Written Evidence Submitted by Dr Jose Gonzalez-Rodriguez, Associate Professor in Analytical Chemistry of the University of Lincoln

(C190078)

My name is Dr Jose Gonzalez-Rodriguez, Associate Professor in Analytical Chemistry of the University of Lincoln. My area of specialism is analytical chemistry with specialist knowledge in sensing technologies and data analysis and modelling. I am submitting this evidence as an individual.

My expertise gives me a good understanding of sensing processes as well as how to utilise data and model responses. I have published 23 papers in the use of sensors for different aspects of pharmaceutical, biomedical and forensic science. Also, in my published record, you will find 27 papers on the use of multivariate and data analysis in these fields.

I learned of the call for evidence for this select committee through my participation in the POST survey on experts' concerns around the impact of Covid-19.

Having read the terms of reference, I would like to comment on some of the aspects covered in the remit of the enquiry related to Covid-19 but also my comments are pertinent to enhance our future response to this or similar pathogens.

1. Summary of conclusions

Given the ample and exceptional expertise that lies within the scientific community in this country, the resources and utilisation of both manpower and information technologies need to be adequately directed to provide effective responses. This argument poses some thoughts for the final development and handling of this crisis. Also, and more important, raises questions and lessons to be learned on the future response to another pandemic event. The need for this or any future government to implement a national strategy to defend ourselves from a similar event is now more urgent than ever. The Covid-19 crisis has made clear certain points that need to be addressed urgently to reinforce our response to pandemic events.

1.1. The need of a centralised point or agency to collate and analyse data provided by the different NHS Trusts in England.

1.2. Research into body markers to identify infection with a clear set of protocols defining what data needs to be collected and the format of the data available for analysis. This could further facilitate the task of the identification of asymptomatic cases.

1.3. Data sanitised to be compliant with GDPR data and analysis of the information received would be necessary. Compliance and consistency of this data can be best achieved by the means of a processing centre for biological emergencies to centralise the information received from the different Trusts.

1.4. Availability of adequate computing facilities and production of a volume of statistically significant amount of patient data are required to establish robust conclusions and avoid conflicting scientific opinions.

1.5. Recruitment, or temporary redeployment, of a team of different specialists in data analysis and computational biology selected from the different public bodies and Universities in England to compile the existing information and produce periodic reports on this and future outbreaks or in case of an emergency.

1.6. Recovery of archived data from the different NHS Trusts to post-process information that might be useful to learn lessons for a future outbreak.

2. The contribution of research and development in understanding, modelling and predicting the nature and spread of the virus;

We all need to praise the admirable work performed by many universities in this country collating the data and presenting the research in top scientific journals. This, being valuable, does not offer the opportunity for government to access key essential conclusions. These papers have been possible because of the close relationship that the NHS and Universities have nurtured for years. However, access to reliable data has been difficult and public reports and sanitised data have not been made available for scientists to study them and maximise our response. Much of the literature has been rushed or using small datasets. This is understandable given the emergency but, in some occasions, the statistical value has been low leading to contradicting or changing conclusions. This is not only a problem in the UK. It has sadly affected most nations with capabilities to significantly contribute to solving this problem. Until today many questions remain unanswered or unclear (on the lethality of the virus and reasons for this, the speed of mutation or the means of transmission and measures that can help to reduce it). Again, these are examples of a non-coordinated action. All the efforts are valuable, but if the forces involved do not push in the same direction the results are diminished or worse, create unnecessary confusion.

More important is the question of the immunity generated: a question for which we do not have a clear answer yet. In this question lies the solution to this crisis. This is where I see the

diaspora of efforts and expertise and mind-power have not been put together to achieve a greater good. There is a need for government to coordinate and command a response and, of course, giving the right credit and economic incentives to institutions. This is where a coordinated effort could also help to reduce the number of casualties and offer clear statistically robust data.

3. **The capacity and capability of the UK research base in providing a response to the outbreak, in terms of the development of testing, diagnostic methods and technologies;**

Sensing technologies and data processing have been developed at a slower pace than desired and it took time for reliable tests to be produced and purchased. A delay in the identification of the virus presence in asymptomatic cases has impacted on the decision making process and keep the risk and the threat very much alive. While detecting the virus when active is relatively straight forward using PCR technology, there is no clear evidence of whether the virus presence after infection can be identified based on antibodies presence. Serology studies suggest a lower incidence of the virus based on the presence of antibodies in their blood. This way of assessing post-infection has been proven uncertain as some positive cases do not show any antibodies after recovering from the disease. This eliminates the usefulness of an immunity passport based on antibody's presence (ethical considerations aside). Only if all suspected cases at the time had been effectively identified and properly recorded we could have a clear picture of incidence and level of protection. This would help to manage future outbreaks assuming the reinfection is unlikely in the short term, as present evidence suggests. This brings the urgent need to collate all available information in case of a second outbreak or another pandemic episode occurring in the near future.

Indirect identification and processing of information from patients known to have contracted the disease and from those asymptomatic cases where no antibodies or sign of the virus can be found has not been effectively accomplished yet. Other biological markers in the body may offer answers to this question but this is difficult to achieve without a coordinated effort. This needs to be corrected for the future if we want to access this resource. Early and effective identification of both asymptomatic cases and early stages of the presence of the virus itself through other markers might help to isolate cases effectively. This is true not only for the case of Covid-19 but it can be applied for other infectious agents which could appear in the future. This would be the mission of a centralised data collection and processing agency. This national centre could use all available data from hospitals to find common biological markers associated

to the disease and be processed using machine learning or multivariate analysis. This is presently lacking.

4. **The capturing during the crisis of data of the quantity and quality needed to inform: decisions made during the crisis; and to maximise the learnings afterwards;**

As commented before, an urgent task must focus in the creation of a national centre or agency to monitor and process the available information from the different NHS Trusts, centralising a response and organising reliable protocols to be distributed among the different hospitals. The response given on this occasion has not been efficiently handled and managed. Hospitals have heroically single handed this locally, with some general advice from the government. Doctors, pharmacists, nurses and other healthcare specialists have been fighting an invisible enemy with the little information provided, which in some occasions was not accurate or changing.

Data and I do not refer to the spread of the virus or the number of casualties or beds available in intensive care have been confined within the walls of the different hospitals across the country. This valuable scientific resource is waiting to be studied. A more profound use and communication of the scientific data and haematological information collated by the different hospitals to identify other signs or useful biological markers to study the disease have been missing during this pandemic. Coordination between the Trusts has not been effectively managed in order to share information. This is possible with the computer resources and data analysis expertise we have in the United Kingdom. Having this effectively in place, such a data pool could be shared and distributed to data scientists, universities and government agencies to collaborate in a joint effort to throw light in the different aspects of the virus behaviour. Some of this work has been done locally and based on previously existing collaboration networks. The reality is that much of this data is still archived and usable, but inaccessible to data scientists to study because of the lack of a call to do so.

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