

Witness Name:

Michael Gormley

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COVID-19 INQUIRY – MODULE 2

Questionnaire Response – Professor Michael Gormley

1: Overview of qualifications, career history, professional expertise and major publications:

- 1.1. I am a full Professor at Heriot-Watt University working in the field of Public Health and Environmental Engineering in the Institute for Sustainable Building Design at the School of Energy, Geoscience, Infrastructure and Society. I joined Heriot-Watt in 2000 as a Research Associate (RA), was made Assistant Professor in 2007, Associate professor in 2012 and Full Professor in 2021. I have a PhD in Mathematical modelling of building drainage systems (2004), a Master of Philosophy Degree in developing products for drainage systems (2002) a Master of Science Degree in Building Services Engineering (1998) – All from Heriot-Watt University. I also have a Diploma in Electronic Engineering from Dundalk Institute of Technology in Ireland (1985).
- 1.2. I have worked in the area of environmental engineering relating to buildings since 2000, primarily in sanitary wastewater systems for buildings, which includes air and water management within the building drainage or sanitary plumbing system.
- 1.3. In 2002-2003, as an RA, I worked on modelling potential failures within sanitary plumbing systems (particularly water trap seal loss due to pressure surges). This was in response to the SARS-CoV-1 outbreak in Hong Kong. As part of this work I helped develop a device to mitigate against pressure transients, a cause of depleted water traps and a potential source of viral transmission (Swaffield, Campbell and Gormley, 2005a, 2005b). This work was a direct

result of the outbreak of SARS-CoV-1 in which the plumbing system was implicated in an outbreak in which 340 people were infected and 42 died in one housing complex.

- 1.4. Following on from this work I initiated research as Associate Professor to further investigate the transmission mechanisms via the sanitary plumbing system within buildings (Gormley et al., 2012, 2017; Gormley, Aspray and Kelly, 2021).
- 1.5. Just upon the outbreak of the pandemic here in the UK, in February/March 2020, I published an opinion piece based on the previous 15 years work in this area in *The Lancet Global Health* (Gormley, Aspray and Kelly, 2020) which was designed to highlight the potential risk of transmission via the sanitary plumbing system. Prior to this, I had worked on Norovirus outbreaks in hospitals (Gormley et al., 2014) and public health sanitation related research in developing countries (Gormley et al., 2013; Gormley, Williams and Ongole, 2018).
- 1.6. Overall, the focus of my work has been the protection of occupants inside buildings from little understood cross-transmission mechanisms in the sanitary plumbing system. At the outset of the pandemic I was invited to join the steering panel for a Scottish Government funded project on 'wastewater-based epidemiology' carried out by the Roslin Institute at the University of Edinburgh because of my expertise in this area.

Publications

- 1.7. Gormley, M. et al. (2012) 'An assessment of, and response to, potential cross-contamination routes due to defective appliance water trap seals in building drainage systems', *Building Services Engineering Research and Technology*, 33(2). doi: 10.1177/0143624411410619.
- 1.8. Gormley, M. et al. (2013) 'Pro-poor sewerage: Solids modelling for design optimisation', *Proceedings of the Institution of Civil Engineers: Municipal Engineer*, 166(1). doi: 10.1680/muen.11.00037.
- 1.9. Gormley, M. et al. (2014) 'Environmental conditions and the prevalence of norovirus in hospital building drainage system wastewater and airflows', *Building Services Engineering Research and Technology*, 35(3). doi: 10.1177/0143624413485080.

- 1.10. Gormley, M. et al. (2017) 'Pathogen cross-transmission via building sanitary plumbing systems in a full-scale pilot test-rig', PLoS ONE, 12(2). doi: 10.1371/journal.pone.0171556.
- 1.11. The Gormley, M., Aspray, T. J. and Kelly, D. A. (2020) 'COVID-19: mitigating transmission via wastewater plumbing systems', The Lancet Global Health, 8(5), p. e643. doi: 10.1016/S2214-109X(20)30112-1.
- 1.12. Gormley, M., Aspray, T. J. and Kelly, D. A. (2021) 'Aerosol and bioaerosol particle size and dynamics from defective sanitary plumbing systems', Indoor Air. John Wiley & Sons, Ltd, n/a(n/a). doi: <https://doi.org/10.1111/ina.12797>.
- 1.13. Gormley, M., Williams, L. A. and Ongole, B. (2018) 'Up-scaling sanitation provision using mixed design methodologies and failure risk assessment: A case study of Marikuppam, India', Journal of Water Sanitation and Hygiene for Development, 8(1). doi: 10.2166/washdev.2017.084.
- 1.14. Swaffield, J. A., Campbell, D. P. and Gormley, M. (2005a) 'Pressure transient control: Part I - Criteria for transient analysis and control', Building Services Engineering Research and Technology, 26(2). doi: 10.1191/0143624405bt119oa.
- 1.15. Swaffield, J. A., Campbell, D. P. and Gormley, M. (2005b) 'Pressure transient control: Part II - Simulation and design of a positive surge protection device for building drainage networks', Building Services Engineering Research and Technology, 26(3), pp. 195–212. doi: 10.1191/0143624405bt120oa.

2: List of groups I participated in and the relevant time period:

- 2.1. I was primarily a participant of the Environmental Modelling Group (EMG), which I started participating in on 5 May 2020 until 25 January 2022. I was attached to the Engineering Systems working group, but also in general discussions on transmission in the built environment.
- 2.2. Later, I was asked to participate in the Transmission in the Wider Environment Group (TWEG) from 12/10/20 – 3/12/20.
- 2.3. From 9/9/20 until 1/4/22 I represented EMG on the Social Care Working Group (SCWG) – this was very much as an observer and relating questions between the two groups.

3: Overview of involvement in groups between January 2020 and February 2022:

When and how you came to be a participant

- 3.1. I was asked by the chair of EMG, Professor Catherine Noakes to become a participant of the group from 5 May 2020. We had worked together previously on the SARS-Cov-1 outbreak in Hong Kong (see paper above) and she was well aware of my understanding of the issues surrounding transmission of viruses in building environments and my work on aerosols. Because of my knowledge of water and wastewater systems I was asked by the Chair of EMG (Professor Noakes) to participate in TWEG from October 2020 until December 2020. My participation in the Social Care Working Group (SCWG) was to facilitate closer links between the two groups as an observer and to report back questions from SCWG to EMG and vice versa. This was from September 2020 until April 2022.

The number of meetings you attended, and your contributions to those meetings

- 3.2. From 5/5/20 to 25/1/22 I attended 34 meetings of EMG, 4 meetings of TWEG (12/10/20 – 3/12/20) and 43 meetings of SCWG (2/9/20 – 1/4/22). Occasionally I attended meetings of other sub-groups (the transmission sub group) for example on an ad-hoc basis or when the need arose. The meetings were all held online on Zoom and the meetings were organised by the chair/secretariat.
- 3.3. Meetings began with an update on the overall situation and any updates from the main SAGE group. The bulk of the work was done as a response to commissions from government departments through the secretariat and the chair. These commissions would be discussed at the meetings, together with progress on document production. The focus of the meetings in this regard was to develop consensus on any given topic whilst allowing all views to be heard. Scientific evidence underpinned the discussions. I fully participated in the discussions, commenting on the evidence presented as required and indicating acceptance of the consensus arrived at.

Your role in providing research, information and advice

- 3.4. The research involved in the early stages was much more intense than latterly. In the beginning so little was known about the transmission mechanisms of the virus that a lot of research was required in order to keep up the changing picture globally. I was involved in literature reviews and drafting documents as necessary, I was given ample space to advise on matters particularly related to my field – sanitary wastewater systems, including ingress of contaminated air into bathrooms and kitchens.

4: Summary of documents to which I contributed for the purposes of advising groups:

- 4.1. Please find attached a list of all the EMG related documents produced in the period I was a member of EMG (**Appendix A**). I have included a key to the role I played in the production of each document (if any).

5: Summary of articles, interviews and/or evidence:

- 5.1. I have not been interviewed by any media outlet in relation to my work, or the work of the groups or the UK's response to the COVID-19 pandemic, with the exception of a piece on the Heriot-Watt University website [U-bend offers layer of protection against COVID-19 - Heriot-Watt University \(hw.ac.uk\)](https://www.hw.ac.uk/news/2020/03/24/u-bend-offers-layer-of-protection-against-covid-19-heriot-watt-university-hw.ac.uk). This piece highlighted the article I wrote for the *Lancet Global health* and offered advice to people on how to stay safe with regard to the potential spread of viruses via plumbing systems. This article was published online on March 24th 2020, before my involvement with SAGE.
- 5.2. I did write two opinion pieces and editorials for academic journals after I began work on EMG - as follows;
- 5.3. Gormley M. SARS-CoV-2: The Growing Case for Potential Transmission in a Building via Wastewater Plumbing Systems. *Ann Intern Med* [Internet]. 2020 Sep 1; Available from: <https://doi.org/10.7326/M20-6134>; This article was a comment on research which suggested that transmission had occurred via the drainage system in a high-rise block of flats in China. My conclusions were that the research added to the growing body of evidence surrounding transmission via the plumbing system, but it was not conclusive.

- 5.4. Gormley M. Wastewater systems in the time of Covid-19: surveillance, epidemiology and design. Proc Inst Civ Eng - Water Manag [Internet]. 2020 Nov 10;173(6):271–3: <https://doi.org/10.1680/jwama.2020.173.6.271>: In this article for the Institute for Civil Engineers journal, I set out the implications for the high prevalence of the virus in wastewater systems. This article was written in November 2020 when it still wasn't entirely clear if SARS-CoV-2 was a threat in wastewater systems, however, it was becoming clear that faecal-oral-ocular transmission was a much lower risk to people than other transmission routes (direct contact and aerosol and droplet transmission for example). Within the wastewater space, attention had already turned to 'wastewater-based epidemiology' in which the prevalence of the virus in the community can be estimated by sampling wastewater system in a particular area. The conclusions were that professionals working in this area should be mindful of potential danger at that time.

6: Views as to whether the work of the groups in responding to the Covid-19 pandemic succeeded in its aims.

- 6.1. The EMG group was composed of experts in the fields of engineering, building environment specialists, behavioural scientists, microbiologists, clinical specialists and government departmental representatives (this is not an exhaustive list). This combination worked well together in that it was possible to combine practical advice that people were likely to follow and that would meet the needs of the commissioning department.
- 6.2. The mix of specialisms reflected the problems associated with protecting people against a novel virus whose spread was from close contact, surface touch and airborne. The response required a multi-disciplinary approach and I think the balance of specialisms in the group achieved that.
- 6.3. The work of the group changed in emphasis over the period, relating to the changes in response necessary for the pandemic. For example, new variants meant that previous research and assumptions had to be re-checked.
- 6.4. I had little to do with the way work was commissioned and I can't comment on that. The questions being asked by government departments and SAGE were sensible and real in nature and there was a sense that, as with most of society

- at the time, departments were genuinely grappling with how to address real problems and find real solutions.
- 6.5. The secretariat provided an excellent resource, drawing together different strands of work and keeping everything on track. The letters from Patrick Valance to Vice Chancellors was particularly welcome as it allowed more time to be devoted to the effort. In early 2021 some teaching buyout help was made available which also helped, although it would have been better had this been agreed earlier (although this is just hindsight). The funding was welcome.
- 6.6. It should be remembered that, particularly at the beginning, a lot of time and effort was expended on the response to the pandemic out of the sheer goodwill of the people involved. I was especially amazed at the dedication of everyone involved and the good spirit with which everyone addressed difficult (and emerging) technical problems. There was a great sense of collegiality and a spirit of working together. With such a diverse group it might have been daunting for some to raise objections, however the meetings were chaired really well and the opportunity to raise concerns was made easier.
- 6.7. Advice was given in the form of papers delivered to the main SAGE group. The documents were poured over, edited, discussed and commented upon until they were in a state that the group was happy with. The papers were delivered to SAGE by the chair of the group or a representative – I did not deliver any papers at SAGE main meetings.
- 6.8. The other groups I participated in – TWEG and SCWG- had a different makeup. TWEG consisted of mostly environmental scientists, agriculture and food specialists. The mix of specialisms was appropriate for the area being covered. The SCWG involved a lot more clinical and epidemiologist experts and had a much different focus. My role on this group was much more as an observer and reporting back to EMG on issues of concern to this group.
- 6.9. Overall, I think these groups were of great use to the pandemic response in the UK and that the aims were broadly met.

7: Lessons that can be learned

- 7.1. The groups were very effective at providing expert opinion on a challenging problem. There was a suggestion that the groups could continue in a 'standby' mode or in a shape that could be reconvened at any time under some other management structure – HSE was suggested. I don't think this has happened. While it would be relatively straight-forward to enlist the experts again quickly, I am unsure about how easy/difficult it would be to re-convene the secretariat or the machinery around feeding into government departments.
- 7.2. One thing that was discussed was the possibility of UKRI promoting calls for research programmes in this area. This would greatly improve readiness for pandemics in the future. I believe those talks did not lead to anything in particular and that academics are advised to apply for research via responsive mode rather than a targeted approach. I think a targeting of research in this area would have been a good legacy from the effort put in by academics, and, while great strides have been made during the pandemic to improve the science, these are still a lot of unknowns.

8: Documents that I hold

The following are available:

- 8.1. Documents presented at SAGE meetings (available at Gov.uk)
- 8.2. Draft Minutes of EMG meetings
- 8.3. Agendas of EMG meetings
- 8.4. Drafts of papers and other materials were stored on web servers (One drive) of Government departments which should be available on request.
- 8.5. Emails of correspondence are available. These mostly involve organising meetings and some comment on papers. There is a large volume of email traffic in relation to this but it can be retrieved if necessary.
- 8.6. All documentation is in electronic format. Some of it is on my secure University server and some will be on government servers.