UK COVID-19 Inquiry

Module 2 - Rule 9 Request to Dr Shaun Fitzgerald - Reference:

M2/SAGE/01/SF

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22 September 2022

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I have been asked to contribute to the UK COVID-19 Inquiry: Module 2 - Rule 9. The request is to Dr Shaun Fitzgerald - Reference: M2/SAGE/01/SF

1 Professional background

I am an engineer who has spent significant time in both academic research as well as in industry. I am a Chartered Engineer (since 1997), a Fellow of the Royal Academy of Engineering (since 2014), a Fellow of the Energy Institute (since 2004), a Fellow of the Chartered Institution of Building Services Engineers (CIBSE) (since 2005) and have spent around 20 years in the field of ventilation in buildings.

I studied engineering at the University of Cambridge where I gained my BA and then after a year in the geothermal industry undertook a PhD in fluid mechanics and heat transfer in geothermal reservoirs. After a post-doctoral research position following the PhD, I joined the Faculty of Stanford University to be the Geothermal Program Manager.

On leaving Stanford I joined Bain & Company, one of the leading strategy consulting firms. In 2001 I left Bain to return to the field of fluid mechanics and heat transfer and led the industrial interface part of a research programme at Cambridge University on natural ventilation in buildings. During this 4 year research programme I published numerous papers on ventilation in buildings and also undertook ventilation design consulting work for a wide range of projects, the vast majority of which were non-domestic. The research papers were mainly focused on natural ventilation within buildings, but the ventilation design consulting work also included the interaction of natural ventilation systems with mechanical ventilation and cooling systems within buildings.

In 2006 I left full-time employment at Cambridge University to set up a spin-out company Breathing Buildings, which acquired the rights to intellectual property that had been created as a result of the research. The company was initially funded by BP and I then took this through multiple rounds of venture capital funding before selling the company to Volution Holdings in December 2016.

During my time at Breathing Buildings I led all of the major ventilation design projects, as well as the largest contracts for supply of controlled ventilation equipment.

I oversaw the natural ventilation design work we undertook for one of the leading architectural firms in London on a major new office building in California as well as the Bloomberg European Headquarters building in London which won the RIBA Stirling Prize in 2018. Both of these buildings were based on a hybrid ventilation concept which involved both natural and mechanical ventilation.

I was heavily involved with the Education and Skills Funding Agency in the revision of Building Bulletin 101 (BB101), which is the document that lays out the ventilation requirements for educational buildings. The revision of BB101 included general teaching spaces as well as laboratories and laboratory storage areas where timescales for removal of contaminants (as might arise from a spillage) were considered. I also had input to Building Bulletin 93 which is the guide to acoustics, since the noise caused by the use of a ventilation system is related to the rate of supply of air; a higher flow rate in a given ventilation system results in higher noise levels.

Whilst Breathing Buildings was originally established as a natural ventilation company, we evolved into hybrid ventilation – the combination of mechanical and natural ventilation. A number of our products had mechanical ventilation incorporated into them, and we therefore had to comply with

mechanical ventilation regulations and testing in our facilities in order to take these to market and work with customers to establish the most appropriate equipment for their needs.

I left Breathing Buildings in 2018 in order to take up the position as Director of the Royal Institution in London. In 2020 I then returned to Cambridge University as Director of the Centre for Climate Repair in the Department of Engineering.

I have published in various leading and relevant journals in my career. Relevant publications include:

- Rutter, H., Parker, S., Stahl-Timmins, W., Noakes, C., Smyth, A., Macbeth, R. Fitzgerald, S., Freeman, A.L.F. 2021 Visualising SARS-CoV-2 transmission routes and mitigations. *BMJ* Dec 1;375:e065312. doi: 10.1136/bmj-2021-065312.
- Freeman, A.L.J., Parker, S., Rutter, H., Fitzgerald, S., Smyth, A., Macbeth, R., Spiegelhalter, D. & Noakes, C. 2021 Expert elicitation on the relative importance of possible SARS-CoV-2 transmission routes and the effectiveness of mitigations. *BMJ* Open. Dec 1;11(12):e050869. doi: 10.1136/bmjopen-2021-050869.
- Wilson, J., Carson, G., Fitzgerald, S., Stansfield, C., Harriss, E. & Reilly, J. 2021 What is the evidence that medical procedures which induce coughing or involve respiratory suctioning are associated with increased generation of aerosols and risk of SARS-CoV-2 infection? A rapid systematic review. *J. Hospital Infection*, https://doi.org/10.1016/j.jhin.2021.06.011.
- Burridge, H.C. *et al*. 2021 The ventilation of buildings and other mitigating measures for COVID-19: a focus on wintertime. Proceedings A, Royal Society RSPA-2020-0855.R2. https://doi.org/10.1098/rspa.2020.0855
- Jones, B., Sharpe, P., Iddon, C., Hathway, E.A., Noakes, C.J., Fitzgerald, S.D. 2021 Modelling uncertainty in the relative risk of exposure to the SARS-CoV-2 virus by airborne aerosol transmission in well-mixed indoor air. *Building and Environment*, **191**, 107617.
- Scientific Advisory Group on Emergencies. Transmission of SARS-CoV-2 and mitigating measures. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/892043/S0484_ Transmission_of_SARS-CoV-2_and_Mitigating_Measures.pdf
- CIBSE Covid Ventilation Guidance. https://go.cibse.org/l/698403/2020-07-15/2n3qmd/698403/87225/CIBSE_Covid_ Ventilation_Guidance_ version_3_FINAL.pdf
- Jones, B.M., Cook, M.J., Fitzgerald, S.D. & Iddon, C.R. 2016 A review of ventilation opening area terminology. *Energy & Buildings*, **118**, 249-258.
- Connick, O., Fitzgerald, S.D., Palmer, D. & Wise, N. 2016 Zero energy retail – a breathing building for Costa Coffee. *CIBSE Technical Symposium*, Edinburgh 14-15 April.
- Gencer, I. & Fitzgerald, S.D. 2015 Passive ventilation and cooling. *CIBSE Technical Symposium*, London 16-17 April.
- Livermore, S., Sher, D., Fitzgerald, S. & Zamboni, G. 2012 Innovative passive cooling in healthcare. *CIBSE ASHRAE Technical Symposium*, London 18-19 April.
- Hamlyn, D, Fitzgerald, S., Cash, D., Still, G. and Armitage, P. 2012 Natural and Hybrid Ventilation Approaches for Shopping Malls – An Examination of Key Issues. *ASHRAE Winter Conference*, Chicago 21-25 January.
- Hamlyn, D., Cash, D., Biggs, C. & Fitzgerald, S.D. 2011 Whole building ventilation strategy selection – a toolkit. *CIBSE Technical Symposium*, De Montfort University, Leicester 6-7 September.
- Fitzgerald, S.D. & Woods, A.W. 2010 Transient natural ventilation of a space with localised heating. *Building and Environment*, **45**(12), 2778-2789.
- Woods, A.W, Fitzgerald, S. & Livermore, S. 2009 A comparison of winter pre-heating requirements for natural displacement and natural mixing ventilation. *Energy and Buildings*. **41**, 1306-1312.
- Bower, D., Caulfield, C.P., Fitzgerald, S.D. & Woods, A.W. 2008 Transient ventilation dynamics following a change in strength of a point source of heat. *J Fluid Mech.*. **614**, 15-37.
- Fitzgerald, S.D. & Woods, A.W. 2008 The influence of stacks on flow patterns and stratification associated with natural ventilation. *Building and Environment,* **43**, 1719-1733.

- Fitzgerald, S.D. & Woods, A.W. 2007 Transient natural ventilation of a room with a distributed heat source. *J. Fluid Mech. J. Fluid Mech.* **591**, 21-42.
- Fitzgerald, S.D. & Woods, A.W. 2007 On the transition from displacement to mixing ventilation with a localized heat source. *Building and Environment.* **42**, 2210-2217.
- Fitzgerald, S.D. & Woods, A.W. 2004 Stacks and naturally ventilated schools: classroom design. *Passive Low Energy Architecture (PLEA)* **21**.
- Woods, A.W. & Fitzgerald, S.D. 2004 Tension between natural and mechanical ventilation in a large shopping complex. *PLEA* **21**.
- Kenton, A.G., Fitzgerald, S.D. & Woods, A.W. 2004 Theory and practice of natural ventilation in theatres and auditoria. *PLEA* **21**. (best paper award)
- Fitzgerald, S.D. & Woods, A.W. 2004 Natural ventilation of a room with vents at multiple heights. *Roomvent*.
- Fitzgerald, S.D., Lomakina, A., Livermore, S., Lishman, B., Norford, L., Walker, C., Gladstone, C. & Woods, A.W. 2004 Case study: temperature evolution and thermal mass in a passively ventilated office – Houghton Hall, England. *Roomvent*.
- Fitzgerald, S.D. & Woods, A.W. 2004 Natural ventilation of a room with vents at multiple levels. *Building Environ.* **39**, 505-521.
- Fitzgerald, S.D., Woods, A.W. & Chandler, M. 2003 The design of office buildings with atria. *CIBSE conference, Edinburgh*.

2 List of groups

I have served and am serving on a number of bodies to support governments with my expertise in ventilation of buildings.

- SAGE Environmental Modelling Group (April 2020 to May 2022)
- World Health Organisation High Level Expert Consultation Group for Covid-19 in the European Region (December 2021 – present)
- EMG Transmission Group (November 2020 to May 2022)
- PHE Singing and Wind Instrument Group (July 2020 to December 2020)
- High Risk Aerosol Generating Procedures Group (August 2020 to April 2021)
- Science Board of the Events Research Programme (March 2021 to October 2021)

SAGE EMG itself had a number of subgroups earlier on in the pandemic and I was assigned to the Engineering Systems, and Design and Behaviour ones. I also contributed to EMG groups working on specific areas for limited periods of time such as: development of visualisation aids for communication; air cleaners; theatres and performance spaces. I attended one full SAGE meeting. I also contributed to the Cabinet Office Ventilation Technical Advisory Panel, Cabinet Office and Education meeting, and submitted evidence to the Scottish Parliament.

I was also one of the primary authors for the Chartered Institution of Building Services Engineers 'Emerging from Lockdown' series of guides, a Member of the Royal Society Rapid Assistance for Modelling the Pandemic (RAMP) team and attended a number of the DCMS Venues Steering Group meetings.

3 Overview of involvement with groups Jan 2020 to Feb 2022

3.1 Becoming a participant

SAGE EMG I was contacted by Professor Cath Noakes on 22 April 2020 regarding the SAGE Environmental Modelling Group. sciences. She had been asked to form a group which would bring in expertise in flow modelling and exposure/risk models together with expertise in engineering, design and behaviour sciences. The plan for the group was to also pull information from the existing literature that could support the answers to cabinet office questions and to also provide views on interventions/technologies that could be effective. The group met for the first time on 21 April 2020 and recognised that they needed some further expertise in building services that had a practitioner link. Cath contacted Hywel Davies, the Technical Director of the Chartered Institution of Building Services Engineers, who recommended that my expertise would fit well. Cath thought so too, and hence I was asked to join. This mix of academic research experience, and practical work with industry and building users, was deemed to be of additional value to the skills already represented in SAGE EMG.

WHO Following a recommendation, I think by Prof Cath Noakes, I was asked to contribute to a WHO meeting regarding ventilation. Prof Antoine Flaghault subsequently asked me to join the regular meetings of the World Health Organisation High Level Expert Consultation Group for Covid-19 in the European Region. The reason I was asked to join was a result of my expertise in ventilation from both an academic and industry background.

EMG Transmission Group As the pandemic developed, together with our understanding of the potential transmission routes, the EMG Transmission Group was formed with Paul Monks and Isobel Oliver. Paul was aware of my contributions to the work of SAGE EMG and asked whether I could support the EMG Transmission Group.

PHE Singing and Wind Instruments Group DCMS was involved in supporting performance groups in July 2020 and Tom Rodden (CSA for DCMS) suggested I join a group looking at theatres. Following an email on 2 July 2020 from Louise Smith (DCMS) to Jennifer Smith (PHE), I was then put in touch with Simon Tanner (PHE) who chaired a group on Singing and Wind Instrument and I was asked to contribute to this.

AGP On 22 July 2020 I was contacted by James Hynard from DHSC on behalf of the UK Chief Medical Officers to ask whether I would consider being a member of an independent expert panel to review the evidence for complex and unclear cases regarding whether certain clinical procedures would qualify as aerosol generating, and especially where there were differing views, and recommend the appropriate classification. The panel's recommendations would be delivered to the four UK CMOs who could then endorse them for reflection in the public health guidance of the four UK nations. Professor Jacqui Reilly was chair of the panel and was keen for an engineering/physical sciences perspective to be included. The Deputy CMO Prof. Jonathan Van Tam suggested I would be an excellent addition.

ERP Science Board I was asked by Paul Monks (CSA BEIS) to join the Science Board of the Events Research Programme in March 2021. I raised the point that I was part of the overall AIRBODS research team who would be involved in the Events Research Programme, but clarified that my involvement in that research team was not on the workstream involving monitoring of venues. Paul confirmed that since I had declared a potential conflict of interest, and that I would not be involved

in the building/venue monitoring, the Events Research Programme Science Board would still like my involvement.

3.2 Meetings

The meetings which I attended for the groups listed above are indicated in the table below. I chaired the meetings when we were developing a paper on theatres, co-chaired a paper in the EMG Transmission Group EMG-SPI-B Paper: Application of CO2 monitoring as an approach to managing ventilation to mitigate SARS-CoV-2 transmission, and co-chaired a paper on Hotels and MQF. I reviewed and contributed through discussion and email comments on other papers.

Date	SAGE	SAGE EMG	SAGE EMG Engineering Systems	SAGE EMG Design and Behaviours	EMG Transmission Group	SAGE Theatre and Performance Space	SAGE EMG other	Cabinet Office	AGP	SWI (PHE)	ERP Sci Board	WHO
28/04/2020							X					
04/05/2020		X										
04/05/2020		X										
11/05/2020			X									
18/05/2020			X									
19/05/2020		X		X								
26/05/2020		X		X								
01/06/2020			X									
02/06/2020		X										
08/06/2020			X									
09/06/2020		X										
16/06/2020		X		X								
23/06/2020		X										
26/06/2020						X						
01/07/2020							X					
03/07/2020						X						
07/06/2020		X										
13/07/2020										X		
20/07/2020										X		
21/07/2020		X										
22/07/2020									X			
31/07/2020										X		
03/08/2020			X									
04/08/2020		X								X		
05/08/2020		X					X					
10/08/2020									X	X		
13/08/2020	X											
18/08/2020		X	X									
24/08/2020										X		
26/08/2020									X			
03/09/2020									X			
09/09/2020									X			
11/09/2020		X										
14/09/2020										X		
15/09/2020		X										
21/09/2020							X					
23/09/2020		X										
25/09/2020							X					
28/09/2020										X		
29/09/2020		X										
06/10/2020							X		X			
12/10/2020										X		
13/10/2020		X										
19/10/2020			X									
20/10/2020									X			
21/10/2020							X					
22/10/2020							X					
26/10/2020										X		
27/10/2020		X										
03/11/2020			X				X		X			
09/11/2020										X		
10/11/2020		X										
24/11/2020		X										
25/11/2020									X			
30/11/2020					X							
01/12/2020							X					
08/12/2020		X										
10/12/2020			X				X		X			
15/12/2020					X							
16/12/2020							X					
21/12/2020										X		
22/12/2020		X										
15/01/2020					X							
22/01/2021					X							
26/01/2020									X			
29/01/2021					X							
01/02/2021							X					
05/02/2021					X							
08/02/2021							X		X			
09/02/2021		X										
12/02/2021					X							
19/02/2021					X							
26/02/2021					X							
05/03/2021											X	
12/03/2021					X							
19/03/2021					X						X	
26/03/2021					X							
30/03/2021							X					
02/04/2021					X?							
12/04/2021		X							X			
16/04/2021					X							
30/04/2021					X							
12/05/2021		X										
14/05/2021					X							
18/05/2021							X					
04/06/2021											X	
11/06/2021					X							
16/06/2021											X	
25/06/2021					X							
04/07/2021							X					
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09/07/2021							X					
16/07/2021					X							
30/07/2021					X-						X	
07/09/2021		X										
10/09/2021											X	
24/09/2021											X	
01/10/2021					X							
05/10/2021		X										
08/10/2021											X	
22/10/2021											X	
03/11/2021								Cab Off + Edu				
04/11/2021								Scottish Parl. Evid				
07/12/2021								Vent Tech Adv				X
14/21/21		X										
21/12/2021												X
04/01/2022												X
25/01/2022		X										
16/02/2022								Vent Tech Adv				
01/03/2022												X
05/04/2022												X
08/04/2022					X							
03/05/2022												X
20/05/2022		Away Day			Away Day							
07/06/2022												X

3.3 Role in providing research, information and advice

My primary role was to use my background knowledge of the literature and working of ventilation equipment to inform the evidence base for statements on science and engineering which the various groups put together. I did not undertake new academic research on ventilation except that through the AIRBODS research project which commenced on 15 February 2021, but I also consulted with other industry experts and academics on various matters, and involved them in some meetings where specific details were required.

4 Documents

I was involved in discussing and reviewing the papers in the SAGE EMG meetings. The papers discussed and reviewed by the group are listed below. The papers in which I led or co-led are highlighted in yellow.

1. Environmental Influence on Transmission, 28th April 2020

2. Risk Estimation to inform risk assessment, 7th May 2020

3. Principles of understanding of transmission routes to inform risk assessment and mitigation strategies, 14 May 2020

4. Possible additional interventions to address hospital transmission risks of SARS-CoV-2, 12 May 2020

5. EMG: Transmission and Control of SARS-CoV-2 on Public Transport, 18 May 2020

6. EMG: Evidence for transmission of SARS-CoV-2 on ground public transport and potential effectiveness of mitigation measures, 18 May 2020

7. EMG: Summary of disinfection technologies for microbial control, 18 May 2020

8. EMG: Application of UV disinfection, visible light, local air filtration and fumigation technologies to microbial control, 19 May 2020

9. SARS-CoV-2 in the hospital environment and risk of COVID-19 nosocomial transmission, 31 May 2020

10. Transmission of SARS-CoV-2 and Mitigating Measures - update, 4 June 2020

11. TWEG: Evidence of wider environmental transmission of SARS-CoV-2, 12 June 2020

12. NERVTAG/EMG: Hand hygiene to limit SARS-CoV-2 transmission, 2 July 2020

13. EMG: COVID-19 - Theatres, concert halls and other performance spaces, 12 July 2020
https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/905066/S0629_EMG_-_Theatres__Concert_Halls_and_Other_Performance_Spaces.pdf

14. EMG: Measurement of effectiveness of risk mitigation measures in reducing transmission, 16 July 2020

15. NERVTAG/EMG: Role of aerosol transmission in COVID-19, 22 July 2020

16. PHE/EMG: Aerosol and droplet generation from singing, wind instruments and performance activities, 13 August 2020

17. SPI-B/EMG: COVID-19 housing impacts, 10 September 2020

18. EMG: Processing methods to facilitate the re-use of personal protective equipment (PPE), 8 September 2020

19. NERVTAG/EMG: Duration of wearing of face coverings, 15 September 2020

20. EMG: Role of Ventilation in Controlling SARS-CoV-2 Transmission SAGE-EMG, 30 September, 2020

21. EMG: Simple summary of ventilation actions to mitigate the risk of COVID-19, 1 October 2020

22. NERVTAG/EMG SARS-COV-2: Transmission Routes and Environments, 22 October 2020

23. EMG: Potential application of air cleaning devices and personal decontamination to manage transmission of COVID-19, 4 November 2020

24. EMG/SPI-B: Mitigating risks of SARS-CoV-2 transmission associated with household social interactions, 26 November 2020

25. PHE: Factors contributing to risk of SARS-CoV2 transmission in various settings, 26 November 2020

26. TWEG: Environmental monitoring of viral presence, infectivity and transmission of SARS-CoV-2, 3 December 2020

27. EMG/SPI-B/TWEG: Mitigations to reduce transmission of the new variant SARS-CoV-2 virus, 22 December 2020

28. EMG: Application of physical distancing and fabric face coverings in mitigating the B117 variant SARS-CoV-2 virus in public, workplace and community, 13 January 2021 - GOV.UK (www.gov.uk)

29. EMG/SPI-B/SPI-M: Reducing within- and between-household transmission in light of new variant SARS-CoV-2, 14 January 2021

30. EMG: COVID-19 risk by occupation and workplace, 11 February 2021

31. HOCI and EMG: Masks for healthcare workers to mitigate airborne transmission of SARS-CoV-2, 25 March 2021

32. EMG Transmission Group: COVID-19 transmission in prison settings, 25 March 2021

33. EMG and DCMS: Science framework for opening up group events, 16 March 2021

34. EMG Transmission Group: Insights on transmission of COVID-19 with a focus on the hospitality, retail and leisure sector, 8 April 2021

35. EMG, SPI-M and SPI-B: Considerations in implementing long-term 'baseline' NPIs, 22 April 2021

36. EMG and SPI-B: Application of CO2 monitoring as an approach to managing ventilation to mitigate SARS-CoV-2 transmission, 27 May 2021
https://www.gov.uk/government/publications/emg-and-spi-b-application-of-co2-monitoring-as-an-approach-to-managing-ventilation-to-mitigate-sars-cov-2-transmission-27-may-2021

37. EMG/TG/SPI-B: COVID-19 Transmission in Hotels and MQFs, 9th Sept 2021
https://www.gov.uk/government/publications/emg-covid-19-transmission-in-hotels-and-managed-quarantine-facilities-mqfs-9-september-2021

38. EMG and NERVTAG: Update on transmission and environmental and behavioural mitigation strategies, including in the context of Delta, 13 October 2021

39. SPI-B, SPI-M and EMG: Considerations for potential impact of Plan B measures, 13 October 2021 (includes EMG consensus on face coverings shared with cabinet office 28th Sept 2021)

40. EMG and SPI-B: Non-Pharmaceutical Interventions (NPIs) in the context of Omicron, 15 December 2021

41. EMG Transmission Subgroup: Consensus statement on SARS-CoV-2 transmission risk at festivals, 23 December 2021

Support or leadership to papers from other working groups:

42. SCWG: Care homes analysis, 12 May 2020

43. Managing infection risk in high contact occupations, 15 June 2020

44. TFC: Risks associated with the reopening of education settings in September, 8 July 2020

45. COVID-19: Preparing for a challenging winter 2020/21, 7 July 2020

46. NERVTAG: Assessment of transmission of COVID-19 through musical events, 16 July 2020

47. Principles for managing SARS-CoV-2 transmission associated with higher education, 3 September 2020

48. Principles for managing SARS-CoV-2 transmission associated with further education, 3 September 2020

49. Summary of the effectiveness and harms of different non-pharmaceutical interventions, 21 September 2020

50. NERVTAG: Seasonality and its impact on COVID-19, 22 October 2020

51. Key evidence and advice on celebrations and observances during COVID-19, 5 November 2020

52. BEIS CSA Team: Potential application of glycol-based sprays to manage transmission of SARS-CoV-2, 13 November 2020

53. TFC: COVID-19 in higher education settings, 10 February 2021

54. Cross organisation study: Risk factors associated with places of enduring prevalence and potential approaches to monitor changes in this local prevalence, 22 April 2021

55. SCWG: What are the appropriate mitigations to deploy in care homes in the context of the post vaccination risk landscape?, 26 May 2021

56. AMS: COVID-19 preparing for the future – Looking ahead to winter 2021, 2022 and beyond, 15 July 2021

57. RAEng: Infection Resilient Environments – Buildings that keep us healthy and safe, 19 July 2021

58. Academics: Modeling the factors that influence exposure to SARS-CoV-2 on a subway train carriage, 22 July 2021 (journal paper published Feb 2022)

59. UKHSA: Face coverings and COVID-19 – statement from an expert panel, 14 October 2021

5 Articles, interviews, evidence regarding groups

I have given numerous media interviews over the course of the pandemic and written various articles. However, I have done so in the capacity as an academic from the University of Cambridge or as a Fellows of the Royal Academy of Engineering. I have not written articles about the work of SAGE EMG or commented on the response of the UK government. However, I have encouraged people to follow the advice given such as to open windows in multi-occupancy settings.

6 Views on whether work of groups succeeded in aims

a. I felt that the composition of the groups in which I was involved was sensible because the skill sets which I thought were required were either represented, or we could call upon additional people as necessary. There was a reasonable diversity in terms of gender, although other aspects such as good racial diversity was less clear; there was some, but I wonder if it could have been better.
b. I did not identify ways in which the commissioning of work from the groups could have been improved.
c. The resources and support that were available to me were fine. However, I was not encumbered with any teaching, research or administrative responsibilities during the early part of the pandemic which is when the work was potentially most intense. I was only starting a new initiative at Cambridge and I was able to pace that so that I could support the Covid-19 work as fully as required. I was however aware that some other members of the groups were under greater pressure with regards to their regular job.
d. I felt that the statements which were developed by the various groups in which I was involved were sensible and were based on the evidence available at the time.
e. I felt that the groups worked well together, and especially because the chairs of the groups knew about the different groups and were able to provide linkages where necessary.
f. I felt that the overall support from Go-Science, and other administrative areas such as from PHE, worked well. I found it easy to get meetings into my diary, access notes, and access the remote meetings.

7 Lessons learned

I think one of the biggest lessons learned from the pandemic was the value achieved through assembling a multi-disciplinary group of academics and those with relevant industry experience, organised by the creation of groups which had chairs with knowledge of the other groups.

In terms of things which were challenging that could perhaps be done differently if there is a next time, certain group members found it very hard to balance the increased workload from their regular day job with the demands of serving on SAGE EMG and similar groups. If there had been some way for their employer to have relieved them of certain duties, then this would have been helpful. This could perhaps have been made easier for the employer if some funds had been made available early-on to provide fill-in support.

I did wonder whether the policy emanating from scientific statements regarding ventilation could perhaps have been woven in earlier. The initial messaging of Hands, Face, Space was really clear. However, even early on there were questions about the potential role of ventilation and it took some time for the messaging to change and include Ventilate. If we had the time again, I wonder whether it could have been included early on, even if just as a pre-cautionary measure.

8 Documentation

I only hold a selection of some draft and final versions of documents in electronic copy on my laptop. This is because I have not got round to deleting them. I refer to the publicly available documents because I know they are the final versions.