<u>Response to Module 2 Rule 9 request</u>

<u>Reference for Request - M2/SAGE/01/LD</u>

<u>1. A brief overview of your qualifications, career history, professional expertise and major publications</u>

See attached CV.

<u>2. A list of the groups (i.e. SAGE and/or any of its sub-groups) in which you have been a participant, and the relevant time periods.</u>

I was a participant of SPI-M-O from 6 April 2020 to its last meeting on 23 March 2022.

I have also attended meetings of the following groups:

- SAGE Task & Finish Group on Higher Education/Further Education (August 2020)
- SAGE Task & Finish group on Celebrations and Observances (November 2020)
- Data group (23 November 2020, 18 December 2020)
- Children's Task and Finish Working Group (January 2021)
- Occasional meetings of the Variant Technical Group (VTG, 13 May 2021, 10 November 2021, 20 July 2022, 7 September 2022)
- Wales COVID Technical Advisory Group (TAG) (5 November 2021)

<u>3. An overview of your involvement with those groups between January 2020 and February 2022, including: a. When and how you came to be a participant; b. The number of meetings you attended, and your contributions to those meetings; c. Your role in providing research, information and advice.</u>

SPI-M-O: I began attending meetings relating to SPI-M-O on 27 March 2020. My participation was suggested to Graham Medley by Matt Keeling who was, prior to this, the only participant from the University of Warwick. I attended 83 main meetings from 6 April 2020 until the last one on 23 March 2022, and many other meetings arranged by the SPI-M-O secretariat, including over 70 nowcast or medium term projections meetings. My contributions in these meetings and in email discussions included: presenting research undertaken by myself and others; reading, listening to and critically reviewing others' contributions; and contributing to group discussions which were then represented by the SPI-M secretariat in consensus statements. Summaries of the work provided to SPI-M-O are given in answer to question 4 below. In general, SPI-M-O participants responded to commissions communicated to us via the SPI-M secretariat. These provided a structure for the committee to submit work relevant to policy decisions in a timely manner, but participants were also encouraged to submit other non-commissioned work that we felt to be important.

SAGE Task & Finish Group on Higher Education/Further Education: This was a cross-SAGE / cross-government group led by Cath Noakes. It was convened to write two papers in August 2020, one on Further Education ([Principles for managing SARS-CoV-2 transmission Associated with Further Education](#)) and one on Higher Education ([Principles for managing SARS-CoV-2 transmission associated with higher education](#)). Both papers were considered at SAGE 55 (3 September 2020).

SAGE Task & Finish group on Celebrations and Observances: This was a cross-SAGE / cross-government group convened to write a paper in November 2020: [Key Evidence and Advice on Celebrations and Observances during COVID-19](#). This paper was considered at SAGE 66 (5 November 2020).

Data group: This group was set up to aid in communicating data needs between groups. I attended two meetings (23 November 2020 and 18 December 2020) on behalf of SPI-M.

Children's Task and Finish Working Group: I contributed to a document ([TFC: Children and transmission](#)) considered at SAGE 65 (4 November 2020). I also attended a meeting in January 2021, which was convened to plan future work regarding children.

VTG: The UKHSA variant technical group meets to discuss variants of COVID-19. I have attended 4 meetings, once (10 November 2021) to present work on the AY.4.2 variant and other times on behalf of SPI-M, when others have been unable to attend.

TAG: I attended one meeting of the Wales TAG to present analysis of the Immensa lab incident. This analysis had also been presented to SPI-M on 3 November 2021 (see section 4).

4. A summary of any documents to which you contributed for the purpose of advising SAGE and/or its related subgroups on the Covid-19 pandemic. Please include links to those documents where possible.

Reasonable Worst Case and Counterfactual Scenarios
May 2020

13/05/20	Reasonable Worse Case Scenarios. Keeling, Dyson, Hill, Tildesley & the Warwick Team.	SPI-M SAGE 38
Summary. Performed a set of scenarios in which (i) R increases for a short period before settling to R=1 - this generates an increase in cases, which is then maintained until herd immunity is reached; and (ii) R is increased for a period, it then is reduced to 0.7 before settling at 1 - this generates a spike in cases before plateauing at a low level. **SAGE links:** https://www.gov.uk/government/publications/spi-m-o-covid-19-planning-and-reasonable-worst-case-scenarios-20-may-2020 https://www.gov.uk/government/publications/spi-m-o-covid-19-reasonable-worst-case-planning-scenario-21-may-2020		

July 2020

28/07/20	Warwick Reasonable Worst Case (RWC) Narrative. Keeling, Hill, Tildesley, Dyson & the Warwick Team	SPI-M
Summary. This document discussed five RWC (reasonable worse case) scenarios for the immediate future: importations from tourists returning to UK; increase in R in the approach to winter; increased mixing over Christmas & New Year (particularly the movement of students); general apathy towards control measures; lack of protection against infection by the vaccine and reduced efficacy in the elderly. This work fed into SPI-M-O Expert narratives for potential Autumn and Winter Events: https://www.gov.uk/government/publications/spi-m-o-expert-narratives-for-potential-autumn-and-winter-events-29-july-2020		
July 2020	Work done for the July 2020 reasonable worst case scenarios (various pdfs containing plots) Dyson, Hill & the Warwick Team.	SPI-M
Summary. Performed a set of scenarios in which incidence continues as was trending at the time, doubles once by the end of August 2020, doubles in the first two weeks of September and then returns to R=1 until the end of October. This is followed by a two week doubling time throughout November and policy measure at the end of November to reduce non-household contacts to: (A) 25%; (B) 35% or (C) 50% of pre-lock-down levels either (1) including or (2) maintaining school contacts. This work fed into SPI-M-O: Update on planning and reasonable worst-case scenarios		

SAGE link: https://www.gov.uk/government/publications/spi-m-o-update-on-planning-and-reasonable-worst-case-scenarios-29-july-2020

December 2020

09/12/20	Counterfactual scenario for supporting ABCD harms analysis by DHSC and ONS. Dyson, Keeling, Tildesley & the Warwick Team.	SPI-M
Summary. Performed a set of scenarios to determine a counterfactual scenario in which infections increase at either R=1.4 or R=1.7 until hospital occupancy reaches the equivalent of 25,000 in England, after which behavioural changes cause a reduction in R to 1. This work was used for the ONS calculation of the impacts of COVID-19 https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/957265/s0980-direct-indirect-impacts-covid-19-excess-deaths-morbidity-sage-december-update-final.pdf			

Networks and working patterns

18/05/20	The effects of working patterns. Dyson, Tildesley, Hill	SPI-M
02/06/20	The impact of worker networks and contact tracing upon transmission in workplaces. Atkins, Dyson, Hill, Keeling, Tildesley	SPI-M
09/06/20	Workplace contact networks: the impact of forward and backward contact tracing and reactive closure of workplaces. Atkins, Dyson, Hill, Keeling, Tildesley	SPI-M
Summary. These documents developed a network model of workers to investigate the effects of: different patterns of part-time working (e.g. working 3 days on and 4 days off each week); forwards and backwards contact tracing; and reactive workplace closures. The 18/05/20 document also includes a simple analysis considering different distributions of infectiousness over time before symptoms occur. We conclude that: "it is unlikely that the distribution of times from infection to infectiousness is sufficiently narrow and well-known to warrant advising specific patterns of working"; contact tracing can reduce epidemic size (although adherence to the rules is important); we observe only a weak effect of backwards contact tracing; and "for reactive workplace closures to be effective such a policy needs to be enacted when only a small proportion of the workforce (less than 10%) has symptomatic infection within the previous 7 days." The workplace network model was subsequently published in Hill, E.M., Atkins, B.D., Keeling, M.J., Dyson, L, and Tildesley, M.J. A network modelling approach to assess non-pharmaceutical disease controls in a worker population: An application to SARS-CoV-2. PLOS Comp Biol. (2021) Jun 16;17(6):e1009058.		

Education
Schools modelling

27/01/21	Assessing the impact of secondary school reopening strategies on within-school transmission and absences: a modelling study Leng, Hill, Thompson, Dyson, Tildesley, Keeling	SPI-M
03/03/21	The impact of uptake and adherence on transmission and absences resulting from secondary school reopening strategies involving rapid testing. Leng, Hill, Thompson, Tildesley, Keeling & Dyson	SPI-M SAGE 83
21/04/21	Exploring the impact of reopening secondary schools and the effect of mass testing. Leng, Hill, Stage, Klepac, Davis, Gog, Keeling, Tildesley, Dyson & JUNIPER	SPI-M

11/08/21	Modelling within-school SARS-CoV-2 transmission in secondary schools in England in September 2021. Leng, Hill, Thompson, Tildesley, Keeling & Dyson	SPI-M

Summary. These documents developed a model of transmission within schools and the effects of lateral flow and PCR testing. The work estimates the effects of testing on transmission and the trade-off with school absence rates.

This was later published in two journal articles:
Leng T, Hill EM, Thompson RN, Tildesley MJ, Keeling MJ, Dyson L. [Assessing the impact of lateral flow testing strategies on within-school SARS-CoV-2 transmission and absences: a modelling study](#) PLOS Comp Biol. 18.5 (2022): e1010158.
Leng T, Hill EM, Holmes A, Southall E, Thompson RN, Tildesley MJ, Keeling MJ, Dyson L. [Quantifying within-school SARS-CoV-2 transmission and the impact of lateral flow testing in secondary schools in England](#). Nat Comms. (2022) 13, 1106

Schools absences data

17/12/20	Report on COVID-19 in schools in England, September - December 2020. Southall, Holmes, Atkins, Dyson, Hill, Keeling & Tildesley	SPI-M SAGE 74

Summary. This document analyses the Department for Education (DfE) Educational Settings data for England. These data record daily absences of students and staff for each school in England, along with information regarding the reason for that absence (e.g. confirmed infection with SARS-CoV-2, isolation as a result of being identified as a contact etc). It is important to note that these data do not record whether infection happened within schools. These data were utilised to indicate the likely prevalence of SARS-CoV-2 amongst those attending school through time from September to December 2020 and how that varied by NHS region and by the level of intervention (tier) that was in place at the time. We observed that the percentage of students with confirmed infection was greater in secondary schools than in primary schools, whilst infection levels in teachers appeared of similar magnitude in both secondary and primary schools. During the period under observation, we observed some regional variation in absences, whilst following the introduction of the tier system and the November lockdown (when schools remained open) absences in teachers were observed to decrease across all tiers, whilst absences in students increased until late November.

Over the subsequent 15 months (up to March 2022), this group continued to produce reports of school absences on a regular basis for SPI-M-O, some of which were presented at those meetings.

SAGE link: https://www.gov.uk/government/publications/tfc-children-and-transmission-update-paper-17-december-2020

23/03/22	Reporting and information loss in education absences data. Leng, Dyson, Thompson, Hill, Keeling & Tildesley	SPI-M

Summary. This work estimated the effect on situational awareness of reducing the educational absences dataset (used in 17/12/20 above and subsequent reports) from daily to weekly reporting. We found that the percentage of schools reporting had already fallen over time, with spatial variation in reporting levels. Wednesday data was highly correlated with weekly data suggesting the data stream would remain informative. If daily data was still recorded for a random sample of schools this could still be useful if the sample was large enough.

Universities

13/01/21	COVID-19 and Universities: Report from the Higher Education working group at the Isaac Newton Institute. Tildesley, Hill, Dyson, Keeling & INI HE group	SPI-M SAGE 76

Summary. This was a report submitted to SPI-M-O in January 2021 from the Isaac Newton Institute Higher Education (INI HE) working group. The INI HE group was comprised of academics

from 9 universities around the UK (Bath, Bristol, Cambridge, Edinburgh, Glasgow, Manchester, Nottingham, Southampton, Warwick) who were tasked with analysing the impact of SARS-CoV-2 in higher education settings. This report summarised their findings and covered a number of areas including (i) the potential influence of a staggered return of students to universities in January 2021, (ii) the potential for spillover transmission from HE settings to the community, (iii) the impact of the emergence of more transmissible variants on HE settings and (iv) the effectiveness of mass testing and the impact of adherence to intervention measures upon transmission. This report found that adherence to measures would have a much more significant impact upon transmission than any marginal gains from staggered student returns, that spillover from students to the community was observed in some, but not all settings and that the emergence of a more transmissible variant may result in impaired effectiveness of mass testing of students.
SAGE link: https://www.gov.uk/government/publications/isaac-newton-institute-covid-19-and-universities-13-january-2021

Variants
Alpha

22/12/20	Juniper on new variant to SPIM 22nd Dec 2020. Juniper	SPI-M SAGE 74

Summary. This document represents initial analysis of the newly emerged Alpha (B.1.1.7) variant using S-gene deletion data. The work assesses the proportion of cases that are thought to be Alpha variant (S-) and the growth rate of S- cases compared to S+ cases by geography and by age. S- cases were shown to have a higher growth rate than S+ cases, while suggestions of different growth advantages by age are shown to be sensitive to the age stratification chosen. It was also clear that the Alpha variant was increasing relative to the original, even during lockdown.
SAGE link: https://www.gov.uk/government/publications/juniper-consortium-notes-on-the-new-sars-cov-2-variant-22-december-2020

Beta/Delta

23/03/21	Variants and Vaccinations. Dyson and Juniper	SPI-M

Summary. Initial work on developing a modelling framework for variants. This was initially assessing the potential risk of the B.1.351 (Beta) variant and concludes that there is the potential for a large wave of infection from this variant if either the vaccination or prior infection didn't provide a high degree of immunity to infection.
A further developed version of this work was published in Dyson L, Hill EM, Moore S, Curran-Sebastian J, Tildesley MJ, Lythgoe KA, House T, Pellis L, Keeling MJ. Possible future waves of SARS-CoV-2 infection generated by variants of concern with a range of characteristics. Nat Comms. (2021) 12:5730.

20/04/21	Variants of Concern - Sensitivity considerations for roadmap modelling. Dyson and Juniper	SPI-M

Summary. Work proposing variant scenarios for consideration for roadmap modelling. Two scenarios are proposed: a) an immune-escape variant with equal transmissibility to Alpha (the resident strain at the time); and b) a more transmissible variant (for example B.1.617, a sublineage of which was later named Delta). An overview of the variant data at the time is also given, particularly highlighting the growth in S-gene positive cases, especially in London, and B.1.617 as a possible cause of this growth.

11/05/21	JUNIPER: Potential community transmission of B.1.617.2 inferred by S-gene positivity - briefing note. Challen, Dyson and others	SPI-M SAGE 89

Summary. Preliminary analysis on potential community transmission of B.1.617.2 (Delta) showing exponential growth of S-gene positive cases since the end of March compared to decreases in S-gene negatives. Recent sequencing results of S-gene positive cases was dominated by Delta.
SAGE link: https://www.gov.uk/government/publications/juniper-potential-community-transmission-of-b16172-inferred-by-s-gene-positivity-briefing-note-11-may-2021

Omicron / BA.2

06/12/21	Early Omicron Results	SPI-M
08/12/21	Early Omicron Results	SPI-M SAGE 99

Summary. The first in a series of documents that provided early model-based projections of the Omicron wave. Here we examined the impact of differential transmission (80-150% of Delta), vaccine efficacy (50%-100% compared to Delta), and different protection from prior infection. We assumed that some control would be achieved through a booster vaccination programme to over 18s or over 40s, but concluded "There is definitely the clear potential for overwhelming public health problems".
The second document highlighted scenarios that most closely match the extremely high early growth in the UK.
SAGE link: https://www.gov.uk/government/publications/university-of-warwick-early-omicron-results-13-december-2021

14/12/21	Early Omicron Results. Keeling, Guzman-Rincon, Tildesley & Dyson	SPI-M

Summary. This document attempted to match the relative growth rate of Omicron compared to Delta of 0.3-0.4 per day. It included early data on vaccine efficacy (lower than against Delta and rapidly waning) and considered the lower Omicron severity and the impact of 'NPIs' (or behaviour change). We stated that "Estimation of both hospital admissions and deaths are confounded by unknown severity of Omicron and unknown VE (second-dose and boosters) against severe disease. We have explored a range of severities, from as severe as Delta to just 10%."

23/12/21	Warwick Omicron Modelling. Dyson and Keeling	SPI-M SAGE 101

Summary. This work looked at the differential impact of continuing with Plan-B or different levels of imposed NPI. It is noted that: "It remains beyond the scope of current models to predict behaviour change in response to the unfolding situation. It is highly likely that there has already been a degree of behaviour change due to concerns about Omicron that are not yet reflected in the epidemiological data; as infection levels continue to build the amount of precautionary behaviour change is likely to increase irrespective of any imposed controls. From this perspective, the Plan B only scenario is likely to be an overestimate of the epidemiological consequences due to self-limiting behaviour."
SAGE link: https://www.gov.uk/government/publications/university-of-warwick-omicron-modelling-22-december-2021
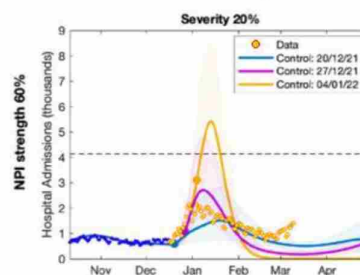
30/12/21	Short-term Projections based on Early Omicron Variant Dynamics in England. Keeling, Brooks-Pollock, Challen, Danon, Dyson, Gog, Guzman-Rincon, Hill, Pellis, Read, Tildesley	SPI-M SAGE 101

Summary. A comprehensive look at the UK Omicron data to that point and projections of likely scenarios (Plan B and shorter tighter NPI controls).
The work was available online as: Keeling, Brooks-Pollock, Challen, Danon, Dyson, Gog, Guzman-Rincon, Hill, Pellis, Read, Tildesley (2021) Short-term Projections based on Early Omicron Variant

Dynamics in England *medRxiv*
https://www.medrxiv.org/content/10.1101/2021.12.30.21268307v1
SAGE link: https://www.gov.uk/government/publications/university-of-warwick-short-term-projections-based-on-early-omicron-variant-dynamics-in-england-23-december-2021

06/01/22	Warwick Omicron Modelling. Keeling & Dyson	SPI-M SAGE 102

Summary. A comparison of Omicron projections to early data from the wave. This document considered a shorter generation time as well as lower severity of Omicron compared to Delta. Here we comment that: "We have assumed that there will only be a small change in the behaviour of older adults from the current estimated value to Step2-like behaviour – given concerns in this age-group the change could potentially be larger."
SAGE link: https://www.gov.uk/government/publications/university-of-warwick-omicron-modelling-6-january-2022

26/01/22	First look at BA.2 VAM linelist. Guzman-Rincon & Dyson	SPI-M

Summary. Comparing Omicron to BA.2 in the VAM linelist and the CLIMB dataset. This showed that BA.2 was a very small proportion of sequenced samples but higher in 30-39 year olds and higher in London and the South East.

14/03/22	Comparison of Omicron Parameters. Keeling & Dyson	SPI-M

Summary. In a retrospective analysis on the Omicron modelling (see figure from 13th December, with the more recent data over-laid). We conclude: "One surprising aspect of the Omicron wave, which substantially limited the scale and severity of the wave, was the public reaction during December and early January – with far more testing and far less mixing than had occurred in November. As such early models (from 13th December) that assumed a high level of NPIs are in the closest agreement with the observed number of hospital admissions (see following pages) – although we had assumed that behaviour change would come from imposed restrictions rather than voluntary action. "

RoadMaps

29/03/21	Road Map Scenarios & Sensitivity. Keeling, Moore, Dyson, Tildesley & Hill	SPI-M SAGE 85
04/05/21	Road Map Scenarios and Sensitivity: Steps 3 and 4. Keeling, Dyson, Hill, Moore & Tildesley.	SPI-M SAGE 88
08/06/21	Road Map Scenarios and Sensitivity: Step 4. Keeling, Dyson, Hill, Moore & Tildesley.	SPI-M SAGE 92/93
06/07/21	Road Map Scenarios and Sensitivity: Step 4. Keeling, Dyson, Hill, Moore & Tildesley.	SPI-M SAGE
12/10/21	Projections of SARS-CoV-2 transmission and COVID-19 disease until June 2022. Keeling, Dyson, Hill, Moore & Tildesley.	SPI-M SAGE 96

Summary. Throughout 2021, there were a series of "Roadmap" documents that looked at the potential for relaxation of controls from the January lockdown to an absence of restrictions. Each of the above documents only refers to the final version of each of the six Roadmaps, whereas each document was the result of an iterated process, sharing preliminary results with the SPI-M-O group and SAGE before producing the final set of results.

The initial document helped provide the forward projections enabling the selection of the time-frame over which relaxation would occur. The next four documents were produced before each Step in the relaxation process and generally provided confidence to the government that none of the step-changes would overwhelm health-care resources. The initial Step 4 document on 08/06/21 demonstrated the uncertainty in Step 4, due to the recent invasion of the Delta variant into the UK, and concerns that there may have been limited vaccine protection. The final document on 12/10/21, considered the longer-term dynamics. Each of the documents shows increasing complexity and a deeper understanding of the roles of vaccination and human behaviour.

A scientific summary document and retrospective examination of the Roadmap projections (including a comparison to subsequent data) is now published: Keeling, M.J., Dyson, L., Tildesley, M.J. Hill, E.M. & Moore, S. (2022) Comparison of the 2021 COVID-19 roadmap projections against public health data in England. *Nature Communications* **13**: 4924. https://doi.org/10.1038/s41467-022-31991-0

SAGE links:
https://www.gov.uk/government/publications/university-of-warwick-road-map-scenarios-and-sensitivity-29-march-2021
https://www.gov.uk/government/publications/university-of-warwick-roadmap-scenarios-and-sensitivity-steps-3-and-4-5-may-2021
https://www.gov.uk/government/publications/university-of-warwick-road-map-scenarios-and-sensitivity-step-4-9-june-2021
https://www.gov.uk/government/publications/university-of-warwick-roadmap-scenarios-and-sensitivity-step-4-6-july-2021
https://www.gov.uk/government/publications/university-of-warwick-projections-of-sars-cov-2-transmission-and-covid-19-disease-until-june-2022-the-action-of-waning-efficacy-and-boosters-12-oc

Other documents

27/04/20	Assessment of Changes to Lock-Down and Other Controls. Keeling, Tildesley, Dyson, Hill, Gorsich, Penman Tamborrina, Hutton, McKimm, Leng, Guyver-Fletcher, Holmes.	SPI-M SAGE 29
Summary. This work examined (i) targeting lockdown at the elderly, (ii) controls that were responsive to local ICU burden, and (iii) the impact of waning compliance in the population. We state: "Of the strategies investigated here, very few do not lead to a sizeable second or third wave" and "If we knew when a vaccine would be available, this would completely change the perspective on many of these calculations, as one option becomes containing the infection until mass immunisation is possible." **SAGE link:** https://www.gov.uk/government/publications/university-of-warwick-assessment-of-changes-to-lockdown-and-other-controls-26-april-2020		

04/05/20	Simulations of Potential Exit Strategies. Keeling, Tildesley, Dyson, Hill, Gorsich, Penman Tamborrina, Hutton, McKimm, Leng, Guyver-Fletcher, Holmes	SPI-M SAGE 33
Summary. This work examined the relaxation of the first lockdown over four phases (from 11th May to 15th August). It assumed that some measures would remain in place and that high levels of contact tracing would be in operation. We also considered sensitivity to compliance, looking at compliance declining over time. We stated that "In general the proposal of gradually opening schools, workplaces and leisure activities, together with contact tracing limits the chance of a		

second wave"; however, we caveat this by noting that with poor tracing we projected a notable epidemic peak in Nov/Dec 2020.

SAGE link: https://www.gov.uk/government/publications/university-of-warwick-simulations-of-potential-exit-strategies-3-may-2020

04/08/20	Questions on local spatial spread. Warwick Team	SPI-M

Summary. Responding to questions looking for "rules of thumb" for local-scale interventions. No specific modelling was undertaken for this document. The summary notes that it is difficult to address the questions "without a clear national objective, for example: reaching and maintaining zero cases; or below a threshold number of hospital admissions." and also notes the need for decisive clear messaging to communicate current and changing regulations.

12/10/20	Further Thoughts Test and Trace Targeting. Dyson & the Warwick Team	SPI-M

Summary. An attempt to estimate the extent and effect of targeted testing at the time. Very little correlation was found between the number of tests per population to the subsequent change in the value of R, "either indicating a lack of effect of testing on R or that this isn't a good way of determining the effect"

25/11/20	Consequences of correlations between having high risk and being tested. Dyson	SPI-M SAGE 70

Summary. Using a simple model with high and low risk groups to consider the effect of correlations between rounds of testing, (i.e. if the people that turn up for one round of testing are more likely to turn up for the next round) and to transmission risk (i.e. if the people that are more likely to transmit or contract the virus are less likely to turn up for testing). In both scenarios, repeated testing is likely to lead to a smaller reduction in cases than when these correlations are not present.
The results of the work were included as part of a SPI-M note to **SAGE 70**:
https://www.gov.uk/government/publications/spi-m-mass-testing-of-the-whole-population-25-november-2020

25/11/20	Adaptive management for fixed-term lockdowns update. Tildesley, Keeling and others including Dyson	SPI-M

Summary. Assessing the health and economic implications of different strengths of intrinsic control with potential short-term precautionary breaks. The work estimates QALY loss due to deaths, hospital and ICU stays and GDP loss due to control measures.

This work was later published as: Tildesley MJ, Vassall A, Riley S, Jit M, Sandmann F, Hill EM, Thompson RN, Atkins BD, Edmunds J, Dyson L, Keeling MJ. Optimal health and economic impact of non-pharmaceutical intervention measures prior and post vaccination in England: a mathematical modelling study. Royal Society Open Science. 2022 Aug 10;9(8):211746.

13/10/21	Control Options for Mitigating a Rapid Rise in Infections. Keeling, Read, Hill, House, Dyson, Tildesley, Challen	SPI-M SAGE 96

Summary. Here we consider three potential causes of a steep rise in infections, hospital admissions and deaths, and the merits of seven control options that could be enacted to control the rise (improved ventilation, improved public awareness, booster and greater vaccine uptake, test-trace-and-isolate, legal changes to restrictions, antivirals / pharmaceuticals, and travel restrictions). We conclude that a doubling of cases every week (or two weeks) would demand a dramatic change in precautionary behaviour, either voluntarily or enforced, to bring infection under control.

SAGE link: https://www.gov.uk/government/publications/juniper-control-options-for-mitigating-a-rapid-rise-in-infection-12-october-2021

03/11/21	ImmensaLab Analysis. Dyson and Guzman	SPI-M
Summary. Exploring the test results from the Immensa lab compared to other test results over time and showing the spatial distribution and age distribution of the problematic tests. We also compare growth rates estimated in different ways to the proportion of tests originating from the Immensa lab to assess the effect of the problematic tests on the epidemic. This work was also presented to the Wales COVID Technical Advisory Group (TAG)		

15/02/22	Long Term Dynamics of COVID-19: Infection and Hospital Admissions. Keeling, Hill, Tildesley & Dyson	SPI-M
Summary. This document considered the long-term dynamics out to 100 years looking at the impact of waning immunity and repeat infections on the pattern of infection and hospital admissions. A key outcome of this analysis is that it may take several years before COVID-19 attains a regular cycle.		

Regular Now-Casting and Medium Term Projections

24/04/20	Now-casting documents. Keeling	SPI-M
02/09/20	Medium term predictions. Dyson & Keeling	SPI-M SAGE
Summary. First in a long series of now-casting and medium term (6-week) projections. Taking the epidemiological observations, re-estimating model parameters and then projecting the dynamics forward over relatively short time scales (assuming no further changes in behaviour or policy). Other estimates were continually produced during 2020, 2021 and early 2022, usually by Keeling and occasionally by Dyson.		

5. A summary of any articles you have written, interviews and/or evidence you have given regarding the work of the above-mentioned groups and/or the UK's response to the Covid-19 pandemic. Please include links to those documents where possible.

A list of my peer-reviewed publications and recorded talks can be found in my CV. I have also contributed to the following Plus magazine articles:

- Testing testing in schools
- COVID-19 and universities: What do we know?
- Vaccination: Where do we stand and where are we going?

And the following Science Media Centre "expert reactions" and press briefings:

- expert reaction to publication of SAGE minutes (29 May 2020)
- expert reaction to a study looking at mandatory face masks and number of COVID-19 infections in New York, Wuhan and Italy (12 June 2020)
- expert comments about preparing for a second wave, re the open letter calling for a review of the UK's preparedness for a second wave (24 June 2020)
- expert reaction to preprint using a simulation to look at potential outcomes of regular entire-school lateral flow testing (8 March 2021)

- [expert reaction to non-peer reviewed modelling presented on a dashboard suggesting that 'a herd immunity threshold (of 73.4%) will be reached this week on 9 April 2021'](#) (8 April 2021)
- [Roadmap modelling – hear from the modellers](#) (15 June 2021)
- [Roadmap modelling – hear from the modellers](#) (13 July 2021)
- [expert reaction to COVID-19 hospitalisation data on patients admitted 'for' COVID-19 and patients admitted 'with' COVID-19](#) (30 July 2021)

I provided modelling advice on COVID-19 to the Isle of Man, through a document: Modelling analysis of potential future outbreaks on the Isle of Man: Preliminary Report, 17/04/2021, and a presentation to the Council of Ministers on 23 April 2021.

I also had a 50% secondment to the Cabinet Office COVID-19 Taskforce Jan-March 2022.

6. Your views as to whether the work of the above-mentioned groups in responding to the Covid-19 pandemic (or the UK's response more generally) succeeded in its aims. This may include, but is not limited to, your views on: a. The composition of the groups and/or their diversity of expertise; b. The way in which the groups were commissioned to work on the relevant issues; c. The resources and support that were available; d. The advice given and/or recommendations that were made; e. The extent to which the groups worked effectively together; f. The extent to which applicable structures and policies were utilised and/or complied with and their effectiveness.

There are many strengths and weaknesses of the SAGE system for conveying scientific advice to policy makers in government. My primary view of this process was from within SPI-M-O, although a later (Jan-March 2022) secondment to the Cabinet Office COVID-19 Taskforce provided an interesting alternative perspective. My purpose here is to give constructive comments on things that worked well or less well, and not to be overly critical of structures and people working under pressure in a time-sensitive emergency. I have structured my comments into themes below.

Organisation

The day-to-day organisation of SPI-M-O requests improved over time. From when I joined in late March 2020 until May 2020, SPI-M-O met on a Monday morning. We would often receive commissions on a Friday afternoon / evening to produce work to be sent in before the 10:30am Monday meeting. In May 2020 SPI-M-O meetings moved to Wednesdays, with commissions on Fridays effectively doubling the amount of time to respond to requests. It is worth noting that these extremely short deadlines, while perhaps necessary during the emergency, do have natural consequences in the quality and robustness of work produced, and the sustainability of this work in the medium and long term.

The SPI-M-O secretariat deserve special mention here. The secretariat are a highly expert group of civil servants, working under extreme pressure to support academic members. They formed the bridge between science and government, communicating with policy makers and civil servants to develop requests into modelling commissions and ensure that the answers were understood with all the essential caveats. They were a buffer to prevent academics becoming overwhelmed with requests and could triage to find the most important questions to policy and to which modelling could make the most significant difference. Their expertise in communicating efficiently to non-scientists was essential in writing consensus statements and documents and hugely valuable. The co-chairs of the SPI-M-O were also fantastic at drawing out consensus from the group. Note here that "consensus" often means understanding where we agree and where we don't – and what evidence we need to know to reach agreement.

Diversity of SPI-M-O groups

One mitigation to working at high speed in a rapidly changing situation was the bringing together of multiple groups onto SPI-M-O. In addition to the formal model-combination of the R values and medium term projections, presenting work to SPI-M-O effectively functioned as an extremely rapid peer review system. This allowed other academics who had also worked on the same question to ask critical questions, highlight uncertainties and assumptions, and make suggestions for improvements. In my view this was absolutely essential to providing good quality scientific advice.

Two main things led to improvements over time in working with multiple groups. Firstly, that all groups obtained access to the same datasets, so that where results were qualitatively or quantitatively different it was possible to understand the origins of these differences rather than simply assuming that it was due to using different data. Even where groups were using different datasets, having access to the data the other group was using enabled comparisons to be made to understand why different results were occurring. Secondly, as groups that had not had long-term funding before the pandemic successfully applied for grants to employ early career researchers, it became possible for those groups to work in a more long-term way, rather than responding only to the most immediate of questions.

There has been much discussion of who should have been invited to contribute to SAGE and subgroups. Inevitably there are many highly qualified experts who were not invited to join these groups, and in my opinion it is hugely important not to pull all expertise away from other essential research topics. The research community worked together to try to use the offers of support from an incredible number of scientists from all areas. The Royal Society RAMP call for volunteers received around 1800 offers of support from individuals and teams, and attempted to pull together this huge amount of expertise into useful forms. The expert review group was particularly helpful in triaging the flood of new literature and providing rapid reviews of new work.

Diversity of SAGE

SAGE is formed to generate and draw together scientific evidence for policy. It is envisaged that policy makers then take into account other factors, such as cost and the economy, at a later stage, and thus economic evaluations are not held to be part of SAGE remit. It is notable that while SAGE outputs were made public and highly scrutinised, economic evaluations of policy were not publicly available. Given the feedbacks between the economic and health impacts (e.g. public reaction to a growing epidemic can harm the economy without any policy intervention; policies intended to boost economic growth can inadvertently lead to economic harm if they cause an increase in infections) linking SAGE and SPI-M-O modelling to groups performing economic evaluations would have been beneficial.

Communication

The SAGE-and-subgroups structure (and the government above it) is arranged in a very hierarchical way, with information primarily flowing up the chain. There are clear reasons for doing this: firstly for organizational reasons, particularly as the number of people involved became larger and informal interactions more unwieldy; and secondly to control information flow out of government. There is a clear tension between the need for scientific advisors to understand the potential actions the government might take and the need to prevent those potential actions being leaked in the media with the consequential political and social ramifications.

Communication up and down the chain generally became gradually better over time. In the early days, from my position on SPI-M-O, it often felt like we prepared responses to commissioned questions, sent things in and presented to SPI-M-O, and then it was unclear how (or if) the work was used. Later on there was representation from the Cabinet Office COVID-19 Taskforce at SPI-M-O meetings, giving context on the current questions and feedback on what was useful (or less useful) from previous submissions. This communication "down" the chain was, in my view, crucial to ensure that the work undertaken was genuinely useful to policymakers.

Communication between groups at the same level (e.g. between SPI-M, SPI-B, EMG etc.) was perhaps less well-managed, and primarily occurred through cross-SAGE / departmental groups such as the Task and Finish groups and to some extent through overlapping membership of the subgroups. It might have been useful, for example, to have had SPI-B views on the reaction to different proposed measures when preparing SPI-M modelling.

Support

The incentives and evaluations in academia can be at odds with the requirements of government advice and running SAGE over an extended period of time. It is inherently stressful for academics to be suddenly thrust into a situation where they are providing advice of national importance on incredibly short timescales on a weekly basis for years, where the advice is rightly under public scrutiny. The GO-Science team provided a point of contact for personal security concerns and access to the Cabinet Office Employee Assistance Program for wellbeing support. This was appreciated, but ultimately difficult to find time to use.

As an academic I receive a salary from my employing institution and did not personally receive money from being in SPI-M-O (nor would I wish to). I do not believe that any other academics on SAGE or subgroups were personally remunerated. In the beginning we donated time to SAGE and subgroups and relied upon our institutions reducing our workloads to enable this. Over time we gradually received more financial support in the form of grants to our institutions, firstly from UKRI and later high volume engagement payments in retrospect for time donated over specific periods. These contributions enabled our institutions to facilitate our engagement and employed early career researchers to expand our contributions to SPI-M-O, although applying for grants also took time away from the immediate response. Larger groups were much more robust to the challenges of long term involvement. For much of the pandemic it would have been seriously damaging to our output if key group members had been taken ill.

The tensions between our day jobs and our work during COVID-19 continue to be felt even now. While institutions like UKHSA and government departments have had teams for some time now preparing for questions from the COVID inquiry, individual academics are again being asked to spend time responding to requests for information at short notice. This comes at a time when most institutional workloads have increased following the end of SAGE and SPI-M-O meetings, and in the period leading up to the new academic year, when academic workloads are generally higher.

I worry about the effects on early career researchers, particularly those employed on short term contracts without a permanent position. Many volunteered to perform work for SPI-M-O and other SAGE subgroups, working evenings and weekends to provide essential analyses. Much of this work was most relevant in the moment and, in a fast-moving pandemic, it was difficult to find the time to write work up for academic publication before becoming overtaken by circumstances. But early career researchers rely on such publications for future employment. As a wider point, we are at

great risk of losing the expertise developed in this way, as funding in the field, having expanded for covid, contracts to lower than pre-pandemic levels.

7. Your views as to any lessons that can be learned from the UK's response to the Covid-19 pandemic, in particular relating to the work of the above-mentioned groups. Please describe any changes that have already been made, and set out any recommendations for further changes that you think the Inquiry should consider making.

Much of my response here stems from the issues discussed in question 6. To summarise:

- **Data**. We need to find ways to facilitate data access to groups providing advice in a timely, robust and useable way while ensuring confidentiality and ethical requirements are met. It is important to note that the computational requirements of modelling often make proposed solutions like the ONS Secure Research Service unwieldy to use for these purposes. Setting up the systems in advance of an emergency would enable a much faster response at the beginning of an outbreak. Sadly many of these difficulties still seem to exist for monkeypox.
- **Communication.** Good communication needs to be facilitated both up and down the chain and between the various subgroups. This requires trust, both from policy makers that the advisors won't disclose potential policies, and from advisors that policy makers won't disclose explanations out of context.
- **Economics.** Where there are feedbacks between the emergency and the economics, in my opinion there needs to be dialogue between SAGE and those undertaking economic analysis of policy options.
- **Multiple groups.** Having multiple research groups with the same data access was key to what SPI-M-O produced. To enable such diversity in the future requires resources to be allocated to multiple groups.
- **Support.** It was unfortunate to have to spend time during the emergency preparing grant applications in order to grow groups. While much of this was for specifically formulated funding calls, and intended to require the least time possible to write the application, the resultant funding was also often quite short term. For example, our COVID rapid response grant was only a year long, and finished in May 2021, almost a year before the last meeting of SPI-M-O. This problem could be alleviated either by longer term funding to have expertise ready to "stand-up" in an emergency and/or by having structures in place to deliver funding quickly when needed.
- **Preparing emergency structures.** Much of this requires preparation in advance, in a flexible way, to be able to deal with future emergencies. It is important to plan how structures like SAGE expand in an emergency. Much of the structure within government has also now changed, with covid work moving out of the cabinet office and into UKHSA. Decisions need to be taken about what work should be undertaken in SAGE and what is managed by UKHSA when required.

8. A brief description of documentation relating to these matters that you hold (including soft copy material held electronically). Please retain all such material. I am not asking for you to provide us with this material at this stage, but I may request that you do so in due course.

I hold various files electronically, much of which is data and model code, some documents shared for meetings, occasional comments on shared documents and some early versions of documents or figures that were eventually sent in to SPI-M-O or manuscripts for academic papers.