Witness Name: UNCOVER
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Dated: 5 December 2023

UK COVID-19 INQUIRY

Usher Network for COVID-19 Evidence Reviews ("UNCOVER")
Response to request pursuant to Rule 9 of the Inquiry Rules 2006
of 3 October 2023

I, Dr Ruth McQuillan, Co-chair of UNCOVER, will say as follows on behalf of UNCOVER:

INTRODUCTION

1 We have been asked to provide information to the Inquiry about the role of "*UNCOVER/ the Usher Institute*". At the outset, we wish to clarify that UNCOVER is not part of the Usher Institute ("the Institute"). However, some members of UNCOVER are also staff members of the University of Edinburgh ("the University") who work within the Institute.

2 UNCOVER is an informal network of volunteers, mainly of University of Edinburgh staff, postgraduate students and alumni, and as such it is not formally part of the University. In contrast, the Institute is one of a number of institutes within the Edinburgh Medical School in the University's College of Medicine and Veterinary Medicine. Accordingly, UNCOVER is not synonymous with the Institute and/or the University and in providing this response, we are not providing information on behalf of the Institute and/or

the University, nor can our views be said to represent those of the Institute and/or the University.

3 UNCOVER's website is contained within the University's website as the majority of our core members are staff members of the University.

4 We have also been asked to provide details of information and/or advice that UNCOVER provided to the Scottish Government during the pandemic. We wish to clarify that UNCOVER's role is not, and has never been, to provide advice. The aim of the UNCOVER network is much narrower and more specific than this: whereas advice involves the provision of guidance or recommendations with regard to prudent future action, UNCOVER's role was purely to provide information in the form of evidence syntheses. Evidence synthesis is an umbrella term used widely in public health and biomedical science to describe a type of research method. It refers to a set of techniques for finding, evaluating, collating and summarising a comprehensive body of existing evidence in order to answer a research question. Evidence synthesis does not involve making recommendations or providing advice, but simply drawing together all of the evidence available on a particular topic and assessing the degree of trust and confidence that can be placed on that evidence. The output can then be used by decision-makers and/or their advisers to inform their decisions or advice. The method is detailed more fully in paragraphs 29 to 38 below. Accordingly, we are unable to answer any questions which relate to the provision of advice (as opposed to information) by UNCOVER. Similarly, in relation to matters on which we have been asked to provide our views about the decision-making of the Scottish Government, we can only comment on the information we produced. As an informal network of individuals, the members of UNCOVER did not have cause to, and do not generally, form a unified view about other matters.

5 For clarity, “evidence synthesis” and “evidence review” are used interchangeably in this statement. “Systematic review”, “rapid review” and “living review” are used to refer to specific types of evidence synthesis.

6 Separately, we have been asked for information relating to work "commissioned" from UNCOVER. Later in the pandemic, UNCOVER was commissioned on a small number of occasions to provide information on particular topics to the World Health Organisation (August – November 2021, January – July 2022, August 2022 – February 2023) and on one occasion received a grant from the Scottish Government (March – October 2022). UNCOVER has also been commissioned by the Scottish COVID-19 Inquiry ("the Scottish Inquiry") to provide research to it (January – February 2022; May – July 2023; September – December 2023; and November 2023 – April 2024). Save for these exceptions, the work produced by UNCOVER work was not formally commissioned, nor did UNCOVER charge a fee to produce its work. Apart from the one occasion mentioned above, when UNCOVER received a grant from the Scottish Government to produce a review of international COVID recovery strategies, and another when we worked collaboratively with Public Health Scotland (PHS) to produce two rapid reviews, all of our interactions with Scottish Government, its agencies and its advisory bodies have been indirect.

7 During the early months of the pandemic, all of the requests for information came to us via the Director of the Usher Institute, Professor Sir Aziz Sheikh (hereinafter referred to as Professor Sheikh), who was a member of the Scottish Government COVID Advisory Group (SGCAG). Typically, Professor Sheikh would email review questions to Professor Harry Campbell (co-founder of UNCOVER). We would complete the work and send it to Professor Sheikh who would then pass it on to the relevant advisory body. UNCOVER did not have direct relationships with these advisory bodies and did not provide evidence directly to them. We did not always know the origin of the request, nor which body or bodies (at Scottish

or UK Government level) our reviews were shared with, therefore cannot say with certainty which reviews were considered by Scottish Government or its advisory bodies and which were not.

8 We also cannot say with any certainty which of our reviews were published by the Scottish Government or its advisory bodies with the exception of two reports which were published by SAGE (referred to at paragraph 66 and 67 below). However, we generally published our reviews on our website. Initially, we did not have a standard form for our reviews and they were simply sent to Professor Sheikh as word documents without coversheets. After some time, we created a template to ensure that our documents had a uniform appearance. We retrospectively reformatted any reviews that had previously been produced in accordance with this template for publication on our website. After the template was created, we tried to use it before providing reviews to Professor Sheikh (or elsewhere as requested); however, this was not always possible due to the time constraints associated with some requests. The reviews produced as exhibits to this statement are in the format in which they were published on our website (save for the review referred to at paragraph 60.4 below, which was not published on our website and is exhibited in its original form). The only changes that have been made to the versions that were originally produced are (1) the format, including the addition of a coversheet; and (2) the addition of a disclaimer on some documents.

9 I have not been directly involved in all of the work undertaken by UNCOVER and do not have direct knowledge of all of the matters referred to in this statement. I have therefore produced this statement in consultation with my colleagues, Professor Evropi Theodoratou and Mrs Emilie McSwiggan. They have reviewed this statement and have confirmed that they are content with it.

SECTION A - INFORMATION AND ADVICE

The Role of UNCOVER

10 UNCOVER came about as a result of several parallel discussions amongst colleagues in the Usher Institute during the second half of March 2020 about how best we might offer our skills, expertise and networks to collate emerging evidence about COVID-19 that might be useful to decision-makers. I emailed Professor Sheikh, Professor Sarah Cunningham Burley, Dean of Molecular, Genetic and Population Health Sciences within the University's Medical School and Professor Harry Campbell on Friday 21 March 2020 offering to take on the role of co-ordinating students and graduates of the University who had skills to conduct systematic reviews in the event that there was a list of 'situation-response questions' to be addressed. Professor Campbell responded the same day noting that he had been having discussions with others about this and that he would get back to me over the weekend.

11 The group that became UNCOVER's initial core team first met on Monday 23 March 2020. The members of UNCOVER's initial core team were Professor Campbell, Professor Evropi Theodoratou, Professor Harish Nair and Dr Neneh Rowa-Dewar and me, all of whom were staff members of the University working in the Institute, and Dr Marshall Dozier from the University's Information Services, and Mrs Emilie McSwiggan, an alumna of the University.

12 The Institute's Director, Professor Sheikh, and other members of the Institute were involved in advising the Scottish and UK Governments as the pandemic unfolded. We realised that in order to provide such advice, Professor Sheikh and his colleagues needed access to up-to-date, trustworthy information and it was this information that we sought to provide.

13 Due to the urgency with which this information was required, we did not set up a formal structure within UNCOVER. We still operate on a relatively flexible basis and have not established ourselves as a formal legal entity.

14 We started work on our first review on 30 March 2020.

15 From the outset, a key principle that the core members of UNCOVER agreed upon was the need to coordinate efforts. Many other researchers, groups and institutions across the UK and globally were involved in similar efforts and communicating and/or collaborating with each other was essential to avoid duplication of effort. On 23 March 2020, UNCOVER took the initiative to establish an online, searchable register of all of the evidence reviews on COVID-19 that had been published anywhere in the world, which we updated each week in the early months of the pandemic. This register is hosted on UNCOVER's website. It is still updated regularly, although no longer on weekly basis. The register is described in two papers we published in academic journals (UN/001 INQ000361289; UN/002 INQ000361290). Our normal practice was for Professor Harry Campbell to receive a question from Professor Sheikh. Professor Campbell, myself and other members of the core team would then allocate the questions to teams of available members with suitable expertise who would then conduct the evidence synthesis.

16 We initially did not have funding for this work; however, later we received internal funding from the Wellcome Trust's Institutional Strategic Support Fund (ISSF3), which supports institutional strategies for the biomedical sciences and had allocated funds to the University to distribute. We were allocated some funding from ISSF3 for the year from 1 June 2020 to 31 May 2021. We also received internal funding from the Data-Driven Innovation (DDI) initiative, which was created by the University and delivered as part of the Edinburgh and South East Scotland City Region Deal. We received DDI funding in May 2020 and February 2021. We also

received funding from DDI to support our collaboration with PHS (referred to a paragraph 27.1 below) during the summer of 2021. In 2021, we also received funding from the University of Edinburgh Principal's Teaching Award Scheme, to support community building activities with our postgraduate student members. All other funding that we have received has been connected with research grants or contracts to complete specific pieces of work.

17 Our core team had particular expertise in epidemiology and public health, evidence synthesis and information science; and, as academics with extensive teaching experience, the team were also well-qualified to train others to apply these skills. Two core team members, Professor Harry Campbell and Professor Harish Nair, are clinically qualified. Details of the expertise of all past and current core members of UNCOVER and its key advisors are provided in Appendix 1. A list of all of UNCOVER's evidence reviews is provided at Appendix 2.

18 In addition to the UNCOVER core team, we drew on a large pool of postgraduate students, academic staff and alumni with core public health, epidemiology and systematic review training, plus subject experts as required.

19 On 9 April 2020 I sent an email appealing to all staff members and PhD students within the Institute to join the network (which had yet to be named UNCOVER). A copy of this email is produced as an exhibit (UN/003 INQ000361291).The core group established criteria that had to be met by post-graduate students to join the network – this included having obtained marks at distinction or merit level and having undertaken training in, and/or having experience of participating in, systematic reviews.

20 Although we describe those that participate in our work as members of UNCOVER, there is no formal process for joining. It is a flexible network – some individuals may be involved on an ad hoc basis and others have

participated consistently since spring 2020 - there is no minimum time commitment required.

21 Where we required additional expertise in other areas, we sought it from within and beyond the University. Due to being formed predominately of academics working within a large university, UNCOVER was able to connect with a wide range of specialist subject experts when conducting evidence reviews. For example, we were able to collaborate with experts in fluid mechanics from the University's School of Engineering when we were working on a review about the transmission of COVID-19 due to their detailed knowledge of how particles move in air. We found that people were very willing to offer their help and expertise at short notice.

22 We also had strong links with:

22.1 international networks through UNCOVER's members' collaborative links with the World Health Organisation ("WHO");

22.2 other international research groups including a group from the Medical Research Council (MRC) in South Africa (with which we collaborated on work relating to the transmission of COVID-19 among children and in schools (UN/004 INQ000361292)); a group from Monash University (with which we collaborated on a paper about non-pharmaceutical interventions ("NPIs") (UN/005 INQ000361293); and a group from University of Bern (with which we collaborated on a review about asymptomatic transmission of COVID-19 (UN/006 INQ000361294)).

22.3 COVID-END, an international COVID-19 Evidence Network to support decision-making, based at McMaster University in Canada.

23 COVID-END created an international platform, in which we actively participated, for those working on COVID evidence synthesis across the

world to meet weekly to share learning, collaborate and avoid duplication of effort.

24 One of the problems that COVID-END wanted to address was that, as the pandemic progressed, many evidence syntheses of varying quality were being produced to answer similar questions. Not only was this a duplication of effort and waste of resources, it was also confusing for decision-makers, who may not have known which evidence was most reliable. To address this problem, we sent COVID-END regular updates of our register of reviews. It collated information from our register and other similar registers. It then critically appraised all evidence reviews as they were published, identifying the highest quality review (and therefore the most reliable evidence) on each topic, to create a resource for decision-makers; although we do not know the extent to which this resource was used by decision-makers.

25 UNCOVER did not seek to inform the public about the nature and threats of COVID-19 or otherwise. However, from the outset we published our evidence syntheses 'open access' (i.e., available free of charge to anyone who looked for them) on our website.

26 Our role was to respond to requests for evidence. As set out at paragraph 7 above, during the initial months of the pandemic, such requests came exclusively from Professor Sheikh, who sat on a number of expert advisory bodies at both UK and Scottish level.

27 Later in the pandemic, we provided evidence directly to Scottish Government or its agencies, on the following occasions:

27.1 In the summer of 2021, we worked collaboratively with colleagues from PHS to produce two evidence reviews requested by them – the first on the effect of alcohol on compliance with COVID restrictions (UN/007 INQ000361295); and the second on the impact of

restrictions on student mental health (UN/008 INQ000361296). These were not funded by Public Health Scotland - we secured some internal funding from the University's Data-Driven Innovation initiative to support this work (see paragraph 16). Both of these evidence reviews were initially published as rapid reviews and later as academic publications in a peer-reviewed academic journal (UN/009 INQ000361297; UN/010 INQ000361298).

27.2 In 2022, we were awarded a research grant by the Scottish Government's COVID-19 Learning & Evaluation Oversight Group to conduct a comparative review of the COVID recovery strategies being deployed by other jurisdictions. The report is published on our website (UN/011 INQ000361299).

28 UNCOVER members worked in teams to find, gather and evaluate information from published studies, and then to summarise the relevant evidence in reports on topics including:

28.1 transmissibility;

28.2 at-risk groups;

28.3 non-pharmaceutical interventions;

28.4 the threat of COVID-19 to at-risk or vulnerable groups in Scotland, including those with pre-existing underlying health conditions; and

28.5 the threat to children and younger people, including school closures.

Evidence Synthesis

29 As described at paragraph 4 above, evidence synthesis is an umbrella term used widely in public health and biomedical science. The rationale behind this approach is that basing a clinical, public health or policy decision on the evidence from one research study alone poses a high risk of 'bias'. Within

this context, 'bias' refers to the possibility of there being systematic error(s) in the research. Where a decision is taken on the basis of a single research study, there is greater risk that it could be based on evidence that is not true or reliable. The overriding aim of evidence synthesis is to support decision-making by producing the most reliable possible evidence on which decisions can be based. If decision-makers rely upon evidence resulting from a well-conducted systematic review, it reduces the risk that the evidence used to inform decision-making is unreliable.

30 The standard evidence synthesis method is systematic review and this was the starting point for UNCOVER when answering research questions during the pandemic. This involves:

30.1 defining a clear research question;

30.2 conducting a comprehensive search to find all potential evidence relating to that question from a variety of sources (and not, for example, relying just on the judgement and existing knowledge of the researchers);

30.3 screening each potential study according to explicit inclusion and exclusion criteria to exclude any studies which are not relevant to the research questions being addressed;

30.4 extracting relevant data systematically, using a pre-prepared form;

30.5 assessing the quality and risk of bias of each included study, using standardised tools; collating and analysing (quantitatively and/or qualitatively) the results of the studies in order to answer the research question; and

30.6 conducting key stages of the process in duplicate in order to quality assure the process.

31 It typically takes 6 - 12 months for a team to conduct a systematic review. However, during the COVID-19 pandemic, urgent questions had to be answered in much shorter timescales – in the early stages of the pandemic evidence was typically required within days or weeks. Therefore, a key challenge was to develop approaches that retained (as far as possible) the rigour of a full systematic review, but that could be conducted much more quickly. In March 2020, the Cochrane Collaboration (a charitable organisation which exists to synthesise medical research findings to facilitate evidence-based choices about health interventions) produced guidelines on conducting rapid reviews, which recommended truncating certain stages of the process. By early April 2020, UNCOVER produced a paper setting out the methodology which we intended to adopt which was based on the Cochrane Collaboration's approach, a copy of which is produced as an exhibit (UN/012 INQ000361300). However, even this truncated approach was too lengthy for the timescales we were working with, typically taking up to six months to complete. We therefore tailored our methodology to the timescales we were given, while maintaining the overall aim of minimising bias. For example, while under a normal systematic review the processes are done in duplicate, some elements were undertaken by a single person. However, we maintained a process of assessing the quality of each piece of relevant research identified. If an answer to a question was required on the same day, it was not possible to conduct a review so we would suggest alternatives, e.g., providing a list of study abstracts or highlighting and summarising a few key papers.

32 Evidence synthesis (whether as part of systematic or rapid reviews) requires teamwork from public health and epidemiology specialists, other subject specialists, systematic review methodologists and information specialists as specific research questions required. As described at paragraphs 17 – 21 above, UNCOVER had a core team of public health, epidemiology, statistics and information specialists and was able to draw on subject specialists from the wider University of Edinburgh community and

from members' professional networks outside the University, as required. Conducting evidence syntheses is an exceptionally labour-intensive endeavour. A key part of the training of public health postgraduate students is training in relation to evidence synthesis, so we were able to quickly mobilise an evidence synthesis workforce (which was initially comprised of volunteers) to undertake this work, under the direction of academic staff.

33 To ensure transparency for every review our methods - including any deviation from standard practice - were clearly documented and reported in a manner which is easily understood by the public health and medical experts for whom they were compiled. In reporting our methods, we complied with the Preferred Reporting Items for Systematic Review and Meta-Analyses (PRISMA) criteria (widely accepted and understood guidelines for reporting review methodology within the field of public health and epidemiology) which helped to ensure that an informed reader would understand which methods we had adopted in undertaking our reviews and which steps we had had to condense or truncate.

34 As explained above, we provided evidence syntheses to colleagues who had advisory roles, principally Professor Sheikh. These colleagues have academic and/or clinical expertise in public health, epidemiology and medicine. It was these colleagues who were the primary intended audience. The methodological information which we provided would enable colleagues conducting advisory work to evaluate the robustness of the evidence. This methodological detail may not have been easily understood by those who do not have public health, epidemiology and/or clinical backgrounds. Similarly, our outputs, particularly when expressing statistical results or detailed systematic review methods, may not always have been comprehensible to a lay audience, which is to be expected in documents of this nature produced for an expert audience. However, the key findings and conclusions of our reviews were written in a way which was designed to be accessible to non-specialists.

35 Sometimes we were asked to update information we had provided at a later stage. At other times we were asked to move onto a different topic. Where we were asked to update information, we did so when time and resources allowed.

36 We used pre-prints in some of our evidence syntheses. A pre-print is a scientific paper which has not been subject to peer-review as is generally required before a paper is published in an academic journal. These are published on a pre-print server (e.g., medRxiv). It became established practice during the pandemic to use pre-prints in systematic reviews, due to the urgent need for information. A crucial stage in the process of conducting a systematic or rapid review is to conduct a formal critical appraisal of each study included in the review. This is done using standard critical appraisal tools. The purpose is to identify the potential for bias in the studies included in the review, so that an overall assessment of the reliability of the evidence can be established. This is an essential stage of any evidence review, regardless of whether the included studies have been published in peer-reviewed journals or not. We critically appraised all the studies included in our reviews in the same manner, regardless of their publication status. We also included a disclaimer to highlight the use of pre-prints.

37 We have been asked about the process we used to ascertain whether the evidence syntheses we provided were used or followed in decision-making. We provided information when requested, but we did not follow up on when, how or by whom it might have been used. We recognised that the information we provided would have been only one part of the picture received by decision-makers, with multiple other sources of information, in addition to advice, feeding into the decision-making process.

38 Similarly, it was not explained to us how or whether information we provided was used in decision-making by the Scottish Ministers or any

other decision makers. Given the responsibilities of civil servants and government advisors and the pressure that they were under at this time, we consider this was reasonable and providing such explanations to us should not have been a priority. As UNCOVER generally responded to requests from Professor Sheikh, knowing how or whether the information we provided was used would not have impacted on the way in which UNCOVER provided information.

Relationships with advisory groups and other bodies

39 Although we did not provide evidence syntheses directly to any of the scientific and expert advisory structures available to the Scottish Government, we understand that some of our outputs were passed to SAGE, SGCAG and the Scottish Government's Environment and Forestry Directorate by Professor Sheikh.

40 We do not know what advice or evidence syntheses were provided by groups other than UNCOVER to the Scottish Government, SGCAG or SAGE, relating to the management of the pandemic in Scotland.

41 We provided information to Professor Sheikh on the risk of transmission of COVID-19 in farms from gates and stiles in response to a request which originated from the Environment and Forestry Directorate. We were asked to provide the information on the same day that we received the request (23 April 2020), which we did. We had no direct interaction with this Directorate.

42 As described at paragraph 27.1 above, we produced two evidence syntheses with PHS and members of UNCOVER had considerable, regular interaction with PHS staff for the purposes of completing these reviews and, more generally, due to the commonality of interests and well-established professional networks between members of UNCOVER and PHS. We consider that our working relationship with PHS was effective.

43 We also conducted a review of the associations between transmission of COVID-19 or other respiratory viruses and population density or other features of neighbourhood design (submitted January 2021). This work addressed one of the research questions from a scoping exercise on the potential health impacts of different scenarios in the City of Edinburgh Council's Edinburgh Local Development Plan. This work was led by Dr Margaret Douglas, who was both a member of UNCOVER at the time, and a member of the Scottish Health Inequalities Impact Assessment Network (SHIIAN). We had no direct interaction with the City of Edinburgh Council.

44 We did not provide any advice to the Scottish Cabinet, the Scottish Government Resilience Room or the Four Harms Group.

45 As far as we are aware, the following UNCOVER reviews were passed to the Scottish Government via Professor Sheikh:

45.1 Rapid review on indoor and outdoor transmission (requested 30/3/2020, submitted 2/4/2020); and

45.2 Rapid review and updates on transmission among children and in schools (requested 30/3/2020, submitted 2/4/2020).

46 We provided reviews to similar timescales on other topics to SAGE and the UK Government's Scientific Pandemic Influenza Group on Modelling ("SPI-M') (via Professor Sheikh) but not, as far as we can recall, directly to the SGCAG.

47 As described at paragraph 34 above, the intended audience for our outputs was primarily public health and epidemiological experts responsible for advising decision-makers. We believe that our outputs were appropriately clear and comprehensible for this audience.

48 We produced results in accordance with the deadlines set by those requesting information from us, insofar as was possible. For example, we

were given three days to complete the reviews on indoor/outdoor transmission and on transmission among children and in schools, referred to at paragraph 45 above. We were given a few weeks to complete the reviews conducted with PHS and for Edinburgh's Local Development Plan described at paragraph 43 above. When it was not possible to do a full review in the time allocated, we provided what we could in response to a question. For example, on 29 April 2020, Prof Sheikh requested a same-day update to our outdoor transmission review, in the light of emerging evidence on aerosol transmission. We believe this was for the Scottish Government. We felt that it was not possible to provide this, so we provided a list of research abstracts that we had identified (UN/013 INQ000361301). The review update followed a week later (UN/014 INQ000361302). We were also asked to provide an answer on the same day as receiving a question about the risk of transmission from touching gates and stiles, as described at paragraph 60.5 below. Due to the short timescale involved in this request, it was not possible to conduct a review; however, we were able to highlight and interpret a few relevant papers.

49 We do not consider that information provided by UNCOVER was too heavily influenced by a particular scientific discipline at the expense of other considerations. As set out at paragraph 17 – 18 above, where it became apparent that other expertise was required in order to answer public health questions, we actively sought this. For example, for the neighbourhood design review we involved a reviewer with expertise in the built environment. For our work on transmission, we involved reviewers with expertise in fluid mechanics. Moreover, due to the limited nature of our role, we were not asked to answer questions which required us to balance non-scientific considerations with scientific ones, nor were we responsible for determining the appropriate balance of competing considerations. Our expertise is in public health and epidemiology - we reasonably assumed those with expertise in other areas were also providing information. Any

determination of how to balance the information we provided with other considerations was made by others.

50 As is good practice, our evidence syntheses would show where the weight of evidence lies in response to a particular question, but also any areas of conflict or uncertainty.

51 To quality assure our outputs, UNCOVER set up a system of internal peer review. At the beginning, this was informal: we read and commented on each other's work before finalising and submitting. Later, Professor Gerry Fowkes, a recently retired, medically qualified senior professor in epidemiology, reviewed most of our outputs. Professor Campbell increasingly also took on this role (initially he was directly involved in producing the reports, but as time went on, he focused more on the role of internal reviewer). Those reviewing our outputs were not involved in producing the reports but they reviewed them and would provide comments, queries and corrections which helped to minimise the risk of groupthink. They were able to perform this role within the very tight timescales under which we were working.

International Context

52 We have been asked to what extent UNCOVER collaborated, liaised or co-operated with international organisations and/or with counterparts in similar academic institutions or the relevant governmental authorities in other countries. As outlined at paragraph 22 above, UNCOVER had strong links with international networks through team members' collaborative links with WHO, with other national and international research groups and with COVID-END. Within the field of public health, international cooperation is generally the default position to avoid unnecessary duplication of effort. Many colleagues in the field have international networks with whom they discuss their work.

53 We conducted a living systematic review on the transmission of SARS-CoV-2 among children and in schools with colleagues at the MRC in South Africa (UN/004 INQ000361292; UN/015 INQ000361303). The purpose of collaborating in this way was to avoid duplication of effort, as both groups were working on the same question. A living systematic review is one that is regularly updated. It is recommended in situations of clinical or public health importance, where there is substantial uncertainty and where the evidence base is rapidly developing.

54 UNCOVER worked with colleagues from Monash University in Australia in conducting a systematic review on the effectiveness of non-pharmaceutical interventions (NPI) (UN/005 INQ000361293). This paper is highly cited as reported by the Altmetric index.

55 UNCOVER had three successive six-month contracts with WHO Global Influenza Programme. The purpose of these contracts was to supply WHO with a range of outputs related to evidence of the impact of COVID-19 on influenza and respiratory syncytial virus (RSV) as COVID-19 restrictions were lifted. We conducted a series of rapid reviews related to this topic (UN/016 INQ000361304; UN/017 INQ000361305; UN/018 INQ000361306; UN/019 INQ000361307; UN/020 INQ000361308; UN/021 INQ000361309; UN/022 INQ000361310; UN/023 INQ000361311; UN/024 INQ000361312), a good practice compendium for the integration of COVID-19 surveillance with influenza surveillance (UN/025 INQ000361313) and three series of regularly updated summaries of relevant published papers (UN/026 INQ000361314; UN/027 INQ000361315; UN/028 INQ000361316). We understand that this evidence informed WHO's decision-making in relation to influenza and RSV surveillance, prevention and response.

56 Several UNCOVER members are Chinese speakers. This meant that we were able to find and use scientific papers published in Chinese as well as in English. This was of enormous benefit, particularly at the start of the

pandemic, when most of the emerging evidence was from China. This evidence was collated from online academic research databases on which academics in China publish their work.

57 As a general principle, the default position when conducting evidence reviews is to identify and assess the quality and relevance of all available evidence from around the world (unless, due to the particular research question, there is a compelling reason to restrict the research to a particular country or countries or population, e.g., due to the relevance of climatic, cultural or socio-economic conditions). Specifically on the subject of NPIs, on 9 April 2020 we were asked by Professor Sheikh to provide a review for the "Advisory committee" (we are unclear which committee this was) addressing the question: *"[a]t what R0 level (and for how long at this level) can NPI restrictions start to be lifted?"*. We submitted this review on 1 May 2020 (UN/029 INQ000361317). This drew on evidence from Austria, the Czech Republic, Denmark, Finland, Germany, Italy, Norway, Spain, Hong Kong and Wuhan, China. Apart from being able to consider some papers in Chinese, we were only able to consider papers published in English due to time constrains and our lack of resources. However, we always made this limitation clear within the methodology section of our reports.

Conclusions and Lessons Learnt

58 In early 2022, UNCOVER was commissioned by the Scottish COVID-19 Inquiry ("the Scottish Inquiry") to produce a series of background reports identifying key events and Scottish Government decisions in relation to the public health response to the pandemic (UN/030 INQ000361318; UN/031 INQ000361319; UN/032 INQ000361320; UN/033 INQ000361321; UN/034 INQ000361322; UN/035 INQ000361323). In these reports, we highlighted instances where there may have been potential for lessons to have been learned from the experiences of other countries. However, we did not come to a view on whether lessons ought to have been learned or were in fact

learned. In conducting this work, our role was simply to highlight issues and questions which the Scottish Inquiry might wish to explore further.

59 UNCOVER also received a grant from the Scottish Government's COVID-19 Learning and Evaluation Oversight Group in 2022 to conduct an evaluation of international pandemic recovery strategies and identify good practice relevant to Scotland (UN/011 INQ000361299). This review aimed to identify and prioritise policies, interventions and examples of good practice, which may help to address the three themes of the COVID-19 Recovery Strategy, and its stated aim of making life better than it was before the pandemic for Scotland's most disadvantaged citizens; drawing on information from relevant comparator countries. The purpose of this review was to identify and evaluate COVID recovery policies from countries around the world to identify good practice relevant to Scotland. This work focused particularly on three key policy areas identified as priorities by Scottish Government: (1) financial security for low-income households; (2) good, green jobs and fair work; and (3) the wellbeing of children and young people. The following summary of our findings is taken from a presentation given to the Scottish Government COVID-19 Learning and Evaluation Group on 8 February 2023, which noted that our analysis identified several cross-cutting themes:

"*Continuity, not change: COVID-19 does not appear to have led to a radical re-thinking of policy approaches in the way that some commentators had imagined might occur. Rather, comparator countries' COVID recovery policies often reflect pre-COVID policy priorities, pre-existing strengths and pre-existing political and economic concerns. In many cases, governments have repurposed or enhanced pre-existing policies as COVID recovery policies. In terms of innovation and green recovery, countries with a pre-existing track record are in a stronger position than new entrants (e.g., hydrogen, battery technology)*

Many countries are making substantial green and social investments: We found examples of both government and EU investment. EU member states aligning their COVID recovery plans with EU priorities can draw on very substantial investment from the EU's Recovery and Resilience Facility.

Scotland's plans are in line with those of comparable jurisdictions: Government policy documents do not always describe policy and spending commitments in terms of COVID recovery, which makes it difficult to distinguish "COVID recovery strategies". However, where it is possible to identify COVID recovery strategies there appear to be strong parallels between the three themes within Scotland's Recovery Strategy and the recovery priorities adopted by other countries.

"Fair work: We found considerable overlap and synergies between the three priority policy areas. Fair work is a strong cross-cutting themes present across all three topic areas. This includes policies which aim to: support incomes and address poverty; create employment opportunities; reduce inequalities; and enhance education and training, particularly digital education"

SECTION B: INITIAL UNDERSTANDING AND RESPONSES TO COVID-19

60 We produced reviews on COVID-19 transmission between 2 April 2020 and 25 August 2020. At paragraphs 60.1 to 60.10, we summarise our key findings, which demonstrate the evolution of our understanding in respect of (i) how COVID-19 was transmitted, including respiratory and fomite transmission and the contributions of close range and longer distance spread; (ii) person-to-person asymptomatic/pre-symptomatic transmission; and (iii) the fact and significance of community transmission:

60.1 **2 April 2020** – UNCOVER completed a review on indoor and outdoor transmission (UN/036 INQ000361324). This found that:

"transmission patterns are consistent with fomites (door handles, lift buttons, taps), droplet spread or aerosolisation in confined spaces." However, it was observed that "[e*]vidence on transmission is limited and of poor quality*". Professor Sheikh requested this report and we understand that he had passed this review to the SGCAG which then passed it to SAGE and SPI-M. The review concluded that:

"Whilst there is evidence of community transmission across a range of (mainly indoor settings), precise transmission mechanisms remain unclear. There is an absence of evidence on transmission in outdoor settings; however, given emerging evidence on the possibility of coughs and sneezes travelling much further than previously thought, caution about the risk of outdoor transmission is warranted."

60.2 On 5 April 2020 Professor Campbell emailed to say that we had received feedback from Sir Patrick Vallance (presumably via Professor Sheikh) in relation to this review and a review we had produced in relation to Schools (see paragraph 79 below) to say that these reports were very helpful. We were asked to update these reviews with any new information and to address a further question in relation to facemasks (see paragraph 60.3 below).

60.3 **7 April 2020** – UNCOVER completed a review on community use of face masks to prevent transmission of COVID-19 (UN/037 INQ000361325). One of the sub-questions of this review was: "*[w]hat is the mode of transmission of SARS-CoV-2 and other common respiratory pathogens?"* This review concluded that:

"SARS-CoV-2 is transmissible by contact and droplets. SARS-CoV-2 can be detectable and viable in aerosols, suggesting possible transmission routes by aerosols. However, little evidence is available so far demonstrating actual aerosol transmission episode by SARS-CoV-2".

By email on 9 April 2020, Professor Sheikh asked us to keep updating this review.

60.4 **19 April 2020** – UNCOVER completed a review on pre-symptomatic transmission (UN/006 INQ000361294). This was not published on our website (simply due to an oversight during this extremely busy period) but it was provided to Professor Sheikh who then submitted it to SAGE. It concluded that:

"*This review found evidence to support an important and substantial contribution of COVID transmission from presymptomatic and asymptomatic individuals, with most estimates in the range of 40 - 60 %. This evidence is consistent across a range of different study designs including epidemiological research studies and medium-large scale population testing surveys in open or closed populations supported by data from detailed virological studies and estimates from mathematical models.*"

60.5 **23 April 2020** – UNCOVER provided a same-day answer to a question on the risk of transmission from touching outdoor gates and stiles (UN/0038 INQ000361326). Due to the tight timescale of this request, we did not have time to do a comprehensive or robust review but we had been working on questions relating to transmission for a number of weeks so were familiar with the relevant literature. We found no studies of direct relevance to this question in real-world contexts; however, we found studies on surface contamination and persistence of the SARS-CoV-2 virus on different materials and at different temperatures and humidity levels under laboratory conditions. The findings of these studies were summarised, with the caution that the results of laboratory studies cannot be directly extrapolated to real-world conditions.

60.6 **30 April 2020** – We received a request from Professor Sheikh for an update of our outdoor transmission review. This was in the context of emerging concerns about aerosol transmission. We understand that the SGCAG had received a request from the First Minister requesting a response the following day. We could not do a full update within this timescale so we updated our search for relevant evidence and compiled a list of relevant research abstracts (UN/013 INQ000361301), which we sent to Professor Sheikh on 30 April 2020.

60.7 **8 May 2020** – UNCOVER updated a review on outdoor transmission in response to the request from Sir Patrick that we should keep updating this review. We passed this update to Professor Sheikh (UN/014 INQ000361302). This update integrated evidence from epidemiological, environmental, laboratory and fluid mechanics studies and concluded that:

"*SARS-CoV-2 is transmissible by contact (fomites) and droplets. It can be detectable and viable in aerosols, suggesting possible transmission routes by aerosols. However, little evidence is available so far demonstrating actual aerosol transmission by SARS-CoV-2.*"

60.8 **27 May 2020** – UNCOVER updated a review on outdoor transmission (UN/039 INQ000361327). This update concluded that:

"SARS-CoV-2 is transmissible by contact (fomites) and droplets. It can be detectable and viable in aerosols, suggesting another possible transmission route." This report was published on our website but we have not been able to confirm at this juncture if this was passed to Professor Sheikh.

60.9 **15 August 2020** – UNCOVER updated a review on indoor transmission (UN/040 INQ000361328). This report was published on our website but we have not been able to confirm at this juncture if this was passed to Professor Sheikh. This review sought to answer ten sub-questions on indoor transmission. It concluded that:

"*Based on the evidence available to date, the most common transmission route for SARS-CoV-2 is person-to-person, short-range spread via mostly respiratory droplets that directly reach recipients either through the air or through touching contaminated surfaces and then transferring the virus on the hands to mucosal membranes. Evidence from numerical simulation and fluid mechanics studies, microbiological laboratory studies and environmental sampling studies suggest that aerosol transmission is theoretically possible and is another potential source of transmission. Evidence from an outbreak linked to a choir practice is also consistent with this*."

The review also looked at the potential role of ventilation systems in transmission and concluded that:

"*Air currents are responsible for the dispersal of both aerosols and large droplets within buildings, between different rooms and even between different floors. This dispersal can be amplified by a variety of factors, including ventilation and air conditioning systems, differences of temperature between rooms and air currents entering through open windows. However, ventilation systems are also likely to dilute the concentration of viral particles in the air and thereby to play a potential role in decreasing transmission. Ventilation systems are likely to decrease virus transmission risk near the source but to increase virus transmission risk further away from the source."*

On fomite transmission, this review found that:

"Laboratory-based experiments demonstrate that the length of time SARS-CoV-2 remains viable on surfaces depends on the type of surface and the environmental conditions. Evidence suggests that the virus prefers smooth, non-fabric surfaces, low temperatures and damp conditions."

60.10 Further detailed information on the half-life of the virus on different surfaces and under different environmental conditions is provided in the review. This review was later published (UN/041 INQ000361329).

61 UNCOVER did not conduct any reviews focusing on the exponential growth in transmission - our focus was on routes/mechanisms of transmission.

62 On 9 April 2020 we were asked by Professor Sheikh to provide a review addressing the question: "*At what R0 level (and for how long at this level) can NPI restrictions start to be lifted*?". We submitted this review on 1 May 2020 (UN/029 INQ000361317). We had a clear understanding of the significance of the R number and the need to keep this below one. This is a well-established and understood epidemiological concept.

63 Members of UNCOVER with particular expertise in modelling later published a modelling study in the Lancet Infectious Diseases on the temporal association between the R number and introducing/lifting NPIs (UN/042 INQ000361330). It concluded that:

"*Individual NPIs, including school closure, workplace closure, public events ban, ban on gatherings of more than ten people, requirements to stay at home, and internal movement limits, are associated with reduced transmission of SARS-CoV-2, but the effect of introducing and lifting these NPIs is delayed by 1–3 weeks, with this delay being longer when lifting NPIs. These findings provide additional evidence that can inform policy-*

maker decisions on the timing of introducing and lifting different NPIs, although R should be interpreted in the context of its known limitations."

64 We conducted a review on risk factors for poor outcomes (i.e., mortality, ICU admission and invasive mechanical ventilation) in hospitalised COVID-19 patients. The literature search was conducted in May 2020 and the paper was written in December 2020 (UN/043 INQ000361331). The paper was published in the Journal of Global Health in 2021. It concluded that:

"*Male sex, older age, obesity, diabetes and chronic kidney diseases are important risk factors of COVID-19 poor outcomes*".

65 On 13 August 2021 we produced a systematic review and meta-analysis on the risk of serious COVID-19 outcomes among adults and children with severe asthma (UN/044 INQ000361332). This was requested by Professor Sheikh to help inform decision-making by the UK Joint Committee on Vaccination and Immunisation. The review was published in the European Respiratory Review on 2 November 2022 (UN/045 INQ000361333). It concluded that:

"… there is limited evidence demonstrating that those with severe asthma are at increased risk of COVID-19 mortality compared to those with mild asthma or no asthma. However, high-quality evidence demonstrated that severe asthma requiring high-dose ICS [inhaled corticosteroids] *or OCS* [oral corticosteroids] *was associated with a higher risk of COVID-19 hospitalisation compared to mild asthmatics and/or nonasthmatic controls*."

Part C - Decisions in relation to non-pharmaceutical interventions ("NPIs") – general

66 UNCOVER produced a rapid review on a topic that partly addressed the effectiveness of reduction of person-to-person contact/social distancing

(UN/036 INQ000361324). The review was on the evidence for the importance of outdoor transmission and indoor transmission of COVID-19 and was received as a request from the SPI-M UK modelling committee via Professor Sheikh on 30 March 2020. This review was sent to Professor Sheikh on 2 April 2020. We understand that Professor Sheikh sent this review to SPI-M, and SAGE. It was subsequently published on the SAGE website. The conclusions of the review are discussed in paragraph 60.1 above.

67 UNCOVER also produced a rapid review on a topic that partly addressed the effectiveness of the closure and opening of schools (UN/046 INQ000361334). The review was on what the evidence is for transmission of COVID-19 by children (or in schools) and was received as a request from the SPI-M UK modelling committee via Professor Sheikh on 30 March 2020. This review was sent to Professor Sheikh on 2 April 2020, who sent it to SPI-M, Scottish Advisory Committee and SAGE. It was subsequently published on SAGE's website (see paragraph 79 for the conclusions of this review).

68 UNCOVER produced rapid reviews on topics that partly addressed the effectiveness of facemasks. The initial review of relevance to this area was on whether the use of facemasks in the general population make a difference to infection spread. An additional question was then explored on whether there is any evidence in sub-groups of people (e.g., teachers, shopworkers) that facemasks have health benefits. Finally, we conducted a third sub-review on the different types of face masks. The conclusions of these reviews are summarised in the following paragraphs.

68.1 **7 April 2020** - We provide a review on facemask use in the general population, in response to a request from by Professor Sheikh on behalf of a UK advisory group received on 3 April 2020 (UN/037 INQ000361325). As it was so early in the pandemic, there was no

data on mask-use in relation to COVID-19, so we had to rely on data from other respiratory pathogens. The question we were asked to address was *"[d]oes the use of face masks in the general population make a difference to spread of infection?"* We concluded that:

"*This review found mixed and low quality evidence on the use of face masks to prevent community transmission of respiratory illness, with much of the evidence generated in very different contexts from the UK*".

68.2 **19 April 2020** – We completed a review on homemade facemasks (UN/047 INQ000361335). This addressed the question: "*[a]re homemade face masks effective at reducing transmission of COVID-19 in community settings?"* This found that the evidence suggested that homemade masks are not effective at filtering respiratory aerosols but may have potential to reduce transmission through droplets; however, the quality of the evidence was very low. The review further concluded that:

"*Although at the individual level, homemade facemasks may only have a marginal protective effect, when multiplied up to the population level, they may contribute to reducing transmission. However, we found no research evidence quantifying this."*

This review was updated on 27 May 2020 (UN/048 INQ000361336) to incorporate evidence on fluid mechanics. This concluded:

"Although they are not effective at filtering aerosols, homemade masks worn by sick people can reduce virus transmission by mitigating aerosol dispersal (Tang, et al, 2009; Viola et al, 2020). Homemade masks worn by sick people can also reduce transmission through droplets. By reducing the number of droplets reaching surfaces, homemade masks can reduce the risk of transmitting or

acquiring COVID-19 through reducing environmental (surface) contamination."

68.3 **20 April 2020** – we updated the review on facemask use in the general population (UN/049 INQ000361337). The question addressed by this update was: "*[w]hat is the effectiveness of face masks in preventing respiratory transmission in the community?"* Again, this was based on data from other respiratory pathogens. This update concluded that:

"*Based on the evidence from four recent systematic reviews and meta-analyses, wearing face masks in the community is not significantly associated with a reduction in ILI [influenza-like illness] and the overall assessment of the quality was classified as low*".

68.4 **22 April 2020** – we provided a review on facemasks and frontline workers in response to requests received from Professor Sheikh on 9 and 14 April 2020 (UN/050 INQ000361338). This review addressed the question: *"[w]hich occupations and activities might benefit from masks wearing to reduce the transmission of COVID-19?"* Our understanding was that the background to this review was that the Scottish or UK (from the request provided, we are not sure which) Government was considering whether face masks could be used by key workers, such as teachers and retail workers, as part of a phased strategy to come out of lockdown. The review found no robust data to answer this question and concluded that there was insufficient evidence from this review to answer the question. This review was updated on 27 May 2020 to incorporate evidence from fluid mechanics studies (UN/051 INQ000361339). Whilst the epidemiological evidence remained unchanged (there was insufficient evidence to answer the question), there is robust fluid

mechanical evidence to suggest that mask wearing can mitigate virus transmission described above.

69 These reviews were sent to Professor Sheikh on 22 April 2020.On 27 May 2020 we updated the review on facemask use in the general population (UN/052 INQ000361340). This update addressed the same question as the 20 April update. It incorporated evidence from fluid mechanics studies. This update concluded:

> "*Although epidemiological studies do not support the hypothesis that masks are effective at reducing the transmission of respiratory infections, there is robust evidence from laboratory studies which measure the extent to which droplets and aerosol are dispersed. Droplets ejected by unfiltered sneezes can reach 7 – 8 metres (Bourouiba, 2020), coughs can reach 4 – 6 metres (Bourouiba et al, 2014) and aerosols more than 1 metre (Bourouiba et al, 2014; Tang et al, 2009; Viola et al, 2020). The ranges depend on temperature, humidity and environmental airflows. Furthermore, there is evidence from this type of study that wearing a mask can reduce these distances to a few centimetres (Tang et al 2009; Viola et al, 2020). Hence, from a mechanical point of view, there is evidence that masks CAN mitigate virus transmission. Of course, these fluid mechanics studies do not account for potential behavioural factors associated with mask use (e.g. perhaps touching your face more, washing your hands less, engaging more readily in high risk exposures, reusing a contaminated mask etc). As these may play a role in actual transmission rates there is an ongoing need for robust epidemiological studies to assess the real world impact of mask use on SARS-CoV-2 transmission rates*".

70 In terms of non-pharmaceutical interventions (NPIs), UNCOVER conducted a rapid review and modelling study on (i) how population-level NPIs reduced

SARS CoV-2 transmission; (ii) how these were related in time to the reproduction number (R); and (iii) whether countries have used measures of R in making decisions about the application of these interventions (UN/029 INQ000361317). This work was later published in Lancet Infectious diseases in February 2021 and its conclusions are outlined at paragraphs 62 – 63 above (UN/042 INQ000361330).

71 UNCOVER also participated in a systematic review and meta-analysis on the effectiveness of public health measures in reducing the incidence of COVID-19, SARS-CoV-2 transmission, and COVID-19 mortality that was led by Monash University and was published in BMJ in November 2021 (UN/005 INQ000361293). It concluded that:

"This systematic review and meta-analysis suggests that several personal protective and social measures, including handwashing, mask wearing, and physical distancing are associated with reductions in the incidence [of] covid-19. Public health efforts to implement public health measures should consider community health and sociocultural needs, and future research is needed to better understand the effectiveness of public health measures in the context of covid-19 vaccination."

72 In April 2021, we conducted a rapid review on the prevalence of post-COVID-19 syndrome (Long Covid) that was submitted by Professor Sheikh to the Scottish Government (UN/053 INQ000361341) It noted that there were severe limitations with the quality and scope of the literature and the answer we could provide to the question at that stage was heavily caveated. We could not provide an estimate of prevalence with any degree of certainty.

73 At paragraphs 73.1 and 73.2 below, we have identified areas in which a particular vulnerable or at-risk group (as defined by the Inquiry within its Rule 9 request) was the **focus** of a review by UNCOVER. Some factors, such as age and sex, are commonly investigated as risk factors in public

health research, and so may have been indirectly addressed in a wide range of different reviews, but were not the primary focus of that work.

73.1 **Children and Young People:** We conducted a number of rapid reviews on the role of children in the transmission of SARS-COV-2 as described in paragraph 79 to 83 below (UN/046 INQ000361334; UN/054 INQ000361342; UN/055 INQ000361343; UN/056 INQ000361344).

73.2 **Ethnic Minorities:** UNCOVER conducted a rapid review on ethnic variations in COVID-19 incidence and outcomes on 25 April 2020 that was submitted to Professor Sheikh on 29 April 2020. This addressed the question: "What is the Evidence on Ethnic Variations in COVID-19 Incidence and Outcomes?" (UN/057 INQ000361345). Our analysis found that people from Black, Asian and Minority Ethnic (BAME) backgrounds were at higher risk of severe outcomes from COVID-19 compared to people of white ethnicity, and the general population as a whole. We also found evidence for ethnic inequalities in health, housing, working conditions and education creating vulnerabilities that disadvantaged ethnic minority populations and increased their susceptibility to COVID-19. We produced an update to this review on 28 May 2020 (UN/058 INQ000361346). This confirmed the findings of the earlier review and highlighted specific risks faced by refugees and asylum seekers, including homelessness, precarious living conditions and shared accommodation.

74 However, we do not know the extent to which the Scottish Government took account of the impact of the virus and measures taken to control its spread on these groups.

Part D - Specific decisions taken by the Scottish Government in its management of the COVID-19 pandemic

75 We have been asked about decisions taken on:

75.1 7 May 2020 - Extension of the lockdown restrictions in Scotland for another three weeks, with indication they could be changed if there is evidence it was safe to do so.

75.2 11 May 2020 - In a national address to Scotland at the beginning of the 7th week of lockdown, Nicola Sturgeon asked the nation "to *stick with lockdown for a bit longer - so that we can consolidate our progress, not jeopardise it... I won't risk unnecessary deaths by acting rashly or prematurely*."

75.3 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*".

76 In respect of these three areas of interest, on 9 April 2020 we were asked to provide a review addressing: *"[a]t what R0 level (and for how long at this level) can NPI restrictions start to be lifted*?". We received this request from Professor Sheikh who was seeking information for "*the Advisory committee*" – however we do not know if this was a Scottish or UK Government advisory committee. We submitted this review on 1 May 2020 (UN/029 INQ000361317). This drew on evidence from Austria, the Czech Republic, Denmark, Finland, Germany, Italy, Norway, Spain, Hong Kong and Wuhan, China. This review found that:

"*Of all the non-pharmaceutical interventions (NPIs) introduced at a population level in countries affected by COVID-19, including school closure, public events ban, social distancing and 'lockdown', lockdown contributed most...to reduction in R….(A)ll countries appear to be adopting a cautious approach and relaxing restrictions in a phased manner*."

The review also highlighted substantial uncertainties in estimating and interpreting the R number in the midst of an outbreak and concluded that *"decisions on enforcing and lifting NPIs need to balance information from R and other key parameters and cannot be based on R alone."*

77 We have been asked what lessons were learned by UNCOVER as a result of the experience of the first lockdown; in particular, about the nature of the virus and the infection. We produced a series of reviews about the transmission of COVID-19 (UN/006 INQ000361294; UN/013 INQ000361301; UN/014 INQ000361302; UN/036 INQ000361324; UN/038 INQ000361326; UN/039 INQ000361327; UN/040 INQ000361328). This is the only topic related to the nature of the virus and the infection that we have focused on. The evolution of our understanding is set out in paragraph 60 above.

78 We provided several reviews and updates of the evidence on face masks, as summarised at paragraphs 68 to 69 above (UN/037 INQ000361325; UN/047 INQ000361335; UN/048 INQ000361336; UN/049 INQ000361337; UN/050 INQ000361338; UN/051 INQ000361339; UN/052 INQ000361340; UN/059 INQ000361347; UN/060 INQ000361348).

79 On 30 July 2020 the First Minister, Nicola Sturgeon, announced that schools would be allowed to reopen on 11 August 2020, with all pupils expected to be in class full time from 18 August. UNCOVER completed a review on the evidence for transmission of COVID-19 by children (or in schools) on 1 April 2020 (UN/046 INQ000361334). At the time, the review found that "*no high quality studies directly addressing the study question were identified*" and

that there were *"no reported outbreaks of COVID-19 in schools or nurseries"*. Although "*there has been no confirmed evidence or reports of paediatric cases as the main source of infection*", the review found that "*there is risk of transmission by infected children (with virus in nasal secretions and stools) and some evidence of faecal-oral transmission in asymptomatic paediatric cases. This limited evidence may have substantial implications for community spread in day-care centres, schools, and homes*."

80 UNCOVER updated this review on 9 April 2020 (UN/055 INQ000361343). The request for this update came from SPI-M via Professor Sheikh. The review noted that there was "*a single case report where there was COVID-19 confirmed transmission from one child to family members*", indicating *"very limited evidence of transmission of SARS-CoV-2 from children."* The review also found that "*an investigation on environmental contamination in the isolation room of an infected infant confirmed that a generally well infant with COVID-19 can contaminate the environment with PCR-detectable virus*."

81 In an updated review dated 6 May 2020 (UN/056 INQ000361344), UNCOVER continued to find no high-quality studies directly addressing the study question, and very limited evidence of transmission of SARS-CoV-2 from children, including an additional report of "*two pupils infecting another pupil after close contact in a high school in Australia*." The report also noted that "*it is estimated that the number of infected children with latent asymptomatic or with mild symptoms of respiratory or gastrointestinal illness is higher than in adults and some studies highlight that young people and children may be important sources of asymptomatic transmission."*

82 In a further update dated 2 July 2020 (UN/054 INQ000361342), the conclusions of the earlier reviews continued to be supported, and "*we did not identify more studies that reported documented cases of SARS-CoV-2*

transmission by children." The review also described four studies of school or day care settings which did not identify onward transmission of the virus within these settings.

83 UNCOVER published two academic papers in the Journal of Global Health, in June 2020 (UN/061 INQ000361349) and December 2020 (UN/062 INQ000361350), on the findings of our rapid reviews on the role of children in the transmission of SARS-CoV-2. Both papers concluded that *"there is limited evidence detailing transmission of SARS-CoV-2 from infected children."* We also published a paper reporting the findings of our living systematic review of the evidence for transmission of COVID-19 by children in schools, also in the Journal of Global Health, in December 2020 (UN/004 INQ000361292). The paper concluded that: "*There is limited high-quality evidence available to quantify the extent of SARS-CoV-2 transmission in schools or to compare it to community transmission. Emerging evidence suggests lower IAR [infection attack rate] and SARS-CoV-2 positivity rate in students compared to school staff. Future prospective and adequately controlled cohort studies are necessary to confirm this finding.*"

Part E - Key challenges and lessons learned

84 In order to identify what we consider to be key issues and junctures in the decision-making process relating to the management of the pandemic in Scotland. We can:

84.1 reflect on our very specific experiences of the rapid synthesis of evidence to support those advising the Scottish Government; and

84.2 draw on the work we were commissioned to do by the Scottish COVID Inquiry, which takes a much broader perspective.

85 As described above, our modest role in the pandemic response was to respond rapidly to urgent requests of information from those advising the

Scottish Government. This took place mostly during the spring and early summer of 2020, when there was considerable uncertainty about fundamental questions, such as: "*how is the virus being transmitted?*"; "*do face masks prevent community transmission?*"; and "*to what extent is the virus transmitting among children and in schools?*". Decisions had to be taken about when and how to ease restrictions; how to protect those working in buildings that remained open; whether to make mask-wearing compulsory in public places; whether and when to reopen schools; on the basis of limited, uncertain and rapidly evolving evidence.

86 Equipping decision-makers (and those advising them) with the most up-to-date evidence available, and also giving them a clear indication of the certainty and trustworthiness of that evidence, seems to us to be a fundamentally important element in pandemic response – one which ought to underpin all decision-making. Many lessons have been learned over the past three years about the importance of having systems in place that can be rapidly deployed, e.g., to enable mass testing or the provision of PPE. In the same way, it is our belief that attention should be given to arrangements for the rapid review of evidence to support decision-making. This work is specialised and labour-intensive and requires a high level of organisation.

87 The academic, scientific and public health community took the initiative and mobilised to perform this function; however, we suggest that such an important function should not be dependent on the initiative of private individuals - it would benefit from a level of government coordination and investment. We are not suggesting that this function should be centralised or controlled by government - we believe that there is a strength in several groups working independently to answer the same question, to guard against "groupthink" and political bias and to provide quality assurance. However, this work could be better supported, coordinated and resourced.

88 As described elsewhere in this document, UNCOVER was an active participant in COVID-END, an international network of academic and public health evidence specialists, who sought to share evidence, highlight the highest quality evidence on key topics and avoid duplication of effort. COVID-END (supported by UNCOVER and others) produced a register of best evidence syntheses on key public health, clinical, and wider public policy questions, which was freely available to search online. It also convened international citizen panels to identify priority questions for future work. A key question is the extent to which those responsible for decision-making or advising decision-makers were aware of this and similar resources and how two-way engagement between decision-makers/advisors and those producing evidence could be strengthened internationally.

89 Finally, on the subject of the review of evidence, a key aspect for consideration for future pandemic preparedness is the potential role of artificial intelligence ("AI"). Groups around the world are already working on which aspects of the systematic review process could be automated (e.g., screening the literature, data extraction). These are very time-consuming exercises when done manually so the use of AI could potentially speed up this process. However, before that happens, we need to be confident that this is done accurately and in an unbiased way. There are also (as we understand it) technical challenges related to extracting data from tables. However, AI is not an area in which we are experts.

90 Taking a broader perspective on the pandemic in Scotland, in February 2022 we undertook work for the Scottish Inquiry, producing six background papers on the public sector response during 2020 and 2021 (covering pandemic preparedness, restrictions and lockdowns, testing, PPE, the vaccination strategy, and shielding) (UN/030 INQ000361318; UN/031 INQ000361319; UN/032 INQ000361320; UN/033 INQ000361321; UN/034 INQ000361322; UN/035 INQ000361323). In 2023, we updated this to

include January to December 2022 (UN/063 INQ000361351). We are now working on two further background papers for the Scottish COVID Inquiry, on the impact of Scottish Government COVID-19 policies and decisions on (i) refugees and asylum seekers, and (ii) women and girls. In brief, this work, which is based entirely on documents in the public domain, involved the construction of a detailed timeline for each topic, identifying key decisions, actions and events. We drew out key themes on each topic and a suggested list of questions that the Scottish COVID Inquiry might wish to consider in more detail. It is important to state that our role was not to draw conclusions but to pose questions/ highlight issues which the Scottish Inquiry might wish to explore further, and therefore the reports are not a statement of UNCOVER's views in respect of any of those issues.

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: 5 December 2023

LIST OF EXHIBITS

UN/001-INQ000361289. Zhang X, Xu W, Dozier M, Nzvere FP, Krishan P, He Y, et al. Advances in COVID-19 research until November 2020: Update from the UNCOVER registry. Journal of Global Health. 2021. DOI: 10.7189/jogh.11.03022

UN/002-INQ000361290. Xu W, Zhang X, He Y, Dozier M, Owers B, Li X, et al. UNCOVER registry: A searchable online catalogue for COVID-19 evidence reviews. Journal of Global Health. 2020. DOI: 10.7189/jogh.10.020101

UN/003-INQ000361291. Campbell H, McQuillan R. Email: COVID evidence reviews in Usher. 2020.

UN/004-INQ000361292. Xu W, Li X, Dozier M, He Y, Kirolos A, Lang Z, et al. What is the evidence for transmission of COVID-19 by children in schools? A living systematic review. 2020. Journal of Global health 2020. DOI: 10.7189/jogh.10.021104

UN/005-INQ000361293. Talic S, Shah S, Wild H, Gasevic D, Maharaj A, Ademi Z, et al. Effectiveness of public health measures in reducing the incidence of covid-19, SARS-CoV-2 transmission, and covid-19 mortality: systematic review and meta-analysis. BMJ. 2021. DOI: 10.1136/bmj-2021-068302

UN/006-INQ000361294. McQuillan R, Dozier M, Goodwin L, Plant S, Harpur A, Nair H, et al. What is the evidence for pre-symptomatic / asymptomatic COVID-19 transmission and the possible policy implications of these findings. Rapid review. 2020 20 April.

UN/007-INQ000361295. Adams E, Bogle A, Cullen B, Donaghy G, Dozier M, Hartnup K, et al. To what extent is alcohol consumption in social gatherings associated with observance of COVID-19 restrictions?: A rapid review. Rapid review. 2021 4 August

UN/008-INQ000361296. Dozier M, Farfan de los Godos E, Fryer J, Goodwin L, Hair K, Iduye D, et al. What is the impact of COVID-19 mitigation strategies on the mental health of post-secondary school students? Rapid review and summary. 2021 24 August.

UN/009-INQ000361297. Lee B, Krishan P, Goodwin L, Iduye D, Farfan de los Godos E, Fryer J, et al. Impact of COVID-19 mitigations on anxiety and depression amongst university students: A systematic review and meta-analysis. Journal of Global Health. 2023. DOI: 10.7189/jogh.13.06035

UN/010-INQ000361298. Kulkarni D, Nundy M, McSwiggan E, Adams E, Dozier M, Hartnup K, et al. To what extent is alcohol consumption in social gatherings associated with observance of COVID-19 restrictions? A rapid review. Journal of Global Health. 2022. DOI: 10.7189/jogh.12.13001

UN/011-INQ000361299. Adams E, Iduye D, McSwiggan E, Mureyi D, Nundy M, Atkins N, et al. An Evaluation of International Pandemic Recovery Strategies and Identification of Good Practice Relevant to Scotland. Comparative review. 2023.

UN/012-INQ000361300. McQuillan R, Dozier M, Theodoratou E, Nair H, McSwiggan E, Fowkes G, et al. COVID-19 Rapid Review Group – What methodology should we use? Methodological paper. 2020 26 March.

UN/013-INQ000361301. McQuillan R, Dozier M, Goodwin L, Theodoratou E. Outdoor transmission - updated list of abstracts. Answer to urgent question. 2020 30 April.

UN/014-INQ000361302. McQuillan R, Dozier M, Nundy M, McSwiggan E, Goodwin L, Kulkarni D, et al. What is the evidence for outdoor transmission of SARS-CoV-2? Update 1 - 8 May 2020. Review update and summary. 2020 8 May.

UN/015-INQ000361303. Xu W, Li X, Dong Y, Dozier M, He Y, Kirolos A, et al. SARS-CoV-2 transmission in schools: An updated living systematic review (version 2; November 2020). Journal of Global Health. 2020. DOI: 10.7189/jogh.11.10004

UN/016-INQ000361304. Nair H, Wang X, Kulkarni D, Dozier M, Hartnup K, Campbell H. Summary: National influenza immunization strategies in the COVID-19 era. Rapid review summary. 2020 29 July.

UN/017-INQ000361305. McSwiggan E, Dozier M, Gornall-Wick A, Hayward T, Krishan P, Kulkarni D, et al. What are the parameters (attack rates, generation intervals, latent period, incubation period, duration of infectiousness, reproduction number) and modes of transmission of RSV [respiratory syncytial virus]? Rapid review. 2023 10 March.

UN/018-INQ000361306. McSwiggan E, Atkins N, Bhattacharyya U, Devine C, Dozier M, Lee B, et al. What are the parameters (attack rates, generation intervals, latent period, incubation period, duration of infectiousness, reproduction number) and modes of transmission of seasonal and pandemic influenza? Rapid review. 2023 30 July.

UN/019-INQ000361307. McSwiggan E, Agyei-Manu E, Dozier M, Fryer J, Hegarty H, Iduye D, et al. What are the odds of severe outcomes (including hospitalisation, ICU admission, mechanical ventilation and/or mortality) for people who are co-infected with more than one respiratory virus (namely SARS-CoV-2, influenza, RSV) compared to people with monoinfection? Rapid review. 2022.

UN/020-INQ000361308. Li Y, Ashcroft T, Gillette E, Kulkarni D, H. N. Case definitions for surveillance integrated for influenza and COVID-19. Rapid review and summary. 2020 19 October.

UN/021-INQ000361309. Kulkarni D, Ashcroft T, Lee B, Nundy M, Hartnup K, Bhattacharyya U, et al. A rapid review update - case definitions for surveillance integrated for influenza and COVID-19. Update 1 - 5 October 2021. Review update. 2021 5 October.

UN/022-INQ000361310. Wang X, Kulkarni D, Dozier D, Hartnup K, Paget J, Campbell H, et al. Influenza vaccination strategies for 2020-21 in the context of COVID-19. Journal of Global Health. 2020. DOI: 10.7189/jogh.10.021102

UN/023-INQ000361311. Lee B, Ashcroft T, Agyei-Manu E, Farfan de los Godos E, Leow A, Krishan P, et al. Clinical features of COVID-19 for integration of COVID-19 into influenza surveillance: A systematic review. Journal of Global Health. 2022. DOI: 10.7189/jogh.12.05012

UN/024-INQ000361312. Atkins N, Harikar M, Duggan K, Zawiejska A, Vardhan V, Vokey L, et al. What are the characteristics of participatory surveillance systems for influenza-like-illness? . Journal of Global Health. 2023. DOI: 10.7189/jogh.13.04130

UN/025-INQ000361313. Ashcroft T, Nundy M, Lee B, Kulkarni D, Shi T, McQuillan R, et al. Integration of COVID-19 surveillance into influenza surveillance. Best practices' compendium. Best practice compendium. 2021 8 October.

UN/026-INQ000361314. Nundy M, Nolan G, Gornall-Wick A, Pistol J, Rust M, Theodoratou E, et al. Fortnightly summary of publications on influenza and RSV, in the context of COVID-19. Part 3: 24 November 2022 - 15 April 2023. Fortnightly summary of research publications. 2022 - 2023.

UN/027-INQ000361315. Nundy M, Lee B, Atkins N, de Silva U, Boakye D, Zhou Y, et al. Weekly summary of publications on influenza and RSV, in the context of COVID-19. Part 2: 12 February - 22 July 2022. Weekly summary of research publications. 2022.

UN/028-INQ000361316. Kulkarni D, Ashcroft T, Lee B, Nundy M, Hartnup K, Theodoratou E, et al. Weekly summary of publications on influenza and RSV, in the context of COVID-19. Part 1: 16 August - 24 October 2021. Weekly summary of research publications. 2021.

UN/029-INQ000361317. Li Y, Nair H, Kulkarni D, Nundy M, Harpur A, Dozier M, et al. How have population-level non-pharmaceutical interventions [NPIs] to reduce SARS CoV-2 transmission been related in time to the reproduction

number (R) and have countries used measures of R in making decisions about the application of these interventions? Rapid review and summary. 2020 1 May.

UN/030-INQ000361318. McQuillan R, Theodoratou E, McSwiggan E, Adams E, Atkins N, Fryer J, et al. Scottish COVID-19 Inquiry. Academic Research. Portfolio 1: Public Sector Response. Shielding and associated assistance programmes. Background research for Scottish COVID-19 Inquiry. 2022.

UN/031-INQ000361319. McQuillan R, Theodoratou E, McSwiggan E, Adams E, Atkins N, Fryer J, et al. Scottish COVID-19 Inquiry. Academic Research. Portfolio 1: Public Sector Response. Investigation of the strategic elements of the handling of the pandemic relating to the supply, distribution, and use of Personal Protective Equipment. Background research for Scottish COVID-19 Inquiry. 2022.

UN/032-INQ000361320. McQuillan R, Theodoratou E, McSwiggan E, Adams E, Atkins N, Fryer J, et al. Scottish COVID-19 Inquiry. Academic Research. Portfolio 1: Public Sector Response. The design and delivery of the vaccination strategy. Background research for Scottish COVID-19 Inquiry. 2022.

UN/033-INQ000361321. McQuillan R, Theodoratou E, McSwiggan E, Adams E, Atkins N, Fryer J, et al. Scottish COVID-19 Inquiry. Academic Research. Portfolio 1: Public Sector Response. The delivery of a system of testing, outbreak management and self-isolation. Background research for Scottish COVID-19 Inquiry. 2022.

UN/034-INQ000361322. McQuillan R, Theodoratou E, McSwiggan E, Adams E, Atkins N, Fryer J, et al. Scottish COVID-19 Inquiry. Academic Research. Portfolio 1: Public Sector Response. Whether, when and how to impose lockdown and other restrictions in response to the COVID-19 pandemic. Background research for Scottish COVID-19 Inquiry. 2022.

UN/035-INQ000361323. McQuillan R, Theodoratou E, McSwiggan E, Adams E, Atkins N, Fryer J, et al. Scottish COVID-19 Inquiry. Academic Research. Portfolio 1: Public Sector Response. Pandemic Preparedness and Exercises. Background research for Scottish COVID-19 Inquiry. 2022.

UN/036-INQ000361324. McQuillan R, Dozier M, Harpur A, McSwiggan E. What is the evidence for the importance of outdoor transmission and of indoor transmission of COVID-19? Rapid review and summary.; 2020 2 April.

UN/037-INQ000361325. McQuillan R, Dozier M, Campbell H, Theodoratou E, McSwiggan E, Li Y, et al. Does the use of face masks in the general population make a difference to spread of infection? Rapid review and summary. 2020 7 April.

UN/038-INQ000361326. McQuillan R, Theodoratou E, Dozier M, Campbell H. How long can SARS-CoV-2 persist outdoors on gates, fences and stiles in the Scottish context? Answer to urgent question.; 2020 23 April.

UN/039-INQ000361327. McQuillan R, Dozier M, Nundy M, McSwiggan E, Goodwin L, Kulkarni D, et al. What is the evidence for outdoor transmission of SARS-CoV-2? Update 2 - 27 May 2020. Review update. 2020 27 May.

UN/040-INQ000361328. Anderson N, Attili A, Barranco Cárceles S, Dozier M, Epelle E, Gabl R, et al. What is the evidence for indoor transmission of SARS-CoV-2? Rapid review and summary. 2020 15 August.

UN/041-INQ000361329. Goodwin L, Hayward T, Krishan P, Nolan G, Nundy M, Ostrishko K, et al. Which factors influence the extent of indoor transmission of SARSCoV-2? A rapid evidence review. Journal of Global Health. 2021. DOI: 10.7189/jogh.11.10002

UN/042-INQ000361330. Li Y, Campbell H, Kulkarni D, Harpur A, Nundy M, Wang X, et al. The temporal association of introducing and lifting non-pharmaceutical interventions with the time-varying reproduction number (R) of SARS-CoV-2: a modelling study across 131 countries. Lancet Infectious Diseases. 2021. DOI: 10.1016/S1473-3099(20)30785-4

UN/043-INQ000361331. Li Y, Ashcroft T, Chung A, Dighero M, Horne M, McSwiggan E, et al. Risk factors for poor outcomes in hospitalised COVID-19 patients: A systematic review and meta-analysis. Journal of Global Health. 2021. DOI: 10.7189/jogh.11.10001

UN/044-INQ000361332. Lee B, Agyei-Manu E, Atkins N, Bhattacharyya U, Dozier M, Lewis G, et al. Risk of serious COVID-19 outcomes among adults and children with severe asthma: A systematic review and meta-analysis. Systematic review and meta-analysis. 2021 13 August.

UN/045-INQ000361333. Lee B, Lewis G, Agyei-Manu E, Atkins N, Bhattacharyya U, Dozier M, et al. Risk of serious COVID-19 outcomes among adults and children with moderate-to-severe asthma: a systematic review and meta-analysis. European Respiratory Review. 2022. DOI: 10.1183/16000617.0066-2022

UN/046-INQ000361334. Li X, Xu W, Theodoratou E. What is the evidence for transmission of COVID-19 by children [or in schools]? Rapid review. 2020 1 April.

UN/047-INQ000361335. McQuillan R, Dozier M, Narain A. Are homemade facemasks effective at reducing transmission of covid-19 in community settings? Rapid review and summary. 2020 19 April.

UN/048-INQ000361336. McQuillan R, Viola I. Are homemade facemasks effective at reducing transmission of covid-19 in community settings? Update 1 - 27 May 2020. Rapid review update (summary). 2020 27 May.

UN/049-INQ000361337. Theodoratou E, Dozier M, Guyan M, Li X, Xu W, McSwiggan E, et al. What is the effectiveness of face masks in preventing respiratory transmission in the community? Rapid review and summary. 2020 20 April.

UN/050-INQ000361338. Carver C, Guyan M, Pierre M. Which occupations and activities might benefit from mask wearing to reduce the transmission of COVID-19? Rapid review and summary. 2020 22 April.

UN/051-INQ000361339. McQuillan R, Viola I. Which occupations and activities might benefit from mask wearing to reduce the transmission of COVID-19? Update 1 - 27 May 2020. Rapid review update (summary). 2020 27 May.

UN/052-INQ000361340. Theodoratou E, Dozier M, Guyan M, Li X, Xu W, McSwiggan E, et al. What is the effectiveness of face masks in preventing respiratory transmission in the community? Update 1 - 27 May 2020. Rapid review update (summary). 2020 27 May.

UN/053-INQ000361341. Theodoratou E, McQuillan R, Curry G, Dong Y, Dozier M, Goodwin L, et al. What is the prevalence of the post COVID-19 syndrome (defined as having signs and symptoms 12 weeks post the acute phase of the infection)? Rapid review summary. 2021 1 April.

UN/054-INQ000361342. Theodoratou E, Li X, Xu W, He Y, Kirolos A, Lang Z. What is the evidence for transmission of COVID-19 by children [or in schools]? Update 3 - 2 July 2020. Rapid review update (summary). 2020 2 July.

UN/055-INQ000361343. Theodoratou E, Li X, Xu W. What is the evidence for transmission of COVID-19 by children [or in schools]? Update 1 - 9 April 2020. Rapid review update (and summary). 2020 9 April.

UN/056-INQ000361344. Theodoratou E, Dozier M, Li X, Xu W, He Y, Kirolos A. What is the evidence for transmission of COVID-19 by children [or in schools]? Update 2 - 6 May 2020. Rapid review update (and summary). 2020 6 May.

UN/057-INQ000361345. McQuillan R, Dozier M, Theodoratou E, Li X, McSwiggan E, Goodwin L, et al. What is the evidence on ethnic variation on COVID-19 incidence and outcomes? Rapid review and summary. 2020 29 April.

UN/058-INQ000361346. Curry G, Dozier M, Theodoratou E, Li X, McSwiggan E, Kulkarni D, et al. What is the evidence on ethnic variation on COVID-19 incidence and outcomes? Update 1 - 28 May 2020. Rapid review update (summary). 2020 28 May.

UN/059-INQ000361347. Theodoratou E, Dozier M, Guyan M, Li X, Xu W, McSwiggan E, et al. Does the use of face masks in the general population make a difference to spread of infection? Update 2 - 27 May 2020. Rapid review update (summary). 2020 27 May.

UN/060-INQ000361348. Theodoratou E, Dozier M, Guyan M, Li X, Xu W, McSwiggan E, et al. Does the use of face masks in the general population make a difference to spread of infection? Update 1 - 19 April 2020. Rapid review update (and summary). 2020 19 April.

UN/061-INQ000361349. Li X, Xu W, Dozier M, He Y, Kirolos A, Theodoratou E. The role of children in transmission of SARS-CoV-2: A rapid review. Journal of Global Health. 2020. DOI: 10.7189/jogh.10.011101

UN/062-INQ000361350. Li X, Xu W, Dozier M, He Y, Kirolos A, Lang Z, et al. The role of children in the transmission of SARS-CoV2: updated rapid review. Journal of Global Health. 2020. DOI: 10.7189/jogh.10.021101

UN/063-INQ000361351. Adams E, Ashcroft T, Atkins N, Krishan P, Nundy M, St Jean C, et al. Scottish COVID-19 Inquiry. Academic Research. Portfolio 1: Public Sector Response. Update covering the period 1 January 2022 to 31 December 2022. Background research for Scottish COVID-19 Inquiry. 2023.