Science and Technology Committee

Oral evidence: UK Science, Research and Technology Capability and Influence in Global Disease Outbreaks, HC 136

Thursday 7 May 2020

Ordered by the House of Commons to be published on 7 May 2020.

[Watch the meeting](#)

Members present: Greg Clark (Chair); Chris Clarkson; Katherine Fletcher; Andrew Griffith; Darren Jones; Mark Logan; Carol Monaghan; Graham Stringer; Zarah Sultana.

Questions 423 - 488

Witnesses

I: Professor Sir Ian Diamond, National Statistician; and Professor John Edmunds OBE, Professor of Infectious Disease Modelling, London School of Hygiene and Tropical Medicine.

II: Professor David Peters, Chair of the Department of International Health, Johns Hopkins University; and Professor Sir David Spiegelhalter, Chair, Winton Centre for Risk and Evidence Communication at the University of Cambridge.

Examination of witnesses

Witnesses: Professor Sir Ian Diamond and Professor Edmunds.

Q423 **Chair:** The Science and Technology Committee is undertaking an inquiry into the scientific aspects of the response to the pandemic for two reasons: first, to obtain contemporary evidence of decisions and assessments made during the course of the outbreak; and, secondly, to consider what lessons might be drawn in real time that have an implication for the future handling of the pandemic and further decisions to be made. Today, we will be looking at how UK and international comparative statistics can help with that understanding.

Before we do that, I have to tell the Committee that in our evidence session of 25 March a director of Public Health England undertook to share with the Committee the evidence and assessment on which the decision was made to reject the South Korean model of mass testing using multiple laboratories, in favour of a different and more centralised UK approach. That information has not been provided, so on 1 May I wrote to Public Health England asking for it to be disclosed in time for this meeting of the Committee.

Since the decision explicitly to reject the South Korean approach may be one of the most pivotal decisions made during this pandemic, it is obviously crucial to be able to learn the lessons of that decision for further decisions that might be taken. It is very regrettable and concerning that this evidence is being withheld from the Committee. After the Committee's public session, it will consider the next steps to take in the matter.

I am delighted to call our first witnesses in this session: the National Statistician, Sir Ian Diamond, and Professor John Edmunds, professor of infectious disease modelling at the London School of Hygiene and Tropical Medicine. Both are members of SAGE, the advisory group. You are welcome, and thank you for joining us today.

Sir Ian, perhaps we can start with the question of how to measure the impact of the virus. In your view, what is the best way to measure the incidence of Covid-19 and deaths from it?

Sir Ian Diamond: There is a difference there, but perhaps I can start by thanking you. It is always a pleasure to give evidence to the Science and Technology Committee.

Thank you for that very good initial question. I would first make a distinction between prevalence and death. To start with prevalence, much of the work done thus far has been based on the very excellent modelling that John Edmunds and his team, and other modelling teams around the UK, have done; but it has been modelling because Covid-19 is not a notifiable disease. In the future, we will start to get data-led measures of national and sub-national prevalence through a survey that the ONS,

together with the University of Oxford, the University of Manchester and the Wellcome Trust, is leading.

The survey, which is starting in the field at the moment, in phase 1, takes a nationally representative sample of households in England. I have to say that the response has been overwhelming. In the households that have agreed to take part, we will take swabs from all members of the household over the age of two and from a sub-sample of households blood samples. That will enable us to measure the antibodies and hence to know those people who have been exposed to the disease. We will get the measure of prevalence through the swabs and samples there.

The design involves going back to the same households one week later. We have now had about the first 500 of those returns. That enables us to make empirical estimates of the rate of transmission: R. We are working with a sub-group of SAGE called SPI-M, of which John is one of the leading members, to ensure that we are able to produce estimates of both the prevalence and, over time, but not quite yet, antibodies in the population.

In phase 2, which will start in a couple of weeks and go straight on, we will expand the study, with a slightly different design, to enable us twice a week over the next year to get estimates of the prevalence of the disease in the population, not only nationally across the United Kingdom, but regionally in England and across the devolved nations, as well as for specific sub-populations—for example, people of black and minority ethnic backgrounds who we know from evidence have an increased risk, and those in frontline occupations, for example healthcare workers, or those who have high numbers of contacts.

We are not quite sure at the moment whether we will be able to do it, but we aim to try to do it for people in high-contact occupations—for example, bus drivers. That is the plan. We will produce on Thursdays and Mondays estimates for population and sub-population. That will enable us to have good empirical knowledge of the course of the disease over the next year.

If I may move to deaths, it is an incredibly sad story, and we worry about it a lot. It is also one where there are enormous differences in the way things are reported. If you would allow me a "He would say that" moment, I would argue that the ONS has the most complete reports, because we base our reports solely on death registrations. If I could remind you, that would be everyone who had died having on their death certificate that Covid was a cause. That could be because they had been tested positive for Covid-19, but, in addition, it could be because the medical practitioner did not have a positive test but was clear from the symptoms that it was Covid and placed that either as the primary cause of death on the death registration certificate or as the secondary cause.

We take either the primary or the secondary cause as Covid for the very simple reason that there is some heterogeneity among medical

practitioners as to which they might choose as primary or secondary. We believe that is the most complete way, but it comes with a lag. Obviously, after a death there has to be a length of time before registration is complete. That is why every Tuesday we report deaths up to the end of the previous week, from 10 days before.

There are other data that give more timely information—for example, deaths that have occurred in hospitals. They enable more timely reporting, but they come with some lags that are quite difficult to measure because they depend on when the hospital reports. In those data, if you look at the time series of deaths, you always see a reduction around the weekend because hospitals do not report on those days.

The ONS has worked very profitably with both the Department of Health and Social Care and the Care Quality Commission since 27 April to produce data on a daily basis. They still have the problems I just mentioned, but they are able to include deaths in care homes as well. That is a more complete dataset than that for hospitals, particularly given the course of the epidemic in care homes.

In summary, the ONS data are the most complete, but of necessity there is a bit of a lag. We are able to find out day by day through the data reports, but there are challenges around their completeness.

Q424 **Chair:** Perhaps witnesses could keep their answers as short as possible. We have lots of questions and we want to make full use of the time.

Sir Ian Diamond: Chair, you put such a full question, but I apologise.

Q425 **Chair:** It was a comprehensive introductory answer. To pick up a couple of points, you mentioned a prevalence study. You say that is now being conducted in the field. When do you expect the results of the first wave to be published?

Sir Ian Diamond: We hope or intend to publish next Thursday the first weekly results. After that, we intend them to be available on Thursday and Monday for a year.

Q426 **Chair:** From next Thursday there will be a regular twice-weekly publication for a year.

Sir Ian Diamond: That is our intention at the moment. Were next Thursday to change for any reason, and at the moment I cannot see that, I will let you know as soon as possible.

Q427 **Chair:** Obviously, it is going to provide some invaluable data on the spread of Covid and where it is happening in particular communities and groups. Would it have been possible to do, say, a month ago?

Sir Ian Diamond: We were asked to come into this study on 17 April. From your previous life as both a Minister for Science and the Secretary of State for BEIS, you will know that it takes some time to set up a study. The fact that we came into it on a Thursday and, with the University of

Oxford, put together the design and protocol—by the way, the protocol is published and available for anyone to look at—and put it to medical ethics the following Monday and data ethics on Tuesday, with letters out to potential participants on the Wednesday, seems to me to be one of the most rapid surveys I have ever in my life seen go into the field.

Q428 **Chair:** I am not going to demur, but I draw from it that, if that speed had been applied to a request to you earlier, this very useful information might have been available over the last few weeks, rather than the next few weeks.

Sir Ian Diamond: We responded to the first request we got.

Q429 **Chair:** I understand; that is very clear.

In terms of the death statistics, which, as you say, it is your very sad duty to record, there is some discussion as to the best measure even of something as specific as deaths. Professor Chris Whitty has talked in recent days about excess deaths being the most relevant—excess deaths being the number of deaths experienced in each week or month of the year over what the pattern of previous years would indicate could be expected. As Professor Whitty has said, it includes not just direct deaths from Covid, but indirect deaths, perhaps of people with other conditions that have not been treated, and also, as he put it, the knock-on effects of the economic impact. What is your assessment of that?

Sir Ian Diamond: The ONS, together with the Government Actuary's Department, the Home Office and the Department for Health and Social Care, has a paper that looks at the whole concept of excess death. I think it is now in the public domain, but I will check. I am clear that excess death all-cause mortality is a very important indicator and one that I am personally very much in favour of using. You are absolutely right.

We look at four categories. The first is Covid-19 direct deaths but controlling for those that were definitely Covid-19. The second is short-term indirect ones—the ones we are seeing at the moment. As I have said publicly before, my late mother, in the last couple of years of her life, went in and out of hospital a couple of times, sometimes just to have an antibiotic or something like that. At the moment, that option may not exist because of reprioritisation of beds in the health service. I suspect that, had it not been available to her then, she would have sadly died a little earlier. That kind of thing may well be happening now, as well as excess mortality as a result of people not feeling that they should go to a hospital and perhaps dying of a heart attack. That kind of excess mortality is important.

There is a third type of excess mortality that you did not mention, which concerns those that will come in the longer term. For example, perhaps cancer screening is being reprioritised now, or people are not having chemotherapy, so over the longer term we are likely to see, potentially, a number of deaths from that. The fourth box you mentioned are those associated with the potential for a long-term recession.

As to our judgment, I think everyone would agree that we are going to see a significant decline in our GDP as a result of the actions that the Government, rightly, have taken. The big question is whether or not we have what might be called a V-shaped recovery. If it is a very quick V-shaped recovery, we should not see any mortality effects. Indeed, some of the literature suggests that we may even see a reduction in mortality—for example, fewer road accident deaths. If we have a longer recession, perhaps an L-shaped or even bathtub-shaped recession, we would expect the extra unemployment and people being pushed into poverty to lead to reductions in healthy life, with both mortality and potentially reductions in disability-free life.

Q430 **Chair:** The information on excess deaths is something that the Office for National Statistics itself collects.

Sir Ian Diamond: We collect and report it weekly. For the first two categories I talked about, which are in what you called real time at the beginning of this session, there is, first, the highest number of deaths we have seen weekly since we started collecting weekly data in 1993; and, secondly, very high numbers of deaths, typically between 11,000 and 12,000 per week, over and above those we would have expected over a five-year average. Normally, when we look at excess deaths, we see the highest number right in the heart of winter, in the heart of what is often called the flu season. To see them in the middle of a sunny April is absolutely sobering.

Q431 **Chair:** What is your record of the number of excess deaths in the last month?

Sir Ian Diamond: For the last two weeks of recording, it has been between 11,000 and 12,000. I will write to you about the previous two weeks afterwards.

Q432 **Chair:** I am very grateful, Sir Ian. You described a V-shaped recovery as minimising the economic impacts on health, which you set out very eloquently, but whether that recovery is V-shaped—in other words, rapid—depends on decisions made by Ministers, advised by the scientific community, on some of the measures. Clearly, what is contributing to the recession in the economy now, which the Bank of England talked about this morning, are the social distancing measures. Is it the case that the discussions in SAGE take account of the economic impact of the length of endurance of these conditions in seeking to reduce the number of deaths?

Sir Ian Diamond: The discussions in SAGE have included consideration of the excess deaths in the four categories in the paper I described to you, which was brought to SAGE by John Aston, the chief scientific adviser to the Home Office, and myself. The major discussions in SAGE are very much on the biomedical science issues and the modelling of the numbers.

Q433 **Chair:** You have made the point very clearly that the impacts on the

economy have health effects, including deaths. You are a former head of the Economic and Social Research Council. In your view, is there the advice in the committee, as well as the very important medical and epidemiological advice, to assess that fourth pillar of the impact on deaths?

Sir Ian Diamond: That issue has been brought up. We need to recognise that the Treasury is working absolutely flat out—the Office for National Statistics is helping where it can—to identify the best ways to reduce the length of time we will be in recession. Everyone agrees that what we want is a very steep V-shaped recovery. At the moment, I am very clear that the Office for National Statistics is speaking on a very regular basis with Her Majesty's Treasury to provide any evidence that is needed as people start to think of the policies that we would need. I am also conscious that the Royal Society has been thinking of bringing together groups to think about the economics of what needs to be done now, not only at a UK level but globally.

Q434 **Graham Stringer:** Sir Ian, is part of your responsibility both in your position in ONS and as a member of SAGE to keep the Government honest, at least statistically? Do you have any comments or criticism of the way the Government have presented their statistical analysis of what is happening during this crisis?

Sir Ian Diamond: Graham, thank you for that question. It is lovely to see you again on this Committee. It has been some time, but it is a pleasure to see you.

In answer to your question, there are enormous numbers of ways in which the Government have been informed by and used data in this emergency. The Office for National Statistics has really stood up and been able to provide information in a very wide range of ways—for example, in identifying the kinds of goods people bought when they were worried pre-lockdown, and being able to put a basket of them together and therefore inform Government about where in the country there were shortages, and modelling over time whether there were price changes in those. Perhaps the good news for the Prime Minister is that last week the price of nappies dropped significantly. We are able to do that kind of work.

In addition, the work on deaths that I have already talked about has been incredibly important. Perhaps you have seen the work we published today on disproportionate deaths among those from the black and minority ethnic community. We have produced data from a weekly opinion survey to understand how people were feeling about the lockdown and how they were acting. We have been using some innovative data science ways to understand the success, or otherwise, of the lockdown—for example, being able to inform Government about trends in the footfall at mainline stations, London tube stations or whatever.

We have had some very good partnerships with the private sector to obtain data that perhaps we would not otherwise have been able to get, to inform Government. The Government have been voracious in their appetite to be informed, and hence I suggest they have had the information on which to make some very difficult decisions.

You also mentioned presentation, Graham. We have a couple of statisticians who are now embedded in Government communications to make sure, for example, that the graphs and figures produced for a press conference, or anything else, are statistically sound. I think that has been something where over time we have seen an improvement.

Chair: Perhaps we could keep the answers short. We do not want to run out of the questions that we have for you, but we want to come to Professor Edmunds.

Q435 **Graham Stringer:** I will try to combine my next two questions, if that will help. We have seen from the statistics that there appears to be concentration of deaths among the poor and people living in densely populated areas. You mentioned the work you have done on ethnic minorities. Is it possible to distinguish between the deaths of people who are poor and people living in densely populated areas, because they are often the same area? Can you disaggregate that? Finally, is it possible to have ethnicity recorded on death certificates, and would you recommend it?

Sir Ian Diamond: They are two very good questions. The simple answer is that in the short term we have not been able to distinguish between the number of people per room in a household and the fact that it is a poor area. We know that the two are highly associated, and there is more potential future work that we will be able to do through further record linkage than we have already done.

When it comes to work on ethnicity, the way we have done it at the moment is by linking death registration with census data. We can do that. Clearly, it takes a short while, but that is a way we will always be able to work. One of the downsides is that we are unable to do it for people who have migrated to this country since the last census, although we might be able to do it from alternative sources.

In answer to your question, if ethnicity was asked for on the death certificate, it would make our work a little easier but that does not stop it. If I were to ask for one thing with regard to death registration, it would be perhaps that we required a registration of the death very, very quickly electronically rather than waiting for the registration. While the practitioner in some situations may have to say, "I'm not quite sure of the cause of death; we need a post mortem," that would at least give us more timely information.

Q436 **Zarah Sultana:** Sir Ian, following up what Graham was saying, do you think that councils need to be working more closely with the ONS and

other organisations to share the data they have on poverty and house bands for us to be able to tell what the correlation is? Are there any other characteristics that it would be good to collect and report more systematically to facilitate research and the management of health issues?

Sir Ian Diamond: The simple answer to your question is: 100%. We have the potential to work with local authorities to understand much more about a number of issues. The good news I can report to you is that, with regard to next year's census, the great majority of local authorities have agreed to work with us and share some information, which is going to be incredibly important for us to be able to undertake what I hope will be the best census we have ever had in this country.

The answer to your question is yes. There are many things that local authorities know about, some of which will be absolutely quantitative and available on administrative records, but other things will be somewhat more qualitative and that will also be incredibly helpful to us.

Q437 **Chair:** Professor Edmunds, thank you for your patience. One of the very important statistics that already features very prominently in discussions is the R ratio—the figure that looks at whether the pandemic is accelerating or decelerating. What is the most recent estimate you have made of the current value of R in the United Kingdom?

Professor Edmunds: A number of different groups around the country are trying to estimate it, and we are doing it on a regular basis, at least every week. The most recent estimates are that R is between about 0.75 and 1; it is just below 1. It varies a bit according to the methodology you employ and the data you look at, and it varies a bit regionally as well. There are some regions that look closer to 1, and probably London is the lowest reproduction number.

Q438 **Chair:** What do you think the number is in London?

Professor Edmunds: It is at the lower end, at the 0.75 end. It is worth understanding what has happened. If you had asked me the question about two weeks ago, I would have given you lower numbers. I would have said to you that the reproduction number was in the range of 0.6 or 0.7, maybe up to 0.8. That is not what you think it is; it is not that people are going about and mixing more than they were before. That is not what happened.

What probably happened is that we had a very widescale community epidemic, so when we were measuring the reproduction number, we were measuring primarily the community epidemic. That has been brought down. The lockdown has worked in breaking chains of transmission in the community, but what is left is a series of ongoing outbreaks in care homes and hospitals up and down the country. If you measure reproduction now, you do not see the reproduction number in the community so much; it has been dominated by the reproduction number in closed settings, in particular hospitals. I do not want to say that is

good news at all, because we have a big problem in hospitals and care homes, but what has happened is that the community epidemic has come down and the epidemic is now being concentrated in those settings.

Q439 **Chair:** That is interesting. The number has increased in the last few weeks, but not just because the estimation has become more accurate. You think it genuinely has increased, but the compositional effects have increased most markedly in care home settings.

Professor Edmunds: I do not think it has increased in care homes. The reproduction number is an average over all the different settings. The way we measure it is to use the official data, and most of us do, and up until very recently that has been almost exclusively about people in hospitals. There are two types of people in hospital who are testing positive: those who went into hospital with Covid and those who went in for another reason and then got Covid.

Although the outside epidemic was then much bigger, our estimates of the reproduction number when we used the official statistics were always being dragged up a bit by the cases occurring in hospital. Now that the epidemic in the community has shrunk considerably over the past five or six weeks—the lockdown has worked in that regard—we are seeing the continuing epidemic in hospitals and care homes. What we are now measuring as a reproduction number is to a significant extent the residual transmission in those settings. Exactly to what extent we do not quite know, because the data are not really good enough to do that.

Q440 **Chair:** Can you say how you measure it? How do you measure R?

Professor Edmunds: There are different ways. Essentially, it is looking at the changes in the incidence. As for the estimates I gave you earlier, four or five different modelling groups around the country were looking at this last weekend. Essentially, they were all fitting mathematical models to the data and inferring what the reproduction number was.

The reproduction number measures incidence. If you look at incidence trends, it has come down quite sharply. That is when the reproduction number was probably significantly below 1. A few weeks ago it was probably more like 0.6 or 0.7, but now it is levelling off because we have reduced the community epidemic and we are left with the residual epidemics that are going on in hospitals and care homes, and they are not going down or are not going down at the same rate. More of what we are seeing when we measure it is the ongoing incidence in those settings.

Q441 **Chair:** How is the reproduction number to be measured in future, given that the current estimate for the future is going to be very important for policy decisions on the question of turning on and off social distancing measures?

Professor Edmunds: You would not want to take just one technique to look at it. It is a fundamental measure in epidemiology, and because of that you can get an estimate of it through different methods and ways. If

it is sitting at the core of an infectious disease epidemiology, there is a range of different methods you can use to get an estimate. You would continue to do that and estimate it using a variety of methods and data sources. Then you put them together.

That is what is happening in SPI-M; you put all those processes together. There is a range of different groups using different methods to try to estimate the reproduction number. Then we come together and come up with a consensus about what we think it might be, taking into account the different methodological approaches and the different data being used. I think you want to do it like that.

Q442 **Chair:** How frequently will you review the measure?

Professor Edmunds: We do it about twice a week. There is a short-term forecast done twice a week as well, to look at how many beds, ITU beds and so on, may be required. Those are related, because from the reproduction number you can to some extent estimate trends.

Q443 **Chair:** Sir Ian, as national statistician do you oversee the production of those estimates and, in future, the increasingly important twice-weekly estimates of R?

Sir Ian Diamond: No, I do not oversee it. That is led by SPI-M, which is a sub-group of SAGE and is entirely independent. What I can say, given my knowledge of the field, is that they are absolutely world-class modellers from across the United Kingdom.

Q444 **Darren Jones:** Professor Edmunds, clearly, we are all concerned about the public health crisis right now, but increasingly the debate is also about the economic crisis. My understanding is that now-casting the R figure will be a really important part of understanding how we lift or put back certain restrictions across the economy. Could you talk a little about any of the limitations of using the R figure for that purpose, and what your view is about a differential R across different parts of the country, but a national approach to lifting or putting back restrictions?

Professor Edmunds: There are problems with any of the data sources. In some way, they are all a bit biased and they all have differential delays associated with them. For instance, if you are looking at deaths, it may take three to four weeks from infection to death, unfortunately. If you are using deaths to estimate what is going on in the epidemiology, you have to account for that delay, because changes in deaths now actually reflect changes in infection that happened about a month ago. You need to take those things into account. If you want to monitor R much more rapidly, I would not use the death data as a primary source. You want to look much more closely at changes in behaviour.

One of the things we have been doing at the school, and which I have been involved with for the last six or seven weeks, is monitoring changes in epidemiological relevant behaviour and contact patterns. From that, we can estimate R directly. That has no delays. As soon as changes in

behaviour occur, we get an estimate of how the reproduction number might have changed. That is probably the most rapid way of doing it.

Methods that rely on the epidemiological data would be a little bit behind. That was what we saw during the lockdown. We said straightaway that we thought the reproduction number was about 0.6. It took weeks and weeks for the epidemiological data to confirm that the reproduction number was in the region of 0.6 or 0.7. Going the other way—coming out of lockdown—our survey would probably be very useful, because it would give us the first indication that it is either going well or not, so it would be particularly important for us to look at that very carefully.

I should add one problem we have had with our data. We set it up very fast, as we had to, and we did not initially survey children. Moving forward, we will be surveying children as well as adults. I do not know whether children will start to go back to school, or something like that, but we need to be prepared for that because it could make a change to the reproduction number.

Sir Ian Diamond: Could I add a quick point to the very eloquent explanation John Edmunds just gave? It is important to recognise that the R on its own is not enough; R needs to be accompanied by prevalence. An R of 1 effectively means that you are flatlining. You could imagine a situation where prevalence was, say, 0.00001 of the population, a very tiny prevalence, but it stayed there over time, and then R would be 1. That is not a bad place to be in. I wanted to add that little note; R is important, but you need to see it in context.

Q445   **Darren Jones:** Professor Edmunds, I understand from your answer that testing and tracing data will give us a more agile approach to understanding R than waiting for death figures because of the lag phase. Is that right?

Professor Edmunds: Testing and tracing data would be extremely useful. It is quite difficult to get an estimate of R from them directly because you are seeing only the ones that you know about. The problem is that there may be cases outside that. That is the whole problem with a test-and-treat approach. What if you do not record your symptoms, and your chains of transmission are not being recorded? Those are probably more important, but you are not measuring any of them.

It would provide extremely useful information, but I would not use the contact tracing data directly on its own to measure the reproduction number, because you are not necessarily catching all the cases. Frankly, that was what happened in the early part of the epidemic. All we were relying on at the beginning was the data coming from PHE's contact tracing and so on, and we were missing large numbers of cases.

Q446   **Darren Jones:** Sir Ian, linked to the question about data—forgive me if I should know this—could you explain how the kind of testing that is to be rolled out by the Government interacts with the sampling study you are

doing at the ONS, and with the REACT sampling around antibody testing as well as antigen testing?

Sir Ian Diamond: The testing strategy is targeted very much at particular groups, so it is not a representative sample of the population as a whole, nor will it be able to do the sorts of things we are doing by taking everybody within a household and understanding the correlations in the household, and being able to get some data on children. It is very valuable and important, but it is getting different data. As I indicated, the kind of things our study will be able to do with population sub-groups is important. By going back to households every week we are able to understand change in those households.

The REACT study, which is a sister study led by Imperial College, is a very good one. It is a very big study, and it will also help us to understand the potential of various methods of measuring antibodies, which requires some further work. Our blood work uses a test; it has to take some blood that goes to the laboratory at Oxford for design. It is called an ELISA test. The Imperial study, which is a very interesting and welcome one, will be looking at a different type of measure that may be useful in the future. It is also a very large study and will indicate to us the potential for sending out swabs by post and getting them back effectively.

I am very much of the view that we need multiple sets of data sources at the moment, and what I have seen thus far is that the studies being undertaken are complementary, with some intersection in the Venn diagram but not enough to worry about.

Q447 **Darren Jones:** You mentioned that you will be publishing the ONS data on Thursdays and Mondays. Do you know whether that is the same for the Government's view of what R is in the context of trying to now-cast the infection rate for broader economic decisions?

Sir Ian Diamond: As I indicated in my first answer to the Chair, we will be working with SPI-M, which is John's group, chaired by Professor Graham Medley. Our aim is to come to a consensus to enable us to give one measure to Government, and do so by using, as John so eloquently said, a variety of different approaches.

Q448 **Chair:** Professor Edmunds wants to come back in, but perhaps I may first put this question. He was very clear that there are different patterns in care homes and hospital settings from the community at large, with different Rs within each. Does it make sense to have a single national R when the policy decisions will pertain to particular groups, particularly hospitals?

Sir Ian Diamond: If I could respond very quickly before John comes in, I think I indicated that we are not going to have one single R; we will have R for a number of sub-groups. It is my opinion that we need to use the testing that is currently being ramped up by DHSC within care homes. We need to build a study around that testing ramp-up to be able to

calculate and monitor the prevalence and transmission of the epidemic in care homes over time, because I believe that the epidemic in care homes is not going away in the short term.

Professor Edmunds: I do not like to contradict Ian, because he is fantastic, but, strictly speaking, there is one R. It is very difficult to get a proper picture. There is one epidemic and linked sub-epidemics. The epidemic in hospitals is not completely distinct from the epidemic in the community, so, if we bring infections down in the community, we ought to reduce infections in hospital. The epidemic in hospitals is also seeding via healthcare workers, in particular cases, back out to the community, so they are linked.

Because they are linked, there is overall, strictly speaking, one R, but I agree with Ian that it is quite difficult to get a proper handle on that one overall R. Looking at sub-groups is very helpful. Looking at the epidemic in the community and the reproduction number in the community, and then looking at the epidemic in hospitals and care homes and looking at the reproduction number in those settings, is very helpful, because there are different control policies you can put in place to reduce reproduction, or rather, reduce incidence. It is not really the reproduction number; you want to reduce incidence and, therefore, reduce deaths in those different settings, so trying to estimate it in the separate settings does matter.

We have a much better idea about the reproduction number in the community than, unfortunately, we do in hospitals and care homes. Our data are not good enough to give us any certainty about what the reproduction number really is in hospitals. It is probably very variable between one hospital and another. Care homes are even worse. We do not have sufficient data to estimate what the reproduction number is in care homes, or the variations between care home and care home, or even to look at whether good practices, or poor practices, within them result in higher reproduction numbers in certain care homes. We do not have the quality of data to be able to answer those questions, unfortunately.

Chair: It seems strange to have inferior data in settings like hospitals and care homes compared with the completely disparate community at large, but perhaps we might need to pursue that separately by correspondence because we have some other ground to cover.

Q449 **Andrew Griffith:** Professor Edmunds, as a preamble, it sounds awfully like we are trying to drive using the rear-view mirror. As you answer this question, I shall be interested in your reaction to that statement.

What do we know, looking forward, about the impact of different social distancing measures on R? At the moment, the R is driven by a number of different slices, or variables, all of which are being applied and are producing one output. As we start to try to peel away those layers, I am interested in how you can quantify each of the particular social distancing measures.

Professor Edmunds: It is a very good question. Unfortunately, we clipped through the gears of social distancing measures very fast. We went from having very little social distancing to full lockdown within a week or two, so it is not possible to disentangle the effect. They were staged; they were introduced one after another, but only by a few days, so it is not easy from a data point of view to see how effective each of the individual measures was. Internationally, other countries did something similar and clipped through the gears so fast that it is very difficult to disentangle each individual one from the data.

You can use models, and the models are better at certain things. We know more about certain things than others. For instance, we can infer the possible impact of school opening with probably more confidence than some of the other measures, because a lot of work has been done on school closures previously for flu. Although it is not identical, you can look across and make some inferences from that, so for certain aspects we can probably have a bit more confidence in the projections.

Others are difficult—where we have not done it before and other countries have not done it before. There is a lot of discussion about bubbles at the moment in linking households and keeping them together. We are quite uncertain about the potential impact of those sorts of measures.

Q450 **Andrew Griffith:** Professor Edmunds and Sir Ian, it now being Thursday, have you seen the draft of the measures proposed to be outlined on Sunday so that you can opine on those? I put that to each of you as experts in your field.

Professor Edmunds: Those are political decisions. I have not seen it.

Sir Ian Diamond: I am unaware of what will be said on Sunday. I believe that, if the measures are to come in over a period of time, we should design ways to monitor and evaluate their impacts.

Q451 **Zarah Sultana:** Professor Edmunds, do you think that the UK and other countries that are looking to ease their lockdowns will be likely to reintroduce them in the near future?

Professor Edmunds: It is hard to say. What we have to do going forward is take it very carefully. As Ian has just said, we would be very unwise to lift all restrictions, and I am sure that is not going to happen. We have to lift them gradually and monitor them extremely carefully, because it would be damaging to have to go back into a lockdown. You cannot rule it out. It is possible that it will not be a full lockdown, but measures might have to be imposed locally if a local outbreak was spreading. I very much hope we can avoid that by doing it gradually, taking our time and evaluating it properly.

Q452 **Katherine Fletcher:** Professor Edmunds, to join the dots between this and previous hearings, I asked Professor Neil Ferguson about the granularity of his behavioural modelling. He told the Committee that he

did not really differentiate between five and 30 people; it was more small groups or tens of thousands. A few minutes ago, you mentioned that the behavioural data and behavioural modelling are key to your estimate of R, so to what level of granularity do your models go in terms of social interaction?

Professor Edmunds: They are all pretty crude. The behavioural data we are collecting to estimate R allow us to look across regions, for instance; it is something we have looked at recently to see whether there are any major regional differences. Beyond that, you would need a large-scale survey to go down to any more local level than that, so it is pretty crude. All our models are pretty crude tools.

Q453 **Katherine Fletcher:** In terms of informing individual social distancing or lockdown release measures, it would not say you can go to a party if there are fewer than 12 people there; your data does not support that.

Professor Edmunds: Not at that level of granularity, no.

Q454 **Carol Monaghan:** Professor Edmunds, in a paper that you published back in February you concluded that in most scenarios highly effective contact-tracing and case isolation is enough to control a new outbreak of Covid-19. Do you stand by that paper, and how useful do you think contact-tracing is at this stage of the infection in the UK?

Professor Edmunds: That was at the beginning of the epidemic. We just had one or two cases, so we were looking at containing them. If you had a good surveillance system, you would pick them up. We were clear in saying that you would have to be able to contact-trace a high number of your contacts; otherwise, it would not be effective.

Moving forward, we have quite a different epidemiological picture. As Ian pointed out, it is not just what the reproduction number is; it is also what the incidence is. The incidence now is much higher than it was right at the beginning of the epidemic when we had just a handful of cases. We have perhaps 20,000 cases a day, so contact-tracing all those would be an enormous undertaking, and probably impossible at the moment. Incidence has to come right down for contact-tracing to be feasible—to trace all the contacts for individual cases, isolate them and quarantine them.

Q455 **Carol Monaghan:** Back on 12 March, the Government decided to abandon contact-tracing almost entirely. Do you think there would have been some use in continuing it beyond that date?

Professor Edmunds: At that point, it was quite clear the epidemic was growing exponentially; it was doubling every three days, so the measures in place, which at the time were just contact-tracing, were clearly not working. At that point, we were probably having thousands of cases a day, yet we were recording and reporting, through contact-tracing, tens of cases a day. At that point, the system had been overwhelmed by the epidemic.

If we get the incidence right down, contact-tracing will play a role. I do not think it is going to be sufficient, and I would not want to rely on it alone. We will need other social distancing measures in place to ensure that we do not go back to a situation where the contact-tracing is just scratching the surface and the epidemic is out of control.

Q456 **Carol Monaghan:** How low would the numbers have to be before contact-tracing could be re-employed?

Professor Edmunds: That is an operational decision rather than an epidemiological one. If you bring it right down, and you have a certain amount of resources to put into it, those resources should be able to cope with it. If you leave the epidemic at a high level, and you have the same level of resources, those resources will not be sufficient to contain the epidemic, which will then increase very rapidly. It is not an epidemiological decision but an operational one.

Q457 **Chair:** We need to wrap up this part of the session, but perhaps I could go back to where we started. Sir Ian, we talked about your new study, the results of which will be available soon. So far, we know principally about deaths. They are our principal data source because testing was restricted; it was not community testing but was within hospitals, so we are just about to discover what the prevalence in the community is.

Sir Ian, you are a very eminent statistician, and UK Statistics is very strong internationally, but statistics and statisticians need data. Surely, the lack of data through lack of testing, leaving aside the medical need for testing, has hampered the ability of UK statisticians and, I dare say, scientists to understand questions of prevalence. Would that be a reasonable reflection?

Sir Ian Diamond: My experience over many decades is that every time you study something new there are always more data you would like to have. We have found out enormous amounts about this particular virus and epidemic as we have gone through.

I believe that the statistical system in this country has reacted at remarkable pace to enable us to inform both the scientists working on the models, for example, and the Government so that they can make decisions. I can think of no study I have ever done in my life when I have thought, "Gosh, I've got all the data I could ever want." There is always more data you would like. I cannot remember in my experience with Government a time when more data have been available; data have been at the heart of the information that Government have been using.

Chair: I am very grateful. We need to conclude this part of the session because our other witnesses are waiting. Professor Edmunds and Sir Ian, thank you very much indeed for joining us today.

Examination of witnesses

Witnesses: Professor Peters and Professor Sir David Spiegelhalter.

Q458   **Chair:** We are inquiring into statistics around the current pandemic. It is a pleasure to have some discussions about international comparative statistics, and we are very honoured to have Professor David Peters, who is the Edgar Berman chair in international health at Johns Hopkins University in Baltimore, and Professor Sir David Spiegelhalter, who is the chair of the Winton Centre for Risk and Evidence Communication at the University of Cambridge. Welcome, both.

I start with a question to Professor Peters. Johns Hopkins makes international comparisons, and it has become a powerhouse in the international comparative understanding of this pandemic. Why are those international comparisons important?

Professor Peters: Thank you for the opportunity to speak with the Committee. I appreciate the chance.

International comparisons are important, first, because this is a pandemic affecting the whole world, and it is important to try to get an understanding of how the pandemic works. This is a virus that does not respect national borders, so that has some implications wherever our population is. Also we hope, when we look at international comparisons, that we can at least get some signals from which we can make comparisons.

The enterprise that led to the mapping and the data that is coming out, which has been a tremendous help for everybody, was not originally designed for international comparisons. It started off as an idea to try to find out what was happening in the Wuhan epidemic. Then it just grew and became a global phenomenon that required a lot more build-up. It was not designed to make international comparisons, but it has become that because of the need to provide a bigger picture of the pandemic.

Q459   **Chair:** What do you say to those who say that, in a pandemic, making international comparisons is difficult to the point of being virtually meaningless, because of great differences in data collection methodologies? Some countries collect data from hospitals and some from within the community. There are certification differences; sometimes Covid-19 is included on death certificates and in some countries it is not. The demographic characteristics of nations vary; Italy's population is much older than Ireland's, for example.

It is also said that, because of the indirect effects of the pandemic, figures available now in real time are not a very good guide to what is going on, and we will not know until it is all over. What do you say to the range of critiques that are entered against the kinds of projects you are doing?

Professor Peters: Those are all fair critiques; they are accurate in the sense that there are lots of artefacts in the data and reasons for differences that have nothing to do with the actual disease transmission itself. That does not mean that you cannot learn from other countries. The whole point is that the data provider signals the point at which we

understand things and then make decisions. If you were to limit yourself to trying to make comparisons of death rates, for example, you would have to do that very cautiously.

It is rather about looking at the data to try to find lessons about how countries have used them to make changes. All the critiques about the problems in measuring death, dependence on testing and who gets tested are absolutely true, but you would not want to limit your comparisons just to trying to make straight comparisons with data, when the data are not comparable.

Q460 **Chair:** Making these comparisons during a pandemic is clearly of great interest. You talked about learning from others. Is it of use to policymakers in the management of it? Are there any instances you can give in which it has been possible for a lesson to be learned that can be applied from one country to another?

Professor Peters: Sure, there are many. It is useful to look at indicators, such as the number of deaths, in any event, to be able to plan for what is going to happen in hospitals and mortuaries, and to understand the epidemic. We have just heard about working out the reproduction number and the incidence, in driving that.

What we have learned from other countries from the data is, first, that containment strategies, early on and then later, as will be relevant as the epidemic goes to the long tail and you have lifting, involve very extensive testing, tracing and isolation—things that are very difficult to do during the peak of the epidemic, but which are absolutely critical. We have seen in very effective early cases, where you have been able to have aggressive lockdown and massive tracing and testing, and isolation based on that, that it works. That is going to be relevant as we move to the tail of the epidemic, and we are talking about when and how you lift many of the restrictions, when you need to have those kinds of things. That is true.

The other thing is that you can look at past epidemics to give you ideas on lessons learned and how to use the data. Given that this is a virus that does not necessarily respect national boundaries, it is often good to look at local epidemics, and what happens in a city's hospitals and hotspots. Given that national data represents a heterogeneous mix of what is happening, you would not want to look at New York City and say that it was all the United States, or that Wuhan is all of China, for example.

In the last session, you talked about the effects of social distancing and how you measure it. Some of the best data on that comes from the 1918 pandemic, where you can see the effects on peak incidence of excess mortality and cumulative mortality. For example, we know that, if you do many of them together and do them aggressively early on, you can reduce the peak incidence of deaths and, to some degree, the overall number of deaths. We also know that, when you start releasing them,

you can expect second waves, and those that did well in the first wave tend to have higher second waves. Those are things that we have seen.

Even from the 1918 data, we cannot identify any single social distancing, physical distancing or isolation measure by itself; rather, there are packages of them. We saw that more interventions put in place have a bigger impact than fewer. It is about doing it earlier rather than later and doing more rather than less. When you take them off, you are going to get waves, which is exactly why you need to have test and trace strategies, to be able to manage and respond to that.

Q461 **Chair:** You discovered that from international comparisons that you have engaged in. Do you have a view on what the best metric is for comparisons? Do you have a preferred figure that you would advance?

Professor Peters: You need to look at a range of things, and you need to know what you are doing at what phase of the epidemic. When we are coming towards the end and we are trying to learn, we will want to look at deaths, and excess deaths. In real time, looking at excess deaths above expected gives us some help; it is a bit like looking in the rear-view mirror, but at least there is a shorter timeframe in which you can look at it. That is helpful. A reproduction number from cases is hugely possible. Eventually, we would like to be able to get good ideas on infection mortality rates, or infection case fatality, which tends to change.

One of the key things in looking at international comparisons, at the very least, is to look at age, sex and preferably comorbidity breakdowns. At this stage, the age breakdowns are critical. I do not know the age breakdowns for the UK, but you see big differences in crude mortality, say, between China and South Korea, where it looks much lower, but in the age-specific breakdown Spain looks very similar to China and South Korea. Spain has crude mortality that is several-fold larger, but the age-specific rates are very similar. I encourage you, at least in looking at mortality rates, to look at age and sex breakdowns to get a better picture of where things are going.

Q462 **Chair:** Thank you, that is very helpful. We will come on to some more questions on that. Perhaps I could ask Sir David a few questions. First, could you clear something up? You wrote an article that has been one of your mostly widely cited articles. You have written many that feature high in the citations index, but one you wrote for *The Guardian* has been much referred to by some very eminent people. Yesterday, you tweeted: "Polite request to PM and others: please stop using my *Guardian* article to claim we cannot make any international comparisons yet." A tweet is rather constrained in the amount of text you can deploy. Can you explain why you felt moved to make that clarification?

Sir David Spiegelhalter: It is all rather unfortunate. I wrote the *Guardian* article as a response to what I thought was an absurd and largely media obsession with league tables—"Are we bigger than Italy?", or whatever. What I was really talking about was the fact that, given the

data available, I would not want to make any statement about comparing what we might call the top tier in Europe at the moment—Belgium, the UK, France, Spain and Italy—because they all record their data in different ways, they have very different populations, and so on. Trying to do detailed ranking is completely nonsensical, and I gave lots of reasons for that, which you have been describing.

Unfortunately, I did not make it clear that I certainly did not mean that we could not make any comparisons with, say, what we might call the bottom tier, such as Portugal, Germany, Austria, Norway and Denmark, which have very low death rates, comparatively, and are clearly a different group of countries. Of course, we should be looking at those gross differences in how the epidemic has developed, but I did not make that clear; I kind of took it for granted.

Then I was slightly surprised to find my paper being used by politicians to say, "Oh, we can't make any international comparisons yet." I thought, "Oh dear," and maybe I should have tried to go privately to the people writing the briefs to say, "Please don't say that." I thought it would go away, but then yesterday at parliamentary questions the Prime Minister referred to me as giving justification for the idea that we cannot make international comparisons. At that point, I thought that I should go public and try to say, politely, please do not use this article, which was a journalistic article of 700 words, bashed off in a few hours, as justification for saying that we can't make international comparisons, because, of course, we can.

Q463 **Chair:** Do you agree with the evidence that we have just had from Professor Peters that there are lessons that one can draw from others' practice?

Sir David Spiegelhalter: Absolutely. If you can see gross differences in outcomes and very big differences in what is being done in those countries, you can start trying to draw some conclusions, I am sure, although that is not what I do. It is still very complex. We have to understand each country individually, apart from its demographics. In Ireland, about 6% of the population is about 75, and this is overwhelmingly a disease of the over-75s, whereas 12% of the population of Italy is in that age category—twice that rate. We would expect a huge difference in mortality rates just from that alone. We need to understand that, and we need to understand something about social mixing, density and housing. We need to understand all those things.

That is why I and my colleagues who are statisticians would definitely emphasise the idea of making within-country models to understand the curve and the development, timing it to different interventions that have been done, relating all those together, and then putting that evidence together by combining all the information from different countries. That is a very careful and meticulous process, requiring detailed knowledge of each of the circumstances, not just making some crass comparisons about very deeply flawed outcome measures.

Q464 **Chair:** Understood. I think you did us the courtesy of listening in to the previous session, where we had a discussion with the National Statistician about excess deaths being a powerful measure. I think that is something that you are inclined to support as well, as a useful measure.

Sir David Spiegelhalter: Yes, very strongly. Sir Ian said he would send you some data. I have the data here: over the four weeks ending 24 April, in England and Wales we had roughly 79,000 deaths registered, and the five-year average is 42,000, so that is 37,000 excess deaths registered over those four weeks, nearly double the normal number of deaths. That is a massive spike, unprecedented in recent times.

Out of those 37,000, only 27,000—still a massive number—were labelled as Covid on the death certificate. That means that there are at least 10,000 what you might call unexplained additional deaths, unexpected for this time of year, happening over those four weeks. One of the crucial things about this whole epidemic is to understand what led to those deaths.

Q465 **Chair:** Your work has been very interesting in disaggregating the data and looking beyond the headlines, and you have some very clear views and perspectives on how the incidence and severity of the virus varies enormously between different groups. Would you like to comment on that?

Sir David Spiegelhalter: Just looking at death data by age and sex, you get an extraordinarily clear pattern. It is remarkable how the dots line up. With both men and women, the rate at which people are dying of Covid in the population goes up about 11% per year, so it doubles every seven years of age. This exponential increase is actually close to our normal background risk: as you get older, your risk of dying goes up. It is difficult mentally to grasp that exponential increase—that it is doubling, doubling and doubling—but it explains why older people are at much higher risk than younger people.

Out of 22,000 Covid deaths, there have been two under 15 so far, which is one in 10,000, and one in 1,000 in those less than 25. Middle-aged people are affected, and we hear about them, partly because the average age of people going into intensive care, for example, is 60. Intensive care is being used on younger, fitter people. The median age at which women die of Covid is 84, which is the median age at which women die at this time of year normally, so the focus is very much on older people.

On sex, compared with women of the same age, men have double the risk of dying of Covid. Interestingly, that is about the increased risk that the data released today from the Office for National Statistics suggests is associated with being in a black or minority ethnic group, so about double the risk is associated with that, as well.

Q466 **Chair:** You have been very clear about the need for people to understand risk better. I heard on the radio the other day that you said, "If you get

the virus, your chance of dying is roughly about the same as you would have had this year anyway."

Sir David Spiegelhalter: That is another failure of communication that I have had. From the data provided way back in March by Imperial, it was clear that, if you get infected, the chance of dying was roughly equivalent to the average risk of dying for a person of that age during a year. I have been saying—I still think it is a reasonable thing to say—that, if you get infected, the chance of dying from the virus is roughly the same as the chance of you dying this year. It is like packing all the risk into a few weeks.

I thought, again, that it would be obvious that it was in addition to that risk of dying—that it doubled the chance of dying that year—but no. Many people have taken it to mean that it somehow replaces that risk. Again, I do not know how that misunderstanding arose. It shows that, although I am supposed to be skilled at communicating stats, I do not do it very well all the time.

It is quite a good metric to explain to people the huge variation in risk according to age. Now, of course, the infection fatality rate is disputed. It was 0.9% of the population in the Imperial group; other people argue that it is less. People now say that it is more like 0.4% or 0.5%, which would mean that our risk if we got infected was roughly the same as our six-month risk of dying. That puts it into perspective. It means that more than 10% of over 80-year-olds die each year, so doubling that risk is a really big thing, but doubling a very tiny risk for someone who is young, fit and healthy is not very much. It does not make much difference.

It is the old idea that you cannot say how important doubling a fixed relative risk is, without knowing what the baseline risk is, and what you are doubling. If you are old, frail or have comorbidities, you are already doubling quite a big number, and that is really serious and why you need shielding. If you are young and healthy or a child at school, you are doubling a tiny number, so it should not be such a concern.

Q467 **Chair:** I don't think that anyone doubts your talent in communicating statistical clarity. It is notable that you said that, if you are not worried about dying this year, you should not be so worried about getting the virus. These things are important, because some of the policy decisions that are going to be made about how we can best lift some of the restrictions need to be informed by the objective reality, some of which is expressed in statistics. If it is the case that there are certain groups—you mentioned the young—in which the risk is quite low, that has policy implications. They may be politically difficult policy implications, but would you not agree that it is important to be clear-sighted about the underlying data?

Sir David Spiegelhalter: Yes, and we should introduce a risk-based policy. I should say that at the moment all I am doing is talking about the risk to oneself. Of course, in an epidemic, one has a massive

responsibility to those around you, so obviously one takes precautions not to infect other people. At the moment, we are all being treated the same, essentially. Previously, some groups might have been treated as shielded and others might not have been.

I hope that we could have a policy with a more refined level and a gradation of risk, with traffic lights, or even five colours. Age would have to be the dominant factor, because it is the overwhelming factor that affects your risk, apparently. However, it is also affected by comorbidities, sex and possibly ethnic group and where you live, so other factors could come in that might move you up or down a basic age-structured risk group. As I said, I am not an adviser on policy, but the idea that you can stratify and shield is very powerful, to segment the population into very different groups with very different risks.

Q468 **Chair:** Are your colleagues on SAGE receptive to that?

Sir David Spiegelhalter: I am on the list of SAGE participants, but I am not a member of SAGE. I have been to one meeting.

Q469 **Chair:** One meeting gets you on the list.

Sir David Spiegelhalter: I'm afraid so.

Q470 **Chair:** But they did not invite you back.

Sir David Spiegelhalter: No, I was a dismal failure, so I didn't get another invitation.

Chair: I think we would quite like you there. I turn to my colleague Chris Clarkson.

Chris Clarkson: Actually, Chair, you have asked everything I was going to ask, so I am happy to let another colleague have a go.

Q471 **Graham Stringer:** Professor Peters, you mentioned that there might be a second peak when we come out of the measures that are being taken now. At the start of this, I saw graphs on the television that showed that the more successful we were at repressing the first peak, the higher the second peak would be. Do you recognise that as a probability or a possibility?

Professor Peters: It is certainly a possibility, and whether it happens depends on how well you have a containment strategy during the lifting period. The ability during that lifting period to test, trace and respond with isolation and quarantine, and have a differentiated response, is absolutely critical to succeeding.

We know—again, from the 1918 pandemic—that what you are saying is true: for those that had lower first peaks, in part because they were successful, the early lifting led to higher second waves. Some had three waves, as they gradated. Depending on how policies are implemented, you could well see different waves. The lesson is that where you have

your first wave of peak cases is not necessarily where the next waves are going to be; they are more likely to be in other places. They are still likely to be among the elderly and those who are more disadvantaged— the poor and socially marginalised, or those living in crowded conditions. That is still the case, but, geographically, your observation is very plausible.

Q472 **Graham Stringer:** Given all the caveats you put on international comparisons previously, those international comparisons will be made on crude death numbers or on some other basis. As a general point, will the international comparisons, when they are made after this epidemic, be better than for the 1918, 1957 and 1968 flu epidemics?

Professor Peters: I think so, but death reporting in the world is very low. Just on vital registration, most of sub-Saharan Africa is missing and, similarly, south Asia is very incomplete, so big populations of the world are missing. It is going to be very difficult making those kinds of comparisons on the pandemic, and we will need to use other tools. I was talking about under-reporting just of death, but for cause of death the coverage of data is even more dismal. It will be limited, and we will probably rely on after-event surveys to be able to make some of those estimates, but for that you are talking about impact evaluation later on. Certainly, what we have now will be better than before. We have changed the ICD-10 coding to add Covid. Among those reporting cause of death, notwithstanding differences in where the deaths are reported, afterwards we hope that we will be in a better position to understand it.

The difficulty in trying to understand what impacts made a difference is complicated because many of the impacts were recorded in close sequence in many countries. More tracking of what interventions were put in where, at sub-national levels and not just national levels, seeing how well they are implemented and timing those things will be critical later, when we get to the impact. I am hopeful that that kind of information, based on what colleagues are doing in tracking interventions around the world, will be helpful during the tail end of the pandemic and for decision making as we move forward. But, as was already alluded to, as you make decisions about lifting lockdown, the direct deaths in cases of Covid are only part of the equation. Balancing that with the economic impacts as well as other social wellbeing impacts, including illness and death from other causes, will be critical to help decision makers. It is only going to be one piece of the puzzle.

Q473 **Katherine Fletcher:** The great British public are staying very well informed on this; they are reading lots of stuff and starting to shift to the why questions, to look at what we understand the epidemic to be here in the UK and compare it with other countries, specifically around contributory factors. Most people have noticed that, in general, western nations seem much more affected than the east. Is that showing up in your data, or are you in a position to speculate about contributory factors to that data showing such a difference?

Sir David Spiegelhalter: I prefer not to speculate at all. To be honest, I do not feel that it is my area to ascribe reasons for the differences between Europe and what has happened in the east, or what is happening in major cities such as Bangkok and Delhi, where, as we might expect, there are bigger outbreaks. I do not feel that I am qualified to give a reason for those things happening at all. Sorry. It is not my job.

Q474 **Katherine Fletcher:** I am a biologist myself—data first and others later. I wondered whether we were seeing any early indicators coming out in the data. Professor Peters, have you seen anything that might lead to a conclusion?

Professor Peters: One thing that matters is the timing of the epidemic and when you get hit, and we are going to see differences just because of where you are. Early in an epidemic, you tend to have higher case fatality rates. In large parts of the world, we are not going to know whether people are able to be tested, and where and how people die. In much of Africa, for example, in many countries we will never know what has happened, because the data will never be there. It is hard to look at some of the underlying causes just by looking at the international comparison statistics, because they are so limited in that respect. You can use the data as signals and look at what is happening in countries and how they respond to see what some of the causes are.

If you are lucky enough to have been able to respond aggressively and you have the social trust that people will comply with isolation and severe lockdown, some countries are able to prevent it. You are going to need some level of adherence and trust in what public policymakers say to continue those things during the tail end and the lifting. You see some of the differences strictly because of those behavioural changes. The point is that you can learn from what other countries are doing when you look behind the data, although, unfortunately, it is going to be quite limited in a lot of the poorest parts of the world.

Q475 **Katherine Fletcher:** Is the disease unusual in that it has a period of asymptomatic transmission beforehand? Is that making the data blurrier, or does it not make any difference? It seems to be one of the unique characteristics of this Covid epidemic.

Professor Peters: Absolutely. The problem with knowing the infection rate is that so many people are asymptomatic. Having that extra-long period for incubation makes it difficult, compared with flu, for example. When we were working with Ebola, we did not have to wait to see dramatic results from most cases. Similarly, smallpox was a relatively good candidate, because you did not have asymptomatic cases or carrier states, and you were able to respond. This is a new virus, so we are learning from it, and having an asymptomatic part of the picture makes it very difficult.

Q476 **Katherine Fletcher:** On contributory factors for where we are, what you are saying is that right now—tell me if I am putting words in your

mouth—it is almost impossible from the data to tease out the practical from the behavioural and cultural, such as the likelihood of adhering to lockdown rules, versus even perhaps the underlying biological aspect that has been hinted at in some of the data, such as the differential risk of ethnic groups, as you mentioned, Sir David. Would you say that there was any clarity at all, or are we third, third, third?

Professor Peters: We know that, if you can have lockdown, it works. Having those combined measures of reducing contacts works, so I would not say that the data do not help us with that. Unpacking individual interventions is much more difficult and requires some judgment.

As you move to lifting the restrictions, you want to be able to use the data to help you so that you know that your incidence of cases is stable or declining, or your reproduction number is well below 1, and that you have enough coverage of the testing and tracing. You then have a better idea that what you are measuring is actually the epidemic and not just who you are testing. Having that capability is important. Then it is about understanding that different kinds of contacts have different levels of intensity and different numbers of people, and the potential for changing them is different.

You can look at the data to help you with making decisions about that; it is just that, if you do that simply by looking at international or national-level data on case fatality, it is not going to be very helpful, because there is so much heterogeneity and so much difference in what the data actually mean.

Q477 **Katherine Fletcher:** With international comparisons, it is too soon to tell.

Professor Peters: Simplistic international comparisons, looking at one or a couple of indicators, are too difficult. Learning from experience about what countries are doing and using data to help that is certainly possible.

Sir David Spiegelhalter: To refer to Sir Ian's comments about the survey now being organised through the ONS, as statisticians we cannot do anything without data. It is extraordinary that we are at this stage of the epidemic, yet we still do not know how many people in the country have had it. Some people say that it is more than 50%, while others say it is 5%.

The fact that we do not know those basic facts makes it extremely difficult to make judgments about the infection's mortality or fatality rate, or anything in fact. It is great that the data is coming online now, and we hope that the Royal Statistical Society taskforce encourages open reporting of the testing data so that we can publicly really understand what is going on, but it is very late, as was discussed in the previous contributions.

Q478 **Katherine Fletcher:** Does anybody in the world have better data than us? Does anyone else have a better handle on their population infection

rates?

Sir David Spiegelhalter: Other countries have done much more extensive testing much earlier and will have much more idea of what is going on in that country. Germany publishes its R0 regularly.

Professor Peters: Absolutely, there are countries that are doing that; it is all related to widespread testing, and then the related tracing and isolation. Countries such as South Korea and Taiwan have individual medical records; they have cell phones for tracking, and they can even track your credit cards and watch you on closed-circuit TV. That is very different from voluntary systems.

New Zealand and Iceland have different strategies, using less technology and more person calling to follow up. The ability to have widespread testing and link it to tracing and isolation is particularly relevant very early on in the epidemic, and then later as you start lifting things, when you are able to. That data is there, and it is better in the sense that it can be used directly for policy decisions. Part of it is related to when diagnostic kits are available. That is a big part of being able to get it available. It is not just a statistical issue; it is about the technology to be able to do that.

Q479 **Darren Jones:** We have talked about trying to do international comparisons based on age, gender and comorbidities, and we have just started to talk a little bit about how our responses, be it testing or tracing, have helped other countries to make better decisions. At this stage, can we understand, from an international comparison perspective, comparing the UK with Germany or South Korea, whether it was as a consequence of better testing that they had fewer excess deaths than we have? Does the data show us that, and, if it does, how much confidence do we have about those comparisons around response and excess deaths?

Professor Peters: Any kind of judgment like that takes a lot of caveats. You can clearly say in the cases of South Korea, Taiwan, Singapore, New Zealand and Iceland that, yes, it absolutely helped. They may perhaps have been luckier in starting earlier. I cannot say that they were later in the epidemic, but they were able to take action earlier. Partly that is because of the kinds of experience they have had in the past, with previous epidemics, when they have had to do that.

In the case of South Korea and Taiwan, because of previous SARS and MERS epidemics, they were able to set up those systems. Preparation helps, but they have different expectations about trust in Governments, compliance and privacy laws, and norms, which allow them to do things that you cannot always do in other countries.

I would be much more reticent to make some of the comparisons between Germany and the UK at this time. After you break it down by age and sex, you find that a lot of the countries look a lot more similar

than otherwise, just looking at crude rates, primarily because of the age differences.

Q480 **Darren Jones:** Sir David, did you want to come in on that question?

Sir David Spiegelhalter: Not really. You can observe the lower-tier countries that I described, which have had somewhat different policies from the ones where there have been much higher rates. One could draw a simplistic conclusion, but I would be very unwilling to say the counterfactual—how it would have been different in this country had we done something else. That I would regard as speculation.

Q481 **Zarah Sultana:** Sir David, you have reportedly said that it is "certain" that all reported figures for Covid-19 deaths are "substantial underestimates". How much larger approximately might the actual numbers be for the UK?

Sir David Spiegelhalter: We have to work upwards from the figures that we received until about last week. At the daily press conferences, we heard about deaths in hospitals that had been positively tested, so that was the number that we had and that was the standard of comparison. It is a really inadequate number. Now it has been upgraded; at least two people have died in care homes who were positively tested. Of course, that leaves out all the people who died of Covid who had not been tested, so you have to wait for Office for National Statistics data, which pumps it up a bit more.

Then of course, although it is 11 days late, you get people for whom it is on the death certificate, and that is our Covid total. We have to add, for the excess deaths, a certain proportion of those. As I said, there are about 3,000 deaths a week that are not labelled as Covid but are in addition to the 10,000 that we would normally expect in a week, so that is a third extra unlabelled as Covid. Some of those will be undiagnosed Covid, because, if they are older people in care homes who had not been tested, the registering general practitioner, or whoever, would not feel confident about putting it on the death certificate. They can put "suspected Covid", but it is actually used very rarely, in only 1% of cases. You have all those ways in which it is scaled up.

Then, of course, as we have heard, it finally gets scaled up to the total excess deaths, which are the indirect deaths due to the epidemic. I think that is the anxiety, because, as has been described, we have a hugely disrupted healthcare system, with a big drop in A&E attendances and hospital admissions, as well as almost non-functioning routine care, in chemotherapy, radiotherapy, elective surgery and so on. As Sir Ian described, that is going to have quite a long-term impact on deaths—it is bound to be there—and in the short term. There are reduced ambulance attendances and a drop in ambulances going for chest pain. The data that I would really love is on how often an ambulance arrives at a home to find that the person is already dead. That would be a very important figure.

We would also love to know about care homes where people are dying. At the moment, the majority of extra deaths in care homes are not being labelled as Covid. Why? Are these people not going to hospital? Would they have survived a bit longer if they had gone?

There is some quite worrying evidence if we look at just sex. We know, as I said before, that men have twice the death rate from Covid as women. Allowing for the different age mix, it means that overall 40% more men than women are dying of Covid. If we look at the non-Covid excess deaths, there is a slight excess in men, age adjusted, but it is only about 45% extra in men. If those were all unlabelled or undiagnosed Covid, you would expect the same sex ratio, but it is less than half. That sort of suggests that a substantial proportion of the 3,000-a-week extra deaths—I am not going to say how many or what proportion, but a substantial proportion—are indirect effects of the disruption to the health service and our lives.

Q482 **Zarah Sultana:** There is consensus that the best way to measure the impact of the virus is by looking at excess deaths, but, according to Professor Powis, the national medical director of NHS England, we may not have that data for months. In its absence, what is the best measure available for the UK and other countries to measure the impact?

Sir David Spiegelhalter: We get excess deaths 11 days later from the ONS; what we do not get, necessarily, are the reasons for them, and what they are being labelled as. The exercise over the rest of the year will be to look at that. Has there been an increase in suicides over this period, or a reduction in road deaths, which you might expect, and so on? That will be analysed over the rest of the year to see, over the year, how deaths from different causes are changing unusually for the time of year. That will give us a huge amount of information about the impact of the virus and of the measures taken. It will take time, but we are getting the raw numbers remarkably quickly, and we get them quicker than other people.

Germany and every other state does it differently; they do not put them together. Apparently, although it is not on complete data, Italy's excess deaths are double the Covid rate of deaths. That is the kind of information that we are going to need to make a fair comparison. I hope that we never get to the stage of producing some league table; it is too tragic to indulge in that kind of absurd ranking. Other countries are much slower to bring out that data, but when we have it we can start making some comparisons.

I give real credit to the Office for National Statistics. It is amazing what it has done; it is slogging its guts out to produce new data and analyses, such as the ethnicity analysis today, and organising the service for testing. It is an extraordinary achievement.

Q483 **Carol Monaghan:** Sir David, first, can I say on behalf of all of us that you are an excellent science communicator? You have been explaining

things extremely well this afternoon.

Can I ask you about the case fatality rate? The UK has the highest in the world—I know we are not going for league tables—but we do not have information on the infection fatality rate, which is a different thing altogether and might give an altogether different picture. Sir Ian talked earlier about the prevalence reports that are going to come out, and I think they will give us a lot more information. Could you say a little about the case fatality rate and the infection fatality rate, and what information it is giving us at the moment?

Sir David Spiegelhalter: I take absolutely no notice at all of the case fatality rate. I do not even know what ours is; it seems a complete waste of time to look at it. It is the number of people who have tested positive as the denominator and, out of that, how many deaths there have been. It is so dependent on the testing regime. I could make our case fatality rate go down simply by testing lots more people. It is the worst measure to use to compare countries. It is absolutely pointless.

The infection mortality rate, which is the best one to look at, is the one we cannot estimate because we do not know how many people have been infected, as they have not been tested. Finally, we are going to get that data coming on stream soon, which will be an extraordinary achievement.

Some people say that the infection mortality rate is around 0.9%, which was the original Imperial judgment, while others say it is 0.1%. How can you still be arguing on an order of magnitude difference about a simple factor? Obviously, it is not one number; it will vary from place to place, and so on. But I find it extraordinary that we are still arguing about a basic parameter that we need to understand the epidemic, at this stage, when we are coming out of the epidemic, or at least its first phase.

Q484 **Carol Monaghan:** Is there any sense among the scientific community of what the infection fatality rate might be sitting at? As you said, 0.1% to 0.9% is a massive change.

Sir David Spiegelhalter: It depends who you talk to. Which end do you want? I could find someone to justify each end. One of the major epidemiologists advising Sweden, which has taken a much more relaxed approach, although it is not as relaxed as people are making out—there are still a lot of constraints in Sweden—would say that it is around 0.1%, and that more than half of our population has had it. Next week, we should be able to find out, and about time too.

Some people say that it is more like 0.5%, and I think Neil Ferguson is sticking to something near 0.9%. We really should have an idea about that number; it depends on how many people have had it in the population, and that is something we still do not know.

Q485 **Chair:** Professor Peters, do you have a perspective on those very good questions?

Professor Peters: I totally agree. It is not atypical. It is a novel virus, so we need to find out, and it takes time to do that. I have one addition to the point about the case fatality rate, although I totally agree with the point about international comparisons and looking at it in that way.

I still think that case fatality rates are helpful within a hospital. I am not talking about population case fatality rates and all the flaws there, but within a hospital it is useful to be able to track, especially if you link it to quality improvement measures and clinical protocols. If you have a mechanism for learning from hospital to hospital and understanding the age, sex and comorbidities, you can learn things about how to ventilate patients and when to bring in oxygenation. From a learning perspective, case fatality rates in a hospital are still quite useful.

In the Ebola outbreak, it would have been very helpful to share the wide variation in case fatality, which was assumed to be similar but turned out not to be, because we learned that pushing massive fluids was actually very helpful. For a different purpose, and in the confines of looking at hospital management, the case fatality rate is still very useful.

Q486 **Chair:** On the infection fatality rate, Professor Peters, in your view of countries around the world, is there an emerging tendency towards a particular rate, or does it vary widely from country to country? Over time, is it continuing to vary or is it converging?

Professor Peters: A large order of magnitude difference is not uncommon during a pandemic or a big epidemic. I have been told by my colleagues who are doing the modelling that there is growing convergence, probably towards the middle of the range that Sir David was talking about. Again, it may not be the same in every country, and you need to look at age and sex differences in the infection rate as well.

In terms of what to measure, measuring other causes of death is going to be absolutely critical to understanding how this Covid epidemic has affected us, particularly with things around intimate partner violence or ambulatory care sensitive conditions. In the countries I work in, I see a big problem with not being able to provide immunisations and routine care for children under five. Looking at those kinds of issues, such as child mortality, which are not direct effects of Covid but are due to economic effects and the barriers to healthcare, is absolutely critical. Those are important things to add.

On the comparisons, what this pandemic has shown us is, again, how interdependent we are on each other in our different countries. It emphasises the need to invest in health emergency and disaster risk management around countries, and data systems around countries, as well as in preparedness and common protocols. The trick is to understand local epidemics and responses and be able to manage them. Interconnectedness is absolutely vital.

Sir David Spiegelhalter: The infection fatality rate, and concentrating on that number, can be very misleading, because it is a number that applies to almost nobody. Almost everybody is either way above or way below it. We can say that it is 0.7%, or something like that, but that tends to disguise the fact that if you are a teenager it might be one in 10,000, and if you are a frail person in your 90s it could be 20% or 30%. Trying to summarise that huge range through one number could be very misleading indeed, because people might think that it applies to them, when it applies to almost nobody.

Q487 **Chair:** Sir David, you have been very clear throughout your evidence today on the importance of that disaggregation. As you say, it has very important implications. Decisions are going to be made over the days ahead on how to lift some of the initial lockdown measures. You said that it would be absurd if a low-risk group had to observe restrictions that were relevant to a high-risk group. Would your advice, drawing on your analysis of the statistics, be to have a differentiated approach according to the risk of morbidity and infection in different groups?

Sir David Spiegelhalter: We have always had that, by having a group of people who are shielded and treated differently from everybody else. We have always had that risk-based approach. I suppose what I am saying is that it would be very helpful to have a more sophisticated risk-based approach, in which you put people into a number of groups. People could even self-allocate. An over-70-year-old who felt fit and healthy and wanted to do things, for example, might self-allocate, or people might just have a different risk appetite, but again I am talking about it as a measure in terms of risk to oneself. You need always to consider, on top of that, the risks that we all might be part of to everybody else. That obviously needs to be considered.

Q488 **Chair:** How do you put that together, if you are very low risk for a particular group?

Sir David Spiegelhalter: If we look at primary school kids, out of 22,000 deaths there have been two under 15, as I said, and they will have had some other condition. I would have thought that the risk to schoolchildren is completely negligible, but, of course, schoolchildren can carry the virus to other people. People are obviously studying the infectivity of children who pass it to their own families. That has to be taken into account in the measures that will be brought in. However, as part of the communication, it is helpful to try to make it clear that the kids themselves are not at risk in any sense more than they are normally at risk.

Chair: That is extremely helpful. Today's fascinating session has shown that data is relevant not just for individual medical decisions, vital though it is for that, but for understanding the spread of the pandemic to inform policy decisions, which is also crucial. The more data we have, and the richer that data, the better informed our decisions will be, and a very important dimension of that is to observe and learn from what is

![House of Commons logo] HOUSE OF COMMONS

happening in other countries. I thank both witnesses for your evidence and for the hard and important work that you are doing at the moment.