UK COVID-19 INQUIRY

WITNESS STATEMENT OF MARC WARNER

INTRODUCTION

1. I, Marc Warner, of Irrelevant & Sensitive

2. I am the CEO of Faculty Science Ltd ('Faculty') a company I co-founded in 2014.

3. I make this statement in response to the Inquiry's request for evidence under Rule 9 of the Inquiry Rules 2006 in its letter dated 19th December 2022.

4. This statement is divided into the following sections:

    a. My professional background and experience
    b. Initial involvement in the Covid-19 response
    c. Early work with the NHS
    d. Early impressions of the state of government data and technology
    e. Initial government strategy
    f. Working full-time on the Covid-19 response
    g. Stepping back from full-time work on the Covid-19 response
    h. Key challenges and lessons learned

SECTION A: MY PROFESSIONAL BACKGROUND AND EXPERIENCE

5. I have an undergraduate degree and PhD in physics from Imperial College London and University College London (UCL) respectively, and was a research fellow in Physics at Harvard. After that I co-founded a company, originally called ASI Data Science, and now, Faculty Science Ltd ('Faculty').

6. I have been a member of the UK Government's Digital Economy Advisory Group and was a member of their AI Council, having been appointed by then Prime Minister Theresa May in 2019. I am also a member of the Imperial Court (the advisory board of Imperial College London).

7. Faculty helps people and organisations make better decisions by embedding artificial intelligence in their most important organisational processes. We are world leading specialists at this. Faculty has worked extensively across the private sector, as well as with the UK Government and NHS.

8. Examples of our government work include:
   a. Providing the Home Office with technology that automatically detects both new and existing Daesh propaganda videos and stops them being uploaded.
   b. Leading a consortium, on behalf of DCMS, to support safety tech companies to build tools to identify and remove harmful content online.
   c. Helping DEFRA understand how machine learning could enable better use of data for the purpose of fisheries control and enforcement.
   d. Helping the Department for Education give open access to their Longitudinal Education Outcomes dataset whilst preserving individual anonymity.

SECTION B: INITIAL INVOLVEMENT IN THE COVID-19 RESPONSE

9. Faculty's work with the government and NHS long predates the pandemic. Faculty's first connection with the NHS was in March 2015 through our Fellowship - an education programme designed to help STEM PhDs become data scientists. In this specific project, a Faculty Fellow helped the NHS understand the factors behind patient experience in GP surgeries. Faculty's first work with the government came in 2016. I was asked to join the AI council, an advisory body to HMG, in 2019 under Theresa May.

10. My insight into the COVID-19 response comes via Faculty's work with the NHS. Faculty won a contract, through open competition, to provide capability building to NHSX - a joint NHS / Department for Health body responsible for digital and technology - as its strategic AI lab partner. The competition for the contract took place in December 2019, Faculty won

the contract in January 2020, the contract was signed on 13th February, and we started work that month.

11. For the purposes of this document, I consider my 'official capacity' to be as the CEO of a company contracted by the NHS. It was because of this contract, and informal discussions with the NHSX team, that we became aware of COVID-19 in our 'official capacity'.

12. The first formal meeting about COVID-19 that I attended was on the morning of 3rd March 2020. We met with Matthew Gould, then CEO of NHSX, to discuss whether he would like us to help further given the severity of the circumstances. He appeared grateful for the offer, and asked us to start in earnest (see ***Exhibit MW/1 - INQ000148768***). Faculty's original deliverables under the contract continued, and this additional work took place under the terms of our existing contract.

13. Faculty's leadership decided this was an important moment in the country's response, and we should do what we can to help. We moved our most senior technical leadership (CEO, CTO, Director of AI, Director of Health) alongside a wider team to work on this full time. This meant we spent much of our working day at NHS offices, with NHS officials, or in Whitehall offices. To illustrate the significance of this, there is no other time in Faculty's history that a single one of the people in these roles focused on a single project full time. To put all four on one project was, and still is, a completely unprecedented commitment. We met staff from a number of government departments and agencies during this time (including No10, Cabinet Office, Department for Health (DH), Home Office and others), at their request. Sometimes this would be in the context of a larger meeting where a number of departments would be represented and sometimes informally in smaller meetings. I cannot recollect, and did not diarise, all of the meetings or people I met during this time due to time pressures and the speed of events.

14. This was a considerable sacrifice at the expense of our other work and the wider company, but we felt the situation warranted it. As a result, I was spending significant time on the COVID-19 response from the meeting with Matthew Gould on 3rd March, and I was almost completely full time from 9th March until mid July.

15. The key period where I have some insight into Cabinet Office and No10 decision making was the two weeks between 3rd March and 18th March. It was during this time period, where the need to gather requirements for the COVID data dashboards was at its highest, that I was present in No10 and Cabinet Office (e.g. with the Civil Contingencies Secretariat). Because there were no data systems in place, and the understanding of the pandemic was relatively poor, my areas of expertise in NHS COVID-19 data and broader data analytics and modelling were helpful. By the end of March, our technology systems had developed sufficiently and the wider understanding of COVID-19 had improved, making my continued presence unnecessary. I have much less insight after this.

16. While my presence in Cabinet Office and Number 10 reduced, Faculty continued to work on many projects that were successful contributors to the COVID-19 response, including:

a. **COVID19 Datastore**. A single source of truth for the NHS and central government. It involved integrating data from across the health and care system.

b. **Strategic decision makers dashboard**. This provided a national summary of situation report (SitRep) information. It was designed to help senior national and regional officials make policy and strategic decisions in response to Covid-19.

c. **The COVID-19 Early Warning System.** An AI tool that forecasts vital information such as COVID-19 hospital admissions and required bed capacity three weeks in advance. The predictions can be viewed on a national, regional and trust level and are updated on a daily basis.

d. **Testing of 111 policy changes.** Faculty worked with NHS analysts to evaluate the impact of 111 First - an initiative introduced to increase use of 111 services to distribute demand more effectively across the NHS. Impact was evaluated across eight localised trial locations, ahead of the national rollout. The objective was to help understand i) that the initiative was safe, and ii) whether it was resulting in improved service performance.

e. **Open sourcing of the OpenABM model.** Faculty adapted an agent-based model of COVID-19 and created a software framework that automates processes for calibrating the model parameters to health data and allows the model to be run at national population scale on NHS infrastructure. We developed a method for calibrating the model to three daily data streams (hospital admissions, intensive care occupancy, and deaths). The calibrated model was used to simulate the spread of COVID-19 in England.

f. **Creation of an economic model in addition to the epidemiological model.** Faculty collaborated with Goldman Sachs to integrate their economic simulator into the COVID-19 simulator developed by a team at Oxford BDI. We do not believe this was widely used.

g. **The PHE COVID public dashboard.** Faculty worked with NHS and Public Health England to streamline the reporting of coronavirus cases and deaths into a single public dashboard.

h. **The National COVID Chest Imaging Database.** Faculty scoped and architected the National COVID-19 Chest Imaging Database, in collaboration with others. This provided researchers and developers with access to pseudonymised chest scans from known COVID-19 patients, and the NHS with the infrastructure needed to test the efficacy of diagnostic AI tools for COVID-19. We also designed and led the first NHS validation programme of four real-world AI applications using the large-scale dataset provided by the NCCID.

i. **Environmental Monitoring for Health Protection Programme (EMHP).** Working with the UK Health Security Agency (UKHSA) and Joint Biosecurity Centre, we completed four projects with the EMHP. EMHP monitored the wastewater of 40 million people across England for SARS-COV-2 virus levels. Between June 2021 and May 2022, Faculty created several advanced analytical models that inferred the number of COVID-19 cases in the community based on the quantity of SARS-COV-2 RNA in wastewater samples. These models were used for research purposes only, and helped validate existing decision making rather than drive it. One model used the waste water samples as an input into the NHS COVID-19 Early Warning System (EWS), however, shortly after validation of this model the EMHP programme was put on pause.

17. As I said earlier, my involvement in the government's pandemic response came via Faculty's work with the NHS. It is hard for me to comment on the overall impact of the projects I worked on, as they were created at the very start of the pandemic - and thus my involvement with No10, Cabinet Office and government generally came almost entirely in March 2020 and the weeks leading up to the first lockdown.

18. As such, my general assumption is that the influence of the projects listed above, will be detailed by the government departments they were built for, since Faculty has relatively limited insight into exactly how they were used.

19. However, I will discuss in detail our work with the NHS - the impacts of which I saw first hand, and which I believe were impactful in helping to manage the crisis.

SECTION C: EARLY WORK WITH THE NHS

20. The COVID-19 Early Warning System (EWS) was a system to provide forecasts of the number of COVID-19 patients likely to be admitted at any hospital across England, and the type of bed they were likely to require. The system was used extensively by the NHS, and some of the predictions were fed into the Scientific Pandemic Influenza Group on Modelling (SPI-M). The NHS controlled access to the EWS, so they should be able to provide details of who they gave access to. SPI-M controlled how their predictions were used - I think it was aggregated with many other forecasts - and SPI-M would need to detail who was given access to this information.

21. It was used daily by NHS incident response directors and it was one of many key pieces of information they used to make decisions - such as when to move people between hospitals, and where to send equipment like ventilators. It provided around a thousand NHS staff with millions of accurate individual predictions to help them prepare for COVID-19. The performance of the EWS was so effective that even when other organisations, such as SPI-M, stopped providing forecasts, the EWS was able to continue effectively. It has since won independent awards for the impact it had on NHS decision making.

22. The EWS enabled Faculty to make use of information across the NHS (not just an isolated hospital) and to deal effectively with data quality issues. The primary data source was the COVID-19 Daily NHS Provider Sitrep. Additional datasets are used as leading indicators, including: National laboratory COVID-19 testing data from the UKSHA, Second Generation Surveillance System (SGSS); NHS 111 COVID-19 Telephony Records; Google COVID-19 Community Mobility Reports; and Apple COVID-19 Mobility Trends Reports. Office of National Statistics (ONS) population data was used to scale model parameters between trusts.

23. On top of this, the EWS had safety built into its core. Users could see historical predictions, with the real data superposed as it came in, to ensure the model was trusted appropriately, neither too much nor too little. Each prediction came with an explanation of the basis and rationale, so that users could understand why the model was making the predictions it was. This builds user trust but, more importantly, helps users take the right actions. For example, if a model is predicting a rise in cases, the actions you take are very different if the reasons for the increased infections are due to spread in the community (potentially local lockdowns) or in a hospital (better hygiene practices).

24. It was clearly highly valued by the NHS. Professor Keith Willett, their Senior Incident Director for COVID-19, said: "As a national incident team, we were able to review the likely issues that we were going to face in the next one to two weeks. This enabled proactive conversations with key system leaders to ensure that resilient mitigations were in place and the likely period of time that they would be required for... Very helpfully, the team managing and curating the EWS would also be able to highlight trusts, STPs, and regions of interest and offer useful insights to explain possible changes in key system metrics over time."' Ming Tang, Chief Data & Analytics Officer for NHS England, said: "By using this leading technology developed with Faculty, we are helping to support frontline staff in their ongoing mission to save as many lives as they can by equipping them with the most accurate information. This tool is incredibly important for helping local teams plan to bring back on services for other patients safely, while at the same time flexing capacity locally to support COVID-19 care." These quotations were provided for a case study that Faculty put together on the EWS project - see **Exhibit *MW/22 - INQ000252434*** for the case study, and **Exhibit *MW/23 - INQ000252433*** confirming sign off from Professor Keith Willett and Ming Tang.

25. To be clear, the EWS only grew to that level of sophistication over time. In the initial phases of the work, Faculty were part of a collaboration - including NHSX, Palantir, Microsoft, AWS, Google and others - that was simply aggregating data from across the NHS, cleaning and validating it, and presenting it for further use as evidenced in ***Exhibit MW/2 - INQ000148779***.

26. However, it was this work that meant, for a period of a few weeks in March and early April, Faculty had amongst the most detailed understanding of NHS data of anyone in the country. To explain this: when you collect data, you make choices. Is a patient that enters ICU at 11pm, after rounds, counted as an ICU patient today, or would you count them tomorrow? In different circumstances, either answer can be sensible. However, in a fast-moving crisis, knowing which version you actually choose is vital clarity. Primarily, it was this clarity (because Faculty had seen all the choices made by different officials across government) that meant I was asked at various times to attend meetings, principally by the NHS (e.g. Simon Stevens, Matthew Gould, NR Indra Joshi), but occasionally No10 (e.g. Dominic Cummings, NR Dr Ben Warner, Tom Shinner) and government departments as evidenced in ***Exhibits MW/3 - INQ000148782, MW/4 – INQ000148783, MW/5 – INQ000148784, MW/6 – INQ000148785, MW/7 - INQ000148786***.

27. Since my attendance at these meetings was generally on an ad-hoc, last minute basis, I don't have records of all of them. However, to the best of my recollection, I think I may have attended one Cabinet meeting, one SAGE meeting, and a few COVID-19 daily morning meetings in No10. These all came in the period from the start of March to early April when I was regularly interacting with the NHS, No10 and government departments.

28. In addition to these larger meetings, there were two smaller meetings with the Prime Minister that I was asked to attend. I was in No10 at the request of the NHS, and was asked to attend these specific meetings by Dominic Cummings. I was invited to these meetings as an ad hoc participant, as someone close to the NHS data, and did not receive an agenda, minutes or emails. I did not take notes. The first (which I think was during the week Monday 9th March to Friday 13th March, although could have been earlier) was where the then Cabinet Secretary and other senior civil servants briefed the Prime Minister about when COVID-19 cases were expected to peak. I do not recall the details of the discussion, I only recall my sentiments that the discussion was abstract and somewhat vague. Reflecting, I assume this was because the briefings from the senior civil servants were not as detailed as I thought necessary. The second (14th March) was where Dominic Cummings, who I had worked with in the past, and Dr Ben Warner briefed the PM on the dangers of the 'herd immunity' strategy for the NHS. Dr Ben Warner is my brother. Whilst

not a conflict of interest according to civil service policy, I nonetheless disclosed the relationship informally as soon as I started working, and formally on 1st April 2020.

29. In addition to these official discussions, there were informal discussions - in person or via email or text message. Once we were onboarded to NHSX in early 2020, many of the documents created and emails sent were via my NHS address, but I do not have access to this anymore. I do, however, have some useful documents covering the period 3rd - 14th March in my Faculty email, which I have included here (**Exhibits *MW/1 - INQ000148768 to MW/23 - INQ000252433***), noting that there are some that I can no longer access. I have used many sources of information to reconstruct my account, including Faculty email, Slack messages, my calendar, Signal, Telegram, Google Docs, and Google Slides (although not WhatsApp, as I have historically cleansed my messages in line with NHS and other client information governance policies) to aid in my recollection.

30. Despite the lack of WhatsApp messages, I remember that I was in three broad clusters of WhatsApp groups (although there were many separate groups and the individuals in each one varied); those with our NHS/DH partners (e.g. Indra Joshi, NR, Ming Tang, Matthew Gould, NR, Matt Hancock, Simon Stevens), those with people I had personal relationships with before the pandemic (e.g. NR, Dominic Cummings, Cleo Watson, NR, and Dr Ben Warner) and those with wider no10, no11 and GO-Science (e.g. Sir Patrick Vallance, Lee Cain, Jack Doyle, and many others, most of whom I couldn't identify since the groups were created by others, and thus only appeared as numbers in my phone). These clusters often overlapped somewhat, depending on the specific situation.

31. However, I would be remiss not to point out this was a very difficult, very hectic time, and while I have endeavoured to make every reasonable effort to ensure the recollections above are as accurate as possible, I cannot guarantee its total accuracy.

SECTION D: EARLY IMPRESSIONS OF THE STATE OF GOVERNMENT DATA AND TECHNOLOGY

32. Given we started our COVID-19 work on 3rd March 2020, I cannot usefully comment on anything internal to government during the period January to March. However, I do have

a good sense of the state of the digital infrastructure for managing the pandemic when we started, which was nascent.

33. When Faculty started work on the pandemic on 3rd March, senior decision makers were supplied with important numbers via briefings, which were printed Powerpoint slides. The numbers in the briefings seemed to occasionally contradict numbers that were discussed verbally, leading to confusion. There were other pieces of information, like progression of the disease into the future, that were not included and were calculated by hand in the meetings.

34. I remember circumstances through this period where these paper-based information sources were quickly out of date. For example, I recall a time at the start of our work when the doubling rate of the virus was shown on paper as 6-7 days, but the data showed it was more like 2-3 days. Furthermore, there was a period in mid-March where some briefings for the PM were, despite lockdown, still showing a peak in mid-summer several months away, which contradicted the best understanding of the dynamics of the disease at that time and the graphs produced by the NHS (which showed a peak sooner, I think in April). In these cases, I recall discussions with NHS officials and others trying to help ensure our best understanding was contained in the briefing materials.

35. The government was aware of the deficiencies of paper-based briefing, though, and the Civil Contingencies Secretariat trialled a digital dashboard for the provision of information a few weeks into the pandemic as shown in **Exhibit *MW/8 - INQ000148787***, although this still had a manually inputted back-end data source. To the best of my understanding, it was the COVID-19 datastore infrastructure, along with the combination of the Strategic Decision Makers Dashboard and Public Dashboard, that ultimately moved the UK to more automated, consistent, real time data feeds.

SECTION E: INITIAL GOVERNMENT STRATEGY

36. When Faculty started working on the pandemic in early March, the Government's strategy for managing the pandemic was 'Contain, Delay, Mitigate' as shown in **Exhibit *MW/9 - INQ000148788***. This was an effort to push the peak of the pandemic into the summer, and spread it over a longer time period, while protecting the elderly and vulnerable, as shown

in Slide 11 of **Exhibit *MW/10 - INQ000148769***, taken from a slide I created on 8th March 2020.

37. By the time I joined the discussion, it appeared the herd immunity strategy was considered the only viable option. As far as I could tell (noting that I have very limited insight into matters before I started) this was partially because lockdowns had never been discussed. The reasons for this lack of discussion are unclear to me. But, ultimately, given the assumed absence of vaccines and this apparent initial unwillingness to consider lockdowns, a natural and implied consequence of the adopted strategy of the time was herd immunity. The initial modelling suggested that by following this strategy, at least one hundred thousand people would die, and many more would be hospitalised - see Slide 7 of **Exhibit *MW/10 - INQ000148769***.

38. The acceptance of these consequences came, I think, because it was assumed there were no other options, and the government's understanding of the virus and how it was spreading was still developing. Even if the government was to institute lockdown measures, it was thought that if you were to suppress the epidemic too much, you may get a 're-bounce', which could potentially be worse. This was widely accepted as a binary choice at the time, and is noted on Slide 10 of **Exhibit *MW/10 - INQ000148769***. While the consequences for the NHS were reasonably apparent, as demonstrated in **Exhibit *MW/11 - INQ000148770***, I don't know how widely they were understood.

39. Although I don't have a record of it, I also recall hearing people expressing sentiments along the lines of 'the British public won't tolerate a lockdown', which I think will have played into the assumption that 'Contain, Delay, Mitigate' was the only path. This was despite the fact that lockdown-style restrictions were already in place in areas such as Wuhan and Lombardy. I am unable to remember more specific details around who said this or where or when they said this. I did not make notes related to this.

40. How much any of these, or other reasons, were behind the initial strategy is hard for me to tell, because Faculty only started working on this on 3rd of March. I attended a tiny fraction - four or five out of many hundreds or even thousands - of meetings held across the government about the response. My impression, though, was that the assumptions behind the initial strategy had not been thoroughly interrogated. It seemed that no one felt

empowered to question the strategy, because the expertise required was so broad, and as such the UK was drifting into a set of actions almost by default. I would further note that:

a. There are many assumptions behind any complex strategy. In my view these may have included: the probable characteristics of the disease, the likely development of the disease, the likely response of the population, the likely response of the political system, the likely capacity of the NHS, the likelihood of cures, the likelihood of vaccines, the likelihood of availability of equipment, the likely response of foreign countries, the change in responses of foreign countries over time, etc;
b. In order to properly question these assumptions, deep expertise would be required in each of these domains with a small number of people responsible to coordinate, synthesise and integrate the conclusions derived from each group of domain specialist into one coherent perspective; and
c. For my own part, I spoke to many people about these assumptions, about how the disease and the response to the disease would play out, both inside and outside of government. It is fair to say that almost every conversation referred to in this statement, including those with Sir Patrick Vallance, Sir Chris Whitty, and many others (of which I no longer have a clear memory or notes), included explorations of elements of these assumptions and responses to them. I did not have discussions about these assumptions directly with the Prime Minister, although I was in the room when Dominic Cummings and Dr Ben Warner did - see paragraphs 58-59 for details of this conversation.

41. On Saturday the 7th March, I spoke to Sir Patrick Vallance to understand what he would find useful from the NHS data. As part of that conversation, he provided broader context, including the notes in **Exhibit *MW/12 - INQ000148771***. This, along with other research and further thought, resulted in the slide deck in **Exhibit *MW/10 - INQ000148769***. Sir Patrick Vallance did not expressly ask for this slide deck to be produced; it was something I initially produced as a briefing for the Faculty team, but that I then realised may be more widely useful and decided to share more broadly. It's clear something immediately worried me, and as such I wrote in the aforementioned slide deck "that, at the peak, the NHS will be **completely** overwhelmed" (see Slide 9 of **Exhibit *MW/10 - INQ000148769***). This came from a simple comparison of the numbers predicted to be hospitalised (minimum estimate

of 200,000) versus the number of hospital beds in the NHS (recorded in the document as 100,000).

42. Further in this document (and also in a slide written on 7th March), it is clear that I was uncomfortable with the assumptions underpinning this strategy - see Slide 10 of **Exhibit *MW/10 - INQ000148769***. For example, it was apparent to me that the rationale of this strategy hinged on strong assumptions about multiple things, including the timing of a vaccine, which was assumed to be years away. I could see that if we were able to get a vaccine much faster than anticipated, we might be able to manage the pandemic with other non-pharmaceutical measures, and exit via vaccinated population rather than herd immunity, which could result in fewer hospitalisations and deaths, and ultimately protect the NHS more effectively.

43. This document, where I made my concerns clear, was shared with Matthew Gould (see **Exhibit *MW/13 - INQ000148772*** for the cover email and **Exhibit *MW/10 - INQ000148769*** for the accompanying attachment), Dr Ben Warner and likely others over that weekend (7th/8th March), and also likely shared with Dominic Cummings then or soon after. Sometime around that date, probably the 8th, 9th or 10th, Dr Ben Warner and I were discussing the fact that the current modelled scenarios were all proposing a set of interventions that resulted in the capacity of the NHS being dramatically exceeded. As a result of this conversation, I think Dr Ben Warner phoned Prof Neil Ferguson and asked him to model scenarios that reduced the burden on the NHS to manageable levels.

SECTION F: WORKING FULL-TIME ON THE COVID-19 RESPONSE

44. On 9th March, I moved full time onto the COVID-19 work with NHSX.

45. The scale of the need for technology was clear, and NHSX was charged with coordinating offers to help the NHS that were flowing in from the private sector. They asked me to assist with the coordination of an event at No10 on 11th March to bring together technology companies with NHSX, NHS, and other government officials, which meant I was around No10 for the next few days. There were a small number of ad hoc discussions in this period, including with senior advisors like Sir Patrick Vallance, Sir Chris Whitty and Dominic Cummings, but I do not have a record of them. However, they were extremely

busy at this time, so they were infrequent, snatched conversations before or after meetings. My recollection is that they were mostly focussed on issues surrounding NHS COVID-19 data and what could be learned from it - e.g. how fast was the disease progressing? Where was the disease most prevalent? When and where would the peaks of the epidemic be?

46. It's worth stating here that this early work in the pandemic, including the Early Warning System, COVID-19 datastore, public dashboards, open sourcing of the OpenABM simulator and more, would not have happened except for some good decisions and extremely hard work by the NHSX and NHS team, particularly Matthew Gould, Indra Joshi and others, as demonstrated in **Exhibit *MW/14 - INQ000148773***. Furthermore, this was substantially enabled by the leadership of NHSE, particularly Simon Stevens and his team including NR Adam Roberts, and Barney Leavers, and Ming Tang and her team.

47. Though it was a difficult situation, we were able to work together effectively and, alongside other technology companies, deliver a highly impactful result. I think there is a wider lesson here that, in an era where the cutting edge of technology sits in the private sector, building trusted relationships with very capable suppliers will be an important part of future pandemic management - or in fact the delivery of better public services generally.

48. The Secretary of State for Health approved the COVID-19 datastore on 6th March. My records show Faculty teams were working on the datastore by 9th March (although, in reality, probably before) as well as the required dashboards (the public facing one on gov.uk and the Strategic Leaders one, initially). A meeting with NHSX, Public Health England (PHE) and Cabinet Office about these dashboards took place on Monday 9th March.

49. As I learned more about the current plan of the government over the course of the week of 9th March, my level of concern increased. I recall messaging Dominic Cummings, and likely Dr Ben Warner and others, with stark warnings around this time, but I cannot find them (presumably they were via WhatsApp or NHSX email). I don't remember the specific details of many of them, but I think at least one of them was something like: "Code Red - the system has fucked it. There is no plan."

50. I recall one meeting, which was likely in the week of 9th March (certainly before the 14th) but haven't been able to confirm the exact date, where the Cabinet Secretary at the time was briefing the Prime Minister (PM) about COVID-19 in the Prime Minister's Office. I recall the general outline of the meeting to be the Cabinet Secretary talking the Prime Minister through the current strategy, including how pushing the peak of the virus into the summer would result in lower case numbers and an effective "squashing of the Sombrero". I was asked to attend as 'the data expert' but said nothing in the meeting. I do recall, however, that I felt the participants of the meeting had not been well briefed on the critical issues underpinning the strategy, and that because of this, the PM was under informed about the choices he was going to have to make. Those critical issues included the likely characteristics of the disease, the likely development of the disease, the likely response of the population, the likely response of the political system, the likely capacity of the NHS, the likelihood of cures, the likelihood of vaccines, the likelihood of availability of equipment, the likely response of foreign countries, and the change in responses of foreign countries over time, etc. I formed the impression that the PM was under informed because it seemed clear to me that these issues had not been sufficiently interrogated and the assumptions underlying the choices to be made had not been laid out clearly. This seemed to me to be common across all participants involved and as a result the PM was not, in my view, able to be sufficiently well briefed. I told Dominic Cummings of my deep concerns. He said he was also very concerned, and we had to look at alternative plans.

51. As I became more concerned with the current plan, I started exploring the outlines of different plans, which resulted in what was later referred to in the photo, taken on 14th March of a No10 whiteboard by Dominic Cummings, as the 'Actual Plan' - see **Exhibit *MW/15 - INQ000148774***.

52. It was clear to me that this crisis was a balancing of trade-offs between health, civil liberties and the functioning of the economy. I believed it might be possible to do a few things at once; slow down the pandemic with non-pharmaceutical interventions while keeping the economy running as much as possible, increase NHS capacity over time, and if possible, dramatically speed up the invention of vaccines and other drugs. I believed that this would both minimally harm the economy while protecting as many people as possible. While this thinking was clearly being discussed in the week of 9th to 13th March, the only documented record I have is Slide 18 of **Exhibit *MW/16 - INQ000148775*** (from an

unfinished slide deck written on 15th March.) This also clearly articulates the need to speed up vaccines to exit the pandemic, and I recall informal discussions of 'Manhattan-style' projects for vaccines around this time. These discussions later became 'The BlueDot Project' document, named for the global nature of the project and Sagan's famous description of Earth as the "pale blue dot" - see **Exhibit *MW/17 - INQ000148776***.

53. On Wednesday 11th March, Number 10 held a technology round table event. This was organised by Number 10 and NHSX, in particular Indra Joshi, Matthew Gould and I (in my role as a contractor for NHSX), as evidenced in **Exhibit *MW/18 - INQ000148777***. The event was an opportunity for the Prime Minister to ask for help from the technology sector, see **Exhibit *MW/19 - INQ000148778***. The PM attended relatively briefly. I believe Sir Patrick Vallance and Sir Chris Whitty were there as well. Many technology companies attended, and certainly, Dominic Cummings, Dr Ben Warner and others from No10, attended. The discussion was focussed on how the technology companies could provide help to the NHS, not the wider COVID-19 strategy. At the time, I believe we felt the event had accomplished its goals.

54. On Thursday 12th March, in the evening, I met Dominic Cummings and Dr Ben Warner. We talked through the situation, and I said I was very concerned about the current plan. The speed of spread seemed like it was being underestimated, and the government's own models showed that the consequences of waiting for herd immunity (whether the peak was soon or pushed to the summer) were dire for the NHS, and that seemed under-appreciated.

55. At the time, though, our perspective felt in opposition to the advice from the rest of the system. I cannot assign this to any specific individual conversations, but it was clear to me that collectively the momentum of the civil service was towards herd immunity. This opposition was worrying as, while both Dr Ben Warner and I are experts in data analysis, this was an extremely broad problem, and we were worried that we were missing something.

56. We had another meeting to try to come to a conclusion in the evening of 13th March, which also included Faculty's CTO Andrew Brookes and Dr. Laura Pimpin, an epidemiologist who later worked as an unpaid advisor to No10 for a period of around three months, and

who is also my girlfriend. At this meeting, we decided the right course of action was for Dr Ben Warner and Dominic Cummings to talk to the Prime Minister directly, to ensure he had the information he needed to make informed decisions. This involved laying out, with extreme clarity, the best understanding of the situation, the likely results, and the important ways we feared the herd immunity plan was misunderstood by the wider Whitehall system and could end in a disaster. I cannot point to specific officials who may have misunderstood the herd immunity plan because, in such a fast-paced environment and given the limited remit of my role, I did not have an opportunity to sit down with specific officials and interrogate our individual understandings.

57. But, in as much as it was misunderstood at a system level, I think it was misunderstood in two ways. First, I think it was underappreciated that the herd immunity plan was founded on several low-confidence assumptions, e.g. the speed of the disease, and the time required for vaccines to be rolled out (and many more). Other, very reasonable, sets of assumptions could lead to an alternative optimal strategy that looked very different from herd immunity. Second, there was a misunderstanding in my view around the impact of herd immunity on the NHS, with a lack of appreciation for the fact that this would most likely lead to a collapse of NHS provision, with potentially serious consequences for both COVID-19 and non-COVID-19 medical care. As a result of this discussion, I was asked to be around No10 the next morning in case they had any further questions.

58. While the original plan was that they brief the PM without me, in actual fact I ended up going to the meeting with the PM with them on Saturday 14th March, in case he had any data questions. He did not, and I said almost nothing in the meeting. If I recall correctly, in this meeting were myself, Dr Ben Warner and Dominic Cummings, Dr Laura Pimpin, Imran Shafi, Stuart Glassborow, Lee Cain, and Cleo Watson.

59. It was a critical meeting, and the account that Dominic Cummings gave to MPs in May 2021 is consistent with what I remember. Dr Ben Warner then Dominic Cummings carefully walked the PM through the data and what that meant for how quickly COVID-19 was spreading, and how close we were to breaching NHS capacity. They explained some critical problems, such as official briefings using graphs showing the peak in the summer when it was likely it would actually peak much sooner. They suggested an alternative strategy to the 'single peak, herd immunity' plan: rapid action to get control then managing

possible successive waves while putting massive resources into vaccines, drug treatments and testing. The PM quickly understood the seriousness of the situation, and I believe this new understanding was substantially different to before the meeting. He recognised that if this was true, he would need to change from the current 'contain, delay, research, mitigate' plan to more aggressive 'lockdown' type measures and much sooner than he had thought. I recall leaving the meeting with the understanding that a shift in strategy was very likely, although I believe that the PM wanted to discuss with Sir Patrick Vallance and Sir Chris Whitty before deciding anything. I think this meeting happened the next day, but I was not in attendance.

60. If one has full information about an exponentially growing crisis, then it seems that under many circumstances, if you are going to lockdown eventually, doing it as soon as possible is probably best. However, in the early phases of COVID-19, much was uncertain, including the consequences of the disease, the dynamics of the pandemic, the possible responses, and the UK's ability to implement them. This made it hard for the Government system, which is slow to come to a consensus, to act. In this instance, if I recall correctly, the data indicated that had we waited for another two doubling periods before locking down, a period of likely around one or perhaps two weeks, the NHS would have been overwhelmed.

61. My work on the pandemic ended in July, and I had no significant input or role in the second or third lockdowns. Therefore, I have no useful insight or comment on the timeliness of the decisions to impose and implement the second and third lockdowns. I also don't feel I have a valuable insight into how much consideration was taken of other factors including wider health, social & economic impact, compliance, and the impact on the vulnerable. I can say that, certainly, the balance between public health and economic harm weighed heavily with me. For instance, in an attempt to mitigate the economic harm, we were able to recruit an expert data science team from Goldman Sachs to create an economic model to sit alongside the Oxford OpenABM simulator. As far as I know, at the time, this was the only simulator of its type created anywhere in the world, but I do not believe this was widely used. However, the intention was to enable the government to have the insight to minimise economic damage, while protecting people.

62. As I said before, I attended a tiny number of the overall meetings on the government's response, and was closely involved with No10 for a matter of weeks. Faculty's commercial work was with the NHS only, and as such my focus was on how I could support them.

63. In the next few days and weeks following the 14th March meeting with the Prime Minister, Faculty was busy rapidly building out the technology to power the NHS's data systems. During this period, I was occasionally asked to attend meetings to understand what data and insights senior decision makers would find helpful, to guide the technology build, as demonstrated in **Exhibit *MW/20 - INQ000148780***. This included a SAGE meeting on 18th March. In my recollection, I did not provide any substantive advice at these since my role was to gather requirements for our systems. As the data and forecasting ability of our systems matured, Faculty were asked to attend meetings more regularly, including SPI-M, a sub-group of SAGE, where Faculty (others, not me personally) was a regular participant from early April.

64. During April, our NHS work continued at pace - but I was also spending small amounts of time collaborating with others in thinking about how to bring forward the exit from the crisis. This included working with experts outside government proposing ambitious vaccine development plans, 'The BlueDot Project' (at **Exhibit *MW/17 - INQ000148776***) which I shared with Dominic Cummings, and working with Dr Laura Pimpin on a summary of the known possible ways to exit from lockdown and minimise the economic damage; see "How to keep R<1 and run the economy" at **Exhibit *MW/21 - INQ000148781***, although, as far as I can tell now, this document was not actually shared beyond the two of us. Similar ideas to both documents were being discussed by others at the time. Obviously, neither of the documents included were implemented in the form suggested, and I do not know whether they had any influence over decision makers.

SECTION G: STEPPING BACK FROM FULL-TIME WORK ON THE COVID-19 RESPONSE

65. Throughout April, the Faculty team continued working with the NHS on the data systems and the associated technology improved in quality. Dashboards were made available for senior government decision makers, with valuable small elements - like each data field having an associated definition - meaning many questions that would have been directed to me, were answered directly. Also, further improvements meant that Civil Contingencies

Secretariat and SPI-M could get automated feeds of the data they needed, direct from the systems.

66. Collectively, this meant that my direct presence in No10, and other similar forums, was no longer necessary. I had little to do with Cabinet Office/No10 decision making from around mid-April onwards, although, of course, was still serving the response from an NHS perspective (full time until July, a smaller commitment after that). As mentioned earlier, I was keen to ensure that the government invested in vaccines, as the clearest path out of the lockdown (see 'The BlueDot Project' at **Exhibit *MW/17 - INQ000148776***). To a limited degree, around late April, I suggested some ideas on potential ways to get out of lockdown (see the "R<1 and run the economy" document at **Exhibit *MW/21 - INQ000148781***, but at this point of the pandemic, the ideas being discussed obviously were very nascent.

67. I was back full time in Faculty by mid-July, so at the time the decisions about how to remove the NPI's were taken, I was no longer heavily involved.

68. As far as my records show, which concurs with my recollection, I was not substantively involved in other elements of the Inquiry's interest, beyond the fact that our work was helping to power the NHS data systems.

69. To the best of my recollection, I was not involved in COVID-19 public health communications, beyond Faculty's work testing how the 111 first policy would change behaviour.

70. To the best of my recollection, I was not involved in discussions around further lockdown decisions in November or January.

71. To the best of my recollection, I was not involved in COVID-19 legislation or regulation. Subsequently, I had no formal involvement on how such legislation or regulations were implemented or adhered to, and thus any impact rule breaches would have had. From my perspective as a private citizen though, with no specialist expertise, I think it is sensible to assume that either actual or perceived rule breaches will have weakened wider compliance.

SECTION H: KEY CHALLENGES AND LESSONS LEARNED

72. I assess the UK's response to the pandemic to fall short of what our citizens deserve, but primarily due to problems with the system, rather than particularly directed at a single individual.

73. I divide the response into three sections: the early phases (March lockdown), the middle phases (November and January lockdown) and the exit (post lockdowns until the present day).

74. The early phases of the response: First, as I have said, I believe the initial plans were not thought through with enough detail. Ideally, the government should have been prepared with a more complete sense of the range of possible pandemics, with a more complete sense of the full range of possible interventions that could have been available to it, as well as more concrete plans for how to execute on those interventions if they were required. If this had been in place, and/or made accessible to key decision makers, then the initial plans for responding to the pandemic would have been more informed and detailed.

75. Second, however, no plan survives contact with reality, so it is equally important, if not more important, to improve any plan as soon as you are faced with the specifics of the particular situation. I felt that the empowerment to challenge the plan was lacking. This I inferred from the fact that the initial plan was presented as the only option. Ultimately, this is a consequence of the organisational structure, incentives, culture and HR policies of government.

76. Third, the information reporting systems were slow, and the use of technology was poor. Fourth, the balancing of health and economic outcomes was crude, leading to more suffering than necessary. A national lockdown is a very crude intervention that slows the disease at great economic cost. More subtle interventions, such as those that leveraged more contact outdoors, testing and tracing, or letting geographically or age-stratified people mix, could have reduced the economic damage while preserving the health benefits.

77. However, I do not believe that the majority of the blame lies with the individuals in place at the time, at least during the phases when I have personal knowledge, March to April 2020. That is because the early pandemic response was one of the hardest situations ever faced by any British government. It was a poorly understood, fast moving crisis that affected almost every department across HMG, in parallel. To handle this more effectively, there needed to be better systems in place (of the type outlined in paragraph 78), better generalisable plans and better ways of working that could cope with a crisis like this, coupled with better technology that could support them. That was not the case.

78. As such, I think the response in the early phase of the pandemic points to systemic problems, which naturally point to systemic causes. For example, it's widely recognised that civil servants need to be paid better, perhaps by indexing their pay to the private sector. It's also widely understood that civil service human resources policies need to be changed so poor performers can be removed more easily. Again, it's so widely known that it's a cliche, but Government procurement rules are often unhelpful, regularly resulting in poor suppliers, substantial waste and unnecessary delays. Furthermore, anyone who is close to Westminster will have heard these complaints many times. But, collectively, we have not fixed them. In this sense, I believe that COVID-19 exposed some of the typical failures of modern western governments - true whether in a crisis or not - although more costly and obvious under the severe pressure of COVID-19.

79. Ultimately, I think we view our institutions like gleaming, almost antiseptic, perpetual motion machines that, left alone, will continue forever without friction. But this is the wrong metaphor and the wrong mental model. Our great institutions are far more organic than this, like country gardens, forever growing and changing. And like any garden, they are in need of constant upkeep and repair to be the best version of themselves. But, unfortunately, we seem to have become incapable of repairing them. This will certainly have many causes, but two important ones seem to be that this is partially because short term risk aversion is rewarded (at a cost of enormously increasing long term risk) and partially because, even when individuals try to do the right thing, they are blocked by the many vetoes of the systems that we have created.

80. Linked to the above is the role of the media during the pandemic. Let me be abundantly clear - a free and fair press is a critical part of a well-functioning democracy. There is no

doubt that the media played a crucial role in disseminating some key public health messages that helped keep people safe, allow them to make informed choices about their behaviour, and ultimately save lives.

81. However, the Inquiry may also want to appreciate that how the government functions is inextricably linked to media coverage. It is impossible to understand how the former operates without the latter. If the news cycle of a particular day or week is particularly critical of the government, or an aspect of what the government is doing, then the performance of the government, or the part of it criticised, is often suboptimal. That is, in large part, because ministers and officials can quickly become preoccupied with debating, discussing, or rebutting whatever the story may be. This takes a huge amount of time and energy away from some of the government's most senior decision makers - ministers, special advisors, senior officials and more - who are therefore unable to fully focus on the delivery of public services. This is troublesome in normal times, but the impact of such behaviour in a fast-moving global pandemic may be considerably greater.

82. Then to the middle phases of the pandemic, including November and January lockdowns. Here, I think that we faced the decisions in different circumstances, since much more was known. It is unclear that we performed better. But I have no personal insight into those decisions, so I won't comment further.

83. Finally, to the latter phases of the pandemic. Here I think that one of the great shames is the gradual closing of excellent projects. History tells us that Bletchley Park and the SAS were both closed down after World War II. Clearly, the work during COVID-19 is incomparable to those institutions. But, if even Bletchley and the SAS were closed, what chance do, for example, the Vaccine Taskforce and waste water surveillance programme have? And, predictably, both are now gone - despite being incredibly generalisable capabilities for tackling future pandemics. Likewise is the capacity to do rapid mass testing, which seemed to be a remarkable success story. I'm sure there are many other projects that now languish, when they should have been championed and extended to protect us from a future pandemic - or simply refined to help improve public services more generally.

84. For instance, at a smaller level, Faculty, while continuing to work with the NHS, will no longer be working with central NHS England - even on the award-winning Early Warning

System and while COVID-19 is still prevalent and new variants possible. We could have seized the Early Warning System success and scaled it to be a permanent part of detecting, understanding and monitoring infectious disease across the country, whether seasonal flu or new pandemics. The same goes for a tool we developed to help forecast A&E admissions. But we did not. There will be many other examples of systems and infrastructure being disbanded, and opportunities for innovation and learning being lost. This feels like it could and should have been avoided.

STATEMENT OF TRUTH

I believe the contents of this witness statement to be true and accurate.

Name:

Personal Data

Dated:

29/8/23