Witness Name: Professor Timothy Spector
Statement No.: 1
Exhibits: 6
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UK COVID-19 INQUIRY
WITNESS EVIDENCE FOR MODULE 7

WITNESS STATEMENT OF PROFESSOR TIMOTHY SPECTOR

I, Professor Timothy David Spector, will say as follows: -

SECTION 1. INTRODUCTION

1. I make this witness statement to the UK Covid-19 Inquiry ("the inquiry") in response to the Rule 9 Request for Evidence dated 28 November 2024 and marked with the reference 'M7/SPECTOR/01' in Module 7, which I understand concerns track, trace and isolate from 1 January 2020 to 28 June 2022.

2. Unless stated otherwise, the facts stated in this witness statement are within my own knowledge and are true.

3. I am a Professor of epidemiology at King's College in London, Director of TwinsUK and also co-founder of the science and nutrition company ZOE. I qualified in medicine, was a consultant rheumatologist, did a master's degree in epidemiology, an MD thesis in epidemiology, and practised as a consultant rheumatologist before switching to be a genetic epidemiologist and founding the Department of Twin Research at King's College London. I've been in charge of a cohort of 16,000 twins from all over the country since 1992 and have published over 400 papers related to that twin cohort and over 900 in total including many epidemiology studies and several clinical trials. My work is highly cited (H index 282).

SECTION 2. COVID STUDY

4. On 18th March 2020, we were told to leave the university, stop our studies and go home. On the 19th March 2020, myself and my colleague Jonathan Wolfe, the CEO of ZOE Limited (a company we had founded three years before that was developing nutrition apps and products), decided to help the COVID-19 effort in the UK. At the same time, my senior clinical lecturer, Dr Claire Steves (Consultant Geriatrician at Guys and St Thomas's NHS Foundation Trust with a PhD in Epidemiology, and Clinical Director of TwinsUK) was working clinically in a care home which had a case testing positive for SARS CoV2 (on 18th March 2020). She wanted to get all the staff and patients tested but couldn't because of the restrictive centralised rules on testing. Nurses in the home had reported non-triggering symptoms like loss of sense of smell and hoarse voice.

5. We asked our team at ZOE and the investors to take a risk and stop the company working on nutrition and pivot to trying to produce a symptom tracking app that would be useful in the fight against COVID. Claire and I were discussing how just asking about all symptoms could be a simple way to identify people with higher risk of the disease. The initial idea was to have a simple app that would allow our TwinsUK participants, who had been using a ZOE app to log foods in a nutrition trial, to record their symptoms so we could track national and local prevalence. The company was very enthusiastic about doing this and set a small team of user interface specialists and engineers to sit down with Dr Steves to design an app.

6. By the 21st March 2020 they had produced a beta version of the app on the Apple Store, which we launched initially to the TwinsUK cohort on the 23rd March 2020 (the android version followed a few weeks later). A key feature was incorporating location information, which was prompted by Dr Steves' prior work on geo-social correlates of health. That same day we realised that the whole nation was going into lockdown and so decided to launch the app widely to the public as we realised the huge potential to inform individuals and public bodies about where the outbreaks were. Due to my existing relationships with the media, we managed to get a slot on the BBC's Today programme to launch the app to the Nation which was supported by social media influencers.

Response To the Covid Symptom Study App

7. Within 24 hours, the downloads had gone viral, and we had about a million downloads. Key to maintaining this was support from King's School of Biomedical Engineering, particularly Professor Seb Ourselin (Professor of Healthcare Engineering and Head of the School of Biomedical Engineering and Imaging Sciences, King's College London), Benjamin Murray (Research Fellow and Senior Data Scientist at King's College London) and Dr Carole Sudre (Biomedical Engineer with expertise in medical imaging and computing, King's College London) who designed the methods to be able to handle massive amounts of data quickly. The response of the public was impressive, and the only means, really, of communication was through social media, particularly at that time through Twitter and WhatsApp. I got as many people as I knew to try and get influencers to use the app, download it, check that it was okay, and then encourage others to do the same. The call to arms was to simply log your symptoms every day in the fight against COVID-19. The message struck home, and after another week, we had around 2 million downloads and users of the app, rising to over 4 million.

8. The initial version was specifically designed to be very simple, to take as little time for people, while collecting the essential data. The first few days, it contained only nine symptoms, including the three official ones designated by the government: fever, cough, and shortness of breath, and others like diarrhoea, chest pain, confusion, skipping meals and sore throat. But by the 24th March 2020 we added other symptoms in, as we learned from case reports and colleagues in places like Italy that symptoms were much more widespread than had been reported by the Chinese authorities. We eventually asked over 20 symptoms, and we could drop those found not to be relevant. One of the first symptoms we added was loss of smell or taste, anosmia on 24th March 2020. By the 27th March 2020, Dr Max Freydin (senior postdoctoral researcher, biostatistician and epidemiology at King's College London) developed a model which identified that this symptom was strongly associated with testing positive for COVID-19, and we

made steps to enable this to be written up quickly (see Exhibit TS/02 INQ000561024) by one of our team members (Dr Cristina Menni, Lecturer and biomathematician at King's College London). With my NHS and King's colleague Dr Steves and her team, we also found out that in the elderly aged over 75, acute confusion could be the only presenting symptom (see Exhibit TS/01 INQ000574153), eventually changing guidelines for testing in frail older people. And we also had a novel feature that allowed people to report symptoms daily on behalf of, as a proxy for elderly relatives, friends, or children.

9. Initially using the model created by Dr Freydin, we looked at prevalence across the UK, producing good regional maps of where COVID-19 was likely to be spreading. As sufficient users were reporting them from all the different districts, we were able to gain virtually national resolution. Key to managing the massive data flows each day to UK govt and our analysts was support from King's School of Biomedical Engineering and Imaging Sciences (BMEIS), particularly Professor Seb Ourselin, Ben Murray and Carole Sudre who designed the methods to be able to handle massive amounts of data quickly. We added in reports of individuals who had been tested, which at the time was mostly healthcare workers in the UK, and this allowed us to have a subset of people who were recording both their symptoms and whether they were testing positive or negative in these environments. This allowed us to build on the algorithm understanding the likelihood of people getting COVID-19 based on simple parameters such as symptoms and age, and this further adaptations were a joint effort from our data scientists in ZOE (led by Joan Capdevila Pujol, Head of Data Science), and engineers and data scientists from the BMEIS at King's under the leadership of Prof Seb Ourselin.

10. We reported all this back so that the public were getting a clear picture of what was happening in their area. They could see graphs going up or flat or down and found this very reassuring. Overall, the app served several purposes.
    a. It was a symptom tracker as originally designed, so we could track the change in symptoms over time as the virus evolved and the populations affected evolved. It was very quickly apparent that it had rapidly changed, and at each evolution of the virus, you were going to get different symptoms. This allowed the public to be aware of those symptoms very

fast and be aware that they might be infectious, even if they didn't have classic symptoms or couldn't get a test.

b. Secondly, the app served as a hotspot monitor so that areas where there were particularly high, cases could either be investigated or have extra facilities or health facilities ramped up so that hospitals were aware of likely problems, as the symptoms often predated severe disease by a couple of weeks when people would be admitted to hospital or ITU.

c. It served as a surrogate for testing of individuals and was probably of similar predictive value to most of the testing performed in the UK at the time, and much faster so cases could take early measures to reduce spreading the virus.

d. Psychological support. Many people found it reassuring that they were able to do something, and this has been a recurrent feature of the app. Many hundreds of people who I've met since have told me how it was an incredibly important psychological tool for them as individuals as well as harnessing citizens to actually do something for the country rather than being totally passive. It gave them confidence and a daily routine when otherwise they felt their mental health would have deteriorated.

e. We also used this app as a powerful and rapid research tool, doing large scale citizen science, performing studies in a few days that would normally take years in academic medicine.

f. Finally, the app also worked very effectively when vaccines came out and we were able to see very rapidly the efficacy of vaccines on our large population as well as reporting accurately in an unbiased way the side effects, both minor and major. Users felt that the app was providing them with unbiased real-time data on what was really going on around them. This trust from the public was illustrated in how popular our weekly youtube updates became and we became a trusted source of information for our users and certain key areas of the media.

11. Key Features Which Led to Success:

a. Existing national cohort infrastructure and expertise

b. On the ground clinical understanding

c. Technical expertise from ZOE how to engineer and modify the app quicky

d. Support from epidemiology and engineering teams in King's to scale up

e. Extensive media relations and social network influencing power

f. Less regulation and constraints on companies to launch apps rapidly than institutions

12. The research outputs from the COVID Symptom Study App were numerous and impressive, some of them having thousands of citations within just a few months (see Exhibit TS/05 INQ00047505). I'll focus here on those related to symptoms and not vaccines, as I've not been asked to address that. The biggest impact was probably the clear findings from our app that loss of sense of smell and taste was apparent from the very first cases in the UK and hadn't been picked up by the authorities. There were many people (16%) who had very minor coughs, no fever and loss of smell or taste that were under the impression they did not have COVID, and therefore were still going to meet with elderly relatives, or, if they're in health services, go to work. The data began to accumulate and we did our first analysis after about a week and sent the results to Patrick Vallance, who we were communicating with, and told them we were writing this up as a peer-reviewed article in Nature Medicine. They said they weren't directly dealing with the symptoms and as it was clinical would pass it on to Jonathan Van Tam (see email RE Data from symptom tracker, 28-Mar-2020). We produced a preprint of the paper (see Exhibit TS/03 INQ000574154) and then a few weeks later the actual article came out (11-May-2020) (see Exhibit TS/04 INQ000475051) and we made weekly requests to the government via email and publicly via media and press releases to change the limited definition of infection and make it official policy that this was a key symptom that should be recognised.

13. If you had loss of sense of taste or smell, there were very few other things that could be due to. Although only around one in five people had it, It had very high specificity, meaning (unlike other symptoms) that if you had the symptom it was not likely to be anything else than Covid-19. We were not given any information from the government other than they were still thinking about it. In the meantime,

since publishing the preprint (1st April, 2020), many other countries, including the EU, France, Germany, Canada, the US and the WHO had changed their criteria.

14. Despite the worldwide acceptance, the UK government did not act until about six weeks later (see Exhibit TS/06 INQ000237497) (18-May-2020). On 3rd April there was a press conference (see https://www.youtube.com/watch?v=XGIq9E1xfls begins 33:24), where the Deputy CMO (JVT) was asked why loss of smell was still not on the official list of symptoms, and replied he didn't think there was sufficient evidence yet to include this as a criteria. At this time the government was aware from our data, that 16% of the UK population had COVID-19 with anosmia as the only major symptom.

15. Subsequent symptom reporting via the app continued, and mention of delirium as a new symptom (see Exhibit TS/01 INQ000574153) was very helpful for people working with care of the elderly and nursing homes, as was the fact that children presented with a different set of symptoms, and we disseminated these findings as widely as we could through our YouTube channels and social media. We continued to update on symptoms throughout the pandemic as they slowly changed to have overlap with colds and RSV infections. The initial symptoms particularly of shortness of breath became much less common and other more rare ones which were quite unique to COVID-19 became apparent and we reported on these widely. The best example of this was the cutaneous manifestations of COVID, these striking rashes occurred on the digits and toes which were pretty unique according to dermatologists and we produced with the help of dermatologists and citizen scientists a free online atlas for public and medical use. These rashes often came on several weeks after COVID, suggesting someone had had prior infections. We also picked up some rarer manifestations such as COVID tongue,

16. **SECTION 3. ATTEMPTS TO WORK WITH THE GOVERNMENT**

After the first day or two of the launch of the app, we saw that it was a success and we were getting very useful data back from participants that we knew would be useful ,We made contact with the government with the initial intention of handing it over to them so they could run it as a UK-wide screening service to find out what was going on. We contacted the UK data centre in Swansea and quickly set up a daily feed to that centre from ZOE so that all the government bodies and the four governments could access that data in real time. The Welsh government and public health team was particularly helpful in organising this. The initial response of the UK government (NHSX) was not supportive. It was to initially try and see if they could stop us doing the app because they were worried it would interfere with the COVID-19app developed by NHSX which was in the trial phase, and we were told it would be released within three weeks to everyone in the UK. The rationale was that the public would be confused and therefore our app would likely damage the major official effort. Pressure was put on my university and funding bodies to make us stop promoting the app (though I have no written evidence). Because of this pressure and with a view to collaboration,, with the help of Professor Sir Robert Lechler (Senior Vice President/Provost (Health) at King's College London) we organised a virtual meeting with many groups including the head of NHSX to reach a compromise. The outcome was we were allowed to carry on, but had to agree to stop as soon as the NHSX app was up and running and agree to promote the future NHS app to our followers who were by then over about two and a half million people. We were allowed to continue with our work providing daily updates of data to the UK government and highlighting anything important. I was relaying to Patrick Vallance and Chris Whitty via email or phone when we found something new and important for the national interest.

17. I did ask multiple times to get an endorsement for the app from the UK government, the DHSS from NHS England or Public Health England, but I never had any success, and I was never able to set up any meetings with NHS England or Public Health England who I were told were the key contacts, although they were copied in on key correspondence. There seemed to me to be a general principle to protect the future NHS app at all costs and block all other approaches. The Welsh government however were happy to rapidly use and endorse the app and we had several meetings with their chief scientist and public health leads and they did use their Welsh government social media platform to promote it on April 4th. We did help them identify some outbreaks in South Wales where we picked it up before their own statistics and they were able to warn local hospitals. The Welsh backing meant we did have a higher proportion of Welsh

users. Scotland followed suit with endorsement of the Scottish government following discussions with the CSO for Scotland as well as their public health dept and promoted the app on twitter on the 10th april. We were also approached by Greater Manchester to help them as well as the South London boroughs to provide specific local information.

18. We were clearly disappointed that the UK government and NHS England were not interested in taking on our app. We'd only anticipated running it for a couple of weeks and then handing it over, showing how successful it was. We believed it could have been rolled out to the majority of the UK population (as an estimate over 40 million people) helped by the fact that we had the facility for people to use proxy reporting for the young and elderly. This would have given us amazing coverage of the whole of the UK and even in the early days using our subset of population being tested we got a very accurate representation of the pandemic. We also were able to spot trends before the other systems that eventually came into place such as the Department of Health ONS surveys and the episodic Oxford Imperial blood surveys which were generally a week or two behind the ZOE forecasts and at roughly 100 times the cost (ONS costs £390 million). At ZOE we decided to continue with the support of the company and its generous investors for another four months although this used up large resources from the small company. But we felt we were doing an amazing service, and we managed to launch in Sweden and the US although uptake was not as great in those countries for a number of complex local reasons.

19. After a month or two it became apparent that the government was still not keen on taking over the symptom study app as we had envisaged or endorsing it and we knew that the small start-up company investors could not fund us indefinitely. We approached the Department of Health to fund us directly so that we could continue reporting. They were initially very reluctant, but after lobbying the select committee in the House of Lords, and suggesting we asked our supporters to lobby parliament, we did finally get approval to fund us for approximately £2 million, for an initial period of nine months and this was provided we worked closely with the Department of Health on press releases and social media, which we agreed to. They then agreed to a short extension and then the funding was finally pulled and at that time our running costs of around £3 million a year were

about 1% of the Department of Health ONS survey costing £390 million, so it could easily have been funded for longer.

'What If' Scenario - What If the Government Had Taken Over and Enlarged the CSS App?

20. We were told the impending NHS app would incorporate both symptoms reporting, diagnosis and track and trace facilities. Overall, my impression from attending several official analytic meetings (Spi-M) in the first 3-4 months was that the government experts seemed to rely on modelling data from SPI-M rather than trends from self-reported cases from the app, which were trusted less. If history had taken a different path and NHS and DHSS had embraced and endorsed the app after the first few weeks at the beginning of April 2020 when clearly successful, assuming a 70 percent take-up we could have achieved coverage in the UK of around 30-40 million people including the proxy reports of elderly relatives and children. This would not have cost more than a few adverts and social media campaigns to organise - probably less than £500,000. It turned out in retrospect, based on predictive values of different testing regimens, our covid symptom app with daily symptom reporting along with a small subset of healthcare workers with regular testing would have provided accurate information in real time. This provided good estimates of risk in local areas of infection rates, patterns of increase or decrease as symptoms changed, and indications of new strains.

21. Mass COVID-19 testing with kits was seen as the only possible solution without seriously considering alternatives, which ended up costing billions of pounds for the taxpayer and lacked good sensitivity, especially in women and children where daily symptoms were probably as effective. The testing plan could have been rolled out in a more organised, less hurried and more targeted way, and as people queued for tests, they were often spreading the virus to others. The other advantage was that symptoms were reported much earlier than waiting for the results of the testing, which often occurred 3-5 days later when the testee had already infected others. A big reason our app was not trusted enough was the problem of missing asymptomatic cases. It became clear that asymptomatic individuals had lower viral loads and so were less infectious, whereas missing

new symptoms like loss of smell and telling them they were uninfected was likely a worse mistake in public health terms as they had high viral loads and were highly infectious.

22. The impact on health and finances of not using our app nationally is hard to quantify with any precision, but the insistence to continue to rely solely on testing and 2-3 symptoms for several months undoubtedly led to hundreds of thousands of excess infections, thousands of extra-long COVID-19 cases and could have saved at least £10 billion if used properly in conjunction with testing. As an example, we estimated with data from 3.2 million people that nearly 16% of cases presented solely with loss of smell and this symptom was by far the most predictive of COVID-19 infection, it also lasted much longer than fever so more likely to be noticed. At the time the government claimed the real figure was less than 2 percent. So, since we first alerted our users with anosmia to self isolate on 1st April to the 18th may when the UK government finally agreed to add anosmia as a criteria for testing and isolation, over 6 weeks of government delay had occurred. In this time many extra COVID-19 cases could have been diagnosed early and a large proportion prevented from infecting others by staying home. Instead of wasting £22 billion on a test and trace system which never worked properly, an integrated national app with symptom reporting and selected test sampling would have been done for a fraction of the cost.

SECTION 4. FUTURE PANDEMICS

23. I believe the ZOE app has shown that a strategy that includes a national symptom-based app is essential as an early response tool allowing the government and the population to know what is going on and assess their personal risks. This should be done at the same time as labs are looking for good rapid diagnostic tests they can subsequently roll out if needed. But future accurate tests cannot be relied on, we used a test with only 70 percent sensitivity for Covid, and must consider this may be not easy or rapid for the next pandemic pathogen. The government should change its mindset and encourage small companies and universities to develop tools rather than trying to shut them down or see them as of lesser value. Once developed they can be badged as official

UK health tools. Government and DoH responses will always be slower than industry and this hard lesson needs to be learnt.

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.

Personal Data

Signed:____________________________

Dated: ___24th March 2025______________________________