Witness Name: Thomas Woolley

Statement No.: 1

Exhibits: 8

Dated:

Personal Data

UK COVID-19 INQUIRY

WITNESS STATEMENT OF THOMAS WOOLLEY

I, Thomas Woolley, will say as follows: -

Membership

1. I am a Senior Lecturer in mathematical biology at Cardiff University. Although not my primary research, I have the skills to do epidemic modelling and teach the theory to 4th year undergraduate students. However, prior to January 2020 I had not worked on any coronaviruses, or with public health bodies in relation to communicable diseases.

2. I joined WG TAG policy modelling subgroup October 2020 as I was asked to help model the number of secondary infections that Universities would create over Christmas (**Exhibit TW/1** - INQ000224105). This extended to modelling disease spread in Higher Education settings. In April 2021 I was asked to join WG TAG Environmental to use my agent-based modelling to advise on social distancing and policies for reopening cafes, night clubs, etc. However, this work never crystalised into briefing reports. I cannot say for certain why this work never went further, however, I could suggest two potential reasons. Firstly, WG TAG Environmental were responding to rapidly changing demands, thus, although my skills may have been useful at the point I was asked to join they interests of the group may have changed by the time I was part of the group. Secondly, WG TAG Environmental were also working with Swansea University and it could be that they were supplying all the modelling that was needed.

3. The composition of the two TAGs was very similar, and although the membership size fluctuated, there were around 20 people from international backgrounds and from diverse disciplines such as the civil service, health professionals and scientific modelers. This diverse make up allowed the group to take into account sources of information and perspectives, both national and international

4. Outside of video conferencing and emails, I did not communicate with ministers, senior advisors, or senior civil servants. Specifically, I have no WhatsApp messages.

5. Questions that I worked on were usually emailed directly to me and I would meet with a subgroup of the TAG membership to iterate our modelling answers and clarify assumptions. These were then presented back to the whole group. This arrangement allowed us to move quickly in providing answers, which were robustly tested against the knowledge of the TAG's membership.

6. The subgroup I met with were highly effective at providing insights into the scenarios they wanted modelling. The whole TAG was then able to challenge the entire workflow. These challenges, questions and clarifications led to further iterations of the models of disease spread in educational settings.

7. From my view there were no divergences of opinion that lasted beyond a discussion either within the TAG, or in my experience, the discussion happened externally leading to an update of the model, which encapsulated the new information.

8. Outside of these interactions I cannot say what the relationship between the TAGs and the senior politicians was and if this led to any delays.

Mathematical modelling

9. I and collaborators have produced two pieces of work for the TAGs (**Exhibit TW/1** - INQ000224105, **Exhibit TW/2** - INQ000224110, **Exhibit TW/3** - INQ000224111, **Exhibit TW/4** - INQ000224103, **Exhibit TW/5** - INQ000224104).

10. The first (**Exhibit TW/1** - INQ000224105) was a statistical piece of work, which estimated the number of secondary infections that would be produced due to university students returning home for Christmas. The work was commissioned around 13th October 2020, after the students had returned to university, but before the Christmas holidays.

11. Text briefings were made and Prof. Paul Harper communicated this work to the WG Director, Skills, Higher Education and Lifelong Learning, Huw Morris, and we were informed that the work was considered by the Welsh Government's Technical Advisory Cell and Higher Education Task and Finish Group dealing with Covid-19. This work was developed into a more detailed academic paper (**Exhibit TW/1** -INQ000224105, published in the journal of *Health Systems*) and a science communication piece for the media website *theconversation.com*.

12. The results of the work demonstrated that, on average, we would expect every infected student to generate one further infection. If no further interventions were taken then at a modest 1% infection level, we estimated that there would be 9,400 new secondary household cases across the UK. Moreover, we suggested

that these secondary infections may be even more problematic over the Christmas period due to family gatherings being larger and including more elderly relatives.

13. Based on our results it was decided that there was evidence that encouraging students to return to their permanent home address from university residences would create greater risks than encouraging students to remain located close to their university of study. This decision and the reasoning behind it were communicated to colleagues in the UK Government, Scottish Government and Northern Ireland Executive and informed the wider development of policy in this area across the UK.

14. As a result of this work staggered release dates for students returning home were implemented in Cardiff University. Moreover, the local testing that the University was offering was ramped up to provide as much confidence as possible that the students were COVID free. This was reinforced by messaging from the university that students who received a negative result should isolate as much as possible before returning home, whilst those receiving a positive result should not travel for 10 days.

15. With regards to the timeliness of the first and subsequent firebreak lockdowns. From my position as a mathematician, it was clear from the high contagiousness of the disease and the data from international sources on number of cases that it would spread extremely quickly. Explicitly, the very basis of mathematical models that predict infection spread show that the initial spread grows exponentially. Thus, it was clear that the numbers were not going to stop increasing without some kind of large intervention.

16. This prediction was so clear to me that I moved my lecturing online two weeks before the rest of the university followed suit because I could see that I was at risk and had to take personal action.

17. Note that high contagousness is not, in itself, a worry. The common cold and flu often have high numbers of infections during winter. The difference here is that the infection was linked with a high mortality rate, either directly or through varying medical complications. Thus, without a vaccine, or lockdown protocols, the pandemic was never going to stop.

18. However, having said all of this, I fully recognize that I was enacting decisions to primarily keep myself and my family safe. The Welsh Government have a much wider remit and have to support the economy and children's education, as well as people's health. Thus, whereas I and my wife had a fairly easy time adapting to lockdown life, as we are in careers that could transition online and our children are not in school yet, I fully understand that the Welsh Government had to consider a wider arrange of responsiblilities, including the fact that people hated being in lockdown due to the isolation.

19. Thus, although I do think that the lockdown could have occurred earlier, I don't think they could have run it any longer than they did without causing a social uprising. Bringing the lockdown in earlier, would simply have meant that that the next lockdown would have had to have occurred earlier. Specifically, it would have just brought all of the lockdowns forward.

20. In short, lockdowns, although a possible solution, were not a sustainable solution. If the lockdowns had continued and/or were made longer then, at best, I would foresee people would simply start disobeying the lockdown orders and at worst, civil disobedience would erupt. The only lasting solution, other than just accepting the high mortality rate, was the creation of a vaccine.

21. Our second piece of work was commissioned by Head of Policy HE Covid-19, Bethan Cradock (**Exhibit TW/2** - INQ000224110, **Exhibit TW/3** - INQ000224111, **Exhibit TW/4** - INQ000224103, **Exhibit TW/5** - INQ000224104). We were asked whether we could determine the number of infections that would likely occur in small scale higher education and further education settings. Namely, how would the virus spread in classrooms and halls of residence? Moreover, we added non-pharmaceutical interventions and considered various scenarios of staggering student return, to see which combination of factors was the most effective. Due to the small number of people involved in the modelling we used an "agent-based" simulation.

22. In terms of mathematics "agent-based" modelling describes a framework where entities are represented by interacting "agents". These agents are programmed with rules and behaviours that describe how they will react in the face of various stimuli. For example, our agents represented individual humans and were able to present states such as healthy, infected and infectious. The agents were further provided with rules defining how they move between these states depending on who was around them and how closely they interacted.

23. The results of this work were numerous, and I offer a selected sample here:

    - More COVID testing means fewer cases overall but leads to more absences as cases are detected and social bubbles are isolated.

    - Maintaining good social distancing practices, adding masks and good ventilation (reducing the R number) is the best way to reduce infection spread.

    - Encouraging student compliance with covid-19 isolation regulations also reduces both the total number of infected and number of days absent.

    - Halls of residence with larger occupancy flats are more susceptible to rapid increases in infections, as testing frequencies are reduced.

- Halls with smaller flats result in fewer absences as fewer noninfected students are required to isolate out of caution.

- A pre-emptive test before student arrival can significantly reduce the number of infections over a three-week period only in a highly infectious environment.

- Lowering the R number and imposing strict social distancing measures is more effective in controlling the spread of infection than increasing testing frequencies.

- Increasing test accuracy has little impact on reducing infection spread unnecessary isolation in comparison to lowering the R number.

24. The work and results were iterated with Bethan Cradock and presented to WG TAG Policy. Bethan informed us that she had shared our work the Scottish Government and DfE colleagues. Once again, this was developed into a publication for the scientific literature and was published in the journal *COVID* (**Exhibit TW/6** - INQ000316297).

25. In June 2022, 16 months after the work was presented, we were told about the impacts of our work, which include:

    - the implementation of the asymptomatic testing pilot for higher education, with the evidence supporting a 28-day testing policy balancing the need to reduce the spread of COVID and the impact of repeated self-isolation periods and missed educational opportunity. This differed significantly to other education policies which required ongoing regular testing;

    - the decision by Welsh Ministers to keep higher education institutions open for in-person teaching during the November 2020 firebreak period. This enabled a planned and controlled movement of students for the winter holiday;

    - implementation of the test to travel policy whereby students were required to test before travelling between term time and out of term addresses;

    - the removal of teaching bubbles in further education.

26. It should be noted that we were not consulted on these outcomes and so were not privy as to how they were decided upon, which is why in paragraph 1 of question 6 of **Exhibit TW/7** - INQ000183866 I say that "interpretation of the results were sometimes extrapolated beyond their true applicability".

27. In both cases online apps were developed to support the Welsh Government's translation of the research. The apps can be found at

    https://josh-will-moore.shinyapps.io/Infection_rates_returning_students/

    https://josh-will-moore.shinyapps.io/Covid_19_Intervention_IBM/

The apps were supplied to the Welsh Government as we found that the questions and data were changing so quickly that it would be better to offer the solution techniques to the policy makers. In this way they would cut out the slow process of contacting my team, my team running various scenarios and then providing feedback. The apps should allow the policy makers to run their scenarios of interest rapidly and move directly to decision making.

28. In delivering both pieces of work, apart from providing the initial question and offering time to clarify and read through solution drafts, no resources were supplied to answer the question. To be fair no resources were requested as it was presumed that there would be none. But, equally, no resources were sought because we were too busy working on answering the questions as we knew time was a crucial factor.

29. I have since seen information in one post-COVID meeting that showed Wales received a smaller share of total research funding (per capita) when compared against the rest of the UK. Thus, we should have been more ambitious, but the funding should have been more easily available and tied to the questions being asked. So, it would have been clear as to the resources that each question would come with, making prioritisation easier and reducing the overlap of people working on the same questions.

30. Regarding the civil service asking the right questions, I fully believe they were being pragmatic in their approach and, thus, asked for answers regarding whatever issue arose next. Equally, if we did not feel like we were answering the right questions then I never felt afraid of discussing appropriate changes with the people I worked with.

31. Our research into disease spread in educational settings and Halls of Residence focused on small numbers of people (up to a thousand) constantly interacting in small locations, e.g. classrooms, or communal kitchens (**Exhibit TW/2** - INQ000224110, **Exhibit TW/3** - INQ000224111, **Exhibit TW/4** - INQ000224103, **Exhibit TW/5** - INQ000224104). The features of these simulations were, thus, similar to alternative places such as cafes, gyms and night clubs, which were locations of interest for TAG environment. Namely, we could have repurposed our work to support decision making in these spaces. This is why I have said in point 1 to question 7 of **Exhibit TW/7** - INQ000183866 there should have been "clearer repositories of data and knowledge. Much of the work was repeated by different bodies because they were in different TAGs and didn't know of each other". Allowing the team members to know what questions each TAG was considering would have allowed the team members to choose the problems they felt their expertise were best suited.

Outcomes

32. As mentioned above, although I was eventually informed of what results my work fed into, I often had to chase people for these outputs. Thus, once I had finished the work and offered it to the TAGs, I did not see how it was developed on their side, meaning it seemed like it was not being used, even if it was. This lack of connection to the policy maker's use of the work is equally heavily linked to the disposability I felt and how unrewarding the process seemed because, although letters of thanks were eventually given, I again had to chase for specific letters to be written about my input, which I could use to demonstrate to my supervisors what I had been working on.

33. The published work got picked up by the mainstream media (**Exhibit TW/8** - INQ000316298). The accompanying public comments heavily criticized the use of mathematics to predict possible outcomes. Being responsible for the work I used these comments as a basis for a public presentation at the Hay Festival in 2022. Talking with the public directly, the dominant message was that information regarding the error bounds around our work had not been communicated clearly. Equally, there was a lack of understanding as to the underlying assumptions on which the models were based. Essentially, the audience felt that they did not have a means of questioning the decisions that had been made and that if they had been able to talk to the scientists behind the predictions that would have been able to clarify their thoughts and been much happier that the right course of action had been taken.

Advice

34. The civil service was put under huge pressure during COVID and, as discussed above, I did eventually receive clarification as to how my work was used. Thus, the process was eventually made transparent. Equally, during the height of COVID I can fully appreciate that the civil service did not have time to constantly feedback on how our work was being used and individually thank all the people who were developing solutions to their questions. However, in future, I would recommend that processes be put in place that would a) ensure academics are told how their work was finally used (as early as possible), without having to chase for the information and b) provide a rough timescale for this use. This would provide the academics with confidence that their work is being used and provide a road map for when the results would be seen.

35. Secondly, based on discussing my work with the public I believe more could be done to have public interaction forums with the scientific community. This would allow the public to scrutinize the work and, thus, have more confidence in the messaging produced by the government.

36. The Hay Festival event that I ran involved recruiting a colleague from anthropology as it was clear from talking to him that different communities observe governmental advice in different ways. This was equally backed up by some of the research presented in one of the TAGs (I forget which one), which

demonstrated that the populations from different cultures had different take up rates for the vaccines.

37. Based on these interactions, although I do feel the work of the TAGs and my research was scrutinised from many different viewpoints, I also feel that experts from the anthropological sciences were missing from the initial policy discussions. Thus, in future it would be good to see members of the social sciences included as rapidly as possible.

38. Finally, from my experience of TAG policy and TAG Environment I do feel that there should have been more cross talk between members. Or perhaps a way of highlighting the questions that each TAG was considering would have sped up the process of finding the right experts for the questions.

Positive features of the TAGs

39. Even though not all pertinent disciplines may have been present, overall I did feel that the expertise in the discussions were first class and those who knew best were able to direct conversations, justify their opinions, whilst being open to challenges.

40. Also because of the diversity of backgrounds of the people in the meetings the hierarchy was flat as we all knew we were experts in our own individual areas, but we were there to be more than the sum of our parts.

41. The TAGs were meetings of minds where requests for answers could be made and new research from world-wide perspectives could be presented. Thus, from an academic perspective of idea generation, the TAGs were highly stimulating. Specifically, I cannot think of a time when a difference of opinion lasted beyond the demonstration of pertinent evidence.

42. Critically, I never felt that there was over-representation of policy colleagues. Their input was always valued as their interests were often very timely, which kept the research from becoming too abstract. Moreover, they were often required to clarify what information was known and where their knowledge gaps where.

Questions that I cannot answer

43. Due to the separation of policy makers and scientists, I cannot specify exactly how effective, or consistent the decision-making process was. I do believe all our results were considered. However, I was not privy to how the final decisions weighted the evidence.

Statement of Truth

I believe that the facts stated in this witness statement are true. I understand that proceedings may be brought against anyone who makes, or causes to be made, a false statement in a document verified by a statement of truth without an honest belief of its truth.

Signed: Personal Data

Dated: 1/11/2023