referred to in the Rule 9 Module 2 request made to me.

27.10 In my view any exit strategy would be informed by trends observed by HPS/PHS – hopefully in any demonstration of downward trajectory - in surveillance output on the impact of the measures with respect to cases, hospitalisations, ICU activity and deaths reported along with consideration of the incubation period for COVID-19 (which leads to lags in some of the trend data). My recollection is that such encouraging trends were present in data over the months of April/May 2020 in Scotland and the rest of the UK

27.11 From my perspective there was a seamless transition from the exit of Catherine Calderwood, the continued access to DCMO Gregor Smith in the intervening period then and also following his subsequent elevation to CMO.

27.12 With regard to vaccination and treatment I would make the following points.

27.12.1 **The likelihood and timing of an effective vaccine to Covid-19 being discovered and made available in sufficient quantity for the needs of the Scottish population.** The sources of information regarding 1. likelihood and timing of vaccine development, demonstration of safety and beneficial effect and 2. timetable re mass production and deployment of vaccine in a unified vaccination programme are respectively the domain of the Joint Committee for Vaccination and Immunisation and the Scottish Government led COVID-19 vaccination programme.

[92] Neil M Ferguson, Daniel Laydon, Gemma Nedjati-Gilani, et al. Report 9: Impact of non-pharmaceutical interventions (NPIs) to reduce COVID19 mortality and healthcare demand. March 2020. http://dx.doi.org/10.25561/77482.

27.12.2 **The likelihood and timing of an effective treatment for Covid-19 infection becoming available.** The likelihood and timing of an effective treatment were the under review by SAGE and SGCAG with multiple sources of advice originating from clinical investigation teams globally. Professor Sir Peter Horby led one such consortium, the RECOVERY trial in the UK (JM/16 -INQ000354104)[93]. This origins of this trial was from another of the pandemic hibernation projects, 'The UK hibernated pandemic influenza research portfolio: triggered for COVID-19' (JM/54 - INQ000347513)[94] (these hibernation projects included what would be reactivated and become the Scottish EAVE-II and ISARIC studies as previously documented). This RECOVERY trial offered initial insight into the benefit of reduced mortality from the use of dexamethasone treatment and had a global consequence in influencing the outcome for those affected by Covid-19.

28. Continuation of the first lockdown

28.1 SAGE and SGCAG continued to review all available evidence from the UK and internationally in relation to the knowledge on Covid-19 across the spring and summer. During the spring the elimination had been considered a possibility but the more realistic prospect, prior to the deployment of an effective vaccine, was to drive cases as low as possible during lockdown before any relaxation of societal measures. This latter relaxation could only be introduced gradually with a concurrent assessment of the impact on the epidemic curve and the careful consideration of the available options (short of lockdown) that could be deployed in the event of the resurgence of cases. What was then advocated and implemented was a series of steps down from

[93] UKRI/ISARIC4C. The RECOVERY trial. May 2022. [Accessed November 2023].
[94] Simpson, C. R.; Thomas, B. D.; Challen, K. et al. The UK hibernated pandemic influenza research portfolio: triggered for COVID-19. The Lancet Infectious Diseases, 20(7), pp767-769. 15 May 2020.

Lockdown and accompanying pauses to allow assessment of whether it was safe to move to the next step down.

28.2 I agree with the comment made in the corporate statement of the Director General Strategy and External Affairs on behalf of the Scottish Government (Strategy and External Affairs) (JM/25 - INQ000215495)[95], where it is said at paragraph 155 that a 'Zero COVID" strategy in Scotland would have been unlikely to be sustainable because of essential travel to and from Scotland, particularly from the land border in England.

28.3 I understand that information considered by SAGE and SGCAG would have formed the basis of advice to Scottish Government regarding 'super shielding'.

29 Extending the period of the first lockdown:

29.1 16 April 2020 – After reviewing the lockdown with all nations in the UK, the decision was made to extend it for another three weeks until 7 May (JM/55 - INQ000347458)[96];

29.2 7 May 2020 - Extension of the lockdown restrictions in Scotland for another three weeks, with an indication they could be changed if there was evidence it was safe to do so (JM/56 - INQ000347507)[97]; and

29.3 11 May 2020 – In a national address to Scotland at the beginning of the seventh week of lockdown, Nicola Sturgeon asked the nation *"to stick with lockdown for a bit longer – so that we can consolidate our*

[95] Director General Strategy and External Affairs. COVID-19 Public Inquiry Module 2A Corporate statement. June 2023.
[96] Scottish Government. Coronavirus (COVID-19) update: First Minister's speech. 16 April 2020. [Accessed November 2023].
[97] McShane, A. Nicola Sturgeon extends Scotland's coronavirus lockdown by three weeks. LBC News. 7 May 2020. [Accessed November 2023].

progress, not jeopardise it…I won't risk unnecessary deaths by acting rashly or prematurely." (JM/57 - INQ000347456)[98].

29.4 The decision on any extension of the period of lockdown was the responsibility of Scottish Government in Scotland. My understanding of this process was that the information and intelligence on the impact of the Lockdown measures were carefully considered as part of this process to allow a decision on easing of measures. Much of the information on the situation and intelligence commentary was provided by the PHS Covid-19 surveillance team that I led. Data from this, and from similar information from across the rest of the UK and internationally, gave statistical modellers the basis on which their scenario output could be run to provide an indication of when a nadir (rather than necessarily zero cases) would follow. My understanding of these data was this demonstrated that there was a reduction in cases and following a lag, reduction in hospitalisations and deaths.

29.5 On 23 April 2020 the Scottish Government published details of its strategy for ending lockdown, the "Covid-19: A Framework for Decision-Making". The stated aim of this strategy was to suppress the virus so that the R-number remained below 1, demands on the NHS did not exceed capacity and people were able to return to some semblance of normality. The First Minister said that the lifting of restrictions in Scotland was "*likely to be phased*" with some measures remaining in place until 2021 "*and beyond*" (JM/58 - INQ000347502)[99].

29.6 My understanding is that the rationale and medical/scientific basis for the strategy announced at that time and for the way it was communicated to the Scottish public likely formed from the intelligence provided by PHS, PHE & our DA HPT's, WHO, SAGE, NERVTAG, SGCAG, SPI-M & JCVI.

[98] Scottish Government. Coronavirus (COVID-19): First Minister address to the nation 11 May 2020. [Accessed November 2023].
[99] BBC News. Lifting of Scottish coronavirus lockdown 'likely to be phased'. 23 April 2020. [Accessed November 2023].

29.7 However, my understanding was that the rationale and medical /scientific basis of this was as follows: the aim of keeping the R-number below 1 meant attempting to avoid a return of exponential growth of the pandemic wave. The expected benefit of this would be to keep the number of cases within a range that the NHS could manage without exceeding capacity to do so whilst imposing the minimum restriction on society to achieve this. This assumed that such societal measures would be flexible until a clear benefit from any future vaccination programme was observed. If we regard the societal measures applied during the lockdown as akin to applying a brake on the pandemic, the "phased" easing of restrictions was to release this brake incrementally. By doing so this allowed assessment of whether the criteria for further release in easing of restriction could then be undertaken. The significant uncertainty re how quickly this easing in the braking could achieve easing of societal measures to control Covid-19 was consistent with the statement reflected "until some time in 2021".

29.8 I agreed with these ambitions and thought that SG, through the First Minister, her Ministerial colleagues, and supported by the CMO/NCD, handled this difficult to hear messaging extremely well.

29.9 In relation to the Framework "Four Harms" which were at the core of the Scottish Government's strategy the "Four Harms" strategy was an SG initiative. I do not recall being invited to offer comment on the creation of the strategy but I was in agreement with it. My view is that the construct allowed a practical consideration of the dimensions one needed to cover and this Four Harms meeting was very ably chaired by Ken Thomson. My recollection was that there was limited, rather than no consideration, of inequality in many of these Four Harms meetings e.g. consideration of inequalities in a schools setting or in impact of clinical disease or as applied to vaccine uptake. The chair in my view was inclusive of all views expressed, incisive and thoughtful in his deliberation and in distilling and presenting summary information from these meetings as advice to Ministers.

29.10 On 28 April 2020, the Scottish Government recommended that people cover their faces while in some public places such as shops and on public transport (JM/59 - INQ000347466)[100].

29.11 Infection prevention and control advice for health care associated infection is offered by ARHAI. Societal advice on infection prevention and control in other settings was however the domain of Scottish Government. My understanding was that in the absence of good evidence on the effectiveness of covering faces in public places that this was a further measure that could contribute to reducing R by **reducing rather than preventing all risk from the wearer to others** - Without good quality aerobiology challenge studies this was difficult to quantify. However even if reducing the pressure of infection by a small amount e.g. reducing R by 0.1, when taken together as a package of societal measures, this measure could make a contribution to limiting the spread of Covid-19 infection. PHS view on covering faces in public spaces was then permissive rather than endorsed.

29.12 Personally, I was very supportive of this measure as this was something that all members of society could do to take control of their environment even if the main benefit was to others from me wearing a facial covering rather than to me from others.

30 Effectiveness of the first lockdown

30.1 My PHS team has produced extensive epidemiological analysis on the trends in clinical illness reporting on cases and the reducing trend in cases requiring hospitalisation and deaths reported and either directly published this data or contributed this data to daily outputs from Scottish Government.

[100] BBC News. Coronavirus: Scottish government suggests covering face in shops. 28 April 2020. [Accessed November 2023].

30.2 High quality publications documented the results of the effectiveness of the First Lockdown in Scotland in controlling the spread of COVID-19 – see (JM/60 - INQ000256624)[101] and (JM/39 - INQ000347524)[102].

30.3 In relation to the assessment which was done of consequences of lockdown not related to the spread of the Covid-19 virus such as economic, social or non-Covid health related consequences, my understanding is that this was at the heart of the SG Four Harms process. Please see (JM/61 - INQ000347508)[103].

30.4 Similarly any assessment regards the impact of the first lockdown on vulnerable and at risk groups both during and after the lockdown was in place would have naturally been addressed in this setting.

31 Conclusions and lessons learned

31.1 I have previously made reference to conclusions and lessons learned in both the PHS Corporate Narrative (JM/2 - INQ000108544)[104] and Corporate Statement (JM/3 - INQ000183410)[105].

31.2 From my perspective the lessons learned by the experience of the first lockdown were that in times of crisis that strong leadership, effective communication and "buy in" from the public were essential to the success of the suite of societal measures that led to the reduction in cases, hospitalisations and deaths.

[101] Lycett, S. J. et al. Epidemic waves of COVID-19 in Scotland: a genomic perspective on the impact of the introduction and relaxation of lockdown on SARS-Cov-2. 20 January 2021. [Accessed November 2023].
[102] Da Silva Filipe A, Shepherd JG, Williams T et al. Genomic epidemiology reveals multiple introductions of SARS-CoV-2 from mainland Europe into Scotland. Nature Microbiology 1 January 2021;6(1):112-122.
[103] Scottish Government. Impact of COVID-19. 18 December 2020. [Accessed November 2023].
[104] PHS. COVID-19 Public Inquiries: PHS Corporate Narrative. January 2023.
[105] PHS. COVID-19 Public Inquiries: PHS Module 1 Corporate Statement. May 2023.

31.3 Additional lessons were around the limitations of the pre-existing resource which, even with redeployment of NSS or PHS staff to support the response, impacted on workload for key staff, in particular consultants in public health and specialists in health protection, who along with the rest of the epidemiology, analytical and support staff, bore a heavy burden of the response within Health Protection Scotland and its successor, PHS. My observation was of similar issues for my colleagues in NHS boards and beyond.

31.4 In response to, in particular, what lessons were learned from the first lockdown about:

31.4.1 the impact on vulnerable or at risk groups;

31.4.2 four-nation working;

31.4.3 internal and external communication;

31.4.4 the nature of the virus and the infection; and

31.4.5 compliance by the Scottish public with, and the effectiveness of, Covid-19 laws and regulations?

31.5 **Vulnerable or at risk groups –** The epidemiology of initial cases was further explored by painstaking investigation offering insights into risk groups. The output from ISARIC-4C, The RECOVERY trial – a UKRI pandemic hibernation project reactivated at the start of the COVD-19 pandemic (JM/16 - INQ000354104)[106] and from CO-CIN (JM/50 - INQ000308733)[107] allowed further observations on risk groups and signals for closer examination including on the role of obesity, whilst these two studies, supplemented by mortality analysis, generated some concern for vulnerable ethnic groups. These were the subject of discussion in SAGE and SGCAG.

[106]UKRI/ISARIC4C. The RECOVERY trial. May 2022. [Accessed November 2023].
[107] CO-CIN. COVID-19 n-patient demographics after 1 August 2020 compared with whole CO-CIN cohort, 16 September 2020. 25 September 2020. [Accessed November 2023].

31.6 **Four nations working –** HPS and its successor PHS had extremely good relations with our health protection direct counterparts in PHE and with our DA colleagues. Regarding this latter I maintained excellent dialogue with our colleagues and from time to time with our Eire colleagues too as we were all keen to learn from each other. The NERVTAG, SAGE and JCVI structures worked very well overall though balancing attendance with other service pressures was very demanding.

31.7 **Internal and external communication –** the internal communication within HPS and our successor organisation PHS were good overall due to high attendance by teams engaged in the daily choreography of meetings though they would have potentially benefitted from having all staff briefing sessions – these were not brought in until much later (from 5th March 2021). External communications were good overall but intermittent issues arose in liaison with PHE and SAGE but all such issues were easily resolved.

31.8 **Nature of the virus and the infection –** it was difficult at times to keep up with the volume of new science that emerged by the end of the first lock-down. There were significant developments in our understanding within these few months as reviewed and communicated through SAGE, SGCAG, NERVTAG and improvements in modelled output from SPI-M consequent to these findings.

31.9 **Compliance with laws and regulations** – During this period I was free to travel to and from my place of work whilst remaining Covid-19 compliant and saw first-hand the overall excellent compliance of the general public with the laws and regulations of the day.

31.10 From my own perspective the dynamic nature of the emerging knowledge of the pandemic meant that a continual process of learning and adapting to the emerging pandemic were essential. This was at the root of all of my interaction with my colleagues and stakeholders and I

encouraged my staff to creatively overcome practical issues encountered. This proved very useful for the initial and subsequent waves of infection with Covid-19.

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

32 General

32.1 I would offer the following observations from my own perspective:

32.2 **Rationale –** I have already offered a perspective on this in relation to the prior time period.

32.3 **Scientific advice and other advice –** were informed by consideration of the modelling work from SPI-M and SPI-O and reviewed by SAGE and SGCAG and surveys conducted on behalf of SG on compliance etc. for the likely impact of a variety of combinations/suites of measures to be enacted/societal measures released.

32.4 **Restrictions fair?** – these were difficult decisions but in my view made fairly and recognised that for the most vulnerable represented significant restriction for the longest period.

32.5 **Divergence –** I would suspect that any divergence if apparent would likely reflect differences in the situation as it pertained to Scotland at the time, the options available and deemed appropriate, and reflect the differences in structures/health care delivery/rural urban settings/unique issues for localities (e.g. the NHS island boards and LA's).

33 The steps taken to ease the first lockdown

33.1 From my own perspective the cautious incremental stepwise approach to the easing of lockdown was commensurate with the trends in cases, hospitalisation and deaths whilst considerate of the need to ensure that a

period of reflection was built into the interval between steps allowing national health protection teams to provide PHS with the evidence base to collate, consider and give advice to support further relaxation of measures should conditions warrant them.

33.2 Phase 3 of the route map on 10 July 2020, in which the wearing of face coverings became mandatory in shops in Scotland, was from my perspective (and I understand it was also the perspective of my PHS colleagues and my ARHAI colleagues) clearly a decision for and by the Scottish Government. I have no recollection of whether modelling data down to this granular level of contribution as a single measure was available to describe how much it would result in reducing the Reproductive number. However even in the absence of this data this measure, which I too adopted along with the rest of the public in wearing of facial covering in other settings, was a simple measure empowering the public to take control of their environment that would likely positively reinforce their ability to reduce transmission to others.

33.3 In relation to planned reopening of schools on 11 August 2020, with all pupils expected to be in class full-time from 18 August (JM/62 - INQ000347467)[108], this was informed by trends in epidemiology of cases by age group and on advice from SAGE and SGCAG informed by SPI-M and SPI-O which provided much of the focus for such discussion along with the additional input to SG from co-opted colleagues offering dealing with early years/schools/Further Education.

33.4 Border controls were a complex area for discussion. My understanding is that Border control (through Border Force) is a UK rather than a Devolved issue and the greatest majority of international travellers to Scotland arrive in UK airports outside Scotland. Any decision made unilaterally by Scotland would then have limited impact in Scotland. Scientific advice to Cabinet Office and Ministerial decision for Border Force was offered by

[108] BBC News. Coronavirus: Scottish schools to fully reopen from 11 August. 30 July 2020. [Accessed November 2023].

PHE and latterly by JBC on the basis of their review of the international situation. I and my team continued to share information on cases in individuals known to have recently travelled abroad and joined with our epidemiology and colleagues in PHE and DA's to exchange information.

33.5 PHS continued to review and share trends in cases and local intelligence from NHS boards and their Local Authority colleagues with Scottish Government and reciprocally with UK health protection authorities re their own situations.

33.6 The local investigation and management of local outbreaks are the responsibility of each of the NHS territorial boards in liaison with their Local Authority colleagues. An additional role of PHS in these settings was in coordination (through the NIMT), generation of advice and a joint task of communication of findings. Please see 'The Management of public health incidents: guidance on the roles and responsibilities of NHS led incident management teams' which outlines more on this approach (JM/4 - INQ000147512)[109].

33.7 The following NHS boards undertook the following IMT's with support from PHS:

a) NHS Lanarkshire - A call centre outbreak, identified at the Sitel site in Motherwell in July 2020 (JM/51 - INQ000347462)[110];

[109] PHS. Management of public health incidents: guidance on the roles and responsibilities of NHS led incident management teams. Version 12.1 (interim update). 14 July 2020. [Accessed November 2023].
[110] BBC News. Coronavirus: Outbreak investigated at Motherwell contact tracing centre. 20 July 2020. [Accessed November 2023].

b) NHS Grampian - The Aberdeen outbreak in August 2020; (JM/63 - INQ000347464)[111], (JM/64 - INQ000347450)[112], (JM/65 - INQ000347460)[113], (JM/66 - INQ000347463)[114] and

c) NHS Greater Glasgow & Clyde management of a rise in cases in Glasgow in September 2020.

33.8 The findings and learning from each of these investigations were shared with the NIMT for their consideration.

34 Eat Out to Help Out

34.1 I had no involvement in the Eat Out to Help Out Scheme. I am unaware of any involvement that I or my PHS colleagues had apart from the possibility of potentially correlating the scheme with other Covid-19 data on surveillance to investigate any association with the impact (or otherwise) of the scheme. My understanding is that there was no/limited PHS work done in this area I have no recollection of any specific output dealing with the likely impact produced.

34.2 I have no recollection of reading anything on whether the Scottish Government ascertained whether the Treasury had sought or received scientific advice in respect of its Eat Out to Help Out scheme prior to its implementation.

34.3 I and my team provided daily data on trends in Covid-19 cases, hospitalisations and deaths across this period. All of this data is available

[111] BBC News. Coronavirus: Pub cluster cases rise to 32 after FM warning. 4 August 2020. [Accessed November 2023].
[112] BBC News. Aberdeen coronavirus outbreak: number of cases rises to 79. 7 August 2020. [Accessed November 2023].
[113] BBC News. Coronavirus: Local lockdown in Aberdeen extended. 19 August 2020. [Accessed November 2023].
[114] BBC News. Coronavirus: Partial lifting of Aberdeen lockdown restrictions. 23 August 2020. [Accessed November 2023].

on the PHS website (JM/67 - INQ000354110)[115] and the data is available on an Open Data platform for perusal: (COVID-19 Statistical Data in Scotland – Datasets) (JM/21 - INQ000347451)[116].

34.4 All of the surveillance data was shared with Scottish and UK Government on a daily basis. In addition, I chaired the COVID-19 NIMT on behalf of PHS and provided advice after each NIMT to the CMO and senior SG Policy officials.

35 Conclusions and lessons learned

35.1 In the period from June to August there was intensive scrutiny of the effectiveness of restrictions in forensic detail scrutinised by the PHS and by the NIMT. Advice from the NIMT was submitted after each meeting of this group.

35.2 There has to my knowledge not been any assessment of how different or earlier decisions relating to the management of the pandemic would have made any impact.

35.3 The assessments of any economic, social or non-COVID health related consequences made over this period would have been by colleagues in the Four Harms group. My observation as a member of this group is that all advice offered following each meeting of the Four Harms group was done with the consideration of all Four Harms.

35.4 I understand that the Scottish Government have made some assessment of the impact on vulnerable and at risk groups (JM/68 - INQ000347492)[117].

[115] PHS. Viral respiratory diseases (including influenza and COVID-19) in Scotland surveillance report. 21 September 2023. [Accessed November 2023].
[116] PHS. COVID-19 Statistical data in Scotland – datasets. 12 October 2023. [Accessed November 2023].
[117] Scottish Government. The Impacts of COVID-19 on Equality in Scotland. September 2020.

35.5 The experience highlighted the difficulty in containing spread in NHS board areas using the interventions available below level 3 in Scotland. It also highlighted that the tempo of the spread of the Covid-19 wave presented a difficulty for an application of social measures when an increase was observed in mainland Scotland but cases were at much lower levels in remote and rural settings – in particular, in the NHS island boards.

35.6 I would offer the following views on key conclusions for this period.

35.7 **Impact on vulnerable or at risk groups –** individuals who were the most vulnerable had prolonged periods of social isolation to protect them from the expected range of complications that could arise from their exposure and subsequent infection.

35.8 **Four-nation working –** The communication challenges within England for PHE, Test & Trace and JBC and possibly risks or issues with communication challenge for England and the DA's as perceived by Cabinet Office may also have led to the announcement of the creation in August 2020 of UKHSA. This did not however become operational until 1st April 2021.

35.9 **Internal & External –** Internal communication processes within PHS continued to develop post PHS coming into operation in April 2020. For external issues – see Four Nation working above.

35.10 **Nature of the virus & infection –** the role of asymptomatic infection began to become much clearer. Continued insight was provided from ISARIC-4C & CO-CIN. The first of the treatments for COVID-19 was demonstrated to have a significant impact in those severely unwell – the role of dexamethasone. This was a key finding of The RECOVERY trial – a UKRI pandemic hibernation project reactivated at the start of the COVD-19 pandemic (JM/16 - INQ000354104)[118] published in June 2020. Changes in ICU management were also documented by CO-CIN colleagues (JM/50

[118] UKRI/ISARIC4C. The RECOVERY trial. May 2022. [Accessed November 2023].

- INQ000308733)[119]. Much progress was made in the set-up of the EAVE-II programme (JM/69 - INQ000149107)[120]

35.11 **Compliance –** My own observation was of increasing challenge for compliance and variable interpretation for specific settings e.g. construction versus call centres.

35.12 The NIMT dynamically assessed and refined these approaches over the course of the pandemic to reflect the increasing understanding of the virus.

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

36 The rationale behind the strategies and NPI's was as outlined in the SG Framework document (JM/70 - INQ000347528)[121].

36.1 I and my PHS team continued to provide surveillance information to SG in the period September 2020 to End December 2020. I led the PHS chaired NIMT throughout this period offering advice to the CMO and Scottish Government on the response to the increasing number of cases.

36.2 In the absence of a full lockdown it was unclear whether the range of measures available would be sufficient to suppress cases of Covid-19. The NIMT offered advice within the parameters of the SG framework and observed the limited impact of measures at or below Level 3 measures. The emergence of the Delta variant was a particular challenge over the latter part of the timeframe.

36.3 I and my PHS team provided a suite of surveillance output to support the deliberations of the NIMT for NHS boards, LA's and SG in assessing the

[119] CO-CIN. CO-CIN: COVID-19 n-patient demographics after August 2020 compared with whole CO-CIN cohort, 16 September 2020. 25 September 2020. [Accessed November 2023].
[120] Simpson C.R.; Robertson C.; Vasileiou E. et al. Early Pandemic Evaluation and Enhanced Surveillance of COVID-19 (EAVE II): protocol for an observational study using linked Scottish national data. BMJ Open 2020 /06/01;10(6).
[121] Scottish Government. COVID-19 – Framework for decision making: Scotland's roadmap through and out of the crisis. Phase 3 Update. 10 September 2020. [Accessed November 2023].

situation by locality/NHS board and advised which interventions should be increased/stay the same/be relaxed over the time period.

36.4 The advice offered from each of these NIMT has been made available to the Inquiry.

36.5 On 10 September 2020, the number of people permitted at social gatherings indoors and outdoors was reduced to six in a bid to stem the acceleration of Covid-19 cases, while customers in pubs, restaurants and cafes were required to wear face coverings when not eating. Planned changes scheduled for 14 September were postponed until 5 October, meaning theatres, live music venues, indoor soft play facilities and indoor contact sports would not open as originally planned (JM/71 - INQ000347461)[122].

36.6 I am unclear what the scientific basis was for the number of individuals being limited to a specific number as announced on 10th September 2020 but expect this and the delay to the schedule of changes due on 14th September 2020 were a pragmatic ministerial response to limit the social mixing experienced at the time.

36.7 I understand that the rationale and scientific basis for the decision communicated on 22 September 2020 when the First Minister announced that the ban on visiting other households would be extended across Scotland from the following day and that a 10pm curfew on pubs and restaurants would follow from 25 September (JM/72 - INQ000347468)[123], was the increase in cases described by PHS across the summer along with the observed limited impact of measures available and to that point deployed (as laid out within the SG framework) to blunt the increase observed. This was clearly communicated by the First Minister to the Scottish public.

[122] BBC News. Coronavirus: Maximum size of gatherings in Scotland cut to six. 10 September 2020. [Accessed November 2023].
[123] BBC News. Covid: Ban on meeting in houses extended across Scotland. 22 September 2020. [Accessed November 2023].

36.8 Further measures were announced on 24 September 2020 regarded students at Scottish universities being advised not to visit pubs, restaurants and parties, and to socialise only with members of their accommodation in a bid to stem the spread of Covid-19 (JM/73 - INQ000347490)[124]. The PHS & NIMT review of our surveillance information combined with observations from analysis of Test and Protect (T&P) data and consideration of the Whole Genomic Sequence (WGS) results led to the conclusion that increased social mixing in College and University settings posed a clear challenge to limiting the spread of infection. A Four Harms review of the NIMT advice supported the implementation of what then developed into the consideration by Scottish Government of this and subsequent policy announcement.

36.9 The continuing or threatened further increase in cases necessitated consideration of further measures to reduce the spread of infection. The observation that maintaining social distance, for those who had consumed alcohol, was challenging and had led to the conclusion that curbing this threat would likely make a contribution towards lowering transmission. The Four harms consideration of this led to the limitation of this to those outlined above.

36.10 PHS and NIMT considered all of the surveillance, T&P and WGS results across this time period and offered advice to the CMO and SG on trends observed. Additional information was available from PHE/JBC, WHO and deliberation of SAGE & SGCAG. The rapid increase in the dominance of the Delta variant and its replacement of Alpha, along with the reporting of increased number of hospitalised cases and deaths, were of particular concern.

36.11 I and my PHS, NHS board, LA and SG colleagues were also very aware of the lessons from the First Lockdown and the direct effects of this re Harm 1 and sought to apply these to this situation. We were also aware of some of the literature and experience of our colleagues re the indirect effects of this.

37 The 5-tier Covid management system

[124] BBC News. Covid: Scottish university students told not to go to pubs. 25 September 2020. [Accessed November 2023].

37.1 On 23 October 2020, the First Minister unveiled Scotland's new five-tier COVID-19 system (JM/74 - INQ000347489)[125]. I understand that the Scottish Government drafted the measures within each of the tiers and shared these with the 4-harms group, NIMT, PHS and Directors of Public Health prior to discussing firm proposals with Local Authorities and third sector representatives.

37.2 My understanding is that this allowed some refinement of the prior approach, reflecting the observations on the effect of lockdown and the impact of incident management measures implemented in initial NHS boards experiencing the increase in cases in Grampian, Lanarkshire and Glasgow and allowing the NIMT more flexibility in the offer of advice for measures already agreed in the Framework that would carry the weight of Scottish Government behind them.

37.3 Whilst I was the Strategic Incident Director and chair of the NIMT, I understand that the suggested content of these changes stemmed from internal discussion in SG. I very much welcomed the tiers, as I understand so too did the NIMT.

37.4 However it ultimately appeared to have limited utility and regrettably proved insufficient to reduce the spread and clinical impact of the Delta variant that was becoming the more dominant strain type. A similar picture however was evident across the rest of the UK and very many international settings so the lockdown necessity in Scotland in response to the Delta variant would likely have been necessary no matter the suite of measures available short of this.

37.5 My understanding was that the suite of measures was compared and contrasted by SG colleagues in the formulation of the Scottish approach with those in the rest of the UK (for example the system of restrictions which came into force in England on 14 October 2002) and internationally.

[125] BBC News. Covid: Scotland to enter new five-level alert system. 23 October 2020. [Accessed November 2023].

37.6 It was not possible in advance to conclude that the 5-tier system would be destined to failure but rather it was a pragmatic approach to deal with the variants thus far experienced. What then followed was a variant (Delta) that outcompeted the other variants and would require the deployment of the COVID-19 vaccination programme to bring the number of cases under control without recourse to a prolonged period of lockdown.

37.7 My view is that communications around the tier system (which was the responsibility of Scottish Government) were as simple as communication leads could make them but were challenging to make understandable.

38 Conclusions and lessons learned

38.1 A number of assessments of the effectiveness were considered by SPI-M in the provision of estimates of the effect of individual NPI's or their combination. These outputs were considered by SAGE and SGCAG and I would cross refer the listing of the documents considered by them.

38.2 It is easy to look with retrospect and confuse this with the real life experience - it is important that there is a distinction made however in the information and conclusions that could be drawn in real time with later retrospective analysis that is currently being published or will be published in the future e.g. see (JM/75 - INQ000347532)[126] and (JM/76 - INQ000347516)[127].

38.3 I am unaware of any assessment of any different or earlier decision making on outcome. This may however be possible to deduce from the output of modelling scenarios but these are not real-life and not a guarantee of the outcome.

[126] The Royal Society. COVID-19: examining the effectiveness of non-pharmaceutical interventions. August 2023. [Accessed November 2023].
[127] Lison, A.; Banholzer, N.; Sharma, M. et al. Effectiveness assessment of non-pharmaceutical interventions: lessons learned from the COVID-19 pandemic. The Lancet Public Health, 8(4), e311-e317. April 2023.

38.4 The Four Harms group considered economic, social or non-Covid health related consequences of the restrictions implemented in Scotland over this period and would be the source of any assessment for this period. My observation as a member of this group is that all advice offered following each meeting of the Four Harms group was done with the consideration of all Four Harms.

38.5 **Vulnerable and risk group** - I understand that there were a number of assessments of the impact of the first lockdown, for example: (JM/77 - INQ000147575)[128], (JM/78 - INQ000347496)[129], (JM/79 – INQ000354099)[130] (this latter one was revised over time).

38.6 The collective experience, including advice from PHS and the NIMT, was fed into the SG Framework and any subsequent revised approaches.

38.7 **Four-nation working –** continued close working with all agencies and initial preparations in hand for the new relationship with UKHSA.

38.8 **Internal & external communications –** there was a period of stability in internal and external communications.

38.9 **Nature of the virus & Infection** – NERVTAG, SAGE & SGCAG continued to review emerging science. A few scientific articles on important work undertaken in Scotland during this period include the following; Reductions in A&E Health service utilisation (JM/80 - INQ000347506)[131] and; risk predictors re outcome which were produced by EAVE-II (JM/35 - INQ000283181)[132] and

[128] PHS. Rapid review of the impact of COVID-19 on mental health. June 2020. [Accessed November 2023].
[129] Scottish Government. COVID-19: Children, young people and families October 2020 Evidence Summary. November 2020.
[130] Scottish Government. Coronavirus (COVID-19): advice for people who were on the Highest Risk List. November 2023. [Accessed November 2023].
[131] Mulholland R.H.; Wood R.; Stagg H.R. et al. Impact of COVID-19 on accident and emergency attendances and emergency and planned hospital admissions in Scotland: an interrupted time-series analysis. Journal of the Royal Society of Medicine. 2020;113(11):444-453.
[132] Clift A.K.; Coupland C.A.;C, Keogh R.H. et al. Living risk prediction algorithm (QCOVID) for risk of hospital admission and mortality from coronavirus 19 in adults: national derivation and validation cohort study *BMJ* 2020; 371. October 2020.

infrastructure enabled to begin the process to evaluate the COVID-19 vaccine following first doses of vaccine.

38.10 **Compliance –** SG behavioural data was suggestive of some reduction in compliance.

38.11 The NIMT I led continued to consider and act on lessons learned as each new piece of information emerged.

H. DECISIONS RELATING TO THE SECOND LOCKDOWN (JANUARY 2021 TO 2 APRIL 2021)

39 Background to the second lockdown

39.1 On 25 December 2020, restrictions were relaxed for Christmas Day to allow people to mix indoors and travel more freely (JM/81 - INQ000347477)[133]. My understanding was this was a difficult decision made my Scottish Government having considered the Four Harms advice against the escalating number of cases and a back-drop of previous communications and the experience and behaviour of the Scottish public during the prior Christmas Lockdown. My understanding was that after much careful consideration the balanced decision was that this single day of celebration, in as safe a circumstance as could be achieved, offered the greatest chance of compliance both in the short and longer term and of current and future adherence to societal measures and future engagement with the population of Scotland.

39.2 On 26 December 2020, mainland Scotland was put into level four restrictions (close to full lockdown) (JM/82 - INQ000354106)[134]. Communication was through the agency of the Scottish Government. The advice from the NIMT and the surveillance data from PHS, along with the

[133] BBC News. Covid in Scotland: More than 1000 new cases as rules relaxed. 25 December 2020. [Accessed November 2023].
[134] BBC News. Mainland Scotland moves into level 4 lockdown. 26 December 2020. [Accessed November 2023].

epidemiological picture across the rest of the UK and internationally, led to the conclusion that such a restriction was necessary to reduce the impact of the Delta wave.

40 **The second lockdown**

40.1 On 4 January 2021, mainland Scotland was placed under lockdown until the end of January 2021, beginning from midnight. Schools were closed and people were ordered to stay at home except for essential purposes. My understanding is that it was the demonstration by PHS, and communicated by NIMT advice, of further deterioration in the epidemiological picture (increasing cases, hospitalisations and deaths), and the resultant modelling scenarios re future impact on the NHS in Scotland in cases, hospitalisations and deaths, which necessitated the recourse of Lockdown.

40.2 In my capacity as PHS Strategic Incident Director and as chair of the NIMT I fully supported the advice and the actions taken by SG to mitigate the risk to the public health from the Covid-19 wave.

40.3 This was another difficult decision at the time made in the context of almost a year of concern re Covid-19. It is likely that the single day relaxation of measure on Christmas day made a small contribution to the amplification of the cases that followed, **BUT** the resulting benefit in terms of increasing the compliance of the Scottish public in the subsequent months with societal Covid-19 measures was arguably greater in the long run. I maintain the same conclusion today as I did then that the overall balance was well judged.

40.4 My understanding of modelled data was that whilst the medically vulnerable made a significant contribution to the total number of cases, these were outnumbered by the number of cases in the rest of the population. Thus, the greatest number of cases prevented were protected by the approach adopted.

40.5 The respected scientists involved in the Great Barrington Declaration have a legitimate alternative view to that which was adopted as the position in Scotland, or the rest of the UK (the UK decision being informed by SAGE and SGCAG deliberation). However, I acknowledge that scholars may be considering any alternate approach for years to come and comparing and contrasting the relative strengths of any conclusions drawn.

40.6 The suite of measures suggested, from analysis of SPI-M output, that to drive R down there would need to be the reintroduction of attendance restrictions for schools. This was, however, likely to be one of the most difficult decisions for SG and UK Ministers.

40.7 On 19 January 2021, the First Minister extended Scotland's lockdown until mid-February 2021 (JM/83 - INQ000347482)[135]. This reflected the PHS surveillance data and the advice of the NIMT regarding the trajectory of any change in cases, hospitalisations and deaths. Scottish Government led on the communication re this as was the case across the pandemic.

41 The easing of the second lockdown

41.1 On 22 February 2021, Scotland's schools began a phased reopening, with the youngest pupils returning to the classroom (primaries 1 - 3).

41.2 From my perspective there had been important developments in the background that prompted a tangible promise of a route out of Lockdown in the few days before this planned phased re-opening. Scotland (through the EAVE-II study) had been the first nation to produce a population level analysis of the effectiveness of the COVID-19 vaccine in preventing hospitalisation pre-publishing (on 19th February) this and publicising it at a media event facilitated by the Science Media Centre. Please see the

[135] BBC News. Covid in Scotland: Schools to stay closed as lockdown extended. 19 January 2021. [Accessed November 2023].

following article: *Effectiveness of First Dose of COVID-19 Vaccines Against Hospital Admissions in Scotland: National Prospective Cohort Study of 5.4 Million People* (JM/84 - INQ000147534)[136].

41.3 This article would form the basis of a peer-reviewed publication in the Lancet article on April: 'Interim findings from first-dose mass COVID-19 vaccination roll-out and COVID-19 hospital admissions in Scotland: a national prospective cohort study' (JM/85 - INQ000147546)[137].

41.4 Additional weight/validation to our findings was given by similar observations from our UKHSA colleagues in their prepublication article (of which I am a co-author) on 2nd March 2021; 'Early effectiveness of COVID-19 vaccination with BNT162b2 mRNA vaccine and ChAdOx1 adenovirus vector vaccine on symptomatic disease, hospitalisations and mortality in older adults in England | medRxiv' (JM/86 - INQ000347448)[138] and also the peer reviewed article that stemmed from it: 'Effectiveness of the Pfizer-BioNTech and Oxford-AstraZeneca vaccines on Covid-19 related symptoms, hospital admissions, and mortality in older adults in England: test negative case-control study' on 13th May 2021 (JM/87 - INQ000347455)[139].

41.5 I understand that the SG route map out of Covid-19 had always had at its heart that any societal measures were to be in place for the shortest time that they were needed thus practical steps to have a phased return were in keeping with this for school children and would have considered the trends in epidemiology of cases by age group.

---

[136] Vasileiou, E., Simpson, C.R.; Robertson, C. et al. Effectiveness of First Dose of COVID-19 Vaccines Against Hospital Admissions in Scotland: National Prospective Cohort Study of 5.4 Million People. The Lancet. 19 February 2021.
[137] Vasileiou, E.; Simpson, C. R.; Shi, T. et al. Interim findings from first-dose mass COVID-19 vaccination roll-out and COVID-19 hospital admissions in Scotland: a national prospective cohort study. The Lancet, 397(10285), pp1646-1657. 23 April 2021.
[138] Lopez Bernal, J.; Andrews, N.; Gower, C. et al. Early effectiveness of COVID-19 vaccination with BNT162b2 mRNA vaccine and ChAdOx1 adenovirus vector vaccine on symptomatic disease, hospitalisations and mortality in older adults in England. medRxiv 2021. [Accessed November 2023].
[139]LopezBernal J, Andrews N, Gower C. et al. Effectiveness of the Pfizer-BioNTech and Oxford-AstraZeneca vaccines on covid-19 related symptoms, hospital admissions, and mortality in older adults in England: test negative case-control study *BMJ* 2021.

41.6 On 23 February 2021, the Scottish Government published an updated decision-making framework, setting out the broad order of priorities for relaxing lockdown restrictions and the conditions to be met at each stage.

41.7 My understanding of this was as is laid out in the document. Review of the scientific information and advice, analysis of and adaptation of tiered suites of measures to control Covid-19, consideration of the WHO position and the roll out of the vaccination programme led to the updated decision making framework. This update was the result of significant discussion and input from PHS, NIMT, SG officials, CMO/NCD and the Four Harms group and guided by additional information from SAGE, SGCAG, JCVI, SPI-O and SPI-M.

41.8 Communication was as ever led by Scottish Government.

41.9 On 2 April 2021, the "stay at home" order was lifted in Scotland, and replaced with a three-week "stay local" order that required people to stay within their local council area. On 6 April 2021, the First Minister confirmed that all secondary school pupils would return full time to the classroom after the Easter holidays and that they would no longer need to follow social distancing rules but required wear face coverings throughout the school. (JM/88 - INQ000347483)[140], (JM/89 - INQ000347484)[141], (JM/90 - INQ000347473)[142].

41.10 My understanding was following review of the PHS surveillance data on trends and the advice of the NIMT and the Four Harms group, this decision was made. This incremental change was then made to further lift restriction in a measured way.

[140] BBC News. Covid in Scotland: Secondary schools to return full time after Easter. 6 April 2021. [Accessed November 2023].
[141] BBC News. Covid in Scotland: Stay at home rule lifted after three months. 2 April 2021. [Accessed November 2023].
[142] BBC News. Covid in Scotland: Families and friends reunite as restrictions ease. 16 April 2021. [Accessed November 2023].

42 Conclusions and lessons learned

42.1 The purpose of the second Lockdown was to reduce cases, hospitalisation and deaths by altering the trajectory of the epidemic curve that would otherwise have ensued.

42.2 I believe the second lockdown achieved its purpose. There was a strong correlation between the measures introduced and their impact subject to the anticipated lag that follows the intervention.

42.3 I am unaware of any assessment of different or earlier decisions. This may however be possible to deduce from the output of modelling scenarios but these are not real-life and not a guarantee of the outcome.

42.4 I am unaware of any assessment of the impact of the second lockdown on vulnerable and at risk groups both during and after the lockdown other than the discussion within the Four Harms setting chaired by Scottish Government.

42.5 The high level of uptake, and the speed of this achievement by the public and professionals of the offer of Covid-19 despite the challenge of this second Lockdown, was remarkable and very likely reflected the acceptance that this remained the single best hope of an eventual return to normality in society.

42.6 **Vulnerable and risk groups –** We began to see early evidence of a differential uptake of Covid-19 vaccination by socioeconomic group and by risk group for first dose of vaccine and shared this information with NHS boards, LA's and SG.

42.7 **Four-nation working –** continued close working with all agencies and initial preparations in hand for the new relationship with UKHSA for 01/04/2021.

42.8 **Internal & external communications –** Development of all PHS open staff briefing sessions in MS Teams environment. SG continue in role as Communications lead for the national emergency.

42.9 **Nature of the virus & Infection –** see Scotland's leading contribution on vaccine effectiveness as documented above (PHS published a statement (JM/91- INQ000235195)[143]) highlighting how welcome and encouraging the results were and was featured on the national news. There was extensive coverage in the media and the First Minister highlighted the study in her COVID-19 statement on 22nd February saying 'this is exceptionally encouraging news' (JM/92 - **INQ000235124**)[144].

42.10 **Compliance –** My recollection is that over this period that SG data on trends was suggestive of reducing compliance with societal measures.

42.11 NIMT considered, and reacted to incorporate, all lessons learned into routine practice across PH in Scotland.

I. Decisions relating to the period between April 2021 and April 2022

43 General

43.1 Review of the PHS surveillance trends, the context from UKHSA and DA colleagues & the WHO international data, the discussion of local intelligence from NHS boards and the contribution from SG colleagues, including analysis of modelling in NIMT when combined with SAGE and SGCAG information, led to NIMT advice re easing for consideration in the Four harms setting. The updated SG Framework was applied to the findings considered by the Four Harms group.

[143] PHS. Vaccine linked to reduction in risk of COVID-19 admissions to hospitals. February 2021. [Accessed November 2023].
[144] Scottish Government. Coronavirus (COVID-19) update: First Minister's statement - 22 February 2021. February 2021.

43.2 On 16 April 2021, the stay local rule was lifted for Scotland and up to six people from six different households were allowed to meet up outside again, but people were still not permitted to stay overnight outside their council area, and the advice remained for people to shop within their council area whenever possible (JM/93 - INQ000347487).[145]

43.3 On 20 April 2021, the First Minister confirmed the reopening of outdoor hospitality, gyms and non-essential retail from Monday 26 April. Non-essential travel between Scotland and the UK's other Home Nations was also permitted again from that date (JM/93 - INQ000347487)[146].

43.4 On 14 May 2021, the First Minister Nicola Sturgeon confirmed that Glasgow and Moray would remain in level 3 restrictions for a further week after the rest of Scotland moved to level 2 on Monday 17 May due to high rates of COVID in those areas (JM/94 - INQ000347475)[147].

43.5 On 1 June 2021, the First Minister announced the next round of relaxing restrictions, with Glasgow moving from level 3 to level 2 restrictions from Saturday 5 June. Some areas of Scotland moved to level 1 restrictions, but 13 council areas in the Central Belt remained in level 2. Island communities moved to level zero, meaning they had no restrictions (JM/95 - INQ000347503)[148].

43.6 My understanding was that each of these pieces of advice was consistent with the Four Harms review of the current situation in Scotland and considered the lagged reduction in cases in each of these areas not matching the progress seen in other parts of Scotland. PHS, NHS boards, and Scottish Government worked with Local Authorities and their

[145] BBC News. Covid restrictions ease as Scotland moves to level zero. 19 July 2021. [Accessed November 2023].
[146] BBC News. Covid restrictions ease as Scotland moves to level zero. 19 July 2021. [Accessed November 2023].
[147] BBC News. Covid in Scotland: Glasgow and Moray to remain under level 3 restrictions. 14 May 2021. [Accessed November 2023].
[148] BBC News. Lockdown easing paused for millions as rules are relaxed in Glasgow. 1 June 2021. [Accessed November 2023].

respective communication teams to ensure consistency of messaging and resolve any confusion.

44 The move to level zero

44.1 On 19 July 2021, Scotland moved to level zero restrictions, allowing larger numbers of people to meet up indoors, as well as attending weddings and funerals (JM/93 - INQ000347487)[149].

44.2 My understanding was this advice was consistent with the Four Harms review of the current situation in Scotland. (Personally, I gave a declaration of interest re this important notice and recused myself from contribution to this advice as my daughter was due to marry on 26th July 2021. She like many individuals similarly affected over the pandemic then had her wedding ceremony at the third date it was set).

44.3 On 9 August 2021, the bulk of pandemic related restrictions were removed in Scotland. Rules that remained included compulsory mask wearing in some locations and restrictions surrounding the administration of schools in the early part of the new academic year (JM/96 - INQ000347470)[150]. Children under the age of 12 were no longer legally required to wear face coverings in public places (JM/97 - INQ000347471)[151]. Nightclubs were among the venues allowed to reopen following the lifting of restrictions (JM/98 - INQ000347481)[152].

44.4 My understanding was this advice was consistent with the Four Harms review of the current situation in Scotland. Coordination and leadership

[149] BBC News. Covid restrictions ease as Scotland moves to level zero. 19 July 2021. [Accessed November 2023].
[150] BBC News. Covid in Scotland: 'Right moment' to lift restrictions, says Sturgeon. 9 August 2021. [Accessed November 2023].
[151] BBC News. Covid in Scotland: Children under 12 to be exempt from wearing face masks. 6 August 2021. [Accessed November 2023].
[152] BBC News. Covid in Scotland: Nightclubs reopen with celebrations and cheers. 9 August 2021. [Accessed November 2023].

on communication remained the responsibility of SG during this emergency.

44.5 In relation to the Scottish Government's COVID passport scheme (JM/99 - INQ000347529)[153], (JM/100 - INQ000347486)[154]. My understanding of this COVID-19 passport scheme reflected the need to maximise population coverage of the vaccination programme and protect the rest of the population, who were unvaccinated, by reducing the risk of exposure in closed settings where close contact may have been expected.

44.6 On 18 September 2021, following changes to the traffic lights system in England, the Scottish Government announced that the green and amber lists would merge, but unlike England that there will be no changes to the rules regarding COVID tests for returning travellers (JM/100 - INQ000347486)[155].

44.7 My understanding of this system was that it was an inter-country discussion through government departments and I have no recollection that there was any direct input requested from myself or my PHS colleagues other than surveillance data or T&P information on travel association of cases.

44.8 In relation to the risk of Covid transmission connected to the COP 26 summit which took place in Glasgow between 31 October and 12 November 2021 my comment is as follows.

44.9 Much pre-discussion with UK government and SG colleagues had taken place with PHS colleagues in the planning of the event. Dedicated teams of PHS, NHS Greater Glasgow and Clyde and SG staff were created to plan and support the event with specific analysis planned to assess the

[153] BBC News. Scots to need vaccine passports for large events. 1 September 2021. [Accessed November 2023].
[154] BBC News. Covid in Scotland: Vaccine passport benefits 'outweigh concerns'. 2 September 2021. [Accessed November 2023].
[155] BBC News. Covid in Scotland: Travel rules simplified but test regime may stay. 18 September 2021. [Accessed November 2023].

impact of the event, including the use of an event code within the T&P system to assist evaluation. PHS and NIMT advice, based on a reduction of cases leading to a plateau in Scotland which followed a peak in September, was that the event could proceed but the final decision on the event was the responsibility of the Government. The evaluation of the event (see (JM/101 - INQ000147540)[156] showed the risk of infection in attendees was less than the risk of infection in the rest of the Scottish population and concluded that there was "no evidence of any connection between Omicron cases and COP26. With infections falling in the two weeks following the end of the summit, it is likely that COP26 has had little impact on COVID-19 epidemiology in Scotland."

46 **The emergence of the "Omicron" variant (first detected in South Africa in November 2021)**

46.1 Omicron was first discussed with our UKHSA colleagues following a confidential information exchange with colleagues in South Africa in the first weeks of November 2021 following a rapid increase in test positivity across many of the South African Provinces and an early description of an increase in pressure on hospitals. Such an increase was the subject of intense international scrutiny since prior population exposure to wild type Covid-19 viruses was previously thought to have generated high levels of immunity within the population.

46.2 Significant findings like this were the subject of discussion directly between myself and SG colleagues and in the NIMT. Thereafter UKHSA confirmed that 2 cases of Covid-19 with mutations consistent with B.1.1.529 were identified in the UK on 27th November 2021.

46.3 Risk assessment of this variant under investigation was conducted and led by the UKHSA, with contribution from PHS and DA colleagues within the Variant Technical Group (VTG),and shared with SAGE and NERVTAG. This analysis provided the scientific rationale for the advice.

[156] PHS. Surveillance of the impact of COP26 on COVID-19 infections in Scotland: Final report. 14 December 2023.

46.4 I do not believe a further lockdown should have been implemented in response to the emergence of the Omicron variant from around December 2021.

46.5 Unlike the situation for Lock-down 1 and 2, the situation in Scotland and the rest of the UK had significantly changed as very large numbers and percentages of the population had received one, two or more doses of the Covid-19 vaccine and assessment of the severity of illness by VTG and modelling data supported the advice that in this instance Lockdown would not be required.

46.6 On 10 December 2021, First Minister said that Scotland faced a "tsunami" of Omicron cases with it likely to become the dominant variant of COVID within days (JM/102 - INQ000347488)[157]. She announced changes to self-isolation rules from the following day, requiring anyone living with someone who tested positive for Covid-19 to self-isolate for ten days, while other contacts could stop self-isolating once they had received a negative PCR test or if they have had two vaccine doses.

46.7 This change reflected a greater understanding of the transmission risk from individuals and consideration of SPI-M output to SAGE along with likely other sources of advice to SG including that of the NIMT.

46.8 On 16 December 2021, the Scottish Government issued new guidelines for hospitality and retail businesses advising the return of social distancing and one-way systems for shops and supermarkets. The guidelines were effective from 12.01am the following day.

46.9 On 21 December 2021, new measures were announced for Scotland effective from (26 December) that limited the number of spectators at outdoor sporting events to 500, and indoor events such as concerts to 200 if seated and 100 if standing. Pubs and restaurants were required

[157] BBC News. Covid: Scotland facing 'tsunami' of Omicron cases. 10 December 2021. [Accessed November 2023].

to offer table service only. Edinburgh's Hogmanay Street Party was also cancelled (JM/103 - INQ000347478)[158].

46.10 On 26 December 2021, fresh restrictions were brought in as an attempt to halt the spread of the Omicron variant, including the cancellation of all large events (JM/104 - INQ000347480)[159].

46.11 On 27 December 2021, one metre physical distancing measures were reintroduced for the hospitality and leisure sectors, while hospitality had to provide table service only. Nightclubs were required to close for a period of at least three weeks (JM/105 - INQ000347474)[160].

46.12 Across each of these four dates my understanding was that, based on consideration of PHS surveillance data and advice from NIMT and other groups, additional social distancing measures were considered appropriate and proportionate by Scottish Government.

47. The lifting of restrictions in April 2022

47.1 On 18 April 2022, the rules regarding the wearing of face coverings in shops and restaurants, and on public transport were lifted (JM/106 - INQ000347491)[161].

47.2 My understanding was that, based on consideration of PHS surveillance data and advice from NIMT and other groups, additional social distancing measures were considered appropriate and proportionate by Scottish Government.

48. Conclusions and lessons learned

[158] BBC News. Covid in Scotland: New rules trigger wave of cancellations. 22 December 2021. [Accessed November 2023].
[159] BBC News. Covid in Scotland: Nightclubs close and 1m distancing returns. 27 December 2021. [Accessed November 2023].
[160] BBC news. Covid in Scotland: Final push to get 'boosted by the bells'. 27 December 2021. [Accessed November 2023].
[161] BBC News. Covid self-isolation guidance to end in Scotland. 28 April 2022. [Accessed November 2023].

48.1 There is a correlation (when accounting for lag) between the measures instituted and the reduction in cases, hospitalisation, and less so for deaths. This is difficult to disentangle from the much stronger correlation between vaccination receipt and risk of death and hospitalisation, or the lesser correlation between vaccination and cases, and confounded by the different dominant strains over a time period beyond this period of consideration.

48.2 I am unaware of any assessment of any different or earlier decision making on outcome. This may however be possible to deduce from the output of modelling scenarios but these are not real-life and not a guarantee of the outcome.

48.3 The Four Harms group considered this and would be the source of any assessment for this period. My observation as a member of this group is that all advice offered following each meeting of the Four Harms group was done with the consideration of all Four Harms.

48.4 **Vulnerable and risk groups –** Work led by my PHS and EAVE-II colleagues described the impact of COVID-19 on pregnancy (JM/107 - INQ000347526)[162] and asthma (JM/108 - INQ000347515)[163].

48.5 **Four-nation working –** PHS continued its close working with all agencies and further developed our working relationship with UKHSA.

48.6 **Internal & external communications –** PHS developed its relationship with the EAVE-II team led by University of Edinburgh contributing to significant scientific understanding about the role of COVID-19 in clinical illness and the effectiveness and waning of immunity to infection in

[162] Stock, S.J., Carruthers, J., Calvert, C. et al. SARS-CoV-2 infection and COVID-19 vaccination rates in pregnant women in Scotland. *Nature Medicine* 28, 504–512. 13 January 2022.
[163] PHS and EAVE II. Risk of serious COVID-19 outcomes among adults with asthma in Scotland: a national incident cohort study. The Lancet 10(4), pp347-354. 13 January 2022.

vaccinated individuals. SG continued in role as Communications lead for the national emergency.

48.7 **Nature of the virus & Infection –** A number of important findings were documented during this period as follows;

48.8 **Mass gathering events – Euro2020** (JM/40 - INQ000280918)[164]. **I would like to add one key event missing from my rule 9 request.** There is no specific question asked about the experience of the Euro2020 championship which was delayed to the summer period of 2021. In early May 2021, Scotland entered a third wave of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) infections. This wave was characterised by a 20-fold increase in diagnosed cases. The rapid rise, from a 7-day cumulative incidence of 21 per 100,000 population to 427 cases per 100,000 population from 4 May to 3 July 2021, occurred alongside several notable events. These included the Delta variant (Phylogenetic Assignment of Named Global Outbreak (Pango) lineage designation B.1.617.2) overtaking Alpha (B.1.1.7) as the dominant strain circulating in Scotland, a gradual relaxation of lockdown restrictions and the 2020 European football championship (EURO 2020). We used contact tracing data routinely collected through telephone interviews, undertaken as part of the 'Test and Protect' system implemented by the Scottish government, to describe the potential contributions of EURO 2020 to a third wave of SARS-CoV-2 in Scotland. Critically, our study showed that EURO 2020 cases had a higher average number of contacts and a higher secondary attack rate than the general population. The majority of the cases reported attending unofficial EURO 2020 events linked to smaller gatherings such as house parties, visits to pubs and restaurants, as well as extended travel highlighting a need for targeted guidance on how to safely celebrate in small informal gatherings with appropriate social distancing, proper ventilation and mask wearing in closed spaces.

[164] Marsh K.; Griffiths E.; Young J. et al. Contributions of the EURO 2020 football championship events to a third wave of SARS-CoV-2 in Scotland, 11 June to 7 July 2021. Euro Surveillance. 2021;26(31). August 2021.

Evidence of the potential risks in transmitting SARS-CoV-2 in vehicles is especially well documented, yet travel to London by private cars and public buses were common.

48.9 While this analysis suggests that the behaviour and events surrounding EURO 2020 games (as opposed to match attendance itself) uniquely contributed to Scotland's third Covid-19 wave, causality cannot be proven. To do so, similar information about behaviours of the uninfected population related to participation at EURO 2020 events is needed. A similar picture of rising cases has emerged elsewhere in Europe where games have been held, with a 10% increase in cases in the week leading up to 27 June 2021. The EURO 2020-related transmissions have also been documented in Finland, where 947 new SARS-CoV-2-positive cases were linked to travel to the host city Moscow, Russia.

48.10 It is not possible to say whether EURO 2020 cases acquired or transmitted infection while attending a specific event, especially considering rising background prevalence. The EURO 2020 games occurred alongside other events in Scotland that could have contributed to a rise in cases, including the introduction of the potentially more transmissible SARS-CoV-2 Delta variant and an easing of lockdown measures just before the matches.

48.11 Because this analysis uses self-reported data and some people may be reluctant to admit risky behaviours, the number of EURO 2020 cases reported is likely to be an underrepresentation of the actual number. At the same time, PCR testing uptake in Scotland increased by more than 50% from May to July 2021, thus increasing case detection rates during this third wave. Further work to establish linkages between EURO 2020 and non-EURO 2020 cases using genetic sequencing is underway.

- SARS-CoV-2 Delta VOC in Scotland: demographics, risk of hospital admission, and vaccine effectiveness (JM/109 - INQ000320568)[165]

- The Scottish Parliament. Timeline of Coronavirus (COVID-19) in Scotland (JM/110 - INQ000347533)[166]

- National Health Service Scotland (NHS inform). Test and Protect. Help stop the spread of coronavirus (COVID-19). Edinburgh: NHS inform; 2021(JM/111 - INQ000354109)[167].

- BBC News. Euro 2020: Thousands of Scotland fans gather in central London (JM/112 - INQ000347498)[168]

- Public Health Scotland. COVID-19 daily dashboard. Edinburgh: Public Health Scotland; 2021. Available from: (JM/113 - INQ000233599)[169]

- Union of European Football Associations (UEFA). COVID-19 guidance for your EURO 2020 match (JM/114 - INQ000347494)[170]

- Public Health Scotland. Daily trend of vaccinations by age group and sex (JM/115 - INQ000347452)[171]

[165] Sheikh, A.; McMenamin, J.; Taylor, B. et al. Sars-Cov-2 Delta VOC in Scotland: demographics, risk of hospital admission, and vaccine effectiveness. The Lancet 397(10293), pp2461-2462. June-July 2021.
[166] The Scottish Parliament. Timeline of Coronavirus (COVID-19) in Scotland. 10 May 2023. [Accessed November 2023].
[167] NHS Inform. Test and Protect [Archived]. July 2021.
[168] BBC News. Euro 2020: Thousands of Scotland fans gather in central London. 18 June 2021. [Accessed November 2023].
[169] PHS. COVID-19 & Respiratory Surveillance in Scotland Dashboard. [Accessed November 2023].
[170] UEFA. COVID-19 guidance for your EURO 2020 match. April 2020. [Accessed November 2023].
[171] PHS. Daily trend of vaccinations by age group and sex. 2021. [Accessed November 2023].

- Jayaweera M, Perera H, Gunawardana B, Manatunge J. Transmission of COVID-19 virus by droplets and aerosols: A critical review on the unresolved dichotomy (JM/116 - INQ000347446)[172].

- World Health Organization (WHO). Weekly epidemiological update on COVID-19 - 29 June 2021. Emergency Situational Updates. Edition 46. (JM/117 - INQ000347449)[173].

- Finnish institute for health and welfare. COVID-19 cases on the rise again in Finland – infections reported particularly among Euro 2020 football fans returning from Russia (JM/118 - INQ000347493)[174].

- Scottish Government. Coronavirus (COVID-19): trends in daily data (JM/119 - INQ000347457)[175].

48.12 **EAVE-II**

48.12.1 EAVE-II demonstrated its utility for investigation at a population level of very rare potential adverse events not identified during clinical trials to ensure communication on vaccine safety and maintain public confidence in the vaccination programme (JM/120 - INQ000347525)[176].

[172] Jayaweera, M.; Perera, H.; Gunawardana, B. et al. Transmission of COVID-19 virus by droplets and aerosols: A critical review on the unresolved dichotomy. Environmental Research, 188. September 2020.
[173] WHO. Weekly epidemiological update on Covid-19 - edition 46. 29 June 2021. [Accessed November 2023].
[174] Finnish institute for health and welfare. Covid-19 cases on the rise again in Finland – infections reported particularly among Euro 2020 football fans returning from Russia. 1 July 2021. [Accessed November 2023].
[175] Scottish Government. Coronavirus (Covid-19): trends in daily data. 21 April 2022. [Accessed November 2023].
[176] Patone, M., Handunnetthi, L., Saatci, D. et al. Neurological complications after first dose of COVID-19 vaccines and SARS-CoV-2 infection. Nature Medicine 27, pp2144–2153. 25 October 2021.

48.12.2 Further EAVE-II showed the effectiveness of two doses of vaccine in Scotland and Brazil against hospitalisation and deaths were similar even though the dominant strain types in both countries were different adding to the public, medical and political confidence that the Covid-19 vaccination programme was generating the success hoped for even with different viral strains developing (JM/121 - INQ000347512)[177].

48.12.3 In a further analysis and against a concern re waning of immunity, EAVE-II evaluated the effectiveness of the COVID-19 vaccine against Omicron as the next strain causing significant number of cases of infection and NHS hospitalisation pressure (JM/122 - INQ000347514)[178].

48.12.4 **Compliance –** My recollection is that over this period that SG data on trends was suggestive of further reducing compliance with societal measures.

48.12.5 There were some issues that arose e.g. in relation to Border control that PHS and NIMT would have provided Scottish Government with advice on but did not because they understood such advice were reserved matters. I understand however that our SG colleagues were in direct contact with their UK counterparts on this issue.

[177] Katikireddi, S. V.; Cerqueira-Silva, T.; Vasileiou, E. et al. Two-dose ChAdOx1 nCov-19 vaccine protection against COVID-19 hospital admissions and deaths over time: a retrospective, population-based cohort study in Scotland and Brazil. The Lancet, 399(10319), pp25-35. 1 January 2022.

[178] Sheikh, A.; Kerr, S.; Woolhouse, M. et al. Severity of omicron variant of concern and effectiveness of vaccine boosters against symptomatic disease in Scotland (EAVE II): a national cohort study with nested test-negative design. The Lancet Infectious Diseases, 22(7), pp959-966. July 2022.

48.12.7 The NIMT dynamically assessed and refined these approaches over the course of the pandemic to reflect the increasing understanding of the virus. I note that this question is slightly different from those in previous sections as it asks about pandemics pleural. The Standing Committee for Pandemic Preparedness was established by Scottish Government in August 2021. In August 2022 the SCoPP interim report recommendations were as follows: to develop proposals for the creation of a Centre of Pandemic Preparedness in Scotland; to build on Scotland's existing data and analytics strengths to support proposals that advance the development of these as core infrastructure for future pandemics; to develop linkages to Scottish, UK, and international scientific advisory structures, networks, and agencies and strengthen information flows from these in order to inform Scottish preparedness and response in the face of future pandemic threats; and to support continued innovation in life sciences and public health research for the development of diagnostics, vaccines, and therapeutics to provide the capability to respond to novel threats when required. Short Life Working Groups were established as follows: Centre of Pandemic Preparedness proposals - Dr Maria K Rossi, PHS; Data and Innovations work - Dame Anna Dominiczak, Chief Scientist (Health), Scottish Government and; Science and Community Engagement Group - Professor Linda Bauld, Edinburgh University and Professor Stephen Reicher, University of St Andrews.

48.12.8 At the request of the SCoPP, PHS stood up a short life working group for the Centre for Pandemic Preparedness and held three events in June and July 2023 to engage with stakeholders and identify the issues and attributes needed for such a structure. Recommendations in relation to this, to be provided to SG, are expected in November 2023.

49. Conclusions and lessons learned from the use of NPIs in response to the Pandemic

49.1 **Worked well –** Lockdown 1 and the uniform suite of measures across the UK reduced the number of cases to low numbers. Lockdown 2 when initiated had a similar effect.

49.2 **Issues –** intercountry issues due to Borders Force/Control and different traffic light systems and for advice travellers returning to one country but with onward travel to another UK country.

49.2.1 Application of tiers in Scotland had less than expected effect at Tier 3 or below.

49.2.2 Recognition in Scotland that treating all NHS boards in the same way had a difficulty associated with it when the impact of cases for the health service in the central belt of Scotland could be profoundly different from that in remote and rural areas, in particular for NHS island boards. This was addressed, however, as the waves unfolded.

49.3 **Obstacles –** creation of agencies (PHS and UKHSA) during the pandemic created obstacles for effective communication but these were surmountable. There were challenges for the speed at which guidance could be developed, agreed and deployed in support of the NPI's due to differences between England and the DA's.

49.4 **Missed opportunities –** conceivably the NPI's were in place for too long as they applied to children and their long term impact have as yet not been fully quantified.

J. Care homes and social care

50.1 I am sure that I speak on behalf of everyone in PHS in saying that we express our deep regret about each and every one of the deaths of individuals affected by Covid-19 which was a disaster for each of these individuals, for their families, and when considering deaths in care homes, for the carers of residents and the staff of these care homes too.

50.2 Surveillance data provision on health protection in the pre-pandemic period was limited to either that provided by general practitioners through the statutory notification of infectious disease, or that provided on the number of individuals identified through investigation and management of care home outbreaks by local NHS boards supported by HPS.

50.3 In my opening comments in my Rule 9 statement I recorded that leadership of key areas of work was allocated to specific individuals. Whilst I was coordinating the overall response, I had limited involvement in the strategy for guidance relating to care homes. My colleague Dr Colin Ramsay led this team as Strategic Incident Director for HPS and PHS. My colleague Dr Maria Rossi assumed an interim role leading on care homes work spanning the period from October 2020 to cover the rest of the period included in this Rule 9 response. The Cabinet Secretaries for Health and Wellbeing (CSHW) over the period were Miss Jeanne Freeman (until May 2021) and she was succeeded on her stepping down from Scottish Parliament by the now First Minister Hamza Yousaf as CSHW (May 2021 – March 2023). A number of senior civil servants and advisors would have supported the CSHW over this time period.

50.4 Coordinating the initial response was significantly hampered by there being no clear single agency responsible for the health and wellbeing of all of the residents and staff of care homes. The Care Sector is constituted by, in the main, a number of private concerns with input on different aspects of their work by the Care Inspectorate and Local Authorities with limited NHS board involvement.

50.5 I understand that a number of professional bodies, HPS, NHS boards, Local Authority, representatives of care sector providers, and SG representatives will potentially have contributed to the response initially meeting in groups with overlapping agendas and terms of reference. I will return to the improvement in coordination that followed in subsequent paragraphs.

50.6 During the first months of the pandemic the international description of the impact of Covid-19 and its impact on the elderly were of concern. I recall that in HPS led daily meetings chaired by me as Strategic Incident Director and attended by certain Scottish Government policy and CMO directorate colleagues, I raised initial concerns about care homes being a key area of risk re the potential impact of Covid-19.

50.7 I understand that some of the background to the subject of Care Homes was covered in the PHS report published in October 2020 (JM/123 - INQ000147515)[179]. I also understand that guidance was sought in relation to the safe discharge/transfer and/ or isolation within care homes, along with guidance on the testing of such patients and that this changed over time in Scotland and the rest of the UK as policy developed.

50.8 I have no specific recollection of any instances of advice offered by PHS not being followed. Rather, my recollection of conversations with my PHS colleagues was of this being an area in relation to which it was very challenging area trying to reach a consensus in a timely manner. The nub of the challenge was that Guidance in relation to public health incident response is normally an area of responsibility of PHS with input, in the form of comment, sought from a variety of stakeholders, to ensure that the Guidance is fit for purpose. During the pandemic the additional area of responsibility in the generation of

[179] PHS. Discharges from NHSScotland hospitals to care homes between 1 March and 31 May 2020. 28 October 2020.

public health advice was the lead role in relation to communication assumed by Scottish Government itself with the goal of maintaining the public confidence in response. This, when coupled with our rapidly developing understanding of the risks of transmission of Covid-19 and the demands on Ministers for daily podium briefings, meant keeping guidance up to date proved challenging for all concerned in the process. This was also the basis for communication difficulties for the team drafting the guidance in this important area. I understand this led to concerns either in PHS and/or Scottish Government of misunderstandings and disagreements around what the precise language of the guidance should be. I understand there were some difficult conversations around this issue.

50.9 The awareness of these difficulties led to the identification of a solution as an attempt to address the issue. This was by the creation of the Policy Alignment Check (PAC) process. PHS was asked to adhere to the process by Scottish Government. It's scope was not just in relation to care home guidance but extended across the spectrum of guidance provided by PHS (although a number of exemptions to what was needed to go through in relation to this PAC process did develop). Scottish Government and PHS then worked to an agreed mechanism to attempt to ensure that PHS guidance mirrored policy.

50.10 There were instances in which during drafting of guidance as part of the PAC process that requests for changes to wording in guidance produced by PHS would be made by Scottish Government. What then followed, until the PAC process was discontinued, was in my view a cumbersome process for sign off of all guidance materials by PHS. Despite the best endeavours by PHS staff, the PAC process was frequently not timely in its operation and as a consequence, this led to operational difficulties for care homes, NHS boards and Local Authorities (who were working to not current versions of care home guidance not reflecting any updates communicated at the podium of daily briefings by Scottish Government). This may have generated

consequent reputational issues for our fledgling organisation PHS in the eyes of our stakeholders and the general public.

50.11 In an example of the delays that followed the implementation of the PAC process, I provide a snapshot of what this meant - please see the following example from PHS dated 30th May 2020: PHS reported to Scottish Government delays in 11 sets of guidance as PHS waited for a response from the Scottish Government; 6 of the 11 guidance documents had been with Scottish Government for nine days, 1 of the 11 for three days and the remaining four with government for 1 day. The change logs for the creation and amendments to guidance documents, along with the supporting email chains showing the discussion with Scottish Government, demonstrate that this was not an isolated incident.

50.12 A second issue was that the PAC approach impacted on the operational autonomy of PHS.

50.13 I note that in its corporate statement, Scottish Care (JM/124 - INQ000224524)[180] says at paragraph 56 that it advocated from early March 2020 that there needed to be robust clinical assessment and testing of residents entering care homes both from the community and acute NHS settings. Scottish Care also says at paragraph 60 that it advocated that all individuals entering a care home should be treated as if they were COVID positive and therefore barrier nursed for an initial fourteen days. My understanding from discussion with the PHS team then and Dr Ramsay at the time in relation to whether Scottish Government received representations from Scottish Care in these terms is that this is likely to be correct.

50.14 I have examined the emails between HPS/PHS and Scottish Government. These demonstrate that discussion on isolation and appropriate infection prevention and precaution took place. HPS/PHS

[180] Scottish Care. UK Public Inquiry Module 2A Corporate Statement. July 2023.

advocated that new admissions should be isolated for 14 days regardless of COVID-19 test results. These emails further demonstrate the evolution of advice in relation to whether individuals should be admitted into care homes when they were known to have a positive case. They also document the rationale behind a change in policy from the testing of limited numbers namely the initial symptomatic cases alone to confirm an outbreak of Covid-19 (and the management thereafter of all other untested symptomatic residents on a presumptive basis that they had Covid-19), to an enhanced surveillance involving the testing of all symptomatic residents and discussion around staff testing considerations.

50.15 I have no recollection of any discussion in relation to testing priority being also given to staff working in care homes in consequence of their having regular close contact with clinically vulnerable individuals. I do, however, note the Scottish Government policy extended to include care home staff on May 25th 2020 – reference – please see page 8 of COVID-19: Scotland's Testing Strategy (JM/125 - INQ000235139)[181]. In its Corporate Statement (JM/124 - INQ000224524)[182], Scottish Care says at paragraph 45 that obtaining access to adequate PPE was a key concern for care providers in Scotland at the start of the pandemic and states it alerted the Scottish Government and NHS National Services Scotland on 5 March 2020 that there were critical shortages of PPE in the care sector, that costs for available products had become exorbitant and that there was a need for a national flexible and responsive delivery mechanism. I have no recollection regarding any discussion about Scottish Government prioritisation of PPE for the care sector. I was not central to any discussion in that regard and, therefore, there would be merit in checking the email logs from ARHAI, NSS Logistics or Dr Ramsay to confirm this.

[181] Scottish Government. Scotland's Testing Strategy - Adapting to the Pandemic. August 2020.
[182] Scottish Care. UK Public Inquiry Module 2A Corporate Statement. July 2023.

a) April/May 2020

50.16 I note that the Cabinet Secretary for Health on 21 April (JM/126 - INQ000347459)[183] made the following statement;

"I have required NHS Directors of Public Health to take enhanced clinical leadership for care homes. This will, for the first time, see these NHS directors reporting on their initial assessment of how each home is faring in terms of infection control, staffing, training, social distancing and testing and the actions they are taking to rectify – and rectify quickly – any deficits they identify. To supplement this new clinical oversight we are establishing a national rapid action group - comprising the key partners with operational responsibility in this area. Recognising that Care Homes are primarily operated by independent providers. This group will receive daily updates and activate any local action needed to deal with issues as they emerge, as well as co-ordinate our wider package of support to the sector. In addition, we're equipping the Care Inspectorate for an enhanced role of assurance across the country, including greater powers to require reporting. Testing for staff and residents is being expanded, including all symptomatic residents of care homes"

50.17 I understand that this statement was made as a consequence of the experience of all stakeholders involved to the effect that improvements were required to ensure that Care Home residents and staff were afforded the maximum protection from Covid-19. This reflected the need to bring the care homes within the sphere of public health delivery through the Directors of Public Health for the then current, and as it transpired future, waves of infection with Covid-19.

50.18 HPS and PHS were part of a discussion led by Scottish Government relating to the need to free up beds in hospitals by way of the discharge

[183] Scottish Government. Coronavirus (COVID-19) update: Health Secretary's statement 21 April 2020. [Accessed November 2023].

of patients to care homes in the period before the 21 April 2020 announcement. There are email chains relating to this and these are provided as evidence. I would note, however, that decisions on policy were the responsibility of Scottish Government.

50.19 PHS welcomed the communication by Scottish Government that required NHS Directors of Public Health to take enhanced clinical leadership for care homes and for them to report on their initial assessment of how each home was faring in terms of infection control, staffing, training, social distancing and testing and the actions they were taking to rectify any deficits they identified. A number of coordination issues were considerably assisted by the designation of lead roles to the Directors of Public Health.

50.20 The Scottish Government established a rapid action group, comprising the key partners with operational responsibility in this area. I understand that this group received daily updates and activated any local action needed to deal with issues as they emerged, as well as co-ordination of the Government's wider package of support to the sector.

50.21 Part of this response was the expansion of testing for staff, including all symptomatic residents of care homes. This followed the announcement by Scottish Government that patients discharged from hospital to a care home should have given two negative tests before discharge, in addition to which all new admissions to care homes were to be tested and isolated for 14 days and the clear social distancing measures set out in guidance.

50.22 It is noted that in its Corporate Statement (JM/124 - INQ000224524)[184], Scottish Care says at paragraph 66 that as time passed, and as early as April 2020, it made representations to the Scottish Government that the complete restriction of visiting to care homes (save for limited exceptions in relation to at end-of-life care) was increasingly

[184] Scottish Care. UK Public Inquiry Module 2A Corporate Statement. July 2023.

disproportionate and failing to meet the pastoral and care needs of individuals. Scottish Care also says that it highlighted the traumatic effect this was having upon families.

50.23 Whilst these considerations were important and the consequent suffering very regrettable they were likely expressed to Scottish Government. My understanding of the rationale behind, and the strategy for, the suite of strict infection prevention and control measures instituted is that they were necessary to reduce the chance of the introduction of Covid-19 into the care homes and to limit the severe impact on vulnerable individuals and reduce deaths that otherwise would follow.

b) Further outbreaks

50.24 With respect to the three outbreaks to which the Rule 9 applies below,

(a) The outbreak of coronavirus at the Redmill Care Home in West Lothian in October 2020 which caused eleven COVID-19 deaths (JM/127 - INQ000347472)[185];

(b) The outbreak at a care home in Larbert which led to 20 COVID deaths in the space of a month in November 2020 (JM/128 - INQ000347476)[186]; and

(c) The outbreak at an Aberdeen care home in January 2021, where 85 positive tests for the virus were found (JM/129 - INQ000347485)[187].

[185] BBC News. Covid in Scotland: Deaths at West Lothian care home rise to 11. 17 October 2020. [Accessed November 2023].
[186] BBC News. Covid in Scotland: Larbert care home suffers 20 Covid deaths. 21 November 2020. [Accessed November 2023].
[187] BBC News. Covid in Scotland: Two deaths and 85 cases at Aberdeen care home. 28 January 2021. [Accessed November 2023].

I have no recollection of any involvement with these specific outbreaks.

50.25 All NHS territorial boards dealt with a large number of Covid-19 outbreaks by following PHS guidance. Each NHS board quickly applied, and became familiar with, this guidance negating the necessity for PHS and/ or Scottish Government Covid-19 response officials. PHS and/ or Scottish Government Covid-19 response officials then limited their subsequent attendance to those incidents in which unusual findings required further input.

c) Conclusions

50.26 In my view the situation that arose in Care Homes with respect to Covid-19 was a manifestation of the same issues that arose in the rest of our communities as follows:

- Covid-19 is a highly infectious viral infection that in an unvaccinated community without prior exposure spreads rapidly between individuals.

- Unchecked by societal measures (prior to a successful vaccination programme) it will then spread rapidly in a population once introduced.

- Keeping Covid-19 out of closed settings with vulnerable people was then a priority.

50.27 Specifically for care homes the following should be noted:

- Closed settings such as care homes required a combination of measures including compliance with IPC practices in staff, visitors, and residents and control of movement of residents

within, to and from care homes; with respect to movement to and from care homes, the appropriate application of quarantine periods was required even when faced with negative test results.

- Compliance with IPC measures in a previously untrained staff group, coupled with issues with supply and demand of IPC products and communication challenges re changes in guidance and/ or testing, was a recipe for challenges in protecting residents and staff alike.

- Estimates of the contributions made by the challenges to resultant cases observed are outwith the scope of my statement but would be important to enable the learning of lessons.

50.28 In relation to the specific point referred to in the Rule 9 in which it states that "*Scottish Care and its members were on occasions not provided with sufficient opportunities to engage in the decision-making process*". At the outset I acknowledge that the speed with which initial guidance was being developed proved challenging for all stakeholders. My understanding is that the continued involvement of Scottish Care to the process by Dr Ramsay and by HPS/PHS was much appreciated and necessary to ensure guidance developed was applicable to the setting. My recollection of my discussions with Dr Ramsay relating to his views and those of his guidance colleagues was that he and my colleagues actively sought, listened to and acted on the views expressed by the Care Sector to champion these to Scottish Government.

50.29 This is contrary to the perception recorded in the corporate statement (JM/124 - INQ000224524)[188] of Scottish Care which says at paragraph 133 that Public Health Scotland's distance and detachment from the care sector were particularly evident throughout the pandemic. It is said that at the start of the pandemic PHS did not recognise that it needed input from the social care sector in order to develop effective guidance

[188] Scottish Care. UK Public Inquiry Module 2A Corporate Statement. July 2023.

for the sector. My understanding is that HPS and PHS welcomed from the start of the pandemic input from the social care sector in order to develop effective guidance for the sector along with other agencies and parties. Scottish Care express a concern that *"PHS sought to implement overtly clinical infection prevention control measures in care homes"*. However, I would make the following points: 1. Infection prevention and control advice in the community is an area of responsibility of Scottish Government (advice may have been sought from my ARHAI colleagues who, as of 1st April 2020, were not part of the newly created PHS) and 2. I would further offer the comment that, given the observed morbidity and mortality in care homes, having robust infection prevention and control measures, coupled with ensuring that supply and demand of PPE were matched, were self-evidently important in minimising the impact of this dreadful infection in Care Homes. This should, however, not mean that ethically and morally we do not learn from the experience in applying lessons learned to inform future response.

50.30 My own view is that at the advent of the pandemic, the systems for the collection and dissemination of data and advice between the Health and Social Care Directorate, other Scottish Government directorates, the NHS NSS, PHS, on the one hand, and the care sector on the other, were suboptimal. The surveillance available at the outset was limited to describing outbreaks of seasonal influenza or norovirus rather than designed to deal with a pandemic extending over many years. That being said, good quality outbreak data from the care homes was instrumental in informing service provision and this only emerged from the great joint working across the pandemic and that was better able to address the data needs of individual Care Homes, LA's, NHS boards, PHS and Scottish Government. This output, along with local intelligence from NHS boards, added to it, provided the first reassurance of the protective effect of the deployed covid-19 vaccines in care home settings.

50.31 However, the long term data requirements and funding to enable this surveillance remains to be addressed and should be addressed in recommendations.

50.32 In its corporate statement (JM/7 - INQ000300280)[189], PHS states at paragraph 7.9.1-2:

"*Access to reliable, timely data was not available to PHS from care homes. PHS undertakes an annual Care Home Census* (JM/130 - INQ000147520)[190] *but this data is neither complete nor available in real time. All care homes are invited to participate in the annual Care Home Census, but of the 1,051 care homes for adults open on 31st March 2022, only 70% submitted data for at least part of the Census and 30% of care homes did not submit any data. Having up to date intelligence on care home residents (who they are, when they moved to a care home, and when they left) would have allowed for linkage of laboratory data to care home residents, and enable quicker understanding of care home outbreaks, and therefore supported an effective response."*

50.33 The systems for the collection and dissemination of data and advice between the Health and Social Care Directorate, other Scottish Government directorates, the NHS NSS, PHS, on the one hand, and the care sector on the other, initially did not work effectively. This was a difficult area with no clear line of accountability until the structural changes announced by CSHW in April and May of 2020.

50.34 In my opinion, whilst significant improvement has been made, the recent example of summer/autumn 2023 care home incidents and outbreaks of Covid-19 and the incorrect use of LFD without submission of PCR tests, reported as intelligence by my NHS Board Health Protection team colleagues over recent weeks, continues to demonstrate the remaining

[189] PHS. COVID-19 Public Inquiries: PHS Module 2A Corporate Statement. October 2023.
[190] PHS. Care home census for adults in Scotland: statistics for 2012 – 2022. 13 September 2022.

challenges in relation to the communication of tasks in a setting involving a rapid turnover of care home staff.

Lessons learned

Personal Loggists assigned to strategic incident directors to document key issues

50.35 Many of the significant challenges identified in this section, which relate to reliance on individual memory and institutional memory, could be addressed in the future by resourcing PHS to enable it to assign trained personnel as incident call loggists to each Strategic Incident Director to log/document all of the calls/emails/Team interactions in anticipation of the need to document and produce an IMT and Public Inquiry response.

Autonomy of Public Health Scotland in producing Public Health Guidance

50.36 The rationale for the creation of PHS was the unification of public health advice and expertise into a single organisation to improve the health of the Scottish population, to reduce inequalities and improve health life expectancy in the Scottish population. In order to achieve this, and to be trusted by the people of Scotland to deliver this improvement in public health, this requires the autonomy of PHS as an NHS organisation to work collaboratively in partnership with local authorities and with our other stakeholders. In my personal view, whilst acknowledging there may have been pragmatic reasons for doing so, the autonomy of PHS was affected by the need to set up a PAC process for sign off by Scottish Government of all PHS guidance.

50.37 Moreover, the observed delays in the generation of guidance by the PAC process are difficult to defend particularly when such delays, occurring at a time of fast moving change, may have adversely affected

the confidence of care home residents, their families, carers and the public in public health measures then, now and possibly in the future, unless steps are taken to address this.

50.38 My constructive suggestion on this matter is to recognise the issue and recommend that in future national agencies responsible for such guidance, such as PHS, remain autonomous even when emergency powers that suspend normal arrangements (such as those for Covid-19 which resulted in Ministers rather than the NHS being responsible) are invoked. This is not to say that the Scottish Government should not have input into such guidance in societal or public health emergencies – they have an important role as the leaders in national communication in such instances.

K. BORDERS

51 Internal UK borders

51.1 I and my HPS/PHS colleagues provided surveillance data and through linkage to T&P analysis of cases that were travel related to our NHS boards, LA and SG colleagues. Such analysis allowed the identification of cases associated with internal travel in Scotland and travel between Scotland, England and the other DA's. On behalf of HPS/PHS I led the Scottish NIMT for COVID which also offered advice on this over time. This advice was then used by SG in advising strategy development and refinement over time. I am aware that PHS was part of a health protection forum with those Scottish NHS territorial boards and English PHE/UKHSA regions with contiguous land borders discussing practical issues of mutual interest for those that lived and worked and or travelled in Scotland or England on a frequent basis. Intelligence from this forum allowed PHS and PHE/UKHSA to feed issues to their national IMT's where appropriate. The health protection teams of Scotland, Northern Ireland and Wales maintained a weekly dialogue in non-minuted

meetings at which mutual areas of interest like travel cases could be discussed too and fed back into our NIMT structures.

51.2 My understanding is that data was then available for SG officials and CMO/NCD to enable them to offer advice on measures that could be adopted to address any concerns regarding the borders between Scotland and the other nations of the UK. I understand however that in most instances this data would have formed the basis of advice to travellers re the risk and to avoid all but essential travel from Scotland to other parts of the UK, at specific points in the various waves of the pandemic reflecting the epidemiology of COVID-19 at those points in time e.g. re Blackpool (JM/131 - INQ000347479)[191], (JM/132 - INQ000235107)[192] or Manchester (JM/133 - INQ000347469)[193].

51.3 The Advice/guidance provided to the Scottish public with regard to crossing the borders with other parts of the UK, in particular the land border with England was the responsibility of Scottish Government. My understanding is that, in the main, this advice was provided by Scottish Government as the lead in communicating with the general public. HPS/PHS did consider, from time to time, putting out additional supportive advice to the public, but this would have been in wording consistent with this SG messaging.

51.4 I and my HPS/PHS colleagues provided surveillance data and through the linkage of this information to data held on the Test & Protect database of any cases that were travel associated to our NHS board, LA and SG colleagues. Such analysis allowed association of cases with internal travel in Scotland and travel between Scotland, England and the other DA's. On behalf of HPS/PHS I led the Scottish NIMT for

[191] BBC News. Covid in Scotland: Nicola Sturgeon warns Scots against travel to Blackpool. 14 October 2020. [Accessed November 2023].
[192] PHS. Avoid non-essential travel to Blackpool and other high risk areas. 16 October 2020. [Accessed November 2023].
[193] BBC News. Covid: Greater Manchester-Scotland travel ban row deepens. 24 June 2021. [Accessed November 2023].

COVID which also offered advice on this over time. This was then used by SG in advising strategy development and refinement over time.

52. International borders

52.1 Early pandemic

My understanding is that consideration by the Scottish Government of closing the UK's borders as a means of limiting the spread of Covid 19 in the UK between January and March 2020 would have involved much reliance on advice from SAGE on this matter. My recollection of the SAGE discussion on this related to the modelling by SPI-M in which international travel would need to fall by more than 97% to make a significant impact and that unilaterally closing our borders would have a transient effect with greater effect if applied by all countries. My understanding is that, whilst always a public health option, there would be indirect health consequence and very significant societal and economic consequence that would need to be factored in to any decision too.

52.2 In my opinion, based on the consideration of Harm 1 (Direct harm of Covid-19) of the Four Harms, it can be argued that as part of the first Lockdown measures a decision should have been taken to close the UK borders a week to two weeks before the actual decision was made. In this context wave 1 may have been less **HOWEVER** there are a number of caveats to this: 1. The overall number of cases, hospitalisations and deaths prior to the implementation, and high acceptance by the general public of the Covid-19 vaccination programme, may have been approximately the same over subsequent waves **IF** such measures were put in place well before the vaccination programme; and 2. This does not taken into account the other 3 of the Four Harms and, in particular, the question of whether UK PLC would have been able to weather the subsequent financial challenge that followed particularly if

a decision had been taken unilaterally?; and 3. However, and as has been very well demonstrated, hundreds of seeding events in Scotland with different strains of Covid-19 had taken place in the first months so the early closure of the borders by a week or two may have had limited effect – see (JM/39 - INQ000347524)[194].

52.3 I am unaware of any post-hoc scenario modelling considering this but even if there is such models would tell us what could happen rather than promising that this would be the case.

52.4 I would make the following points: all individuals were required by the UK Border Force to make a declaration on arrival, were handed an information leaflet (available in multiple languages) and permitted to enter if they did not declare symptoms. Scenarios had been discussed in advance between the ports of entry, the responsible Local Authority, the responsible NHS board and HPS/PHS regarding what arrangements needed to be in place if passengers self-reported symptoms or the Port was pre-alerted by the Captain of an ill passenger. This was not screening.

52.5 However, limiting this to doing this at only Scottish points of entry to the UK would have meant the following: 1. I understand that most international travellers to Scotland arrive at sites outwith Scotland as their first UK landfall, such screening would have limited impact for Scotland if unilaterally applied; 2. The volume of travellers at the time being considered would have been a significant logistical challenge and in particular for laboratory capacity as this was well before the set-up of the UK lighthouse system.

[194] Da Silva Filipe A, Shepherd JG, Williams T et al. Genomic epidemiology reveals multiple introductions of SARS-CoV-2 from mainland Europe into Scotland. Nature Microbiology 1 January 2021;6(1):112-122.

53. The remainder of the pandemic

53.1 I and my HPS/PHS colleagues supported our colleagues in port health by the provision of guidance and interpretation of current advice and guidance and provided intelligence to them and to SG through analysis of the travel history of cases either submitted by T&P once they were operational or by NHS boards in advance of this. SG colleagues, in liaison with their UK counterparts, established arrangements for quarantine and screening whilst PHS colleagues sustained dialogue re capturing information from such individuals on testing etc.

53.2 In response to why testing of passengers was not introduced, particularly in January - March 2020 I would like to point out that testing even of symptomatic individuals was a significant challenge at this stage in the pandemic due to constraints on testing capacity.

53.3 The change on 12 March 2020 to guidance (first published on 25 February 2020) advising travellers arriving in the UK from Category 1 countries to self-isolate even if asymptomatic, and advising travellers arriving in the UK from Category 2 countries to self-isolate only if symptomatic, was withdrawn. My understanding is that such advice followed feedback from UK PH agencies re their intelligence on travel associated cases and would have been part of SAGE discussions and direct discussion with respective Government colleagues in each of the DA's.

53.4 The Foreign and Commonwealth Office advised against all but essential travel to other countries from 17 March 2020. It is my understanding that the Foreign and Commonwealth Office offer advice for the whole of the UK.

53.5 Review of the epidemiology of cases revealed the strong international travel association of initial cases. This is an expected finding in epidemic/pandemic spread of infection. It is, however, a limitation in that an active case finding which focuses on a case definition which

includes geography may otherwise miss the initial extent of local community transmission from the returning traveller. At this juncture such undiagnosed non-travel associated case likely dwarfed the number of cases being diagnosed – a fact that SPI-M made clear in their engagement with SAGE.

53.6 The power of whole genomic sequencing here was to provide hard evidence of the multiple importations - I have already made reference to the multiple importations of COVID-19 to Scotland (JM/39 - INQ000347524)[195] – which should be read in conjunction with this study by Pybus, Rambaut and colleagues referenced in my Rule 9 request (JM/134 – INQ000224069)[196].

53.7 All of this information was considered through SAGE & SGCAG. The SAGE deliberations were a likely factor in the change you have recorded in withdrawal of advice re category 2 countries.

53.8 My understanding of border controls/travel restrictions is that non-devolved matters like those for the UK Border Force and the UK Foreign and Commonwealth were, and continue to be, a difficult area for Scotland to influence. I and my PHS team continued to work with colleagues across Scotland to provide intelligence on the impact of domestic and international travel for cases in Scotland for consideration by Scottish Government and through submission of data to UK Government as well as by SAGE and SGCAG.

53.9 In the corporate statement of the Director General Strategy and External Affairs on behalf of the Scottish Government (Strategy and External Affairs), (JM/25 - INQ000215495)[197] it is said at paragraph 157 "*Particularly earlier in the pandemic, Scotland at times adopted a*

[195] Da Silva Filipe A, Shepherd JG, Williams T et al. Genomic epidemiology reveals multiple introductions of SARS-CoV-2 from mainland Europe into Scotland. Nature Microbiology 1 January 2021;6(1):112-122.
[196] Pybus, O.; Rambaut, A.; du Plessis, L., et al. Preliminary analysis of SARS-CoV-2 importation & establishment of UK transmission lineages [Working Paper]. Virological. June 2020. [Accessed November 2023].
[197] Director General Strategy and External Affairs. COVID-19 Public Inquiry Module 2A Corporate statement. June 2023.

more restrictive stance on foreign travel than the UK Government did for England, for example easing restrictions on travellers from Spain after the UK Government had done so for England or Scotland's stricter approach to quarantine hotels (known in Scotland as Managed Isolation) when it was first introduced. In those cases, international passengers were able to circumvent tougher restrictions in Scotland by travelling via England. Where this happened, it would have reduced the efficacy of Scotland's restrictions to a degree. However, the tougher stance in Scotland, based on feedback from the aviation sector, had a negative impact on passenger numbers travelling directly to Scotland so would still likely have served to reduce importation and hence transmission, even if some lower level of importation continued from international travellers entering Scotland via England or elsewhere in the CTA." The divergence you allude to and the rationale for this is more a question for Scottish Government. My view is that the measures instituted in Scotland appeared prudent and took account of the evidence base available at the time.

53.10 Key areas which I consider worked well, and key areas in which I consider there were issues, obstacles or missed opportunities include the following;

53.11 **"Worked well" –** intercountry collaboration with our health protection colleagues

53.12 **Issues –** Cross national borders issues from difficulties found when implementing local (to Scotland) policy compared to the policy of that nation (e.g. Island NHS boards versus mainland) and its interaction or conflict with that of another part of the UK (in particular England).

53.13 **Obstacles –** DA/UK Government and national bodies e.g. FCO and UK Border Force.

53.14 **Missed opportunities –** There was opportunity during the pandemic to engineer a solution to this issue which could have been used to set

a precedent for how such matters could be addressed in the future. This could yet be flagged to the UK Health Protection Oversight Group for their attention now to take up this option.

L. Decision-making between the Scottish Government and (a) the UK Government and (b) the other devolved administrations in Wales and Northern Ireland

54.1 Whilst you have asked about decision making between Scottish Government and the DA's I think this is a missed opportunity if you do not also ask about the decision making between the UK and DA Public Health Agencies, so I have gone beyond the question asked and answered this and the subsequent questions from both perspectives.

54.2 **National Public Health Agencies and their Health Protection teams** - The decision making on what would be the requirement for surveillance, what guidance should be provided, what risk assessment and coordination would be required and what gaps needed to be filled was unilaterally set by each agency to reflect the devolved nature of the health delivery in each country. That being said, the prior work and experience of the national health protection agencies pre-pandemic respiratory teams and the cross working of each agency in prior incident response (not just respiratory) provided a strong foundation on which to build. An inter-pandemic presentational solution for comparing data using the Moving Epidemic Method (MEM), as supported by ECDC in the past, facilitated some aspects of what we then saw in data outputs for the different administrations. Such intercountry comparisons, whilst initially valid, were subject to significant challenge as national specific solutions then evolved.

54.3 To my knowledge, any reactivation of pandemic hibernation projects was instituted by local leads like myself e.g. EAVE-II activation by HPS following approval from SG to underwrite costs (up to a financial

ceiling) whilst response was sought from MRC/NIHR. EAVE-II and other pandemic hibernation projects such as ISARIC-4C & RECOVERY (JM/16 - INQ000354104)[198]) proved essential in providing a strong scientific base for the whole of the UK and globally in describing the impact of the pandemic over the following years of evaluation of the impact of the pandemic.

54.4 The early cohesion was then stretched and, in some ways, broken by new surveillance developments which reflected the potential data sources with the devolved arrangements compared to England and different solutions proposed.

54.5 It would have been ideal if there had been a single source of guidance with annexes identifying where arrangements in the DA's had any stated differences, and this would perhaps have saved considerably on time and effort.

54.6 Later attempts at cohesion in surveillance had limited success and this state of affairs continues to this day in our joint discussion with UKHSA on data dashboards which, through the Post-Brexit, Common Framework arrangements, attempt to address this – see (JM/135 - INQ000347519)[199]. Discussion is being led by UKHSA (All four nations have now held workshops regarding future direction for this).

55. Scottish Government and (a) the UK Government and (b) the other devolved administrations in Wales and Northern Ireland

55.1 From my perspective as an observer, the collaboration between the Scottish Government, the UK Government and the devolved administrations in Wales and Northern Ireland appeared civil and collaborative in most instances.

[198] UKRI/ISARIC4C. The RECOVERY trial. May 2022. [Accessed November 2023].
[199] UK Government. Sets out the principles and governance structure for UK-wide collaboration on health security and public health protection. October 2021.

55.2 With regard to comments on effective collaboration, coordination and/or communication between the UK Government and the devolved administrations including in relation to:

55.3 The Coronavirus Action Plan.-;

55.3.1 From my perspective I would make the following points:

55.3.2 **National Public Health Agencies and their Health Protection teams –** there was little if any advance notice of this to PHS.

55.3.3 **Scottish Government and (a) the UK Government and (b) the other devolved administrations in Wales and Northern Ireland –** I understand that there was some notice regarding this but I am unaware of how much notice

55.4 **The move from 'contain' to delay'.**

55.4.1 From my perspective I would make the following points:

55.4.2 **National Public Health Agencies and their Health Protection teams –** there was a potential short notice given of this from the outcome of confidential discussions in SAGE and how they were expected to land with UK Government Ministers.

55.4.3 **Scottish Government and (a) the UK Government and (b) the other devolved administrations in Wales and Northern Ireland –** I understand that there was a potential short notice given re this but I am unaware of how much notice.

55.5 **The imposition of, easing of, or exceptions to NPIs,** including:

i. Border controls;
ii. Social distancing;
iii. The self-isolation of those suspected to be infectious;

iv. The quarantining of whole households;
v. The use of face-coverings;
vi. The banning of mass gatherings;
vii. The closure of pubs and restaurants;
viii. The closure of schools; and
ix. The imposition of the first lockdown and other subsequent lockdowns, including circuit breakers;

55.5.1 From my perspective I would make the following points:

55.5.2 **National Public Health Agencies and their Health Protection teams – *imposition, easing or exceptions to NPIs* –** my HP colleagues across the UK worked very hard to ensure that we could input advice to our respective Governments and that we shared early intelligence on anticipated changes in any of the items listed i) to ix) as keen observers of SAGE. Whilst I and my team in Scotland were providing much of the surveillance and intelligence as an evidence base on which decisions would be based, or in my role as chair of the Scottish Covid-19 NIMT through my attendance at the Four Harms group, there were still some policy decisions that were for me more difficult to fully comprehend. I do understand, however, that Scottish Ministers may have been privy to additional information and their conclusions may have been based upon such considerations.

55.5.3 **Scottish Government and (a) the UK Government and (b) the other devolved administrations in Wales and Northern Ireland –** I understand that intergovernmental liaison, whilst essential, appeared difficult to corral. There was an impression that, on occasion, there was great political pressure to release information early on whilst the understanding re this was still evolving.

55.6 **The sharing and use of medical and scientific expertise and data;**

55.6.1 From my perspective the sharing of information was exceptionally good across the pandemic by and between National Public Health Agencies and their Health Protection teams & Scottish Government and (a) the UK Government and (b) the other devolved administrations in Wales and Northern Ireland. This is not to say it was perfect nor that it cannot be improved.

55.7 **Public health communications or behavioural management;**

55.7.1 From my perspective the Public Health communication was exceptionally good across the pandemic by and between National Public Health Agencies and their Health Protection teams and Scottish Government and (a) the UK Government and (b) the other devolved administrations in Wales and Northern Ireland. This is not to say it was perfect nor that it cannot be improved.

55.8 **Public health and coronavirus legislation and regulations.**

55.8.1 From the perspective of legislation and regulations this was exceptionally good across the pandemic by and between National Public Health Agencies and their Health Protection teams and assisted by the informal discussion at a three nation (Northern Ireland, Wales and Scotland level) as well as a Four nations level.

55.8.2 Regarding the extent to which I collaborated, coordinated and communicated with my counterparts in the UK Government and the other devolved administrations between January 2020 and April 2022 I would make the following points.

55.8.3 This was a critical component of my role in trying to achieve a "helicopter" view of important and emerging issues, signposting these for resource to enable action and delegating the response to them within PHS.

55.9 With regard to whether, in my view, any reforms to intergovernmental structures are necessary as a result of lessons learned during the pandemic, in this instance I make no further comment.

55.10 In relation to your query about why HPS representatives were not present at initial meetings of SAGE, I have already answered this in my corporate statement (JM/3 - INQ000183410)[200] in response to Module 1.

55.11 I have no recollection of any involvement with the three UK 'Tsars' appointed by the UK Government in April 2020 to tackle what it perceived to be major issues relevant to ensuring public health: vaccines (Kate Bingham), PPE (Paul Deighton) and track and trace systems (Dido Harding).

55.12 In relation to your question on whether, in my view, sufficient consideration was given during 4 nations decision-making to the impact of decisions, including NPIs, on 'at risk' and other vulnerable groups in light of existing inequalities, at the time this was felt sufficient but in retrospect more could have been considered. Incrementally this was partially addressed as the evolving response dynamically applied learning through NIMT and other structures in Scotland.

55.13 In a similar way my observation of the extent of 4 nations decision-making about the response to Covid-19 considered the impact of Covid-19 restrictions for people living and working across internal UK borders is that, this was in retrospect insufficiently addressed at a national level but the health protection teams worked collaboratively to address the practical challenges.

[200] PHS. COVID-19 Public Inquiries: PHS Module 1 Corporate Statement. May 2023.

M. INTERRELATION BETWEEN THE SCOTTISH GOVERNMENT AND LOCAL GOVERNMENT

56.1 In my capacity as the chair of behalf of PHS I invited representatives from COSLA and SOLACE to join the National Incident Management Team to ensure that the views of local government could be heard and to ensure that the situational awareness from the pandemic could in turn be shared with them for their constituent members.

56.2 Proper communication and decision-making between key Scottish Government decision-making and local authorities, in particular in relation to the fact of and reasons for the imposition of both national and local NPIs was a key component in the discussions with all members of the NIMT.

56.3 Medical or scientific information or advice available to the Scottish Government was provided to local authorities to assist in their role in the pandemic. This was a key component in the discussions with all members of the NIMT. My understanding is that this was much valued as was the provision of the informational analysis shared on our "open source" dashboard allowing the presentation of information where appropriate by LA area.

56.4 With respect to the interrelations between the Scottish Government and local authorities, the following key areas consider worked well.

- **Worked well –** the engagement with COSLA & SOLACE in NIMT worked well from my perspective.

56.5 There were issues, obstacles or missed opportunities as follows.

- **Issues –** Sharing and penetration of surveillance data to allow Local Authority level of presentation with appropriate colleagues took longer that envisaged.
- **Obstacles –** busy NIMT agendas meant that there was limited opportunity to invite detailed contribution from COSLA & SOLACE representatives.

- **Missed opportunities –** in retrospect the membership expansion that followed the creation of PHS should have been addressed earlier to include COSLA & SOLACE representatives.

N. COVID-19 PUBLIC HEALTH COMMUNICATIONS

57. Public health communications strategy of the Scottish Government during the pandemic

57.1 This is more a question for Scottish Government. In line with the 'Management of public health incidents: guidance on the roles and responsibilities of NHS led incident management teams' (JM/4 - INQ000147512)[201]. Scottish Government led all aspects of, and coordinated communication in relation to, pandemic messaging. From my observation of the media briefing sessions, which for a long period were daily briefings, these were very skilfully delivered across appropriate ministerial departments but led, in the main, by the then First Minister, Nicola Sturgeon. I had very frequent interaction with the office of the First Minister to support these daily briefings, providing up to the last moment updates on the basis of overnight surveillance updates etc.

57.3 I note that in the Scottish Government Covid-19 Advisory Group corporate statement (JM/14 - INQ000215468)[202] at paragraph 40, Professor Andrew Morris states that SGCAG did not play a direct role in or approve any public health communications by the Scottish Government during the pandemic. You asked what was the nature of the advice which was provided by the Group to the Scottish Ministers in that regard and why did the Group not play a more prominent role in advising in that regard? This is a question for Scottish Government Covid-19 Advisory Group. I understand, as a member of this group, that the group

[201] PHS. Management of public health incidents: guidance on the roles and responsibilities of NHS led incident management teams, Version 12.1 (interim update). 14 July 2020. [Accessed November 2023].
[202] Scottish Government Covid-19 Advisory Group. UK COVID-19 Public Inquiry Module 2A Corporate statement. June 2023.

offered advice rather than being an approver of public health communications which was the responsibility of Scottish Government in this emergency response role.

57.4 The key individuals in devising and implementing the strategy is really a question for Scottish Government but, from my observation, devising and implementing the strategy was a key role for the First Minister supported by her Cabinet, the Chief Medical Officer, National Clinical Director, the Deputy Chief Medical Officer and other Chief Officers. Led by First Minister, they provided the nucleus to the trusted team to put over the key messages of the day.

57.5 From my perspective the Scottish Government's justification for key strategic decisions promulgated was, from my perspective, a fair and accurate reflection of the actual reasons for the decision-making.

57.6 I have no recollection of any such instances of any restriction being placed on publication of medical data or studies carried out by the individuals/bodies providing advice to key decision-makers within the Scottish Government.

57.7 In relation to whether there were any key public health communications that went against expert medical or scientific advice and if so, why was such advice not followed I would make two main responses;

57.8 1. I have already covered in previous sections that there were instances in which a 4 Harms approach would consider Harm 1 but that not necessarily mean that the summary advice from Harm 1 would be successful as the advice in relation to harms 2, 3 and 4 had to be considered. I would suggest that the secretariat for the 4 Harms group could provide a list of such instances and 2. I have outlined that there were instances in which during drafting of guidance as part of the PAC process that requests for changes to wording in guidance produced by PHS would be made by Scottish Government.

57.9 I am unaware of any change in approach re public heath communication other than the standdown/stand back up as required of the daily briefing format as required.

57.10 There was a huge effort to support the importance of vaccination and its potential to minimise infection and its consequences fronted by Scottish Government but with a massive contribution made by my PHS team, the NHS boards, NSS and a host of others.

57.11 From my perspective without performing a content analysis of each and every statement offered by the Scottish Government it is impossible to offer a complete view but, from my own observation, there were instances where the term “guided by the science” or similar statements were made appropriately following which the Scottish Government acted consistently with its statement in making changes guided by the science. The science in this instance was the distillation of collective intelligence provided by SAGE, NERVTAG, SGCAG, PHS, UKHSA, WHO and others provided either by my team or other bodies.

57.12 The Scottish Government’s strategy behind its focus on the R number/keeping the R number below 1 as a key marker of the extent of the pandemic. The principle offered early in the pandemic was to keep R below one emphasising the importance of the suite of societal measures needed (including Lockdown) to achieve this. This messaging subtly changed appropriately over time with the sustained community transmission observed with each of the waves of Covid-19 from different strains leading to more emphasis being put on reducing the impact on the NHS, in particular, to reduce hospitalisation and deaths. This change reflected the advice offered from myself and my PHS colleagues and from SAGE, NERVTAG, SGCAG and others such as the WHO.

57.13 My understanding was that Scottish Government strategy, like the UK Government and that of the other nations, was heavily reliant on scenario modelling output from SPI-M. This outlined possible outcomes in the absence of public health interventions and the possible impact of NPI’s

including Lockdown for cases, hospitalisation and deaths. They later adapted to consider the impact of the vaccination programme to mitigate the impact and used real life uptake and effectiveness data provided by Scotland (PHS and EAVE-II) and England in particular. The modelling data should be regarded as based on predictions of possible future scenarios with the real life observations being the proof of whether NPI's or vaccination had the impact anticipated.

57.14 I would encourage the Inquiry to read the Eurosurveillance paper authored by the WHO, of which I am a co-author, looking at deaths averted by the vaccination programmes across 33 countries in the WHO European region; for more on this: (JM/22 - INQ000347499)[203].

57.15 From my perspective whatever the Scottish Government's messaging system via the media, this appeared to be highly effective in achieving and maintaining the trust of the Scottish public as demonstrated by trends in polling data across time.

57.16 On 23 March 2020 – the first lockdown order was announced for the whole of the UK by the Prime Minister (JM/136 - INQ000347518)[204], with the Scottish Government also announcing a full national lockdown. From my perspective, I would make the following comment. Devolved issues on health, and the need to ensure public confidence in Scotland by the Scottish Government, were highly appropriate and potentially amplified and reinforced the messaging for a Scottish context.

57.17 In relation to whether the Scottish Government public health communications and whether these sufficiently explained the territorial extent of its decisions relating to Covid-19, including NPIs, to the public,

[203] Meslé M. M.; Brown J.; Mook P. et al. Estimated number of deaths directly averted in people 60 years and older as a result of COVID-19 vaccination in the WHO European Region, December 2020 to November 2021. EuroSurveillance, 26(47) 2021. [Accessed November 2023].
[204] Prime Minister's Office. Prime Minister's statement on coronavirus (COVID-19) 23 March 2020. [Accessed November 2023].

57.18 I contend that yes, Scottish Government public health communications sufficiently explained the territorial extent of its decisions relating to Covid-19, including NPIs, to the public. I had no concerns about this.

57.19 Regarding behavioural science advice received in connection with public health communications in Scotland, my observations are that SAGE & SGCAG advice on behavioural science heavily influenced Public Health communication in Scotland. I would defer to my colleagues in behavioural science about whether they could demonstrate its effectiveness.

57.20 PHS note within their corporate statement (JM/7 - INQ000300280)[205], at paragraph 4.2.8, that "*the use of different language to express policy intent led to challenges for PHS in the development of guidance*". I personally agree with this view and in particular have covered this in the section on care home guidance.

57.21 Public Health messaging was in the main very clear but did change over time.

57.22 My personal view is that the National Clinical Director was a fantastic communicator on behalf of the Scottish Ministers across all modalities.

57.23 Medical and scientific advice fed into NCD public communications on the pandemic and any restrictions imposed to manage it, both orally and in writing have been shared.

57.24 My personal view is that the National Clinical Director, as a gifted communicator, was uniquely suited to represent Scottish Government in relation to the business and faith groups.

58. Effectiveness of messaging

58.1 Effectiveness of public health communications in Scotland monitored during the pandemic

[205] PHS. COVID-19 Public Inquiries: PHS Module 2A Corporate Statement. October 2023.

58.1.1 My understanding, from summary data provided, by views expressed by constituent members of the NIMT, from Scottish Government as presented in different fora, along with feedback through SGCAG of behavioural data, was that the effectiveness of the public health communications was observed to be very good. My recollection was that repeated audit demonstrated there were, however, downwards trends in compliance with measures that were covered by public health messaging as the pandemic progressed across 2021 and 2022. The results are provided to Scottish Government from work they commissioned and should be available from them.

58.1.2 I was not privy to the criteria chosen for the selection of individuals to convey key messages or play a role in television briefings (such as the First Minister, the Deputy First Minister, the Cabinet Secretary for Health or Jason Leitch – the NCD).

58.1.3 My view is that the daily television briefings were a very effective method to communicate public health messaging to the public.

58.1.4 Regarding strategy this is a question for Scottish Government. My understanding about the strategy and my observations about the effectiveness of this strategy are as follows: Scottish Ministers outlined and set Policy and led communication on this to Scottish Parliament; Scottish Government officials & CMO/DCMO & NCD communicated policy and context to PHS, NHS boards, NHS NSS & other special boards, LA's, business leaders, and faith groups etc. I understand that there were practical challenges re the choreography of the timing of the briefings of these groups re policy changes, but these are to be expected with Scottish Government making, from my

perspective, honest efforts to ensure all were appropriately informed.

58.1.5 My observation in the initial months of the pandemic response was that there was a particular difficulty in ensuring effective communication re the care homes sector though this improved markedly over time particularly following CSHW asking the Directors of Public Health to have a lead role in the oversight of care homes in their area - see (JM/137 {**INQ000347530**})[206]. There were, however, continued communication challenges over the months and years that followed in relation to communications in this sector.

59. **Effectiveness of the Scottish Government's key public health communications in relation to the steps taken to control the spread of the virus in Scotland.**

59.1 My own opinion is that Scottish Government's communications on public health, in relation to steps taken to control the spread of the virus, were very well communicated overall.

60. **Maintenance of public confidence**

60.1 I observed and I understand from polling data that the messages that the Scottish Government were promulgating about its approach to the management of the pandemic promoted public confidence.

60.2 Overall I would say that the publication of modelling data was sufficiently transparent and timely to support the Scottish Government strategic decision.

[206] Scottish Government. Strengthened clinical oversight for care homes. 17 May 2020. [Accessed November 2023].

60.3 The effectiveness of steps were taken to counter disinformation

60.3.1 Overall these steps appeared successful assisted by high quality rapid assessment by PHS and our collaborators and shared with the rest of the UK and internationally.

60.3.2 This was a key area that PHS offered much support on, either through direct provision of evidence e.g. on the investigation and reporting of safety of COVID-19 vaccine, or through our collaboration with others e.g. the EAVE-II collaboration, to report on risk of natural infection versus risk in vaccinated individuals – please see my response to Q356 and 'Second-dose ChAdOx1 and BNT162b2 COVID-19 vaccines and thrombocytopenic, thromboembolic and hemorrhagic events in Scotland' (JM/138 - INQ000347523)[207].

60.4 In relation to what impact, if any, I consider alleged breaches of social restriction and lockdown rules by Ministers, officials and advisers, and the associated public debate at that time, had on public confidence and the maintenance of observance of those rules by the public I would make the following response.

60.5 My own view is that alleged breaches of social restriction by Ministers, officials and advisers would have had an adverse impact on the maintenance of observance of the rules by the public. In some of these circumstances, there were immediate steps taken to acknowledge mistakes and use these apologies to increase public confidence (e.g. First Minister of Scotland who was without a facial covering at a wake) whilst in others things became so long and drawn out that they would likely, in my view, have had a long term effect on public confidence.

[207] Simpson, C.R., Kerr, S., Katikireddi, S.V. et al. Second-dose ChAdOx1 and BNT162b2 COVID-19 vaccines and thrombocytopenic, thromboembolic and hemorrhagic events in Scotland. Nature Communications 13, 4800, 15 August 2022.

60.6 In relation to why did the SGCAG secretariat not track statements given by members of the Group to the media (see Scottish Government Covid-19 Advisory Group corporate statement (JM/14 - INQ000215468)[208] at paragraph 41) I would offer the following. This is a question for SGCAG. My understanding is that the fact that members were free to conduct themselves in whatever fashion was guided by their employing organisation. The Scottish Government communications team, who routinely monitored and reported on any statements to media, may have a record of any statements.

60.7 I have been asked to consider specific issues and to ask what assessment was done of the role which was played by the following in undermining public confidence in the Scottish Government's management of the pandemic:

(a) The circumstances surrounding the resignation of Catherine Calderwood from her role as CMO on 5 April 2020 (JM/139 **INQ000347465**)[209].

I am unaware of whether the resignation had a lasting effect in undermining public confidence however the smooth transition of the then DCMO Dr Gregor Smith to succeed Catherine Calderwood likely mitigated this risk.

(b) The actions of SNP MP Margaret Ferrier involving two breaches of COVID-19 regulations after travelling to Westminster while experiencing symptoms and attending the Westminster Parliament, then travelling home by train after a positive test and her subsequent prosecution.

[208] Scottish Government Covid-19 Advisory Group. UK COVID-19 Public Inquiry Module 2A Corporate statement. June 2023.
[209] BBC News. Coronavirus: Scotland's chief medical officer resigns over lockdown trips. 6 April 2020. [Accessed November 2023].

My understanding about the circumstances regarding this case are that this was a significant public health issue as potentially members of the general public were placed at risk. The impact of this would likely have been to reduce public confidence.

and

(c) The First Minister breaching COVID regulations by removing her face covering at a wake in December 2020, stating that she "*was kicking [herself] very hard*" over the incident (JM/140 - INQ000215471)[210].

I have already stated in my earlier response in this statement, the immediate apology likely served the purpose of offering an opportunity to reinforce the public messaging.

60.8 In the Corporate Statement of the Director General of Education and Justice on behalf of the Scottish Government (JM/141 - INQ000215480)[211] relating to the Justice and Safer Communities Directorate at paragraph 146 it is said (quoting directly from the substantive findings of the Independent Advisory Group on Police Use of Temporary Powers related to the Coronavirus Crisis [JG2/0029] published on 25 August 2021) "*In general, it appears that compliance was highest during the first lockdown period, when the rules were clear and consistent across the whole population. However, over time, as the Regulations became more differentiated (e.g. across different localities), public messaging became less clear (even by government ministers), and examples of high profile breaches diminished public confidence in the effectiveness of the Regulations [emphasis added], the challenges for policing increased*". You asked what steps were taken to rebuild public confidence in light of these events or incidents and

[210] BBC News. 'I was in the wrong' over Covid rules breach – Sturgeon. 23 December 2020. [Accessed November 2023].
[211] Director General of Education and Justice. UK Public Inquiry Module 2A Corporate statement. June 2023.

whether they were effective? What steps were taken to improve the clarity of public messaging? What assessment was made of the impact of a) the reduction in clarity of public messaging, and b) the diminishing in public confidence as a result of high profile breaches on aspects of the pandemic such as challenges to policing?

60.9 These are primarily questions for Scottish Government who led on communications. In my view, there were a number of perspectives here. Overall, each breach by those in the public eye had an additive effect but likely the greatest sustained effect on diminishing public confidence was in those individuals who failed to take ownership of their mistakes which was only further amplified by the number of instances they appeared to have demonstrated failures in compliance.

61. **Conclusions and lessons learned**

61.1 In relation to the Scottish Government's public health communications during Covid-19, key areas which I consider worked well, and key areas where issues, obstacles or missed opportunities were identified by me are as follows:

61.2 **Worked well –** The overall messaging by the Scottish Government was done exceptionally well. In particular, the daily podium briefings offered a means to influence and magnify messages of the day.

61.3 **Issues –** The breaches in compliance by the high profile figures on the podium led to significant challenge in relation to public confidence but corrective measures, whether through resignation by Catherine Calderwood, or through the apology by the First Minister, offered an opportunity to reset this public confidence.

61.4 **Obstacles –** Whilst during the peak in cases the daily Scottish Government updates at the podium became required viewing, the dropping of coverage by BBC Scotland presented its own challenge

even for avid consumers of output as accessing output became more difficult and was not well publicised.

61.5 **Missed opportunities –** During the peak in activity it was entirely sensible and prudent that the cohort of trusted spokespeople responsible for conveying messages was restricted to those mainly from the CMO/DCMO/NCD and other Chief Officers. However, as activity fell off, there was perhaps a missed opportunity to transition and introduce PHS spokespeople into the media briefings, as planning for the succession into normal activity was something in relation to which PHS would become the usual spokespeople for public health communications.

O. Public health and coronavirus legislation and regulations

62.1 My recollection was that from time to time I, my PHS and or NIMT colleagues may have been consulted on whether we had a medical or scientific view about legislation or regulation either during its creation or in a period of review before "sunsetting" led to it lapsing.

62.2 My PHS guidance team worked closely with our stakeholders including Scottish Government to maximise compliance. I understand that a list of all such guidance has been provided.

62.3 I and my PHS colleagues provided advice to Scottish Government and our stakeholders re all NPI's. I am unsure what is meant by the phrase "utility of attaching sanctions". I have assumed that you mean for example the potential to associate fines and potential prosecution by this. On this assumption all of these considerations were useful in creating a mind-set conducive to compliance and reduce the threat of cases to the public health and I was supportive of them but made no contribution to their design.

62.4 The rationale behind the "FACTS" message promulgated by the Scottish Government (JM/142 - INQ000347500)[212] and its effectiveness is a question for Scottish Government. My understanding about the rationale is that this would have been the result of advice received from HPS/PHS, SAGE and others and considered by CMO/DCMO/NCD in collaboration with Scottish Government Policy leads and their communication team. From my own perspective this seems an effective method of conveying this message to the public but evaluation would have been the responsibility of the Scottish Government.

P. KEY CHALLENGES AND LESSONS LEARNED

68.1 I was asked to provide any documents insofar as they relate to the discharge of my duties in response to the Covid-19 pandemic and make the following response:

a) Oral or written evidence provided to UK Parliament Select Committees investigating the government response to the pandemic;

I have no oral or written evidence to provide in response to this section.

b) Oral or written evidence you provided to the Scottish Parliament Committees investigating the ways in which decisions were taken by the Scottish Government in connection with the management of the pandemic;

Please see my response to the questions relating to the Justice Committee and see the transcript of the proceedings (JM/9 - INQ000354105)[213]. This documents the advice offered.

[212] Scottish Government. FACTS public health campaign: FOI release. 28 October 2020. [Accessed November 2023].
[213] Scottish Parliament. Justice Committee Meeting 19 May 2020 Official Report. May 2020.

and

c) Internal or external reviews or lessons learned exercises to which you contributed.

Copy of Corporate PHS Lessons Learned document is provided (JM/19 - INQ000187754)[214]. Please note that PHS are currently leading a Lessons Learned Exercise in connection with the report of the COVID-19 NIMT. PHS will endeavour to provide this in November 2023 once this is complete.

68.2 In addition, to the extent that I have not covered it in my statement in response to questions above, I was invited to identify what I considered to be key issues and junctures in the decision-making process relating to the management of the pandemic in Scotland, but I have nil to return for response to this question.

68.3 Whilst you asked me to state what I considered the key challenges were, my understanding of the reason for those challenges, what went well and what did not (either as was apparent at the time or in hindsight), and whether you identified (at the time or subsequently) things that could or should have been done differently in the way that the core decision-making in relation to the management of the pandemic in Scotland, I have listed all of these in my previous responses above.

68.4 All of the lessons learned from my experience in relation to core decision-making involved in the Scottish Government's response to Covid-19, in particular in relation to the provision of accurate and timely medical and scientific expertise, and data or modelling in relation to

[214] PHS. Learning Lessons from COVID-19. May 2023.

Covid-19 and identification of any key areas which I consider worked well, and any key areas in which I consider there were issues, obstacles or missed opportunities have already been addressed.

68.5 With regard to your question where you asked me if I have identified areas where I think that core decisions made by the Scottish Government in the management of the pandemic ought to have been taken differently than they were, you also asked me to identify what I think the outcome of any preferable course would have been in terms of its impact on infection, illness and death amongst the Scottish population, I have nothing further to add.

68.6 In relation to recommendations that I would suggest which would improve the Scottish Government's response to a future pandemic I would say the following.

68.7 I have previously covered these above re resource. In relation to identification and description of anything that worked well and difficulties or challenges encountered by me and my colleagues as well as the expert advisory groups of which I were a member in supporting core political and administrative decision-making with the Scottish Government, I have nothing further to add.

68.8 In relation to the following components I understand that the PHS secretariat will provide the following categories of documents where applicable:

68.9 Any internal or external reviews, lessons learned exercises and other reports involving, authored, overseen or responded to by you relating to any of the issues raised in the Provisional Outline of Scope for Module 2A since January 2020.

68.10 A chronological list of any initiatives or activities involving, overseen or responded to by you concerning the making of changes to the role and performance of the medical officers to the Scottish Government and/ or

expert advisory groups in light of their involvement in the response to the Covid-19 pandemic. Please have particular regard to the issues raised in the Provisional Outline of Scope for Module 2A.

68.11 Details of the method, product, conclusions and recommendations of those reviews, lessons learned exercises, reports, initiatives or activities.

68.12 Details of the extent of the Scottish Government's response to any conclusions, and its implementation of any recommendations.

Statement of Truth

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

Signed: Personal Data

Dated: 29th November 2023

Additional information

Acronyms

ACDP	Advisory Committee on Dangerous Pathogens
ARHAI	Antimicrobial Infection and Healthcare Associated Infection
CDC	Center for Disease Control (USA)
CHI	Community Health Index
CMO	Chief Medical Officer
CO-CIN	COVID-19 Clinical Information Network
COSLA	Convention of Scottish Local Authorities
CSH	Cabinet Secretary for Health
DA	Devolved Administration
DCMO	Deputy Chief Medical Officer
EAVE-II	Early Pandemic Evaluation and Enhanced Surveillance of COVID-19
ECDC	European Centre for Disease Control and Prevention
FCO	Foreign & Commonwealth Office
FF100	First Few Hundred surveillance
FM	First Minister
HCID	High Consequence Infectious Disease
HPS	Health Protection Scotland
ICU	Intensive Care Unit
IG	Information Governance
IPC	Infection Prevention and Control
ISARIC	International Severe Acute Respiratory Infection Consortium-
JBC	Joint Biosecurity Cell
JCVI	Joint Committee for Vaccination and Immunisation
LA	Local Authority
LFD	Lateral Flow Device
MEM	Moving Epidemic Method
MRC-CVR	Medical Research Council – Centre for Virus Research
NCD	National Clinical Director
NERVTAG	New & Emerging Respiratory Virus Threat Advisory Group
ONS	Office of National Statistics
NPIs	Non Pharmaceutical Interventions
OOH	Out of Hours
PAC	Policy Alignment Process
PCR	Polymerase Chain Reaction
PHE	Public Health England
PHS	Public Health Scotland
PPE	Personal Protection Equipment
SAGE	Scientific Advisory Group on Emergencies
SG	Scottish Government
SGCAG	Scottish Government Covid Advisory Group
SGoRR	Scottish Government Resilience Room

SID	Strategic Incident Director
SOLACE	Society of Local Authority Chief Executives and Senior Managers
SPI-B	Scientific Pandemic Influenza Group on Behaviours
SPI-M	Scientific Pandemic Influenza Group on Modelling
T&P	Test and Protect
UKHSA	United Kingdom Health Security Agency
WGS	Whole Genomic Sequencing
WHO	World Health Organisation

Appendix A

Appendix A is in five parts and contains the following:

- Part One: Significant PHS publications by title, date, authors, link, purpose and findings.

- Part Two: An extract from PHS's Module 2a Rule 9 response concerning the EAVE-II Consortium

- Part Three: A list of EAVE-II & PHS COVID-19 publications to date.

- Part Four: An extract from PHS's Module 2a Rule 9 response concerning the REACT-SCOT Consortium

- Part Five: A list of scientific and research papers on the topic of COVID-19, authored or co-authored by Public Health Scotland staff

Appendix A - Part One

Significant PHS publications by title, date, authors, link, purpose and findings

Title	Date	Authors	Link	Purpose of Study	Summary Findings
EAVE-II					
EAVE-II Consortium. Effectiveness of First Dose of COVID-19 Vaccines Against Hospitalisation in Scotland: National Prospective Cohort Study of 5.4 Million People.	Feb 2021	Eleftheria Vasileiou, Colin R. Simpson, Chris Robertson, Ting Shi, Steven Kerr, Utkarsh Agrawal, Ashley Akbari, Stuart Bedston, Jillian Beggs, Declan Bradle, Antony Chuter, Simon de Lusignan, Annemarie Docherty, David Ford, Richard Hobbs, Mark Joy, Srinivasa Vittal Katikireddi, James Marple, Colin McCowan, Dylan McGagh, **Jim McMenamin**, Emily Moore, Josephine-L.K Murray, Jiafeng Pan, Lewis D Ritchie, Syed Ahmar Shah, Sarah Stock, Fatemeh Torabi, Ruby S. M. Tsang, Rachael Wood, Mark Woolhouse, Aziz Sheikh	https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3789264	The Pfizer-BioNTech and Oxford-AstraZeneca COVID-19 vaccines have demonstrated high efficacy against the COVID-19 infection in phase 3 clinical trials and are now being used in national vaccine programmes in the UK and several other countries. The aim of this study was to estimate the effectiveness of the first does of these vaccines in preventing hospital admissions.	A single dose of either vaccine resulted in substantial reductions in the risk of COVID-19 related hospitalisation in Scotland.
The Lancet. Interim Findings from First-Dose Mass COVID-19 Vaccination Roll-Out and COVID-	April 2021	Eleftheria Vasileiou*, Colin R Simpson*, Ting Shi*, Steven Kerr*, Utkarsh Agrawal, Ashley Akbari, Stuart Bedston, Jillian Beggs, Declan Bradley, Antony Chuter, Simon de Lusignan, Annemarie B Docherty, David Ford, F D Richard Hobbs, Mark Joy, Srinivasa Vittal Katikireddi,	https://www.thelancet.com/action/showPdf?pii=S0140-6736%2821%2900677-2	The Pfizer–BioNTech and Oxford–AstraZeneca COVID-19 vaccines have shown high efficacy against disease in phase 3 clinical trials and are now being used in national	Mass roll-out of the first doses of the Pfizer–BioNTech and Oxford–AstraZeneca vaccines was associated with substantial reductions in the risk of hospital

19 Hospital Admissions in Scotland: A National Prospective Cohort Study.		James Marple, Colin McCowan, Dylan McGagh, **Jim McMenamin**, Emily Moore, Josephine L K Murray, Jiafeng Pan, Lewis Ritchie, Syed Ahmar Shah, Sarah Stock, Fatemeh Torabi, Ruby S M Tsang, Rachael Wood, Mark Woolhouse, Chris Robertson, Aziz Sheikh		vaccination programmes in the UK and several other countries. The aim of our study was to investigate the association between the mass roll-out of the first doses of these COVID-19 vaccines and hospital admissions for COVID-19.	admission due to COVID-19 in Scotland.
PHS Statement - Vaccine Linked to Reduction in Risk of COVID-19 Admissions to Hospital	22nd Feb 2021	PHS	https://www.publichealthscotland.scot/news/2021/february/vaccine-linked-to-reduction-in-risk-of-covid-19-admissions-to-hospitals/	Vaccination has been linked to a substantial reduction in the risk of COVID-19 admissions to Scotland's hospitals. As part of the EAVE II project, which uses patient data to track the pandemic and the vaccine rollout in real-time, Public Health Scotland (PHS), the Universities of Edinburgh, Strathclyde, Aberdeen, Glasgow and St Andrew's analysed data on vaccine effect. The data was gathered between 8 December and 15 February. During this period, 1.14 million vaccines were administered and 21 per cent of the Scottish population had received a first dose.	Researchers compared the outcomes of those who had received their first jab with those who had not. The study shows that, by the fourth week after receiving the initial dose, the Pfizer and Oxford-AstraZeneca vaccines were shown to reduce the risk of hospitalisation from COVID-19 in up to 85 per cent and 94 per cent, respectively.
First Minister's COVID-19 Update Statement - Nicola Sturgeon	22nd Feb 2021		https://www.gov.scot/publications/coronavirus-covid-19-update-first-ministers-statement-	The statement began with updates on COVID-19 positive reported cases, hospitalisations, intensive care	Edinburgh University this morning published the results of a study showing that by the fourth week after getting a first

at Media Briefing in St Andrew's House, Edinburgh			monday-22-february-2021/	patient numbers and COVID-19 related deaths. Reported 1,445,488 people in Scotland receiving first doses of the vaccine and 1,863 people received their second dose – it is not clear if the second dose statistics is the number in total in Scotland at that stage or just on the previous day. Lower supplies of vaccine mentioned but expected to improve. Uptake of vaccine has been extraordinarily high. As of this week now starting to vaccinate people in priority group six and from now this group will include those with mild or moderate learning disabilities. Group six accounts for the largest group of the population invited to be vaccinated to date. It will account of 1/5 of the entire adult population in Scotland.	dose, the Pfizer and Oxford-AstraZeneca vaccines reduced the risk of hospitalisation from COVID-19 by 85 per cent and 94 per cent respectively.
Efficacy of Vaccination Against Severe COVID-19 in Relation to Delta Varient and Time Since Second	15th September 2021	**Paul M McKeigue**, David A McAllister, Sharon J Hutchinson, Chris Robertson, Diane Stockton, **Helen M Colhoun**	https://www.medrxiv.org/content/10.1101/2021.09.12.21263448v1	The purpose of this study was to investigate: (1) whether vaccine efficacy against severe COVID-19 has decreased since Delta became the predominant variant; (2) whether efficacy wanes with	Effectiveness of vaccination against severe COVID-19 decreased in May 2021 coinciding with the replacement Alpha variant by the Delta variant in Scotland, but this decrease was reversed over the

Dose: the REACT-SCOT Case-Control Study.				time since second dose. The main outcome measure was Severe COVID-19, defined as cases with entry to critical care or fatal outcome.	next month. In the most recent time window, the efficacy of two doses against severe COVID-19 was 91% for the AstraZeneca product and 92% for Pfizer or Moderna products. Against the broader category of hospitalised or fatal COVID-19, efficacy in this time window was slightly lower: 88% for the AstraZeneca product, 91% for Pfizer or Moderna vaccines. Efficacy against COVID-19 declined rapidly in the first two months since second dose but more slowly thereafter. These results suggest that the rapid early waning of effectiveness against hospitalised COVID-19 after the second dose tapers off within a few months. This weakens the rationale for policies based on delivering booster doses to the entire population, rather than to vulnerable individuals for focused protection.
EAVE-II Consortium. Efficacy of two doses of COVID-19 vaccine	16th September 2021	**Paul M McKeigue**, David A McAllister, Chris Robertson, Sharon Hutchinson, Stuart McGurnaghan,	https://www.medrxiv.org/content/10.1101/2021.09.13.21262360v1	Study to determine if COVID-19 effectiveness varies with clinical risk category and investigate risk factors for developing severe COVID-19,	Two doses of vaccine protect against severe COVID-19 in clinically extremely vulnerable (CEV) individuals but the residual risk in double-

against severe COVID-19 in those with risk conditions and residual risk to the clinically extremely vulnerable: The REACT-SCOT case-control study		Diane Stockton, **Helen M Colhoun**, **for the PHS COVID-19 Epidemiology and Research Cell**		in those who have already received two doses of vaccine. Considering immunocompromised groups – some extremely vulnerable groups experience lower vaccine effectiveness, but this is not the case for all extremely vulnerable groups.	vaccinated individuals remains far higher in those who are CEV than in those who are not. These results suggest that any policy of offering booster doses to doubly-vaccinated individuals should focus initially on the clinically vulnerable and lay a basis for determining eligibility for passive immunization to protect those at highest risk.
Characterising Adults in Scotland who are Not Vaccinated Against COVID-19.	7th September 2022	Safraj Shahul Hameed, Elliott Hall, Zoe Grange, Christopher Sullivan, Sharon Kennedy, Lewis D Ritchie, Utkarsh Agrawal, Colin R Simpson, Syed Ahmar Shah, Igor Rudan, Colin McCowan, Josephine L K Murray, Chris Robertson, Aziz Sheikh.	https://www.thelancet.com/action/showPdf?pii=S0140-6736%2822%2901653-1	Demographic information about unvaccinated adults in Scotland.	Demographic information about unvaccinated adults in Scotland, which found that those who were unvaccinated were more likely to be male, live in urban areas with high deprivation or have more than three pre-existing medical conditions. Even after accounting for possible overinflation of population size, a considerable proportion of the adult population of Scotland remains unvaccinated against COVID-19. Predictors of unvaccinated status found may help with formulating a revised national vaccination strategy.
Temporal trends and forecasting of COVID-19	5th July 2021	Colin R Simpson, Chris Robertson, Eleftheria Vasileiou, Emily Moore,	https://www.sciencedirect.com/science/article/pii/S2589750021001059?via%3Dihub	Aimed to create a national dataset of patient-level data in Scotland to identify temporal	The cohort included 5,384,819 people, representing 98·6% of the entire estimated population

hospitalisations and deaths in Scotland using a national real-time patient-level data platform: a statistical modelling study		Colin McCowan, Utkarsh Agrawal, Helen R Stagg, Annemarie Docherty, Rachel Mulholland, Josephine L K Murray, Sir Lewis D Ritchie, **Jim McMenamin**, Aziz Sheikh		trends and COVID-19 risk factors, and to develop a novel statistical prediction model to forecast COVID-19-related deaths and hospitalisations during the second wave.	residing in Scotland during 2020. Hospitalisation and death among those testing positive for SARS-CoV-2 between March 1 and June 23, 2020, were associated with several patient characteristics, including male sex and various comorbidities. For those testing positive, there were decreasing trends in hospitalisation and death rates. The proportion of positive tests among older age groups (>40 years) and those with at-risk comorbidities increased during October 2020. The estimated incidence of SARS-CoV-2 infection based on positive tests recorded in this unique data resource has provided forecasts of hospitalisation and death rates for the whole of Scotland. These findings were used by the Scottish Government to inform their response to reduce COVID-19-related morbidity and mortality.
REACT-SCOT Consortium					
Rapid Epidemiological	20th Octob	**Paul McKeigue, Helen Colhoun et al.**	https://journals.plos.org/plosmedicine/article/file?id=10.1371/journal.pmed	The objectives of this study were to identify risk factors for	The study has shown that, along with older age and male sex,

Analysis of Comorbidities and Treatments as Risk Factors for COVID-19 in Scotland (REACT-SCOT): A Population-Based Case-Control Study	er 2020		.1003374&type=printable	severe coronavirus disease 2019 (COVID-19) and to lay the basis for risk stratification based on demographic data and health records.	severe COVID-19 is strongly associated with past medical history across all age groups. Many comorbidities beyond the risk conditions designated by public health agencies contribute to this. A risk classifier that uses all the information available in health records, rather than only a limited set of conditions, will more accurately discriminate between low-risk and high-risk individuals who may require shielding until the epidemic is over.
Relation of severe COIVD-19 in Scotland to transmission-related factors and risk conditions eligible for shielding support: REACT-SCTO case-control study	23rd June 2021	**Paul McKeigue, Helen Colhoun et al.**	https://bmcmedicine.biomedcentral.com/articles/10.1186/s12916-021-02021-5	Clinically vulnerable individuals have been advised to shield themselves during the COVID-19 epidemic. The objectives of this study were to investigate (1) the rate ratio of severe COVID-19 associated with eligibility for the shielding programme in Scotland across the first and second waves of the epidemic and (2) the relation of severe COVID-19 to transmission-related factors in those in shielding and the general population.	The effectiveness of shielding vulnerable individuals was limited by the inability to control transmission in hospital and from other adults in the household. Mitigating the impact of the epidemic requires control of nosocomial transmission. Severe COVID-19 was strongly associated with recent exposure to hospital (defined as 5 to 14 days before presentation date).
Vaccine efficacy against severe	June 2022	**Paul McKeigue, Helen Colhoun et al**	https://www.thelancet.com/action/showPdf?pii=S	Reports have suggested that the efficacy of vaccines against	This study and others suggest that the efficacy of mRNA

COVID-19 in relation to delta variant (B.1.617.2) and time since second dose in patients in Scotland (REACT-SCOT): a case-control study			2213-2600%2822%2900045-5	COVID-19 might have fallen since the delta SARS-CoV-2 variant replaced the alpha variant as the predominant variant. This study aimed to investigate, for the two main classes of vaccine, whether efficacy against severe COVID-19 has decreased since delta became the predominant variant and whether the efficacy of two doses of vaccine against severe COVID-19 wanes with time since second dose.	vaccines (such as Pfizer and Moderna) against severe disease caused by the SARS-CoV-2 delta variant remains high up to at least 5–6 months after second vaccine dose. However, the efficacy of the ChAdOx1 vaccine (Oxford AstraZeneca) against severe COVID-19 wanes substantially by 20 weeks from second dose. Efficacy of vaccines after 20 weeks and against newer COVID-19 variants remains to be established. The findings support the case for additional protective measures for those at risk of severe disease, including, but not limited to, booster doses, at times when transmission rates are high or expected to rise.
Other Studies Requested					
Risk of severe COVID-19 in patients with inflammatory rheumatic diseases treated with immunosuppressi	12th May 2022 and followed up in 2023	**P McKeigue** and **Helen Colhoun** as lead authors although there are other contributors.	https://eprints.gla.ac.uk/268690/3/268690.pdf https://www.tandfonline.com/doi/full/10.1080/03009742.2022.2063376	The purpose of this study was to investigate the association of severe coronavirus disease 2019 (COVID-19) in patients with inflammatory rheumatic diseases (IRDs) treated with immunosuppressive drugs.	The risk of hospitalized COVID-19 is elevated in inflammatory rheumatic diseases patients treated with immunosuppressive drugs compared with the general population. Of these drugs, methotrexate, hydroxychloroquine, and TNF

ve therapy in Scotland					inhibitors carry the lowest risk. The highest risk is associated with prednisolone. A larger study is needed to estimate reliably the risks associated with each class of targeted disease-modifying anti-rheumatic drugs (DMARD).
Risks of and risk factors for COVID-19 disease in people with diabetes: a cohort study of the total population of Scotland.	February 2021	**P McKeigue** and **Helen Colhoun** as lead authors although there are other contributors.	https://www.thelancet.com/pdfs/journals/landia/PIIS2213-8587(20)30405-8.pdf	The study aimed to ascertain the cumulative risk of fatal or critical care unit-treated COVID-19 in people with diabetes and compare it with that of people without diabetes, and to investigate risk factors for and build a crossvalidated predictive model of fatal or critical care unit-treated COVID-19 among people with diabetes.	Overall risks of fatal or critical care unit-treated COVID-19 were substantially elevated in those with type 1 and type 2 diabetes compared with the background population. The risk of fatal or critical care unit-treated COVID-19, and therefore the need for special protective measures, varies widely among those with diabetes but can be predicted reasonably well using previous clinical history.
Reinfection with SARS-CoV-2: outcome, risk factors and vaccine efficacy in a Scottish cohort	24th November 2021	**P McKeigue** and **Helen Colhoun** as lead authors although there are other contributors.	https://www.medrxiv.org/content/10.1101/2021.11.23.21266574v1	The objective of this study was to investigate how protection against COVID-19 conferred by previous infection is modified by vaccination.	The combination of natural infection and vaccination provides maximal protection against new infection with SARS-CoV-2: prior vaccination does not impair this protection.

Appendix A - Part Two

Extract from PHS Module 2A Rule 9 Statement (Para. 7.5) in relation to the EAVE-II Consortium

7.5.1 Early on in the pandemic PHS was able to work with partners at Edinburgh University, with the support of the Scottish Government, to re-start the Early Estimation of Vaccine and Anti-Viral Effectiveness (EAVE) project, a data reporting system originally created to support the 2009 swine flu pandemic response. In order to inform the national response to COVID-19, PHS worked closely with the University of Edinburgh's Usher Institute, to bring together:

- General practice records for almost all of the population of Scotland.
- NHS Scotland hospital, laboratory test results for SAR-CoV-2, vaccine and National Records for Scotland death data.
- Researchers from the universities of Glasgow, Strathclyde and St Andrews
- Funding from the Medical Research Council and National Institute for Health Research.
- Support from the Scottish Government.

7.5.2 The project was re-named Early Pandemic Evaluation and Enhanced Surveillance of COVID-19 (EAVE-II) and went on to generate vital intelligence. The project garnered international attention when it published one of the first evaluations into the effectiveness of COVID-19 vaccinations. First published on a pre-print server on 22nd February 2021 (PHS/129 - INQ000147534), and then in the Lancet on 23rd April 2021 (PHS/130 - INQ000147546), EAVE-II findings showed that the Oxford-AstraZeneca and Pfizer-BioNTech vaccines reduced the number of people being hospitalised with COVID-19. Randomised controlled trials had already shown the vaccines were safe and effective, but EAVE-II provided the first evidence that it had an effect at a national level. Scotland's size and data infrastructure, plus the speed of the rollout of the UK-wide vaccination programme, meant that the EAVE-II consortium was the first in the world to be able to publish such findings.

7.5.3 PHS published a statement (PHS/131 - INQ000228390) highlighting how welcome and encouraging the results were and Dr Jim McMenamin was featured on the national news. There was extensive coverage in the media and the First Minister highlighted the study in her COVID-19 statement on 22nd February saying 'this is exceptionally encouraging news' (PHS/132 - INQ000228391).

7.5.4. The consortium subsequently addressed further high-profile issues around subsequent waves of COVID-19 infection and the effectiveness of re-vaccination including:

- The waning effectiveness of the vaccine, which supported the delivery of boosters for vulnerable individuals for focused protection and informed discussions around prioritisation for boosters (PHS/133 - INQ000147588)
- Immunocompromised groups, which show that some specific clinically extremely vulnerable groups experience lower vaccine effectiveness, but that this is not the case for all clinically extremely vulnerable groups (PHS/134 - INQ000147535 groups)
- Demographic information about unvaccinated adults in Scotland, which found that those who were unvaccinated were more likely to be male, live in urban areas with high deprivation or have more than three pre-existing medical conditions (PHS/135 - INQ000147525)
- The effectiveness of Scotland's vaccination programme in preventing deaths from the Delta variant (PHS/136 - INQ000147585)

Summary of References in Module 2.2A Corporate Statement Paragraphs 7.5.1-7.5.

EAVE-II Consortium

"The project garnered international attention when it published one of the first evaluations into the effectiveness of COVID-19 vaccinations."

Ref 129 and 130 – Published evaluations

129 – EAVE-II Consortium. Effectiveness of First Dose of COVID-19 Vaccines Against Hospitalisation in Scotland: National Prospective Cohort Study of 5.4 Million People. Eleftheria Vasileiou, Colin R. Simpson, Chris Robertson, Ting Shi, Steven Kerr, Utkarsh Agrawal, Ashley Akbari, Stuart Bedston, Jillian Beggs, Declan Bradle, Antony Chuter, Simon de Lusignan, Annemarie Docherty, David Ford, Richard Hobbs, Mark Joy,

Srinivasa Vittal Katikireddi, James Marple, Colin McCowan, Dylan McGagh, Jim McMenamin, Emily Moore, Josephine-L.K Murray, Jiafeng Pan, Lewis D Ritchie, Syed Ahmar Shah, Sarah Stock, Fatemeh Torabi, Ruby S. M. Tsang, Rachael Wood, Mark Woolhouse, Aziz Sheikh Feb 2021 https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3789264

The Pfizer-BioNTech and Oxford-AstraZeneca COVID-19 vaccines have demonstrated high efficacy against the COVID-19 infection in phase 3 clinical trials and are now being used in national vaccine programmes in the UK and several other countries. The aim of this study was to estimate the effectiveness of the first does of these vaccines in preventing hospital admissions.

Summary Findings – A single dose of either vaccine resulted in substantial reductions in the risk of COVID-19 related hospitalisation in Scotland.

130 – The Lancet. Interim Findings from First-Dose Mass COVID-19 Vaccination Roll-Out and COVID-19 Hospital Admissions in Scotland: A National Prospective Cohort Study. April 2021

https://www.thelancet.com/action/showPdf?pii=S0140-6736%2821%2900677-2

The Pfizer–BioNTech and Oxford–AstraZeneca COVID-19 vaccines have shown high efficacy against disease in phase 3 clinical trials and are now being used in national vaccination programmes in the UK and several other countries. The aim of our study was to investigate the association between the mass roll-out of the first doses of these COVID-19 vaccines and hospital admissions for COVID-19.

Summary Findings – Mass roll-out of the first doses of the Pfizer–BioNTech and Oxford–AstraZeneca vaccines was associated with substantial reductions in the risk of hospital admission due to COVID-19 in Scotland.

Ref 131 – PHS statement

131 – Vaccine Linked to Reduction in Risk of COVID-19 Admissions to Hospital. 22nd Feb 2021 Paul M McKeigue, David A McAllister, Chris Robertson, Sharon Hutchinson, Stuart McGurnaghan, Diane Stockton, Helen M Colhoun, for the PHS COVID-19 Epidemiology and Research Cell

(https://www.publichealthscotland.scot/news/2021/february/vaccine-linked-to-reduction-in-risk-of-covid-19-admissions-to-hospitals/)

Vaccination has been linked to a substantial reduction in the risk of COVID-19 admissions to Scotland's hospitals. As part of the EAVE II project, which uses patient data to track the pandemic and the vaccine rollout in real-time, Public Health Scotland (PHS), the Universities of Edinburgh, Strathclyde, Aberdeen, Glasgow and St Andrew's analysed data on vaccine effect.

The data was gathered between 8 December and 15 February. During this period, 1.14 million vaccines were administered and 21 per cent of the Scottish population had received a first dose.

Summary Findings – Researchers compared the outcomes of those who had received their first jab with those who had not. The study shows that, by the fourth week after receiving the initial dose, the Pfizer and Oxford-AstraZeneca vaccines were shown to reduce the risk of hospitalisation from COVID-19 in up to 85 per cent and 94 per cent, respectively.

Ref 132 – First Minister statement

132 – Coronavirus (COVID-19) Update: First Minister's Statement – 22nd Feb 2021 Statement given by First Minister Nicola Sturgeon at Media Briefing in St Andrew's House, Edinburgh

(https://www.gov.scot/publications/coronavirus-covid-19-update-first-ministers-statement-monday-22-february-2021/)

The statement began with updates on COVID-19 positive reported cases, hospitalisations, intensive care patient numbers and COVID-19 related deaths.

Reported 1,445,488 people in Scotland receiving first doses of the vaccine and 1,863 people received their second dose – it is not clear if the second dose statistics is the number in total in Scotland at that stage or just on the previous day.

Lower supplies of vaccine mentioned but expected to improve. Uptake of vaccine has been extraordinarily high. As of this week now starting to vaccinate people in priority group six and from now this group will include those with mild or moderate learning disabilities. Group six accounts for the largest group of the population invited to be vaccinated to date. It will account of 1/5 of the entire adult population in Scotland.

Summary Findings Reported – Edinburgh University this morning published the results of a study showing that by the fourth week after getting a first dose, the Pfizer and Oxford-AstraZeneca vaccines reduced the risk of hospitalisation from COVID-19 by 85 per cent and 94 per cent respectively.

Ref 133 – Effectiveness of Vaccine

133 – Efficacy of Vaccination Against Severe COVID-19 in Relation to Delta Varient and Time Since Second Dose: the REACT-SCOT Case-Control Study. Paul M McKeigue, David A McAllister, Sharon J Hutchinson, Chris Robertson, Diane Stockton, Helen M Colhoun, for the PHS COVID-19 Epidemiology and Research Cell. Published 15th September 2021.

(https://www.medrxiv.org/content/10.1101/2021.09.12.21263448v1)

The purpose of this study was to investigate: (1) whether vaccine efficacy against severe COVID-19 has decreased since Delta became the predominant variant; (2) whether efficacy wanes with time since second dose. The main outcome measure was Severe COVID-19, defined as cases with entry to critical care or fatal outcome.

Summary Findings - Effectiveness of vaccination against severe COVID-19 decreased in May 2021 coinciding with the replacement Alpha variant by the Delta variant in Scotland, but this decrease was reversed over the next month. In the most recent time window, the efficacy of two doses against severe COVID-19 was 91% for the AstraZeneca product and 92% for Pfizer or Moderna products. Against the broader category of hospitalised or fatal COVID-19, efficacy in this time window was slightly lower: 88% for the AstraZeneca product, 91% for Pfizer or Moderna vaccines. Efficacy against COVID-19 declined rapidly in the first two months since second dose but more slowly thereafter.

These results suggest that the rapid early waning of effectiveness against hospitalised COVID-19 after the second dose tapers off within a few months. This weakens the rationale for policies based on delivering booster doses to the entire population, rather than to vulnerable individuals for focused protection.

Ref 134 – Immunocompromised groups

134 – EAVE-II Consortium. Efficacy of two doses of COVID-19 vaccine against severe COVID-19 in those with risk conditions and residual risk to the clinically extremely vulnerable: The REACT-SCOT case-control study. Paul M McKeigue, David A McAllister, Chris Robertson, Sharon Hutchinson, Stuart McGurnaghan, Diane Stockton, Helen M Colhoun, for the PHS COVID-19 Epidemiology and Research Cell – 16th September 2021

(https://www.medrxiv.org/content/10.1101/2021.09.13.21262360v1)

Study to determine if COVID-19 effectiveness varies with clinical risk category and investigate risk factors for developing severe COVID-19, in those who have already received two doses of vaccine. Considering immunocompromised groups – some extremely vulnerable groups experience lower vaccine effectiveness, but this is not the case for all extremely vulnerable groups.

Summary Findings - Two doses of vaccine protect against severe COVID-19 in clinically extremely vulnerable (CEV) individuals but the residual risk in double-vaccinated individuals remains far higher in those who are CEV than in those who are not. These results suggest that any policy of offering booster doses to doubly-vaccinated individuals should focus initially on the clinically vulnerable and lay a basis for determining eligibility for passive immunization to protect those at highest risk.

Ref 135 – Demographic Information

135 – Characterising Adults in Scotland who are Not Vaccinated Against COVID-19. Safraj Shahul Hameed, Elliott Hall, Zoe Grange, Christopher Sullivan, Sharon Kennedy, Lewis D Ritchie, Utkarsh Agrawal, Colin R Simpson, Syed Ahmar Shah, Igor Rudan, Colin McCowan, Josephine L K Murray, Chris Robertson, Aziz Sheikh. Published 7th September 2022

(https://www.thelancet.com/action/showPdf?pii=S0140-6736%2822%2901653-1)

Demographic information about unvaccinated adults in Scotland, which found that those who were unvaccinated were more likely to be male, live in urban areas with high deprivation or have more than three pre-existing medical conditions. Even after accounting for possible overinflation of population size, a considerable proportion of the adult population of Scotland remains unvaccinated against COVID-19. Predictors of unvaccinated status found may help with formulating a revised national vaccination strategy.

Ref 136 – Effectiveness of Scotland's Programme in Preventing Deaths from Delta Variant

136 – Temporal trends and forecasting of COVID-19 hospitalisations and deaths in Scotland using a national real-time patient-level data platform: a statistical modelling study. Published in the Lancet online, 5th July 2021. Colin R Simpson,

Chris Robertson, Eleftheria Vasileiou, Emily Moore, Colin McCowan, Utkarsh Agrawal, Helen R Stagg, Annemarie Docherty,
Rachel Mulholland, Josephine L K Murray, Sir Lewis D Ritchie, Jim McMenamin, Aziz Sheikh
(https://www.sciencedirect.com/science/article/pii/S2589750021001059?via%3Dihub)

Aimed to create a national dataset of patient-level data in Scotland to identify temporal trends and COVID-19 risk factors, and to develop a novel statistical prediction model to forecast COVID-19-related deaths and hospitalisations during the second wave.

Summary – The cohort included 5,384,819 people, representing 98·6% of the entire estimated population residing in Scotland during 2020. Hospitalisation and death among those testing positive for SARS-CoV-2 between March 1 and June 23, 2020, were associated with several patient characteristics, including male sex and various comorbidities. For those testing positive, there were decreasing trends in hospitalisation and death rates. The proportion of positive tests among older age groups (>40 years) and those with at-risk comorbidities increased during October 2020.

The estimated incidence of SARS-CoV-2 infection based on positive tests recorded in this unique data resource has provided forecasts of hospitalisation and death rates for the whole of Scotland. These findings were used by the Scottish Government to inform their response to reduce COVID-19-related morbidity and mortality.

Appendix A – Part 3

Full list of EAVE-II & PHS COVID-19 publications to date:

EAVE-II Research Publications

1. Predicting incomplete COVID-19 vaccination schedules in Scotland
2. Increased risk of COVID-19 outcomes among minority ethnic groups within Scotland
3. Vaccine effectiveness and severity of Omicron BA.5 variant on COVID-19 outcomes in Scotland
4. Accelerated waning of COVID-19 vaccines due to obesity
5. Pre-print: Identifying Long Covid Using Electronic Health Records
6. Pre-print: Impact of antiviral and monoclonal antibody treatments on serious COVID-19 outcomes
7. Effectiveness of mRNA boosters against symptomatic infection and severe COVID-19 in Brazil and Scotland
8. COPS: Study of major congenital anomalies following COVID-19 vaccination and SARS-CoV-2 infection
9. COPS: Confirmed SARS-CoV-2 infection in Scottish newborns 2020–2022
10. Letter: Uptake of monoclonal antibodies and anti-viral therapies for COVID-19 in Scotland
11. Assessing medication use patterns in patients hospitalised with COVID-19: a retrospective study
12. Spotlight: Patient collaboration in COVID-19 research: translating ideas to reality
13. Letter: Severity of Omicron BA.2 variant and vaccine effectiveness against symptomatic disease in Scotland
14. Waning of first- and second-dose ChAdOx1 and BNT162b2 COVID-19 vaccinations across the UK
15. COPS: Early Pregnancy Outcomes following COVID-19 Vaccination and SARS-COV-2 Infection in Pregnant Women

16. Severe COVID-19 outcomes after full vaccination of primary schedule and initial boosters
17. COPS: Pregnancy outcomes following Delta and Omicron SARS-CoV-2 infection in Scotland
18. BNT162b2 uptake, safety, effectiveness and waning in children and young people aged 12–17 years in Scotland
19. Risk of COVID-19 hospitalizations among school-aged children in Scotland
20. Letter: Characterising adults in Scotland who are not vaccinated against COVID-19
21. Second-dose Oxford-AstraZeneca and Pfizer-BioNTech vaccines and blood clotting and bleeding events in Scotland
22. Effectiveness of Two-Dose Pfizer-BioNTech vaccine among Adolescents in Scotland and Brazil
23. COVID-19 vaccine effectiveness against symptomatic SARS-CoV-2 infection and severe COVID-19 outcomes from Delta AY.4.2
24. Pre-print: Obesity is associated with reduced SARS-CoV-2 vaccine efficacy
25. Protocol: Common protocol for validation of the QCOVID algorithm across the four UK nations
26. Impact of first UK COVID-19 lockdown on hospital admissions in England, Scotland and Wales
27. Impact on emergency and elective hospital-based care in Scotland over the first year of the pandemic
28. Severity of omicron variant of concern and effectiveness of vaccine boosters against symptomatic disease in Scotland (EAVE II)
29. Pre-print: Waning of BNT162b2 or ChadOx1 mRNA Boosters against symptomatic infection and severe COVID-19 in Brazil and Scotland
30. Pre-print: Vaccine Effectiveness of Two-Dose BNT162b2 Against COVID-19 Symptomatic Infection and Severe Cases Among Adolecents
31. Vaccinations, incidence of SARS-CoV-2 infections and COVID-19 hospitalisations in Scotland in the Delta era
32. Uptake of infant and preschool immunisations in Scotland and England during the COVID-19 pandemic
33. First dose ChAdOx1 and BNT162b2 COVID-19 vaccinations and cerebral venous sinus thrombosis
34. Protocol: Investigating the uptake, effectiveness and safety of COVID-19 vaccines

35. Vaccine effectiveness of heterologous CoronaVac plus BNT162b2 in Brazil
36. Risk of serious COVID-19 outcomes among adults with asthma in Scotland: a national incident cohort study
37. SARS-CoV-2 infection and COVID-19 vaccination rates in pregnant women in Scotland
38. Pre-print: Severity of Omicron variant of concern and vaccine effectiveness against symptomatic disease
39. Protocol: Uptake, effectiveness and safety of COVID-19 vaccines in children and young people in Scotland
40. Two-dose ChAdOx1 nCoV-19 vaccine protection against COVID-19 hospital admissions and deaths over time
41. Risk of COVID-19 hospital admission among children aged 5–17 years with asthma in Scotland: a national incident cohort study
42. Protocol: Retrospective cohort study to evaluate medication use in patients hospitalised with COVID-19 in Scotland
43. External validation of the QCovid risk prediction algorithm for risk of COVID-19 hospitalisation and mortality in adults
44. Characteristics and risk of COVID-19-related death in fully vaccinated people in Scotland
45. Neurological complications after first dose of COVID-19 vaccination and SARS-CoV-2 infection
46. Association between multimorbidity and mortality in a cohort of patients admitted to hospital with COVID-19 in Scotland
47. Vaccine Efficacy against the Delta Variant in Scotland
48. COVID-19 hospital admissions and deaths post BNT162b2 and ChAdOx1 vaccinations
49. Protocol: Ethnic and social inequalities in COVID-19 outcomes in Scotland
50. Predicted COVID-19 positive cases, hospitalisations, and deaths associated with the Delta variant of concern, June–July, 2021
51. Temporal trends and forecasting of COVID-19 hospitalisations and deaths in Scotland
52. SARS-CoV-2 Delta VOC in Scotland: demographics, risk of hospital admission, and vaccine effectiveness
53. First-dose ChAdOx1 and BNT162b2 COVID-19 vaccines and thrombocytopenic, thromboembolic and hemorrhagic events in Scotland.

54. Cohort profile: Early pandemic evaluation and enhanced surveillance of COVID-19 (EAVE II) database

55. Impact of COVID-19 Lockdown on the Incidence and Mortality of Acute Exacerbations of COPD

56. Interim findings from first-dose mass COVID-19 vaccination roll-out and COVID-19 hospital admissions in Scotland

57. Impact of COVID-19 lockdown on emergency asthma admissions and deaths

58. Pre-print of COVID-19 Vaccines Effectiveness in Scotland paper

59. COVID-19 in Pregnancy in Scotland (COPS): protocol for an observational study using linked Scottish national data

60. Living risk prediction algorithm (QCOVID) for risk of hospital admission and mortality from COVID-19 in adults

61. Impact of COVID-19 on accident and emergency attendances and admissions in Scotland

62. Protocol: EAVE II Study

Appendix A – Part 4

Extract from PHS Corporate Statement in relation to the REACT-SCOT Consortium

Page 78. (7.6)

7.6.1 PHS also worked with the Usher Institute at the University of Edinburgh along with other academic partners including the University of Glasgow, Glasgow Caledonian University, and the University of Strathclyde on the REACT-SCOT case control study (Rapid Epidemiological Analysis of Comorbidities and Treatments as risk factors for COVID-19 in Scotland). This is a population-based case-control study that works to identify risk factors for severe COVID-19 and to lay the basis for risk stratification based on demographic data and health records. It involves examining the health outcomes of people who have had COVID-19 and comparing each person with a set of 10 'controls' selected from the general population. The study reports periodically, with findings published in scientific journals.

7.6.2 In October 2020 the REACT-SCOT consortium published Rapid Epidemiological Analysis of Comorbidities and Treatments as risk factors for COVID-19 in Scotland (REACT-SCOT): A population-based case-control study (PHS/137 - INQ000147574).[137] The study showed that, along with older age and male sex, severe COVID-19 is strongly associated with past medical conditions across all age groups, many beyond the risk conditions designated by public health agencies contributing to this. This meant that the risk to younger individuals without any recent history of hospital admission or use of prescription drugs is very low.

7.6.3 As part of the shielding evaluation described in section 4.8, PHS led a follow-up study through the REACT-SCOT consortium to explore the risk of severe COVID-19 specifically among shielding people (PHS/138 - INQ000147576).[138] This demonstrated that the shielding programme correctly identified people at higher risk of severe COVID-19. The risk of severe COVID-19 varied between the different clinical shielding conditions. The study also looked at the effectiveness of the shielding programme and

found that the efficacy of shielding vulnerable individuals was limited by the inability to control transmission in hospital and from other adults in the household.

7.6.4 PHS also used the REACT-SCOT study to examine vaccine efficacy. Vaccine efficacy against severe COVID-19 in relation to delta variant (B.1.617.2) and time since second dose in patients in Scotland (PHS/139 - INQ000147588)[139] was published in February 2022. This study was conducted following reports that suggested that the efficacy of vaccines against COVID-19 might have fallen since the delta variant replaced the alpha variant as the predominant variant. The study examined whether efficacy against severe COVID-19 has decreased since delta became the predominant variant and whether the efficacy of two doses of vaccine against severe COVID-19 wanes with time since second dose. The findings supported the case for additional protective measures for those at risk of severe disease, including, but not limited to, booster doses, at times when transmission rates are high or expected to rise. The REACT-SCOT consortium therefore provided key evidence of the impact of COVID-19 on vulnerable and at-risk groups.

Summary of References in Module 2.2A Corporate Statement Paragraphs 7.6.1-7.6.4

Page 78. (7.6)

REACT-SCOT Consortium

"This is a population-based case-control study that works to identify risk factors for severe COVID-19 and to lay the basis for risk stratification based on demographic data and health records."

Ref 137 – A population-based case-control study

137 – Rapid Epidemiological Analysis of Comorbidities and Treatments as Risk Factors for COVID-19 in Scotland (REACT-SCOT): A Population-Based Case-Control Study. Paul McKeigue, Helen Colhoun et al. Published 20th October 2020 (https://journals.plos.org/plosmedicine/article/file?id=10.1371/journal.pmed.1003374&type=printable)

The objectives of this study were to identify risk factors for severe coronavirus disease 2019 (COVID-19) and to lay the basis for risk stratification based on demographic data and health records.

Summary Findings – The study has shown that, along with older age and male sex, severe COVID-19 is strongly associated with past medical history across all age groups. Many comorbidities beyond the risk conditions designated by public health agencies contribute to this. A risk classifier that uses all the information available in health records, rather than only a limited set of conditions, will more accurately discriminate between low-risk and high-risk individuals who may require shielding until the epidemic is over.

Ref 138 – Study exploring the risk of severe COVID-19, specifically among shielding people.

138 – Relation of severe COIVD-19 in Scotland to transmission-related factors and risk conditions eligible for shielding support: REACT-SCTO case- control study. Published in BMC Medicine, 23rd June 2021. Paul McKeigue, Helen Colhoun et al. (https://bmcmedicine.biomedcentral.com/articles/10.1186/s12916-021-02021-5)

Clinically vulnerable individuals have been advised to shield themselves during the COVID-19 epidemic. The objectives of this study were to investigate (1) the rate ratio of severe COVID-19 associated with eligibility for the shielding programme in Scotland across the first and second waves of the epidemic and (2) the relation of severe COVID-19 to transmission-related factors in those in shielding and the general population.

Summary Findings – The effectiveness of shielding vulnerable individuals was limited by the inability to control transmission in hospital and from other adults in the household. Mitigating the impact of the epidemic requires control of nosocomial transmission. Severe COVID-19 was strongly associated with recent exposure to hospital (defined as 5 to 14 days before presentation date).

Ref 139 – Vaccine efficacy study

139 – Vaccine efficacy against severe COVID-19 in relation to delta variant (B.1.617.2) and time since second dose in patients in Scotland (REACT-SCOT): a case-control study. Published in the Lancet June 2022. Paul McKeigue, Helen Colhoun et al. (https://www.thelancet.com/action/showPdf?pii=S2213-2600%2822%2900045-5)

Reports have suggested that the efficacy of vaccines against COVID-19 might have fallen since the delta SARS-CoV-2 variant replaced the alpha variant as the predominant variant. This study aimed to investigate, for the two main classes of vaccine, whether efficacy against severe COVID-19 has decreased since delta became

the predominant variant and whether the efficacy of two doses of vaccine against severe COVID-19 wanes with time since second dose.

Summary Findings – This study and others suggest that the efficacy of mRNA vaccines (such as Pfizer and Moderna) against severe disease caused by the SARS-CoV-2 delta variant remains high up to at least 5–6 months after second vaccine dose. However, the efficacy of the ChAdOx1 vaccine (Oxford AstraZeneca) against severe COVID-19 wanes substantially by 20 weeks from second dose. Efficacy of vaccines after 20 weeks and against newer COVID-19 variants remains to be established. The findings support the case for additional protective measures for those at risk of severe disease, including, but not limited to, booster doses, at times when transmission rates are high or expected to rise.

Risk of severe COVID-19 in patients with inflammatory rheumatic diseases treated with immunosuppressive therapy in Scotland. 12th May 2022 and followed up in 2023 (https://eprints.gla.ac.uk/268690/3/268690.pdf) (https://www.tandfonline.com/doi/full/10.1080/03009742.2022.2063376)

The purpose of this study was to investigate the association of severe coronavirus disease 2019 (COVID-19) in patients with inflammatory rheumatic diseases (IRDs) treated with immunosuppressive drugs.

Summary Findings - The risk of hospitalized COVID-19 is elevated in inflammatory rheumatic diseases patients treated with immunosuppressive drugs compared with the general population. Of these drugs, methotrexate, hydroxychloroquine, and TNF inhibitors carry the lowest risk. The highest risk is associated with prednisolone. A larger study is needed to estimate reliably the risks associated with each class of targeted disease-modifying anti-rheumatic drugs (DMARD).

Risks of and risk factors for COVID-19 disease in people with diabetes: a cohort study of the total population of Scotland. The Lancet, February 2021. (https://www.thelancet.com/pdfs/journals/landia/PIIS2213-8587(20)30405-8.pdf)

The study aimed to ascertain the cumulative risk of fatal or critical care unit-treated COVID-19 in people with diabetes and compare it with that of people without diabetes,

and to investigate risk factors for and build a crossvalidated predictive model of fatal or critical care unit-treated COVID-19 among people with diabetes.

Summary Findings - Overall risks of fatal or critical care unit-treated COVID-19 were substantially elevated in those with type 1 and type 2 diabetes compared with the background population. The risk of fatal or critical care unit-treated COVID-19, and therefore the need for special protective measures, varies widely among those with diabetes but can be predicted reasonably well using previous clinical history.

Reinfection with SARS-CoV-2: outcome, risk factors and vaccine efficacy in a Scottish cohort (https://www.medrxiv.org/content/10.1101/2021.11.23.21266574v1). 24th November 2021.

The objective of this study was to investigate how protection against COVID-19 conferred by previous infection is modified by vaccination.

Summary Findings - The combination of natural infection and vaccination provides maximal protection against new infection with SARS-CoV-2: prior vaccination does not impair this protection.

Appendix A – Part 5

A list of 208 Scientific and research papers on the topic of COVID-19, authored or co-authored by Public Health Scotland staff. (*19 September 2023)*

1. Adeloye D, Katikireddi SV, Woolford L, Simpson CR, Shah SA, Agrawal U, et al. **Uptake, effectiveness and safety of COVID-19 vaccines in children and young people in Scotland: Protocol for early pandemic evaluation and enhanced surveillance of COVID-19 (EAVE II).** 2021;11:05026. https://doi.org/10.7189/jogh.11.05026.
2. Aggarwal D, Page AJ, Schaefer U, Savva GM, Myers R, Volz E, et al. **Genomic assessment of quarantine measures to prevent SARS-CoV-2 importation and transmission** 2022a;13. https://doi.org/10.1038/s41467-022-28371-z .
3. Aggarwal D, Warne B, Jahun AS, Hamilton WL, Fieldman T, du Plessis L, et al. **Genomic epidemiology of SARS-CoV-2 in a UK university identifies dynamics of transmission** 2022b;13. https://doi.org/10.1038/s41467-021-27942-w.
4. Agrawal U, Bedston S, McCowan C, Oke J, Patterson L, Robertson C, et al. **Severe COVID-19 outcomes after full vaccination of primary schedule and initial boosters: pooled analysis of national prospective cohort studies of 30 million individuals in England, Northern Ireland, Scotland, and Wales.** 2022;400:1305–20. https://doi.org/10.1016/S0140-6736(22)01656-7.
5. Agrawal U, Katikireddi SV, McCowan C, Mulholland RH, Azcoaga-Lorenzo A, Amele S, et al. **COVID-19 hospital admissions and deaths after BNT162b2 and ChAdOx1 nCoV-19 vaccinations in 2.57 million people in Scotland (EAVE II): a prospective cohort study**. 2021;9:1439–49. https://doi.org/10.1016/S2213-2600(21)00380-5.
6. Al Knawy B, Adil M, Crooks G, Rhee K, Bates D, Jokhdar H, et al. **The Riyadh Declaration: the role of digital health in fighting pandemics.** 2020;396:1537–9. https://doi.org/10.1016/S0140-6736(20)31978-4.
7. Alsallakh MA, Sivakumaran S, Kennedy S, Vasileiou E, Lyons RA, Robertson C, et al. **Impact of COVID-19 lockdown on the incidence and mortality of acute**

exacerbations of chronic obstructive pulmonary disease: national interrupted time series analyses for Scotland and Wales. 2021;19:124. https://doi.org/10.1186/s12916-021-02000-w.

8. Amele S, Kibuchi E, McCabe R, Pearce A, Henery P, Hainey K, et al. **Ethnic inequalities in positive SARS-CoV-2 tests, infection prognosis, COVID-19 hospitalisations and deaths: analysis of 2 years of a record linked national cohort study in Scotland.** 2023;77:641–8. https://doi.org/10.1136/jech-2023-220501.
9. Aminu AQ, McMahon AD, Clark C, Sherriff A, Buchanan C, Watling C, et al. **Inequalities in access to NHS primary care dental services in Scotland during the COVID-19 pandemic**. 2023. https://doi.org/10.1038/s41415-023-5856-z.
10. Bacchetti R, Connelly L, Browning L, Alexander CL. Changing Molecular Profiles of **Human Cryptosporidiosis Cases in Scotland as a Result of the Coronavirus Disease, COVID-19 Pandemic**. 2023;80:11462. https://doi.org/10.3389/bjbs.2023.11462.
11. Bagaria J, Jansen T, Marques DF, Hooiveld M, McMenamin J, de Lusignan S, et al. **Rapidly adapting primary care sentinel surveillance across seven countries in Europe for COVID-19 in the first half of 2020: strengths, challenges, and lessons learned.** 2022;27:06. https://doi.org/10.2807/1560-7917.ES.2022.27.26.2100864
12. Bedston S, Akbari A, Jarvis CI, Lowthian E, Torabi F, North L, et al. **COVID-19 vaccine uptake, effectiveness, and waning in 82,959 health care workers: A national prospective cohort study in Wales.** 2022;40:1180–9. https://doi.org/10.1016/j.vaccine.2021.11.061.
13. Bell S, Campbell J, Lambourg E, Mark P. **Authors' Reply: Clinical Studies of Vaccine Efficacy**. 2022a;33:1430–1. https://doi.org/10.1681/ASN.2022030382.
14. Bell S, Campbell J, Lambourg E, Watters C, O'Neil M, Almond A, et al. **The Impact of Vaccination on Incidence and Outcomes of SARS-CoV-2 Infection in Patients with Kidney Failure in Scotland.** 2022b;33:677–86. https://doi.org/10.1681/ASN.2022010046.
15. Bell S, Campbell J, Watters C, O'Neil M, Almond A, Buck K, et al. **The impact of Omicron on outcomes following infection with SARS-CoV-2 in patients**

with kidney failure in Scotland. 2023;16:197–200. https://doi.org/10.1093/ckj/sfac173.

16. Blayney MC, Stewart NI, Kaye CT, Puxty K, Chan Seem R, Donaldson L, et al. **Prevalence, characteristics, and longer-term outcomes of patients with persistent critical illness attributable to COVID-19 in Scotland: a national cohort study.** 2022;128:980–9. https://doi.org/10.1016/j.bja.2022.03.017.
17. Bosworth ML, Schofield R, Ayoubkhani D, Charlton L, Nafilyan V, Khunti K, et al. **Vaccine effectiveness for prevention of Covid-19 related hospital admission during pregnancy in England during the alpha and delta variant dominant periods of the SARS-CoV-2 pandemic: population based cohort study**. 2023;2:e000403. https://doi.org/10.1136/bmjmed-2022-000403.
18. Bradley DT, Murphy S, McWilliams P, Arnold S, Lavery S, Murphy J, et al. **Investigating the association between COVID-19 vaccination and care home outbreak frequency and duration.** 2022;203:110–5. https://doi.org/10.1016/j.puhe.2021.12.010.
19. Buckell J, Jones J, Matthews PC, Diamond SI, Rourke E, Studley R, et al. **COVID-19 vaccination, risk-compensatory behaviours, and contacts in the UK** 2023;13. https://doi.org/10.1038/s41598-023-34244-2.
20. Burns J, Mc Goldrick N, Sigerson D, Edwards M, Culshaw S, Clark C, et al. **A Health Inequalities Impact Assessment of the surveillance of COVID-19 in asymptomatic patients attending dental settings in Scotland.** 2022;39:254–9. https://doi.org/10.1922/CDH_00170Burns06.
21. Burton JK, Reid M, Gribben C, Caldwell D, Clark DN, Hanlon P, et al. **Impact of COVID-19 on care-home mortality and life expectancy in Scotland.** 2021;50:1029–37. https://doi.org/10.1093/ageing/afab080.
22. Calvert C, Brockway MM, Zoega H, Miller JE, Been JV, Amegah AK, et al. **Changes in preterm birth and stillbirth during COVID-19 lockdowns in 26 countries.** 2023a;7:529–44. https://doi.org/10.1038/s41562-023-01522-y.
23. Calvert C, Carruthers J, Denny C, Donaghy J, Hillman S, Hopcroft LEM, et al. **A population-based matched cohort study of early pregnancy outcomes following COVID-19 vaccination and SARS-CoV-2 infection.** 2022;13:6124. https://doi.org/10.1038/s41467-022-33937-y.
24. Calvert C, Carruthers J, Denny C, Donaghy J, Hopcroft LEM, Hopkins L, et al. **A population-based matched cohort study of major congenital anomalies**

following COVID-19 vaccination and SARS-CoV-2 infection. 2023b;14:107. https://doi.org/10.1038/s41467-022-35771-8.

25. Campbell C, Sommerfield T, Clark GRC, Porteous L, Milne AM, Millar R, et al. **COVID-19 and cancer screening in Scotland: A national and coordinated approach to minimising harm.** 2021;151:106606. https://doi.org/10.1016/j.ypmed.2021.106606.
26. Carlson CJ, Farrell MJ, Grange Z, Han BA, Mollentze N, Phelan AL, et al. **The future of zoonotic risk prediction.** 2021;376:20200358. https://doi.org/10.1098/rstb.2020.0358.
27. Cerqueira-Silva T, Katikireddi SV, de Araujo Oliveira V, Flores-Ortiz R, Junior JB, Paixao ES, et al. **Vaccine effectiveness of heterologous CoronaVac plus BNT162b2 in Brazil.** 2022;28:838–43. https://doi.org/10.1038/s41591-022-01701-w.
28. Cerqueira-Silva T, Shah SA, Robertson C, Sanchez M, Katikireddi SV, de Araujo Oliveira V, et al. **Effectiveness of mRNA boosters after homologous primary series with BNT162b2 or ChAdOx1 against symptomatic infection and severe COVID-19 in Brazil and Scotland: A test-negative design case-control study.** 2023;20:e1004156. https://doi.org/10.1371/journal.pmed.1004156.
29. Colhoun HM, McGurnaghan SJ, McKeigue PM. **Microvascular disease in diabetes and severe COVID-19 outcomes - Authors' reply.** 2021;9:201. https://doi.org/10.1016/S2213-8587(21)00055-3.
30. Collier DA, De Marco A, Ferreira IATM, Meng B, Datir RP, Walls AC, et al. **Sensitivity of SARS-CoV-2 B.1.1.7 to mRNA vaccine-elicited antibodies** 2021;593:136–41. https://doi.org/10.1038/s41586-021-03412-7.
31. Conway DI, Culshaw S, Edwards M, Clark C, Watling C, Robertson C, et al. **SARS-CoV-2 Positivity in Asymptomatic-Screened Dental Patients.** 2021;100:583–90. https://doi.org/10.1177/00220345211004849.
32. Creaney G, McMahon AD, Ross AJ, Bhatti LA, Paterson C, Conway DI. **Head and neck cancer in the UK: what was the stage before COVID-19? UK cancer registries analysis (2011-2018).** 2022;233:787–93. https://doi.org/10.1038/s41415-022-5151-4.

33. Cullen LA, Grange Z, Antal K, Waugh L, Alsina MS, Gibbons CL, et al. **COVID-19 vaccine safety in Scotland - background rates of adverse events of special interest.** 2023;224:1–7. https://doi.org/10.1016/j.puhe.2023.08.006.
34. Cuschieri S, Calleja N, Devleesschauwer B, Wyper GMA. **Estimating the direct Covid-19 disability-adjusted life years impact on the Malta population for the first full year.** 2021;21:1827. https://doi.org/10.1186/s12889-021-11893-4.
35. Daines L, Mulholland RH, Vasileiou E, Hammersley V, Weatherill D, Katikireddi SV, et al. **Deriving and validating a risk prediction model for long COVID-19: protocol for an observational cohort study using linked Scottish data.** 2022;12:e059385. https://doi.org/10.1136/bmjopen-2021-059385.
36. Dale CE, Takhar R, Carragher R, Katsoulis M, Torabi F, Duffield S, et al. **The impact of the COVID-19 pandemic on cardiovascular disease prevention and management.** 2023;29:219–25. https://doi.org/10.1038/s41591-022-02158-7.
37. Davies GA, Alsallakh MA, Sivakumaran S, Vasileiou E, Lyons RA, Robertson C, et al. **Impact of COVID-19 lockdown on emergency asthma admissions and deaths: national interrupted time series analyses for Scotland and Wales.** 2021;76:867–73. https://doi.org/10.1136/thoraxjnl-2020-216380.
38. Devleesschauwer B, McDonald SA, Speybroeck N, Wyper GMA. **Valuing the years of life lost due to COVID-19: the differences and pitfalls.** 2020;65:719–20. https://doi.org/10.1007/s00038-020-01430-2.
39. Dickson E, Palmateer NE, Murray J, Robertson C, Waugh C, Wallace LA, et al. **Enhanced surveillance of COVID-19 in Scotland: population-based seroprevalence surveillance for SARS-CoV-2 during the first wave of the epidemic**. 2021;190:132–4. https://doi.org/10.1016/j.puhe.2020.11.014.
40. Dickson EM, Zambon M, Pebody R, de Lusignan S, Elliot AJ, Ellis J, et al. **Do point-of-care tests (POCTs) offer a new paradigm for the management of patients with influenza?.** 2020;25:11. https://doi.org/10.2807/1560-7917.ES.2020.25.44.1900420.
41. Docherty AB, Farrell J, Thorpe M, Egan C, Dunn S, Norman L, et al. **Patient emergency health-care use before hospital admission for COVID-19 and long-term outcomes in Scotland: a national cohort study**. 2023;5:e446–57. https://doi.org/10.1016/S2589-7500(23)00051-1.

42. Douglas M, Katikireddi SV, Taulbut M, McKee M, McCartney G. **Mitigating the wider health effects of Covid-19 pandemic response.** 2020;369:m1557. https://doi.org/10.1136/bmj.m1557.
43. Fenton L, Gribben C, Caldwell D, Colville S, Bishop J, Reid M, et al. **Risk of hospital admission with Covid-19 among teachers compared with healthcare workers and other adults of working age in Scotland, March 2020 to July 2021: population based case-control study.** 2021;374:n2060. https://doi.org/10.1136/bmj.n2060.
44. Fernandes PM, O'Neill M, Kearns PKA, Pizzo S, Watters C, Baird S, et al. **Impact of the first COVID-19 pandemic wave on the Scottish Multiple Sclerosis Register population**. 2020;5:276. https://doi.org/10.12688/wellcomeopenres.16349.1.
45. Fitzpatrick D, Duncan EAS, Moore M, Best C, Andreis F, Esposito M, et al. **Epidemiology of emergency ambulance service calls related to COVID-19 in Scotland: a national record linkage study**. 2022;30:9. https://doi.org/10.1186/s13049-022-00995-6.
46. Flood J, Shingleton J, Bennett E, Walker B, Amin-Chowdhury Z, Oligbu G, et al. **Paediatric multisystem inflammatory syndrome temporally associated with SARS-CoV-2 (PIMS-TS): Prospective, national surveillance, United Kingdom and Ireland, 2020.** 2021;3:100075. https://doi.org/10.1016/j.lanepe.2021.100075.
47. Flook M, Jackson C, Vasileiou E, Simpson CR, Muckian MD, Agrawal U, et al. **Informing the public health response to COVID-19: a systematic review of risk factors for disease, severity, and mortality.** 2021;21:342. https://doi.org/10.1186/s12879-021-05992-1.
48. Florentino PTV, Millington T, Cerqueira-Silva T, Robertson C, de Araujo Oliveira V, Junior JBS, et al. **Vaccine effectiveness of two-dose BNT162b2 against symptomatic and severe COVID-19 among adolescents in Brazil and Scotland over time: a test-negative case-control study.** 2022;22:1577–86. https://doi.org/10.1016/S1473-3099(22)00451-0.
49. Foulkes S, Monk EJM, Sparkes D, Hettiarachchi N, Milligan ID, Munro K, et al. **Early Warning Surveillance for SARS-CoV-2 Omicron Variants, United Kingdom, November 2021-September 2022.** 2023;29:184–8. https://doi.org/10.3201/eid2901.221293.

50. Goulding A, McQuaid F, Lindsay L, Agrawal U, Auyeung B, Calvert C, et al. **Confirmed SARS-CoV-2 infection in Scottish neonates 2020-2022: a national, population-based cohort study.** 2023;108:367–72. https://doi.org/10.1136/archdischild-2022-324713.
51. Grange Z, Buelo A, Sullivan C, Moore E, Agrawal U, Boukhari K, et al. **Characteristics and risk of COVID-19-related death in fully vaccinated people in Scotland.** 2021;398:1799–800. https://doi.org/10.1016/S0140-6736(21)02316-3.
52. Green L, Ashton K, Bellis M, Clements T, Douglas M. **Predicted and observed impacts of COVID-19 lockdowns: two Health Impact Assessments in Scotland and Wales.** 2022;37. https://doi.org/10.1093/heapro/daac134.
53. Green MJ, Pearce A, Parkes A, Robertson E, Katikireddi SV. **Pre-school childcare and inequalities in child development.** 2021;14:100776. https://doi.org/10.1016/j.ssmph.2021.100776.
54. Greene GJ, Thomson CS, Donnelly D, Chung D, Bhatti L, Gavin AT, et al. **Whole-population trends in pathology-confirmed cancer incidence in Northern Ireland, Scotland and Wales during the SARS-CoV-2 pandemic: A retrospective observational study.** 2023;84:102367. https://doi.org/10.1016/j.canep.2023.102367.
55. Hall V, Foulkes S, Insalata F, Kirwan P, Saei A, Atti A, et al. **Protection against SARS-CoV-2 after Covid-19 Vaccination and Previous Infection.** 2022;386:1207–20. https://doi.org/10.1056/NEJMoa2118691.
56. Hameed SS, Hall E, Grange Z, Sullivan C, Kennedy S, Ritchie LD, et al. **Characterising adults in Scotland who are not vaccinated against COVID-19.** 2022;400:993–5. https://doi.org/10.1016/S0140-6736(22)01653-1.
57. Hanlon P, Chadwick F, Shah A, Wood R, Minton J, McCartney G, et al. **COVID-19 - exploring the implications of long-term condition type and extent of multimorbidity on years of life lost: a modelling study**. 2020a;5:75. https://doi.org/10.12688/wellcomeopenres.15849.3.
58. Hanlon P, Chadwick F, Shah A, Wood R, Minton J, McCartney G, et al. **COVID-19 - exploring the implications of long-term condition type and extent of multimorbidity on years of life lost: a modelling study.** 2020b;5:75. https://doi.org/10.12688/wellcomeopenres.15849.2.

59. Hanlon P, Chadwick F, Shah A, Wood R, Minton J, McCartney G, et al. **COVID-19 - exploring the implications of long-term condition type and extent of multimorbidity on years of life lost: a modelling study**. 2020c;5:75. https://doi.org/10.12688/wellcomeopenres.15849.1.
60. Hardelid P, Favarato G, Wijlaars L, Fenton L, McMenamin J, Clemens T, et al. **SARS-CoV-2 tests, confirmed infections and COVID-19-related hospital admissions in children and young people: birth cohort study**. 2022;6:08. https://doi.org/10.1136/bmjpo-2022-001545.
61. Hastie CE, Lowe DJ, McAuley A, Mills NL, Winter AJ, Black C, et al. **Natural history of long-COVID in a nationwide, population cohort study.** 2023;14:3504. https://doi.org/10.1038/s41467-023-39193-y.
62. Hastie CE, Lowe DJ, McAuley A, Winter AJ, Mills NL, Black C, et al. **Outcomes among confirmed cases and a matched comparison group in the Long-COVID in Scotland study.** 2022a;13:5663. https://doi.org/10.1038/s41467-022-33415-5.
63. Hastie CE, Lowe DJ, McAuley A, Winter AJ, Mills NL, Black C, et al. **Author Correction: Outcomes among confirmed cases and a matched comparison group in the Long-COVID in Scotland study.** 2022b;13:6540. https://doi.org/10.1038/s41467-022-34344-z.
64. Henery P, Vasileiou E, Hainey KJ, Buchanan D, Harrison E, Leyland AH, et al. **Ethnic and social inequalities in COVID-19 outcomes in Scotland: protocol for early pandemic evaluation and enhanced surveillance of COVID-19 (EAVE II).** 2021;11:e048852. https://doi.org/10.1136/bmjopen-2021-048852.
65. Hughes EC, Amat JAR, Haney J, Parr YA, Logan N, Palmateer N, et al. **Severe Acute Respiratory Syndrome Coronavirus 2 Serosurveillance in a Patient Population Reveals Differences in Virus Exposure and Antibody-Mediated Immunity According to Host Demography and Healthcare Setting.** 2021;223:971–80. https://doi.org/10.1093/infdis/jiaa788.
66. Innes H, Buch S, Barnes E, Hampe J, Marjot T, Stickel F. **The rs738409 G Allele in PNPLA3 Is Associated With a Reduced Risk of COVID-19 Mortality and Hospitalization.** 2021;160:2599-2601.e2. https://doi.org/10.1053/j.gastro.2021.02.059.

67. Jansen DE, Carai S, Scott E, Butu C, Pop I, Park M, et al. **COVID-19 has exposed the need for health system assessments to be more child health-sensitive.** 2022;12:03048. https://doi.org/10.7189/jogh.12.03048.
68. Jefferson E, Cole C, Mumtaz S, Cox S, Giles TC, Adejumo S, et al. **A Hybrid Architecture (CO-CONNECT) to Facilitate Rapid Discovery and Access to Data Across the United Kingdom in Response to the COVID-19 Pandemic: Development Study.** 2022;24:e40035. https://doi.org/10.2196/40035.
69. Joy M, Agrawal U, Fan X, Robertson C, Anand SN, Ordonez-Mena J, et al. **Thrombocytopenic, thromboembolic and haemorrhagic events following second dose with BNT162b2 and ChAdOx1: self-controlled case series analysis of the English national sentinel cohort.** 2023;32:100681. https://doi.org/10.1016/j.lanepe.2023.100681.
70. Katikireddi SV, Cerqueira-Silva T, Vasileiou E, Robertson C, Amele S, Pan J, et al. **Two-dose ChAdOx1 nCoV-19 vaccine protection against COVID-19 hospital admissions and deaths over time: a retrospective, population-based cohort study in Scotland and Brazil.** 2022;399:25–35. https://doi.org/10.1016/S0140-6736(21)02754-9.
71. Kemp SA, Collier DA, Datir RP, Ferreira IATM, Gayed S, Jahun A, et al. **SARS-CoV-2 evolution during treatment of chronic infection** 2021;592:277–82. https://doi.org/10.1038/s41586-021-03291-y.
72. Kerr S, Bedston S, Bradley DT, Joy M, Lowthian E, Mulholland RM, et al. **Waning of first- and second-dose ChAdOx1 and BNT162b2 COVID-19 vaccinations: a pooled target trial study of 12.9 million individuals in England, Northern Ireland, Scotland and Wales.** 2023;52:22–31. https://doi.org/10.1093/ije/dyac199.
73. Kerr S, Joy M, Torabi F, Bedston S, Akbari A, Agrawal U, et al. **First dose ChAdOx1 and BNT162b2 COVID-19 vaccinations and cerebral venous sinus thrombosis: A pooled self-controlled case series study of 11.6 million individuals in England, Scotland, and Wales.** 2022a;19:e1003927. https://doi.org/10.1371/journal.pmed.1003927.
74. Kerr S, Vasileiou E, Robertson C, Sheikh A. **COVID-19 vaccine effectiveness against symptomatic SARS-CoV-2 infection and severe COVID-19 outcomes from Delta AY.4.2: Cohort and test-negative study of 5.4 million**

individuals in Scotland. 2022b;12:05025. https://doi.org/10.7189/jogh.12.05025.

75. Kissling E, Hooiveld M, Brytting M, Vilcu A-M, de Lange M, Martinez-Baz I, et al. **Absence of association between 2019-20 influenza vaccination and COVID-19: Results of the European I-MOVE-COVID-19 primary care project, March-August 2020.** 2021a;15:429–38. https://doi.org/10.1111/irv.12839.
76. Kissling E, Hooiveld M, Martinez-Baz I, Mazagatos C, William N, Vilcu A-M, et al. **Effectiveness of complete primary vaccination against COVID-19 at primary care and community level during predominant Delta circulation in Europe: multicentre analysis, I-MOVE-COVID-19 and ECDC networks, July to August 2021.** 2022;27:05. https://doi.org/10.2807/1560-7917.ES.2022.27.21.2101104.
77. Kissling E, Hooiveld M, Sandonis Martin V, Martinez-Baz I, William N, Vilcu A-M, et al. **Vaccine effectiveness against symptomatic SARS-CoV-2 infection in adults aged 65 years and older in primary care: I-MOVE-COVID-19 project, Europe, December 2020 to May 2021.** 2021b;26:07. https://doi.org/10.2807/1560-7917.ES.2021.26.29.2100670.
78. Kläser K, Molteni E, Graham M, Canas LS, Österdahl MF, Antonelli M, et al. **COVID-19 due to the B.1.617.2 (Delta) variant compared to B.1.1.7 (Alpha) variant of SARS-CoV-2: a prospective observational cohort study** 2022;12. https://doi.org/10.1038/s41598-022-14016-0.
79. Kromydas T, Thomson RM, Pulford A, Green MJ, Katikireddi SV. **Which is most important for mental health: Money, poverty, or paid work? A fixed-effects analysis of the UK Household Longitudinal Study.** 2021;15:100909. https://doi.org/10.1016/j.ssmph.2021.100909.
80. Kurdi A, Platt N, Morrison A, Proud E, Gronkowski K, Mueller T, et al. **Evaluation of duration of antibiotic therapy across hospitals in Scotland including the impact of COVID-19 pandemic: a segmented interrupted time series analysis.** 2023;21:455–75. https://doi.org/10.1080/14787210.2023.2181789.
81. Lee B, Krishan P, Goodwin L, Iduye D, de Los Godos EF, Fryer J, et al. **Impact of COVID-19 mitigations on anxiety and depression amongst university students: A systematic review and meta-analysis.** 2023;13:06035. https://doi.org/10.7189/jogh.13.06035.

82. Lee D, Robertson C, Marques D. **Quantifying the small-area spatio-temporal dynamics of the Covid-19 pandemic in Scotland during a period with limited testing capacity.** 2022a;49:100508. https://doi.org/10.1016/j.spasta.2021.100508.
83. Lee D, Robertson C, McRae C, Baker J. **Quantifying the impact of air pollution on Covid-19 hospitalisation and death rates in Scotland.** 2022b;42:100523. https://doi.org/10.1016/j.sste.2022.100523.
84. Leslie K, Findlay B, Ryan T, Green LI, Harvey C, Whettlock AE, et al. **Epidemiology of SARS-CoV-2 during the first three waves in Scotland: A national record linkage study** 2022;77:1–8. https://doi.org/10.1136/jech-2022-219367.
85. Lindsay L, Calvert C, Shi T, Carruthers J, Denny C, Donaghy J, et al. **Neonatal and maternal outcomes following SARS-CoV-2 infection and COVID-19 vaccination: a population-based matched cohort study.** 2023;14:5275. https://doi.org/10.1038/s41467-023-40965-9.
86. Lone NI, McPeake J, Stewart NI, Blayney MC, Seem RC, Donaldson L, et al. **Influence of socioeconomic deprivation on interventions and outcomes for patients admitted with COVID-19 to critical care units in Scotland: A national cohort study.** 2021;1:100005. https://doi.org/10.1016/j.lanepe.2020.100005.
87. Malcolm W, Seaton RA, Haddock G, Baxter L, Thirlwell S, Russell P, et al. **Impact of the COVID-19 pandemic on community antibiotic prescribing in Scotland.** 2020;2:aa105. https://doi.org/10.1093/jacamr/dlaa105.
88. Manoukian S, Stewart S, Dancer SJ, Mason H, Graves N, Robertson C, et al. **Probabilistic microsimulation to examine the cost-effectiveness of hospital admission screening strategies for carbapenemase-producing enterobacteriaceae (CPE) in the United Kingdom.** 2022;23:1173–85. https://doi.org/10.1007/s10198-021-01419-5.
89. Marsh K, Griffiths E, Young JJ, Gibb C-A, McMenamin J. **Contributions of the EURO 2020 football championship events to a third wave of SARS-CoV-2 in Scotland, 11 June to 7 July 2021.** 2021;26:08. https://doi.org/10.2807/1560-7917.ES.2021.26.31.2100707.
90. Marsh K, Tayler R, Pollock L, Roy K, Lakha F, Ho A, et al. **Investigation into cases of hepatitis of unknown aetiology among young children, Scotland,**

1 January 2022 to 12 April 2022. 2022;27:04. https://doi.org/10.2807/1560-7917.ES.2022.27.15.2200318.

91. McAuley A, Gousias P, Hasan T, Rashid L, Richardson C, Reid G, et al. **National population prevalence of antibodies to SARS-CoV-2 among pregnant women in Scotland during the second wave of the COVID-19 pandemic: a prospective national serosurvey.** 2021;199:17–9. https://doi.org/10.1016/j.puhe.2021.08.005.
92. McCartney G, Douglas M, Taulbut M, Katikireddi SV, McKee M. **Tackling population health challenges as we build back from the pandemic.** 2021;375:e066232. https://doi.org/10.1136/bmj-2021-066232.
93. McCartney G, Leyland A, Walsh D, Ruth D. **Scaling COVID-19 against inequalities: should the policy response consistently match the mortality challenge?.** 2020. https://doi.org/10.1136/jech-2020-214373.
94. McCartney G, McMaster R, Shipton D, Harding O, Hearty W. **Glossary: economics and health.** 2022. https://doi.org/10.1136/jech-2021-218244.
95. McDonald L, Wise H, Muecksch F, Poston D, Mavin S, Templeton K, et al. **Comparison of SARS-CoV-2 serological assays for use in epidemiological surveillance in Scotland.** 2021;1:100028. https://doi.org/10.1016/j.jcvp.2021.100028.
96. McDonald R, Eide D, Abel-Ollo K, Barnsdale L, Carter B, Clausen T, et al. **A rapid assessment of take-home naloxone provision during COVID-19 in Europe.** 2022;107:103787. https://doi.org/10.1016/j.drugpo.2022.103787.
97. McKeigue PM, Burgul R, Bishop J, Robertson C, McMenamin J, O'Leary M, et al. **Association of cerebral venous thrombosis with recent COVID-19 vaccination: case-crossover study using ascertainment through neuroimaging in Scotland.** 2021a;21:1275. https://doi.org/10.1186/s12879-021-06960-5.
98. McKeigue PM, Kennedy S, Weir A, Bishop J, McGurnaghan SJ, McAllister D, et al. **Relation of severe COVID-19 to polypharmacy and prescribing of psychotropic drugs: the REACT-SCOT case-control study.** 2021b;19:51. https://doi.org/10.1186/s12916-021-01907-8.
99. McKeigue PM, McAllister DA, Caldwell D, Gribben C, Bishop J, McGurnaghan S, et al. **Relation of severe COVID-19 in Scotland to transmission-related factors and risk conditions eligible for shielding support: REACT-SCOT**

case-control study. 2021c;19:149. https://doi.org/10.1186/s12916-021-02021-5.

100. McKeigue PM, McAllister DA, Hutchinson SJ, Robertson C, Stockton D, Colhoun HM. **Vaccine efficacy against severe COVID-19 in relation to delta variant (B.1.617.2) and time since second dose in patients in Scotland (REACT-SCOT): a case-control study.** 2022;10:566–72. https://doi.org/10.1016/S2213-2600(22)00045-5.

101. McKeigue P. M., McGurnaghan S, Blackbourn L, Bath LE, McAllister DA, Caparrotta TM, et al. **Relation of incident type 1 diabetes to recent Covid-19 infection: Cohort study using e-health record linkage in Scotland** 2023;46:921–8. https://doi.org/10.2337/dc22-0385.

102. McKeigue P M., Porter D, Hollick RJ, Ralston SH, McAllister DA, Colhoun HM. **Risk of severe COVID-19 in patients with inflammatory rheumatic diseases treated with immunosuppressive therapy in Scotland.** 2023;52:412–7. https://doi.org/10.1080/03009742.2022.2063376.

103. McKeigue PM, Weir A, Bishop J, McGurnaghan SJ, Kennedy S, McAllister D, et al. **Rapid Epidemiological Analysis of Comorbidities and Treatments as risk factors for COVID-19 in Scotland (REACT-SCOT): A population-based case-control study.** 2020;17:e1003374. https://doi.org/10.1371/journal.pmed.1003374.

104. McLarty J, Litton E, Beane A, Aryal D, Bailey M, Bendel S, et al. **Non-COVID-19 intensive care admissions during the pandemic: a multinational registry-based study.** 2023. https://doi.org/10.1136/thorax-2022-219592.

105. McPeake J, Blayney MC, Stewart NI, Kaye CT, Chan Seem R, Hall R, et al. **COVID-19 infection and maternal morbidity in critical care units in Scotland: a national cohort study.** 2023;53:103613. https://doi.org/10.1016/j.ijoa.2022.103613.

106. McQuaid F, Mulholland R, Sangpang Rai Y, Agrawal U, Bedford H, Cameron JC, et al. **Uptake of infant and preschool immunisations in Scotland and England during the COVID-19 pandemic: An observational study of routinely collected data.** 2022;19:e1003916. https://doi.org/10.1371/journal.pmed.1003916.

107. Mesle MM, Brown J, Mook P, Hagan J, Pastore R, Bundle N, et al. **Estimated number of deaths directly averted in people 60 years and older**

as a result of COVID-19 vaccination in the WHO European Region, December 2020 to November 2021. 2021;26:11. https://doi.org/10.2807/1560-7917.ES.2021.26.47.2101021.

108. Moran DP, Pires SM, Wyper GMA, Devleesschauwer B, Cuschieri S, Kabir Z. **Corrigendum: Estimating the Direct Disability-Adjusted Life Years Associated With SARS-CoV-2 (COVID-19) in the Republic of Ireland: The First Full Year** (Int J Public Health, (2022), 67, 1604699, 10.3389/ijph.2022.1604699) 2023;68. https://doi.org/10.3389/ijph.2023.1605974.

109. Moran DP, Pires SM, Wyper GMA, Devleesschauwer B, Cuschieri S, Kabir Z. **Estimating the Direct Disability-Adjusted Life Years Associated With SARS-CoV-2 (COVID-19) in the Republic of Ireland: The First Full Year.** 2022;67:1604699. https://doi.org/10.3389/ijph.2022.1604699.

110. Morrison K, Cullen L, James AB, Chua V, Sullivan C, Robertson C, et al. **Predictors of incomplete COVID-19 vaccine schedule among adults in Scotland: Two retrospective cohort analyses of the primary schedule and third dose.** 2023;41:5863–76. https://doi.org/10.1016/j.vaccine.2023.07.070.

111. Mueller T, Kerr S, McTaggart S, Kurdi A, Vasileiou E, Docherty A, et al. **Retrospective cohort study to evaluate medication use in patients hospitalised with COVID-19 in Scotland: protocol for a national observational study.** 2021;11:e054861. https://doi.org/10.1136/bmjopen-2021-054861.

112. Mueller T, Kurdi A, Hall E, Bullard I, Wapshott J, Goodfellow A, et al. **Assessing medication use patterns in patients hospitalised with COVID-19: a retrospective study.** 2022;12:e064320. https://doi.org/10.1136/bmjopen-2022-064320.

113. Mulholland RH, Vasileiou E, Simpson CR, Robertson C, Ritchie LD, Agrawal U, et al. **Cohort Profile: Early Pandemic Evaluation and Enhanced Surveillance of COVID-19 (EAVE II) Database.** 2021;50:1064–74. https://doi.org/10.1093/ije/dyab028.

114. Mulholland RH, Wood R, Stagg HR, Fischbacher C, Villacampa J, Simpson CR, et al. **Impact of COVID-19 on accident and emergency attendances and emergency and planned hospital admissions in Scotland:**

an interrupted time-series analysis. 2020;113:444–53. https://doi.org/10.1177/0141076820962447.

115. Murphy S, O'Reilly D, Owen RK, Akbari A, Lowthian E, Bedston S, et al. **Variations in COVID-19 vaccination uptake among people in receipt of psychotropic drugs: cross-sectional analysis of a national population-based prospective cohort.** 2022;221:417–24. https://doi.org/10.1192/bjp.2022.36.

116. Mutch H, Young JJ, Sadiq F, Rose AM, Evans JM. **Enhanced surveillance of hospitalised COVID-19 patients in Europe: I-MOVE-COVID-19 surveillance network, February 2020 to December 2021**. 2023;28. https://doi.org/10.2807/1560-7917.ES.2023.28.26.2200669.

117. Nafilyan V, Ward IL, Robertson C, Sheikh A. **Evaluation of Risk Factors for Postbooster Omicron COVID-19 Deaths in England.** 2022;5:e2233446. https://doi.org/10.1001/jamanetworkopen.2022.33446.

118. Nickbakhsh S, Ho A, Marques DFP, McMenamin J, Gunson RN, Murcia PR. **Reply to Li et al.** 2020a;222:696–8. https://doi.org/10.1093/infdis/jiaa322.

119. Nickbakhsh S, Ho A, Marques DFP, McMenamin J, Gunson RN, Murcia PR. **Epidemiology of Seasonal Coronaviruses: Establishing the Context for the Emergence of Coronavirus Disease 2019.** 2020b;222:17–25. https://doi.org/10.1093/infdis/jiaa185.

120. Nickbakhsh S, Hughes J, Christofidis N, Griffiths E, Shaaban S, Enright J, et al. **Genomic epidemiology of SARS-CoV-2 in a university outbreak setting and implications for public health planning**. 2022;12:11735. https://doi.org/10.1038/s41598-022-15661-1.

121. Niedzwiedz CL, Green MJ, Benzeval M, Campbell D, Craig P, Demou E, et al. **Mental health and health behaviours before and during the initial phase of the COVID-19 lockdown: longitudinal analyses of the UK Household Longitudinal Study.** 2021;75:224–31. https://doi.org/10.1136/jech-2020-215060.

122. Niedzwiedz CL, O'Donnell CA, Jani BD, Demou E, Ho FK, Celis-Morales C, et al. **Ethnic and socioeconomic differences in SARS-CoV-2 infection: prospective cohort study using UK Biobank.** 2020;18:160. https://doi.org/10.1186/s12916-020-01640-8.

123. Norgaard SK, Vestergaard LS, Nielsen J, Richter L, Schmid D, Bustos N, et al. **Real-time monitoring shows substantial excess all-cause mortality during second wave of COVID-19 in Europe, October to December 2020.** 2021;26:01. https://doi.org/10.2807/1560-7917.ES.2021.26.1.2002023.

124. Nyberg T, Bager P, Svalgaard IB, Bejko D, Bundle N, Evans J, et al. **A standardised protocol for relative SARS-CoV-2 variant severity assessment, applied to Omicron BA.1 and Delta in six European countries, October 2021 to February 2022.** 2023;28. https://doi.org/10.2807/1560-7917.ES.2023.28.36.2300048.

125. Oberndorfer M, Henery PM, Dundas R, Leyland AH, Paranjothy S, Stock SJ, et al. **Study protocol: examining the impacts of COVID-19 mitigation measures on pregnancy and birth outcomes in Scotland-a linked administrative data study.** 2023;13:e066293. https://doi.org/10.1136/bmjopen-2022-066293.

126. O'Toole A, Hill V, Jackson B, Dewar R, Sahadeo N, Colquhoun R, et al. **Genomics-informed outbreak investigations of SARS-CoV-2 using civet.** 2022;2:e0000704. https://doi.org/10.1371/journal.pgph.0000704.

127. Palmateer NE, Dickson E, Furrie E, Godber I, Goldberg DJ, Gousias P, et al. **National population prevalence of antibodies to SARS-CoV-2 in Scotland during the first and second waves of the COVID-19 pandemic.** 2021;198:102–5. https://doi.org/10.1016/j.puhe.2021.07.006.

128. Park M, Budisavljevic S, Aleman-Diaz AY, Carai S, Schwarz K, Kuttumuratova A, et al. **Child and adolescent health in Europe: Towards meeting the 2030 agenda.** 2023;13:04011. https://doi.org/10.7189/jogh.13.04011.

129. Pascall DJ, Vink E, Blacow R, Bulteel N, Campbell A, Campbell R, et al. **The SARS-CoV-2 Alpha variant was associated with increased clinical severity of COVID-19 in Scotland: A genomics-based retrospective cohort analysis.** 2023a;18:e0284187. https://doi.org/10.1371/journal.pone.0284187.

130. Pascall DJ, Vink E, Blacow R, Bulteel N, Campbell A, Campbell R, et al. **Directions of change in intrinsic case severity across successive SARS-CoV-2 variant waves have been inconsistent.** 2023b;87:128–35. https://doi.org/10.1016/j.jinf.2023.05.019.

131. Patone M, Handunnetthi L, Saatci D, Pan J, Katikireddi SV, Razvi S, et al. **Publisher Correction: Neurological complications after first dose of COVID-19 vaccines and SARS-CoV-2 infection.** 2021a;27:2249. https://doi.org/10.1038/s41591-021-01644-8.

132. Patone M, Handunnetthi L, Saatci D, Pan J, Katikireddi SV, Razvi S, et al. **Neurological complications after first dose of COVID-19 vaccines and SARS-CoV-2 infection.** 2021b;27:2144–53. https://doi.org/10.1038/s41591-021-01556-7.

133. Phillips A, Jiang Y, Walsh D, Andrews N, Artama M, Clothier H, et al. **Background rates of adverse events of special interest for COVID-19 vaccines: A multinational Global Vaccine Data Network (GVDN) analysis.** 2023. https://doi.org/10.1016/j.vaccine.2023.08.079.

134. Pires SM, Wyper GMA, Wengler A, Penalvo JL, Haneef R, Moran D, et al. **Burden of Disease of COVID-19: Strengthening the Collaboration for National Studies** 2022;10:907012. https://doi.org/10.3389/fpubh.2022.907012.

135. Puxty KA, Blayney M, Kaye C, McPeake J, Stewart N, Paton M, et al. **Use of protracted CPAP as supportive treatment for COVID-19 pneumonitis and associated outcomes: a national cohort study.** 2023;131:617–25. https://doi.org/10.1016/j.bja.2023.05.012.

136. Robertson E, Reeve KS, Niedzwiedz CL, Moore J, Blake M, Green M, et al. **Predictors of COVID-19 vaccine hesitancy in the UK household longitudinal study.** 2021;94:41–50. https://doi.org/10.1016/j.bbi.2021.03.008.

137. Romani Vidal A, Vaughan A, Innocenti F, Colombe S, Nerlander L, Rachwal N, et al. **Hepatitis of unknown aetiology in children - epidemiological overview of cases reported in Europe, 1 January to 16 June 2022.** 2022;27:08. https://doi.org/10.2807/1560-7917.ES.2022.27.31.2200483.

138. Rudan I, Adeloye D, Katikireddi SV, Murray J, Simpson C, Shah SA, et al. **The COVID-19 pandemic in children and young people during 2020-2021: Learning about clinical presentation, patterns of spread, viral load, diagnosis and treatment.** 2021a;11:01010. https://doi.org/10.7189/jogh.11.01010.

139. Rudan I, Adeloye D, Katikireddi V, Murray J, Simpson C, Shah SA, et al. **The COVID-19 pandemic in children and young people during 2020-2021:**

A complex discussion on vaccination. 2021b;11:01011. https://doi.org/10.7189/jogh.11.01011.

140. Rudan I, Millington T, Antal K, Grange Z, Fenton L, Sullivan C, et al. **BNT162b2 COVID-19 vaccination uptake, safety, effectiveness and waning in children and young people aged 12-17 years in Scotland**. 2022;23:100513. https://doi.org/10.1016/j.lanepe.2022.100513.

141. Seaton RA, Cooper L, Gibbons CL, Malcolm W, Choo-Kang B, Griffith D, et al. **Antibiotic prescribing for respiratory tract infection in patients with suspected and proven COVID-19: results from an antibiotic point prevalence survey in Scottish hospitals.** 2021;3:ab078. https://doi.org/10.1093/jacamr/dlab078.

142. Selke Krulichova I, Selke GW, Bennie M, Hajiebrahimi M, Nyberg F, Furst J, et al. **Comparison of drug prescribing before and during the COVID-19 pandemic: A cross-national European study.** 2022;31:1046–55. https://doi.org/10.1002/pds.5509.

143. Shah ASV, Gribben C, Bishop J, Hanlon P, Caldwell D, Wood R, et al. **Effect of Vaccination on Transmission of SARS-CoV-2.** 2021;385:1718–20. https://doi.org/10.1056/NEJMc2106757.

144. Shah ASV, Wood R, Gribben C, Caldwell D, Bishop J, Weir A, et al. **Risk of hospital admission with coronavirus disease 2019 in healthcare workers and their households: nationwide linkage cohort study.** 2020;371:m3582. https://doi.org/10.1136/bmj.m3582.

145. Shah SA, Brophy S, Kennedy J, Fisher L, Walker A, Mackenna B, et al. **Impact of first UK COVID-19 lockdown on hospital admissions: Interrupted time series study of 32 million people.** 2022a;49:101462. https://doi.org/10.1016/j.eclinm.2022.101462.

146. Shah SA, Moore E, Robertson C, McMenamin J, Katikireddi SV, Simpson CR, et al. **Predicted COVID-19 positive cases, hospitalisations, and deaths associated with the Delta variant of concern, June-July, 2021.** 2021;3:e539–41. https://doi.org/10.1016/S2589-7500(21)00175-8.

147. Shah SA, Mulholland RH, Wilkinson S, Katikireddi SV, Pan J, Shi T, et al. **Impact on emergency and elective hospital-based care in Scotland over the first 12 months of the pandemic: interrupted time-series analysis of**

national lockdowns. 2022b;115:429–38. https://doi.org/10.1177/01410768221095239.

148. Shah SA, Robertson C, Rudan I, Murray JL, McCowan C, Grange Z, et al. **BNT162b2 and ChAdOx1 nCoV-19 vaccinations, incidence of SARS-CoV-2 infections and COVID-19 hospitalisations in Scotland in the Delta era.** 2022c;12:05008. https://doi.org/10.7189/jogh.12.05008.

149. Shaw RH, Greenland M, Stuart ASV, Aley PK, Andrews NJ, Cameron JC, et al. **Persistence of immune response in heterologous COVID vaccination schedules in the Com-COV2 study - A single-blind, randomised trial incorporating mRNA, viral-vector and protein-adjuvant vaccines.** 2023;86:574–83. https://doi.org/10.1016/j.jinf.2023.03.027.

150. Shaw RH, Liu X, Stuart ASV, Greenland M, Aley PK, Andrews NJ, et al. **Effect of priming interval on reactogenicity, peak immunological response, and waning after homologous and heterologous COVID-19 vaccine schedules: exploratory analyses of Com-COV, a randomised control trial**. 2022;10:1049–60. https://doi.org/10.1016/S2213-2600(22)00163-1.

151. Sheikh A, Kerr S, Woolhouse M, McMenamin J, Robertson C. **Severity of omicron variant of concern and effectiveness of vaccine boosters against symptomatic disease in Scotland (EAVE II): a national cohort study with nested test-negative design.** 2022;22:959–66. https://doi.org/10.1016/S1473-3099(22)00141-4.

152. Sheikh A, McMenamin J, Taylor B, Robertson C. **SARS-CoV-2 Delta VOC in Scotland: demographics, risk of hospital admission, and vaccine effectiveness.** 2021a;397:2461–2. https://doi.org/10.1016/S0140-6736(21)01358-1.

153. Sheikh A, Robertson C, Taylor B. **BNT162b2 and ChAdOx1 nCoV-19 Vaccine Effectiveness against Death from the Delta Variant.** 2021b;385:2195–7. https://doi.org/10.1056/NEJMc2113864.

154. Shi T, Pan J, Katikireddi SV, McCowan C, Kerr S, Agrawal U, et al. **Risk of COVID-19 hospital admission among children aged 5-17 years with asthma in Scotland: a national incident cohort study**. 2022a;10:191–8. https://doi.org/10.1016/S2213-2600(21)00491-4.

155. Shi T, Pan J, Moore E, Katikireddi SV, Docherty AB, Fenton L, et al. **Risk of COVID-19 hospitalizations among school-aged children in Scotland: A**

national incident cohort study. 2022b;12:05044. https://doi.org/10.7189/jogh.12.05044.

156. Shi T, Pan J, Vasileiou E, Robertson C, Sheikh A. **Risk of serious COVID-19 outcomes among adults with asthma in Scotland: a national incident cohort study.** 2022c;10:347–54. https://doi.org/10.1016/S2213-2600(21)00543-9.

157. Shi T, Robertson C, Sheikh A. **Effectiveness and safety of coronavirus disease 2019 vaccines** 2023;29:138–42. https://doi.org/10.1097/MCP.0000000000000948.

158. Shipton Debs, McCartney G, McMaster R. **Population health post-pandemic: critiquing the economic approach to recovery.** 2021;2:100098. https://doi.org/10.1016/j.puhip.2021.100098.

159. Shipton Deborah, Sarica S, Craig N, McCartney G, Katikireddi SV, Roy G, et al. **Knowing the goal: an inclusive economy that can address the public health challenges of our time** 2021;75:1129–32. https://doi.org/10.1136/jech-2020-216070.

160. da Silva Filipe A, Shepherd JG, Williams T, Hughes J, Aranday-Cortes E, Asamaphan P, et al. **Publisher Correction: Genomic epidemiology reveals multiple introductions of SARS-CoV-2 from mainland Europe into Scotland.** 2021a;6:271. https://doi.org/10.1038/s41564-021-00865-4.

161. da Silva Filipe A, Shepherd JG, Williams T, Hughes J, Aranday-Cortes E, Asamaphan P, et al. **Author Correction: Genomic epidemiology reveals multiple introductions of SARS-CoV-2 from mainland Europe into Scotland.** 2021b;6:414. https://doi.org/10.1038/s41564-021-00869-0.

162. da Silva Filipe A, Shepherd JG, Williams T, Hughes J, Aranday-Cortes E, Asamaphan P, et al. **Genomic epidemiology reveals multiple introductions of SARS-CoV-2 from mainland Europe into Scotland**. 2021c;6:112–22. https://doi.org/10.1038/s41564-020-00838-z.

163. Simpson CR, Kerr S, Katikireddi SV, McCowan C, Ritchie LD, Pan J, et al. **Second-dose ChAdOx1 and BNT162b2 COVID-19 vaccines and thrombocytopenic, thromboembolic and hemorrhagic events in Scotland.** 2022a;13:4800. https://doi.org/10.1038/s41467-022-32264-6.

164. Simpson CR, Robertson C, Kerr S, Shi T, Vasileiou E, Moore E, et al. **External validation of the QCovid risk prediction algorithm for risk of**

COVID-19 hospitalisation and mortality in adults: national validation cohort study in Scotland. 2022b;77:497–504. https://doi.org/10.1136/thoraxjnl-2021-217580.

165. Simpson CR, Robertson C, Vasileiou E, McMenamin J, Gunson R, Ritchie LD, et al. **Early Pandemic Evaluation and Enhanced Surveillance of COVID-19 (EAVE II): protocol for an observational study using linked Scottish national data.** 2020;10:e039097. https://doi.org/10.1136/bmjopen-2020-039097.

166. Simpson Colin R., Robertson C, Vasileiou E, Moore E, McCowan C, Agrawal U, et al. **Temporal trends and forecasting of COVID-19 hospitalisations and deaths in Scotland using a national real-time patient-level data platform: a statistical modelling study.** 2021;3:e517–25. https://doi.org/10.1016/S2589-7500(21)00105-9.

167. Simpson C R., Shi T, Vasileiou E, Katikireddi SV, Kerr S, Moore E, et al. **First-dose ChAdOx1 and BNT162b2 COVID-19 vaccines and thrombocytopenic, thromboembolic and hemorrhagic events in Scotland.** 2021;27:1290–7. https://doi.org/10.1038/s41591-021-01408-4.

168. Stock SJ, Carruthers J, Calvert C, Denny C, Donaghy J, Goulding A, et al. **Author Correction: SARS-CoV-2 infection and COVID-19 vaccination rates in pregnant women in Scotland.** 2022a;28:599. https://doi.org/10.1038/s41591-022-01730-5.

169. Stock SJ, Carruthers J, Calvert C, Denny C, Donaghy J, Goulding A, et al. **SARS-CoV-2 infection and COVID-19 vaccination rates in pregnant women in Scotland.** 2022b;28:504–12. https://doi.org/10.1038/s41591-021-01666-2.

170. Stock SJ, Carruthers J, Denny C, Donaghy J, Goulding A, Hopcroft LEM, et al. **Cohort Profile: The COVID-19 in Pregnancy in Scotland (COPS) dynamic cohort of pregnant women to assess effects of viral and vaccine exposures on pregnancy.** 2022c;51:e245–55. https://doi.org/10.1093/ije/dyab243.

171. Stock SJ, McAllister D, Vasileiou E, Simpson CR, Stagg HR, Agrawal U, et al. **COVID-19 in Pregnancy in Scotland (COPS): protocol for an observational study using linked Scottish national data.** 2020;10:e042813. https://doi.org/10.1136/bmjopen-2020-042813.

172. Stock SJ, Moore E, Calvert C, Carruthers J, Denny C, Donaghy J, et al. **Pregnancy outcomes after SARS-CoV-2 infection in periods dominated by delta and omicron variants in Scotland: a population-based cohort study.** 2022d;10:1129–36. https://doi.org/10.1016/S2213-2600(22)00360-5.

173. Stock SJ, Zoega H, Brockway M, Mulholland RH, Miller JE, Been JV, et al. **The international Perinatal Outcomes in the Pandemic (iPOP) study: protocol.** 2021;6:21. https://doi.org/10.12688/wellcomeopenres.16507.1.

174. Stuart ASV, Shaw RH, Liu X, Greenland M, Aley PK, Andrews NJ, et al. **Immunogenicity, safety, and reactogenicity of heterologous COVID-19 primary vaccination incorporating mRNA, viral-vector, and protein-adjuvant vaccines in the UK (Com-COV2): a single-blind, randomised, phase 2, non-inferiority trial.** 2022;399:36–49. https://doi.org/10.1016/S0140-6736(21)02718-5.

175. Tibble H, Mueller T, Proud E, Hall E, Kurdi A, Robertson C, et al. **Uptake of monoclonal antibodies and antiviral therapies for COVID-19 in Scotland.** 2023;401:101–2. https://doi.org/10.1016/S0140-6736(22)02398-4.

176. Tod E, Shipton D, McCartney G, Sarica S, Scobie G, Parkinson J, et al. **What is the potential for plural ownership to support a more inclusive economy? A systematic review protocol.** 2022;11:76. https://doi.org/10.1186/s13643-022-01955-y.

177. Torabi F, Bedston S, Lowthian E, Akbari A, Owen RK, Bradley DT, et al. **Risk of thrombocytopenic, haemorrhagic and thromboembolic disorders following COVID-19 vaccination and positive test: a self-controlled case series analysis in Wales.** 2022;12:16406. https://doi.org/10.1038/s41598-022-20118-6.

178. Trayner KMA, McAuley A, Palmateer NE, Yeung A, Goldberg DJ, Glancy M, et al. **Examining the impact of the first wave of COVID-19 and associated control measures on interventions to prevent blood-borne viruses among people who inject drugs in Scotland: an interrupted time series study.** 2022;232:109263. https://doi.org/10.1016/j.drugalcdep.2021.109263.

179. Tsang RS, Joy M, Byford R, Robertson C, Anand SN, Hinton W, et al. **Adverse events following first and second dose COVID-19 vaccination in England, October 2020 to September 2021: a national vaccine surveillance**

platform self-controlled case series study. 2023;28:01. https://doi.org/10.2807/1560-7917.ES.2023.28.3.2200195.

180. Vasileiou E, Shi T, Kerr S, Robertson C, Joy M, Tsang R, et al. **Investigating the uptake, effectiveness and safety of COVID-19 vaccines: protocol for an observational study using linked UK national data.** 2022;12:e050062. https://doi.org/10.1136/bmjopen-2021-050062.

181. Vasileiou E, Simpson CR, Shi T, Kerr S, Agrawal U, Akbari A, et al. **Interim findings from first-dose mass COVID-19 vaccination roll-out and COVID-19 hospital admissions in Scotland: a national prospective cohort study.** 2021;397:1646–57. https://doi.org/10.1016/S0140-6736(21)00677-2.

182. Vestergaard LS, Nielsen J, Richter L, Schmid D, Bustos N, Braeye T, et al. **Excess all-cause mortality during the COVID-19 pandemic in Europe - preliminary pooled estimates from the EuroMOMO network, March to April 2020.** 2020;25:07. https://doi.org/10.2807/1560-7917.ES.2020.25.26.2001214.

183. Vöhringer HS, Sanderson T, Sinnott M, De Maio N, Nguyen T, Goater R, et al. Genomic reconstruction of the SARS-CoV-2 epidemic in England 2021;600:506–11. https://doi.org/10.1038/s41586-021-04069-y.

184. Volz E, Mishra S, Chand M, Barrett JC, Johnson R, Geidelberg L, et al. **Assessing transmissibility of SARS-CoV-2 lineage B.1.1.7 in England 2021;**593:266–9. https://doi.org/10.1038/s41586-021-03470-x.

185. Wedemeyer H, Tergast TL, Lazarus JV, Razavi H, Bakoyannis K, Baptista-Leite R, et al. **Securing wider EU commitment to the elimination of hepatitis C virus** 2023;43:276–91. https://doi.org/10.1111/liv.15446.

186. Wei J, Matthews PC, Stoesser N, Diamond I, Studley R, Rourke E, et al. **SARS-CoV-2 antibody trajectories after a single COVID-19 vaccination with and without prior infection** 2022a;13. https://doi.org/10.1038/s41467-022-31495-x.

187. Wei J, Matthews PC, Stoesser N, Maddox T, Lorenzi L, Studley R, et al. **Anti-spike antibody response to natural SARS-CoV-2 infection in the general population** 2021;12. https://doi.org/10.1038/s41467-021-26479-2.

188. Wei J, Matthews PC, Stoesser N, Newton JN, Diamond I, Studley R, et al. **Protection against SARS-CoV-2 Omicron BA.4/5 variant following booster vaccination or breakthrough infection in the UK** 2023;14. https://doi.org/10.1038/s41467-023-38275-1.

189. Wei J, Pouwels KB, Stoesser N, Matthews PC, Diamond I, Studley R, et al. **Antibody responses and correlates of protection in the general population after two doses of the ChAdOx1 or BNT162b2 vaccines** 2022b;28:1072–82. https://doi.org/10.1038/s41591-022-01721-6.

190. Weir N, Newham R, Dunlop E, Ferguson A, Bennie M. **The impact of the COVID-19 pandemic on pharmacy personnel in primary care.** 2022;23:e56. https://doi.org/10.1017/S1463423622000445.

191. Wells J, Young JJ, Harvey C, Mutch H, McPhail D, Young N, et al. **Real-time surveillance of severe acute respiratory infections in Scottish hospitals: an electronic register-based approach, 2017-2022.** 2022;213:5–11. https://doi.org/10.1016/j.puhe.2022.09.003.

192. Wemyss C, Hobson S, Sweeney J, Chua PR, Binti Mohd Khairi SA, Edwards M, et al. **Improving participation and engagement with a COVID-19 surveillance programme in an outpatient setting.** 2022;11:03. https://doi.org/10.1136/bmjoq-2021-001700.

193. Wiessing L, Sypsa V, Abagiu AO, Arble A, Berndt N, Bosch A, et al. **Impact of COVID-19 & Response Measures on HIV-HCV Prevention Services and Social Determinants in People Who Inject Drugs in 13 Sites with Recent HIV Outbreaks in Europe, North America and Israel.** 2023;27:1140–53. https://doi.org/10.1007/s10461-022-03851-x.

194. Wilkinson SAJ, Sparks N, Kele B, Peacock TP, Robson SC, Connor TR, et al. **Recurrent SARS-CoV-2 mutations in immunodeficient patients** 2022;8. https://doi.org/10.1093/ve/veac050.

195. Willett BJ, Grove J, MacLean OA, Wilkie C, De Lorenzo G, Furnon W, et al. **SARS-CoV-2 Omicron is an immune escape variant with an altered cell entry pathway.** 2022a;7:1161–79. https://doi.org/10.1038/s41564-022-01143-7.

196. Willett BJ, Grove J, MacLean OA, Wilkie C, De Lorenzo G, Furnon W, et al. **Publisher Correction: SARS-CoV-2 Omicron is an immune escape variant with an altered cell entry pathway.** 2022b;7:1709. https://doi.org/10.1038/s41564-022-01241-6.

197. Wood R, Thomson E, Galbraith R, Gribben C, Caldwell D, Bishop J, et al. **Sharing a household with children and risk of COVID-19: a study of over**

300 000 adults living in healthcare worker households in Scotland. 2021;106:1212–7. https://doi.org/10.1136/archdischild-2021-321604.

198. Wright FL, Cheema K, Goldacre R, Hall N, Herz N, Islam N, et al. **Effects of the COVID-19 pandemic on secondary care for cardiovascular disease in the UK: an electronic health record analysis across three countries.** 2023;9:377–88. https://doi.org/10.1093/ehjqcco/qcac077.

199. Wyper GM, Mackay DF, Fraser C, Lewsey J, Robinson M, Beeston C, et al. **COVID-19 and commerce complicate minimum unit pricing effects on health - Authors' reply.** 2023;402:368–9. https://doi.org/10.1016/S0140-6736(23)01251-5.

200. Wyper GMA, Assuncao R, Cuschieri S, Devleeschauwer B, Fletcher E, Haagsma JA, et al. **Population vulnerability to COVID-19 in Europe: a burden of disease analysis.** 2020a;78:47. https://doi.org/10.1186/s13690-020-00433-y.

201. Wyper GMA, Assuncao R, Cuschieri S, Devleesschauwer B, Fletcher E, Haagsma JA, et al. **Correction to: Population vulnerability to COVID-19 in Europe: a burden of disease analysis.** 2020b;78:57. https://doi.org/10.1186/s13690-020-00437-8.

202. Wyper GMA, Assuncao R, Fletcher E, Gourley M, Grant I, Haagsma JA, et al. **The increasing significance of disease severity in a burden of disease framework.** 2023;51:296–300. https://doi.org/10.1177/14034948211024478.

203. Wyper GMA, Assuncao RMA, Colzani E, Grant I, Haagsma JA, Lagerweij G, et al. Burden of Disease Methods: A Guide to Calculate COVID-19 Disability-Adjusted Life Years. 2021a;66:619011. https://doi.org/10.3389/ijph.2021.619011.

204. Wyper GMA, Fletcher E, Grant I, Harding O, de Haro Moro MT, McCartney G, et al. **Widening of inequalities in COVID-19 years of life lost from 2020 to 2021: a Scottish Burden of Disease Study.** 2022a. https://doi.org/10.1136/jech-2022-219090.

205. Wyper GMA, Fletcher E, Grant I, Harding O, de Haro Moro MT, Stockton DL, et al. **Correction: Inequalities in population health loss by multiple deprivation: COVID-19 and pre-pandemic all-cause disability-adjusted life years (DALYs) in Scotland.** 2022b;21:117. https://doi.org/10.1186/s12939-022-01714-4.

206. Wyper GMA, Fletcher E, Grant I, Harding O, de Haro Moro MT, Stockton DL, et al. **Inequalities in population health loss by multiple deprivation: COVID-19 and pre-pandemic all-cause disability-adjusted life years (DALYs) in Scotland.** 2021b;20:214. https://doi.org/10.1186/s12939-021-01547-7.

207. Wyper GMA, Fletcher E, Grant I, McCartney G, Fischbacher C, Harding O, et al. **Measuring disability-adjusted life years (DALYs) due to COVID-19 in Scotland, 2020.** 2022c;80:105. https://doi.org/10.1186/s13690-022-00862-x.

208. Yapp LZ, Clarke JV, Moran M, Simpson AHRW, Scott CEH. **National operating volume for primary hip and knee arthroplasty in the COVID-19 era: a study utilizing the Scottish arthroplasty project dataset.** 2021;2:203–10. https://doi.org/10.1302/2633-1462.23.BJO-2020-0193.R1.

(Search note: Institution/ affiliation search conducted in Ovid Medline and Elsevier Scopus)