HOUSE OF COMMONS

Science and Technology Committee
Health and Social Care Committee

Oral evidence: Coronavirus: lessons learnt, HC 877

Wednesday 9 December 2020

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Watch the meeting

Members present:

Science and Technology Committee: Greg Clark (Chair); Aaron Bell; Chris Clarkson; Katherine Fletcher; Carol Monaghan; Graham Stringer; Zarah Sultana.

Health and Social Care Committee: Jeremy Hunt; Rosie Cooper; Dr James Davies; Dr Luke Evans; Neale Hanvey; Barbara Keeley; Taiwo Owatemi; Sarah Owen; Dean Russell; Laura Trott.

Questions 770 - 865

Witnesses

I: Sir Patrick Vallance, Government Chief Scientific Adviser; Professor Chris Whitty, Chief Medical Officer for England; Dr Jenny Harries, Deputy Chief Medical Officer, Department for Health and Social Care; and Dr June Raine, Chief Executive, Medical and Healthcare products Regulatory Agency.

Examination of witnesses

Witnesses: Sir Patrick Vallance, Professor Whitty, Dr Harries and Dr Raine.

Q770 **Chair:** Welcome to this joint hearing of the Health and Social Care and Science and Technology Select Committees, as part of our joint inquiry into what lessons can be learnt from our response to the Covid pandemic so far.

I am delighted to welcome the Government's chief scientific adviser, Sir Patrick Vallance, the chief medical officer for England, Professor Chris Whitty, and the deputy CMO, Dr Jenny Harries. All have been regular contributors to the hearings of our separate Committees, and we are very grateful for that. We are particularly grateful for their appearance today, given that this session is specifically looking back at the course of the pandemic and learning some early lessons from that. A lot of our questions will be looking back rather than at the immediate events of the last few days.

Having said that, given the importance of the breakthroughs that have taken place in vaccines, we thought that at the beginning of the session we would invite Dr June Raine. I am pleased to say she accepted. Dr Raine is the chief executive of the Medicines and Healthcare products Regulatory Authority, the UK's medical regulator. Everyone knows that the UK is the first country in the world to license the Pfizer/BioNTech vaccine.

Dr Raine, we are very grateful for your appearance before us today. We are going to start with some questions to you, before we turn to our other witnesses. The first question is the obvious one. How was it possible for you to complete the evaluation of the Pfizer/BioNTech vaccine before any other jurisdiction in the world?

Dr Raine: Thank you, Chair, and good morning. As the Covid-19 pandemic is a public health emergency, we undertook to complete our scientific evaluation and approval in the shortest possible time, while complying with established and robust safety, quality and effectiveness standards. We have extensive knowledge in the Medicines and Healthcare products Regulatory Agency on vaccine development with existing vaccines, and that is applied by our very experienced scientists and clinicians, including those at the National Institute for Biological Standards and Control.

We adopted a novel, or innovative, regulatory process known as a rolling review. Normally, all the data on a vaccine's safety, quality and effectiveness, and all required documentation, must be submitted together to start an evaluation to approve a medicine or a vaccine. In the case of a rolling review—in this case—we reviewed data in packages or tranches as soon as they became available from the ongoing studies, on a staggered basis. By reviewing data as soon as it became available, we could reach an opinion sooner on whether the medicine or the vaccine could be approved.

In this case, parallel teams of clinicians and scientists worked on the various aspects of the data required to conclude in as short a time as possible, and that in no way compromised the level of scientific rigour. I can say from knowledge that many thousands of pages of tables and graphs were deliberated over and pored over, pretty much round the clock, from early October onwards.

As an extra layer, to build confidence in scientific rigour, as well as to strengthen our own analyses, all our data and analyses have been thoroughly reviewed by the Government's independent advisory body, the Commission on Human Medicines. They have all—all the members and the chair—had full access to the data and they, too, have particularly reviewed every aspect of safety, effectiveness and quality in order to give advice to the Government.

In summary, Chair, the highest standards of safety, effectiveness and quality have been met. No corners whatsoever have been cut. There are no compromises on standards whatever.

Q771 **Chair:** Thank you, Dr Raine. We are very grateful for that, and also for what you alluded to, which is the extraordinary hard work of your team over many weeks and months. That is very much appreciated by everyone.

The rolling review has been the key to doing it quickly. Why don't other countries do that? Why has it not occurred to them that it might be a good way to do it?

Dr Raine: It has certainly occurred to other countries. As the Committees will understand, the company data have been provided to other regulators, in particular the European Medicines Agency and the Food and Drug Administration in the USA. They too have been able to look in a rolling way, but the flexibility and agility of the clinicians and scientists at the MHRA, coupled with their familiarity with vaccine development and approval and the access to independent expert advice, was key to our ability to progress in the shortest time.

I, too, would like to pay tribute to and thank our Government's independent advisory body, the Commission on Human Medicines, and its expert working group. They met at nights and weekends, particularly in recent weeks, to delve into the detail in the absolute way that the Committees would expect. There has been flexibility and agility on all sides, given the importance of the situation that our country is in at the moment with the pandemic.

Q772 **Chair:** Thank you. In your discussions with other countries, are any of them looking to move to the kind of model that you have followed in this country?

Dr Raine: Certainly. They have welcomed the ability to look at data in advance, rather than the former model of the one-stop shop. I have stressed, though, that the agility that has been employed, not just by our

own staff but by our external experts, has enabled us to progress in the shortest time possible.

It is my understanding that the Food and Drug Administration will be looking this week to conclude its review, and the European Medicines Agency fairly shortly thereafter.

Q773 **Chair:** Clearly, we have been talking about the Pfizer vaccine. When do you expect to complete your review of the AstraZeneca Oxford vaccine?

Dr Raine: The data packages for the AstraZeneca Oxford vaccine have been arriving. We expect a further package in the coming days. The Committees will be aware of the publication yesterday in *The Lancet*—a peer review journal—testifying to the excellent and intensive work that has been done by the Oxford group and AstraZeneca. I would not be able to give the Committees a firm date, because the review is clearly very active. There will be questions and deliberations that we pursue in exactly the same way as we have done for Pfizer/BioNTech. I am not able to give a firm date, but I can assure the Committees that work is proceeding intensively and with great scientific rigour.

Q774 **Chair:** One of the features of the Oxford AstraZeneca data and the clinical trials is that two different doses were part of the investigation. Are you evaluating the use of both types—the full dose and the half dose—or just one of them?

Dr Raine: Our regulatory review is all-encompassing. We will look at all available data that give us insights to benefits and risks that are necessary to reach a position. Clearly, we have great interest in the possible reasons for the different doses having a different efficacy/effectiveness read-out. The position is that we will look at every piece of evidence.

The interim data, as I mentioned, have just been published. They are interim, and we will be reaching a position on the basis of all completed studies and analyses. Of course, part of that will be to examine with great rigour the basis for the appropriate dosage regimen for UK people.

Q775 **Chair:** Do you expect, coming out of that, to have a licence approval, assuming the conditions are met, for a particular dosage regime, or will that be a choice left to others, perhaps clinicians?

Dr Raine: It would not be appropriate for me to predict at this moment. We will look with meticulous care not only at the different efficacy read-outs for the two different regimens, but at the possible reasons for the immune response being different, and whether there is a scientific basis. Therefore, I would not be able to predict whether the final approval, if it is reached, will have either the two or the one regimen.

Q776 **Chair:** Going back to the Pfizer vaccine that you have approved, the Food and Drug Administration in the US says that the Pfizer vaccine offers significant protection after one dose. Does that conform to your findings and your experience of the evaluation?

Dr Raine: Certainly, there is immune protection after one dose, but we are looking to optimal protection. That is why the authorisation in the UK for use of that vaccine looks at two doses, 21 days apart, because we know that there is a very good level of protection seven days after the second dose.

Q777 **Chair:** We know that there is protection from one dose. It is a question of how much higher it is after two.

Dr Raine: Absolutely.

Q778 **Chair:** We have talked about two of the vaccines. For completeness, can you give us an update on where you are with the Moderna vaccine?

Dr Raine: We are engaged with the developers in the rolling review and, in the same way, are expecting to have a mature data package in the coming week or two. Therefore, we will be mobilising the same parallel teams to deliver a rolling review outcome as soon as we can possibly achieve that.

Q779 **Chair:** This is a lessons learnt inquiry, as I described at the beginning. You have been good enough to come today to give us your experience on something that is very live. The development and approval of vaccines has clearly been a crucial part of the response to the pandemic.

Reflecting back, if you even have the ability to do that given the immediacy of your work, are there any lessons that can be learnt already, given your long experience as a medical regulator, about how we might approach the development of vaccines and other drugs in the future?

Dr Raine: We have learnt very important lessons about the absolute imperative of engagement with developers in a proactive way from the earliest stages. We have learnt about the importance of independence and of our expert advisory committees being able to bring in expertise to strengthen the assessments that we deliver. When we think about the future, and the important role of vaccines in our switch to a preventive healthcare system, those vital therapeutic tools should be part of our national infrastructure. At the agency, we look forward greatly to VMIC coming on stream—the Vaccines Manufacturing and Innovation Centre that our own inspectors and experts in the field have been working to help establish.

These are very important lessons, and we will build from them for the future to enable the UK to have access to the best therapeutic options and vaccines that are so important to change health, and potentially minimise or even eliminate certain infectious diseases.

Q780 **Jeremy Hunt:** Dr Raine, in the global race to approve a vaccine, you won the equivalent of a gold medal for Britain in the Olympics. I wondered what you think that says about British science.

Dr Raine: It tells us very important things about British science. This country has brilliant scientists. Their ability to move to areas of public

health importance has been totally impressive. The agency, which is an independent regulator, but formerly seen perhaps as a watchdog, should now become an enabler by active engagement in the earlier stages with those brilliant scientists.

Q781 **Jeremy Hunt:** Where would you say we stand as a country in the global rankings when it comes to our science?

Dr Raine: I would say that we are in the top rankings. I say that with evidence from our Covid response; for example, our ability to show that dexamethasone was a drug that reduced mortality in seriously ill hospitalised patients was a gift, if you like, from the UK to the world. It has saved probably in excess of 1 million lives.

On technical expertise, I would allude to the continuous positive airway pressure device, called the Ventura, which was developed by University College Hospital, together with Mercedes Formula 1 and our team of medical device specialists. Again, that has been associated with a reduction in mortality and a reduction in the use of ventilators. I would say with confidence that UK science is top ranking, and we can provide the evidence.

Q782 **Jeremy Hunt:** Many congratulations to you and your team. As you know, in Russia and China they have been distributing vaccines for some time. Could you explain the difference between what we have done and what they have been doing?

Dr Raine: The UK MHRA is a very active member of the International Coalition of Medicines Regulatory Authorities and helped the coalition become established in recent years. It brings together countries, including China and Russia, and provides a forum to try to answer the very important question that you asked.

Around the world, regulatory rules and standards are different, and approaches to early access are different. Although we have established a coalition, it is early days to understand fully how China and Russia managed to start their particular programmes of immunisation. The standards that we use here in the UK have been established through very robust processes with the international conference on harmonisation, and close linkage and working with the World Health Organisation. Therefore, the British public can have confidence in the standards we adhere to.

Q783 **Neale Hanvey:** Good morning, Dr Raine. Would you mind explaining to us, for the completeness of the evidence we are gathering, the importance of the role of the MHRA in allowing medical products and devices to come into use?

Dr Raine: Our role, in a nutshell, is to enable access, but the evidence we require is that the benefits outweigh any risks. Therefore, we take every care scientifically and in our robust procedures to ensure that those standards are met.

At the point of approving, we also create a proactive plan to monitor the benefits and risks in clinical use. Our job does not stop this week. It

started in the new phase yesterday, as soon as people began to receive their Covid-19 vaccine. If it would help the Committee, I can provide more information about the very careful plans we have made for realtime vigilance. The role is before, during and after; there is a true end to end, looking from the scientific laboratory bench through to the patient who, yesterday, first received the vaccine.

As an illustration, I can share with the Committees that even last evening we were looking at two case reports of allergic reactions. We know from the very extensive clinical trials that that was not a feature, but if we need to strengthen our advice, now that we have had this experience in the vulnerable populations—the groups selected as a priority—we can get that advice to the field immediately.

Q784 **Neale Hanvey:** Looking at it from a slightly different angle, what would your comments be about the use of a treatment or a device for a purpose for which it was not licensed by MHRA? How would you view the promotion of a treatment or device that had not been approved by MHRA?

Dr Raine: The law permits a healthcare professional to use a treatment or a medicine if they consider it in the best interests of their patient, with full information to the patient. Promotion means something rather specific to us, and there is no ability to advertise a medicine that has not been approved. The Committees may know that we took careful steps, before the particular approval this week, to make sure that the availability of a Covid-19 vaccine, through our temporary authorisation of supply in the pandemic, could be the subject of appropriate promotion.

Q785 **Neale Hanvey:** In my experience, unlicensed products have been used. In that circumstance, what kind of information would you expect to be passed to the person who was subject to the use of that product before an unlicensed product was used for unlicensed purposes?

Dr Raine: I stress that the Covid-19 vaccine, which has been subject to temporary authorisation, has met full standards.

Q786 **Neale Hanvey:** Sorry. I should be clear. I am not talking about the vaccine. I am talking about general principles.

Dr Raine: In general terms, the expectation would be that the healthcare professional would share full information with the person whose needs they judged would be met by an unlicensed product, and that they would take full responsibility to monitor safety. They would record the conversation and the necessary point that the person was aware that it had not been licensed for that particular use. There is good advice on the issue, and we have provided that advice to healthcare professionals, particularly so that there is not a barrier and that the obligations for best practice are very clear. I would expect the healthcare professional to be clear that what they were advising was something that any member of their profession would be able to say was evidenced in their experience.

Q787 **Neale Hanvey:** Would you expect evidence on that product to be

gathered using a specific research protocol?

Dr Raine: That would be a most useful thing to do. It is not a requirement, but we expect any company that is marketing a product and aware of unlicensed use to gather data on safety and effectiveness, and submit it to us in the normal way.

Neale Hanvey: Thank you very much.

Q788 **Chair:** Dr Raine, thank you for coming today. You have a lot on your plate. You have at least two other vaccines to direct review work on. We are very grateful to you for helping the Committees with your reflections this morning. I hope you will come back, perhaps in the new year, to reflect at greater leisure on the achievements and their components, so that we can advise our successors. Thank you very much for joining us today.

We are now going to move on to direct our questions to Sir Patrick Vallance, Professor Whitty and Dr Harries. Thank you again for coming. Perhaps we can start with the question of vaccines.

Sir Patrick, you are the Government's chief scientific adviser. You have been personally and intensely involved in the whole move to develop vaccines from the outset. What are your reflections on the components that have allowed us to make this great start, ahead of much of the world in the assessment of the vaccines?

Sir Patrick Vallance: It was my assessment, and other people's as well, very early on, that trying to get a vaccine was going to be a really important part of approaching this disease. In order to do so, recognising that many vaccines fail and there had not been a successful vaccine against any human coronavirus before, it was going to be necessary to look very broadly across the world at what was happening, and to look at a diversity of approaches. There are many new vaccine technologies. The Pfizer/ BioNTech one is an example of a so-called messenger RNA vaccine. That means that the landscape for making vaccines quickly has changed quite radically in the past five to 10 years.

Building on some very important things that were done prior to all of this, which include setting up a vaccines trial network that Chris may want to speak to, long-term investment in the science of vaccinology and related disciplines in the UK meant that we had a good baseline of expertise. We wanted to bring together people from industry as well, to make sure that we had expertise in manufacturing in particular. Very often with a vaccine, the problem is that, even when you have it, it is difficult to make it and to make sure that you can get it out in the right quality at the right time.

We brought manufacturing people in—people from industry, academics and others—to set up a vaccines taskforce to log what was going on across the world and which ones we thought might be the most promising, to work out how we would then support them where it was appropriate to do so, such as the UK ones and others that we thought we needed to support, and to work out mechanisms for access where we

thought that would be necessary. That was the vision behind the vaccines taskforce, which Kate Bingham then came in to lead so successfully.

It was important that we did that, because we do not have a domestic vaccine manufacturing base in this country or, indeed, a domestic company discovering and making vaccines in this country. We have companies that do that, but it is often done elsewhere in the world rather than in the UK. We knew we had some domestic resilience to build up.

The VMIC, which has already been referred to, is part of that, but it was broader as well in terms of so-called fill and finish, which is the final part of the vaccine where you fill the vial itself. It sounds trivial but it is not; it is very complicated and has to be done in certain circumstances. We knew that some of the new technologies, such as messenger RNA vaccines, would ultimately need specialist facilities in order for them to be made. There was a comprehensive and systematic look at that early on, linking to companies across the world that we thought were doing it right, and making sure that, where appropriate, we got options on vaccines.

Very early on, we recognised that vaccine nationalism was not the answer. We had to get ourselves sorted out, but vaccines need to be available for the world, because ultimately this is a pandemic; it is in every country. As part of that, we were also very keen on initiatives through the WHO and others, such as COVAX, on how we became part of a global solution to make sure that doses, money and expertise were available for others as well. That has been an important part.

It was a very comprehensive approach. June Raine spoke about agility, flexibility and scientific expertise. Those were the things that were brought into the vaccines taskforce to try to do this in collaboration as quickly as we could, knowing that it would be necessary to get access both for the UK and across the world.

The final point is that in all of this it has been important to have links in other countries. We have had links with the Warp Speed programme in the US, and with others, to know what is going on and how we can share information and approaches where appropriate to do so.

Q789 **Chair:** Thank you very much indeed. There is lots there that might have wider applications as we look to learn the lessons: internationalism; anticipating future needs; having a spread of possibilities that we are associated with, not knowing which is going to come right; and paying attention to the physical, and sometimes logistical, aspects, as well as the intellectual property. Those are all themes that have a wider application.

Professor Whitty, the clinical trials side has clearly been an indispensable component of this success. What are your reflections from the vantage point of today?

Professor Whitty: I would make two points. Patrick has talked very clearly about the period in this year leading up to the vaccines taskforce. I am going to go back a bit in time and then forward a bit in time.

To go back to how we got to where we are, you could go all the way back to Jenner. I am not going to, but I would like to go back to the Ebola crisis. In the Ebola west African crisis, when I was heavily involved as part of the Department for International Development, one of the things that was clear was that there were vaccines that were very near end point but had not been properly progressed. Therefore, we had to manage the Ebola crisis in west Africa, in support of the Government of Sierra Leone, entirely around case finding and isolation as the principal tool because we did not have a vaccine. Vaccines had got to quite a late stage of pre-clinical development. We realised that we needed to be able to accelerate vaccines through.

To pick up Patrick's point, science is an international discipline; we all have to do our parts. It was the initiative of the then Prime Minister, David Cameron, and of Sir Oliver Letwin, who I think drove a lot of it. They put into the Department of Health, under Mr Hunt at that stage, a UK vaccines network. I was asked to chair it, and I have carried on chairing it since then. The aim of that was to identify diseases that were not flu. I was very clear on that point: they were not flu. There was a lot of thinking about flu and it was really important to think about all the other diseases.

We did three things. We prioritised all the diseases that we could predict might need a vaccine. Obviously, No. 1 was disease X. We had not yet got it, and that is indeed what we have at the moment. No. 2 was MERS, a coronavirus then circulating, and still circulating, in the Arabian Peninsula. That was very important because we then invested in some early MERS vaccine work in Oxford, which was some of the base science that helped them to move so fast on the Oxford AZ vaccine. That is an example of the thinking ahead helping us, although of course you could not predict this particular one. That is one area.

A second initiative on a larger scale internationally was set up, and I pay particular tribute on that to Sir Jeremy Farrar. It was the CEPI initiative and was a large multinational approach to novel vaccines, again for epidemics. I was on the interim board when it was first set up, so I had some understanding of it. That is an area where, again internationally, we tried to identify the kinds of vaccine targets, and the vaccine platforms—the different models of vaccines—and to develop them as much as possible so that we had a wide toolbox for when something happened.

Those kinds of precursor activities, plus a huge amount of basic and translational science, allowed us to advance. When it came to the trials in the UK, we were able to use the National Institute for Health Research, NIHR, clinical trials network, which allowed us to do trials in multiple sites very fast. That helped us both with the drug things we have done—the UK's response on clinical trials for therapeutics has been extraordinary in international terms—and for vaccines. Again, it used the pre-existing system.

If I can skip forward, Dr Raine talked about identifying things once a vaccine is in use. The initial process very importantly picks up common

side effects. That is what big phase two and then subsequently, if they are safe, phase three clinical trials allow to happen. There are extremely rare but important issues, and inevitably you accrue more information over time. The NHS through to the MHRA is in a very good position to make sure that we can pick things up quickly, identify them and communicate them widely, and ensure that we improve practice. There is a backward-looking bit and a forward-looking bit for vaccines. They all depend on pre-existing systems.

Q790 **Chair:** Thank you. That is very helpful and very comprehensive. We have been thinking about the structures of scientific advice in Government throughout the pandemic. Was SAGE part of the response in developing vaccines, or was it outside the SAGE structure?

Sir Patrick Vallance: It is not really a SAGE issue in that way. SAGE would have a view on vaccines from some of the experts around the room, but this was about getting things set up, operationalised and getting the science into practice. That is different from the science advice that comes through SAGE.

It also demonstrates a general point, which is that because SAGE has been so visible a lot of people assume that SAGE is the only form of science advice to Government. Of course, it is not; it is a particular form that brings together things to address questions that cross multiple departments and so on. This was a focused activity that needed to take place, and that is why I was so keen to get a vaccines taskforce working on it with the right experts at the right time, including—Dr Raine alluded to this—making sure that regulators were plugged into it extremely early, so that we were not doing what often happens, which is that you develop something and then something gets thrown over the wall and caught by somebody else.

Q791 **Chair:** That is very helpful. I wanted to establish that not all scientific advice during the pandemic has been through the prism of SAGE. There have been multiple ways.

Sir Patrick Vallance: There are lots of other big organisations, of course, that are scientific operational groups within Government that have dealt with things as well during this epidemic.

Q792 **Dean Russell:** May I say how fantastic the news about the vaccine is? Thank you for all the work you have both been doing to drive that forward.

I have a few questions around the preparations, moving forward. First, could I get an outline and a clear summary of what the next year looks like in terms of the roll-out?

Sir Patrick Vallance: Roll-out of vaccines?

Q793 **Dean Russell:** How are we going to get them to the right people at the right time? There is roll-out in terms of vulnerability. Who is going to be doing the vaccinating? Several million people are going to have to have vaccines. Is it going to be by GPs or hospitals? Who is going to be

administering them? I would like to get an overview of what that will look like.

Chair: Sir Patrick is going to tell me that this is an NHS matter, and therefore the chief medical officer is probably best placed to answer it.

Sir Patrick Vallance: Yes.

Professor Whitty: It is an NHS matter. Although the NHS obviously has independence, I am going to speak in broad terms about the kind of approach it is likely to take.

The first thing is that the only current vaccine for which we have emergency authorisation for use—the Pfizer one—has a very complicated cold-chain system, having to be maintained at minus 70 or below, with relatively small numbers of changes of hands. That makes it rather harder operationally than some of the potential subsequent vaccines that might come through. We have talked about the AZ one already, but there are several others that will come through from a variety of sources later in the year.

It is much easier to operate through hubs, but the aim would be to take it out through the system as far as we can. That is true in all four nations of the UK. Of course, we talk to one another the whole time and try to co-ordinate our activities as much as we can.

When we start off with vaccines, as with any drug, we want to take things a little bit more carefully to begin with, so that we get to know how things work. For example, Dr Raine talked about the fact that we were discussing those two early cases. She and I were discussing that at 11.30 last night. You start off doing it in centres where you have all the equipment, and then, as you are comfortable and understand them, you move them out. That is the standard way you would think about the safety of things. The aim would be to roll out this vaccine, and then any others that get a licence and are effective and safe. We expect by the middle of the year to have a portfolio of probably three or four vaccines that we can use.

Provided that all is going fine and there are no late tumbles, in terms of side effects that the regulators find, or anything of that sort, the first question will be, who has it? The Joint Committee on Vaccination and Immunisation—JCVI—has done a prioritisation list, starting with the most vulnerable and those who look after the most vulnerable, as a way of protecting them: care homes; then people over 80; then people over 70 plus care workers and healthcare workers; and so on. The list goes all the way down to people over 50. We go down in stages because this disease is one that, very predictably, is much more dangerous for older people and people with pre-existing health conditions than for others.

Once we have gone through the first list, which takes us to roughly 20 million people, there are some wider choices to make about how we go on from there. Those will be important ethical and political choices, as

well as clinical choices. The first choices, in a sense, make themselves because they are the people who are the most at risk.

The final question—I am happy to expand on any of these—is whether we need to revaccinate people and, if so, when. We know that these are very good vaccines to provide short to medium-term protection. We do not know how long that lasts. It might last for a very long time; it might last for nine months. It is more likely to be somewhere between the two. In that case, we may have a situation where we need to be in a position to revaccinate, particularly people who are the most vulnerable.

We will have to think about all of those things as information comes out on length of effect, efficacy, safety and so on, and which vaccines best suit which people.

Q794 **Dean Russell:** Are we going to look at an annual vaccination programme? By the sound of it, that is potentially the case. On the rate of vaccination, if we have the same Select Committee in a year's time, what would be a good result for you as a percentage of the population being vaccinated?

Professor Whitty: To answer your first question on whether we need to revaccinate and how often, we do not know. There are broadly two reasons to revaccinate. One is that the immune system wanes, so the same vaccine is used repeatedly but you still have to revaccinate. The other is that the genetic thing you are targeting the vaccine against shifts, and the infection evolves around the vaccine. That is what happens with flu. You then have to reformulate the vaccine and use a slightly different vaccine to deal with the new version. Those are the two situations in which you might need to do it.

In terms of what looks like a good response, the first priority is absolutely to provide protection for the people who are most likely to have severe ill-health, potentially die or certainly end up in hospital with severe problems. Those are predictable based on the numbers. Some people who are younger and not predictable will still get severely ill with this infection. We would want to go down further than that, but start off with the most vulnerable.

That is all about protecting the individual who has the vaccine. A second question, to which we do not yet know the answer, is whether, if you vaccinate someone, you protect the people they meet. Is it a transmission-preventing vaccine? We do not yet know that. My expectation is that it will be to some extent, but whether it is a small or a large amount is not yet clear.

Some vaccines only provide individual protection. The tetanus vaccine, for example, only protects the person who is vaccinated; it protects no one else at all. In that case, you are really trying to make sure that it is for the most vulnerable. If, on the other hand, it is something that protects everyone around you, it is strongly in the interests of everybody that many other people are vaccinated. It then means that people for

whom the vaccine is not working, or who cannot take it or have chosen not to take it, are protected by the fact that people around them have immunity and are therefore not going to transmit disease to them. We do not know that yet, and it would be a mistake for us to say that we are going to try to achieve that kind of population immunity. We are not confident yet whether that is biologically possible. I think it is likely, but it is not definite.

Q795 **Dean Russell:** The thing that everybody is looking at for the vaccine is around when we are going to come out of lockdown. That is the light at the end of the tunnel. If it is the case that the vaccine only protects the individual from transmission and not others, at what point does SAGE recommend that lockdowns are no longer needed? Have there been conversations on that point yet?

Professor Whitty: I will give a view, and then Patrick will want to give a view. My view on that is that what the vaccine will do for sure, even if it has no onward protection advantage at all—I think that is unlikely; I think it will reduce transmission, but let's assume it doesn't—is that, incrementally, it will first reduce the mortality rate very substantially. Mortality is very heavily skewed towards older people, so once you get through that it will substantially reduce it. Then it will start to reduce very substantially the number of people who go into hospital and have severe disease. At a certain point, society, through political leaders, elected Ministers and Parliament, will say that this level of risk is a level of risk that we think it is appropriate to tolerate, just as we accept that in an average year 7,000 die of flu and in a bad flu year 20,000 people die of flu. We accept that that is what happens biologically. At a certain point, you say that the risk is low enough that we can largely do away with the most onerous things that we have to deal with.

It will happen incrementally. We will not do absolutely everything until one day when we suddenly stop. There will be a gradual retreat, but it is a de-risking process rather than it just going away. We will de-risk, hopefully to a very low level of risk, but it is very unlikely that we will get to a zero level of risk. SAGE can help—this is where I turn to Patrick—in saying what level of risk there is. It is ultimately a societal, and therefore a political, question as to what level of risk the population wishes to tolerate, relative to the damage that is done to other areas of society, the economy and so on. Those are the difficult choices.

We are not there yet. For the next three months—I want to be very clear—we will not have sufficient protection. We are going through the most difficult time of year for respiratory infections, and the most difficult time of year for the NHS. The idea that we can suddenly stop now because the vaccine is here would be premature. It is like someone giving up a marathon race at mile 16. It would be absolutely the wrong thing to do, but there will come a point when the choice about exactly when to start to ramp things down, how fast and which things, needs to be made. That is fundamentally a science-informed political decision.

Q796 **Chair:** Sir Patrick, do you have anything to add?

Sir Patrick Vallance: I agree that it is a science-informed political decision. What we are looking at is exactly that sort of question, depending on the effects of the vaccine on transmission. As Chris said, we do not know that yet. You would have different models as to what that would mean for the degree of immunity you end up with across the population that is relevant to keeping suppression of transmission versus protecting those who are most vulnerable.

Priority No. 1 has to be to protect those who are most vulnerable. You can see the effects of that. There will still be transmission among others at that point, so we need to be aware of that. Then we will know a bit more, as we learn about transmission across the different vaccines, about their effect. Ultimately, there are decisions to be made about how much risk society wishes to take with that.

Q797 **Chair:** Assuming, perhaps pessimistically, that there isn't prevention of transmission, but only protection of the individual, what would be a reasonable threshold proportion of people vaccinated for the conversation to start as to removing the social distancing measures?

Professor Whitty: Ultimately, it is a political question. I think very few people would recommend starting to remove things during a high-risk period of the year, which the winter always will be for respiratory infections, until the tiers the JCVI has laid out are covered. Those are the ones who are by far the most likely to die. They are the ones who are by far the most likely to end up in the NHS.

That leaves a lot of people who could, for example, have all the syndrome of things currently called long Covid. There is a variety of other medical things. It is not that that will get rid of the problem completely. Once you have got to that stage, what we want to do next becomes a really important conversation. Of course, you can have the conversation in advance of that, but most people would want to see that level of protection. If you were only to vaccinate those 20 million people—the numbers are rough, but just for the sake of argument—you would still have a lot of people who were susceptible. That will not produce population immunity, even if it prevents transmission. It will substantially reduce mortality and significantly reduce impact on the NHS, but it will still leave a lot of people who could become ill and could, in some cases, have serious outcomes.

Q798 **Chair:** As we have talked about before in this Committee, concern for the NHS being overwhelmed has been an important driver. Once we get to that point, you can have the conversation as to the balance of harms and advantages of a different regime.

Professor Whitty: Yes, but I go back to my point that I consider that to be a question for Ministers and elected politicians on behalf of society. We can inform them by saying, "If you do this, this is what we think will happen," and, "If you do this, that will happen," but it is a societal choice. I do not think that medics or scientists should make that final decision.

Chair: That is very clear; thank you very much.

Q799 **Rosie Cooper:** Professor Whitty, we know that the UK secured access to several vaccines. Are there implications in having those different vaccines in circulation? How would we determine who gets what? Will the population have a choice? I would want a choice. Would it depress vaccination rates if people are not allowed to choose?

Professor Whitty: Getting to a situation where we have enough vaccines that you have a choice as to which one you want will be a very nice problem for us to have. It is not the problem we have at the moment, and it is not the problem we are going to have for the next four months.

I am nowhere near the top end of the tiers so it will not be for a while, but when it is my turn to be vaccinated, I will absolutely have the vaccine at the point when it is appropriate for me to do so. I will be given a choice probably between either having no vaccine or the vaccine that is available for me at that stage. I will be very happy with that. If the choice is between no vaccine and a good vaccine, I am going to choose to have a good vaccine. I do not have a strong view as to which good vaccine I have, provided it is safe and effective. The whole process that Dr Raine was talking about at the beginning, and the subsequent post-authorisation surveillance, is all there to do that.

It may be that we get to a situation in the autumn where there is more than one vaccine, but a lot of that will be to do with the particular properties of the vaccine, exactly how it works and what the side effects are. There are so many things we currently do not know. There may be particular people for whom particular vaccines are better or worse medically, just as there are for many medical drugs. If you want to bring down someone's blood pressure, there is a choice of about 30 drugs you could use. With some of them you toss a coin, and with some of them it is clear that particular people are going to benefit from particular drugs. That may well be true here.

I go back to my first point. It would be a nice problem to have. Currently, if the choice is between a good vaccine and no vaccine, I shall go for whichever good vaccine is available.

Q800 **Rosie Cooper:** You have just indicated that you were unlikely to have a choice for about four months. Later in your answer, you mentioned the autumn. If there isn't approval for the Oxford vaccine soon, will there be an interruption of supply? We have ordered 40 million doses of the Pfizer vaccine. What is the supply schedule? With the Oxford vaccine, when it comes on stream, we do not currently have evidence of its efficacy in the over-55s. What is the strategy? How are we going to maintain supply over the next six months, shall we say?

Professor Whitty: I will make a science comment, and Patrick may then want to make one because he is on the vaccines taskforce, which I am not, on this particular issue.

The science point is that on the AZ vaccine—the Oxford vaccine—there is one particular bit that has not been tried in older people with full data.

The paper was published in *The Lancet* yesterday and it bears full reading. There are older people who have had it, so it is not that there is no data on older people. It is just the way the trial was constructed.

The second rather obvious point is that, of course, every company that has an authorised product is going to want to ship as much of it as fast as it can make it. These are not trivial things to make. They are significant things, and they have to be made properly to maintain proper efficacy and safety. You have to have a proper cold chain and so on. A lot of it will be constrained simply by what is possible as much as by choice. In fact, choice is probably a second order question at this point in time. Patrick, do you want to add to that?

Sir Patrick Vallance: I am not sure that I have much to add. It is a supply chain issue at the moment, and we need to wait and see where the Oxford AstraZeneca vaccine gets to with the regulators. There is the Moderna vaccine as well, as Dr Raine said. Depending on where they get to in the regulatory process and the ability to supply, we will either have more or less vaccine available. At the moment, we have Pfizer in a decent position in terms of the number of doses to get on with the most high-risk people, as we said.

Q801 **Rosie Cooper:** Could I press the point about Pfizer and the current take-up? I understand that the amount being given to the major hospital centres is around 1,000 doses currently. When will they get their next supply? Are you really saying that even at this small number you are assured of continued supply, or are we going to end up with a gap while we wait for further supplies into the country?

Professor Whitty: I am glad to say that the British public in all four nations of the UK have the services of some extremely good supply chain people, and I am not one of them. It is a very fair question, but I do not think that either Patrick or I are the right people to ask how supply chains work on this particular thing. My understanding is that there will be a steady stream of vaccines, as the manufacturers can make them and they can be shipped. We anticipate being able to move steadily and ramp up over the coming months.

The great majority of people being vaccinated, as people have said several times over the last several days, will be vaccinated in January, February and March next year and not this side of Christmas. We should be really clear about that. Even if the AZ Oxford vaccine is authorised for use by the MHRA, we are still looking towards next year, 2021, before we have significant amounts of supply of those two vaccines.

Q802 **Chair:** We have a lot of ground to cover. We want to turn to the subject of treatments. If we could have short questions, and answers that are as brief as you can manage while conveying the information, that would be very helpful.

Sir Patrick Vallance: I want to reiterate something I said at the beginning. Vaccine technologies have changed so radically in some cases—such as the messenger RNA vaccine in the last few years—that it

completely changes the possibility of getting rapid responses to new infections. That is a point that is really important to learn in terms of resilience going forward. You can go from the genetic sequence of a bug to the potential vaccine candidate in a very short period of time. There is lots of optimisation to do afterwards, but that is a new thing that is worth hanging on to as we think about the lessons we need to learn for the future.

Chair: Absolutely. Thank you for putting that on the record. It is one of the most exciting developments and discoveries during this time. It is really important, and we are determined that the Committee should highlight lessons that can be applied, hopefully immediately, for future use.

Q803 **Dr Davies:** Professor Whitty, some moments ago you referred to the UK's response in the development of therapeutics as extraordinary. What is your view as to how that could be improved further still, looking to future pandemics?

Professor Whitty: Let me say why I think it was extraordinary, because it is important that we celebrate the things that have gone well, before saying where I think we could improve further.

The numbers of people who are in studies in the UK are quite extraordinary. To take an example, yesterday the RECOVERY trial—the largest trial of therapeutics—reached 20,000 people, UK citizens who had volunteered to be part of it. Other trials are also ongoing. We currently have 90,000 people under trial, and in total over 640,000 people are taking part in Covid studies of some sort or another in the UK. That is an absolutely extraordinary achievement.

It builds on a combination of things: the very strong foundations of the NHS and the very strong funders we have, such as the National Institute for Health Research, which I run, and the Medical Research Council, which is in UKRI, and the Wellcome Trust, among others. There are also the medical research charities, so there is a good funding base. There are outstanding academic centres throughout the system and, very importantly, a very strong ethics and regulatory system. The HRA—Health Research Authority—looks at the ethics before things happen, and the MHRA regulates trials. If we did not have those building blocks, it would be very difficult to do that.

We have been able to respond so quickly because we have a lot of building blocks, but the biggest reason is that UK citizens have been extremely generous with their time, and have been prepared to take the slight risk of going into clinical trial with a new drug or vaccine because they wish to do that for society. They are the extraordinary heroes of this. If you just think about those numbers, when we get to the end of next year we will look back and find that a very high proportion of the research on therapeutics was done here in the UK. It is because of all those things coming together. There is a lot to be proud of. A very

remarkable number of drugs have been tried by RECOVERY, REMAP-CAP and a variety of other trials.

What could we do differently? We demonstrated real speed on what are called phase three studies. We have a great skillset in that. Those are drugs that you can take straight through to a rapid large-scale trial. The RECOVERY trial, which I talked about, ran out of Oxford, was funded by many people, including NIHR, and has been highly successful. That takes drugs already licensed for other uses. We know a lot about their side effects. In the main, we know a lot about their other properties. You can take them into large-scale trials where you can find things out very quickly. That has been really strong.

We have been slightly less strong on what are called phase two studies, which is an earlier stage of development. The key thing there is to identify which drugs you need that work. What we did fairly ruthlessly, because we had to, was this. There were only a certain number of people who could go into trials. At the beginning, we set up a system for urgent research priorities, where we prioritised only a very small number of studies and said, "Those are the only ones that can actually happen with full support from the whole system." That was because what we were worried about—it has happened in many other countries—was that people would launch 300 trials, not one of which would reach its end point because they were all too small. It was important to do the prioritisation, but the difficulty is that there are of course winners and losers when you do prioritisation. The worry is about whether you are actually prioritising the wrong things.

I think we were very strong on phase three. We have been very strong, thanks to the Medical Research Council and others, on some of the basic sciences. In the phase two area, we have lessons to learn. When we look back, that is the bit that probably we would do better, learning from the experience this time. That is not to say that we did it badly. I think we have done it well, but I think we could have done it even better.

Q804 **Dr Davies:** Earlier in the inquiry, it was alleged that there had been poor investment in platforms for developing new treatments, both in this country and worldwide. Would you agree with that comment?

Professor Whitty: I think Sir Patrick, who has full industry experience in that, is the best person to answer. I can add to anything he says.

Sir Patrick Vallance: We have covered it for vaccines. There is an issue about manufacturing capability and capacity in the UK that is being addressed. It is something that needs looking at.

For therapeutics, as Chris said, the infrastructure worked really well for existing medicines to be tried for a new disease in phase three. That is so important, because if you look around the world there has been pressure in all sorts of countries to say, "Such and such a drug looks exciting. We should give it to everybody." We saw that with chloroquine and various other examples.

You cannot understand what works from just looking at a small study. You need to test things in a big study. It has been so important to end up with both the positive and the negative results. Clinical trial infrastructure has been well funded and well supported. It has worked well.

Moving on to the question of new drugs, we have two major pharmaceutical companies in this country and lots of smaller ones. New drugs take much longer to come through, so I only expect to see brand-new targeted drugs for Covid getting into clinical trials possibly this year. Possibly this year we might see some. That is largely in the hands of the big companies and the small companies that do that. The UK is in quite a good position, and we will see what happens with the drugs they may come up with.

I will pick one specific example. Very early on, it was possible that so-called neutralising antibodies could be beneficial. Those are antibodies that have been made in the laboratory that neutralise the virus. Essentially, it is mimicking what a vaccine does but doing it by giving the antibody itself. There, the sequence of the antibodies, and what it might be useful to look for, became known quite early on. The UK has picked up on that, and companies and others have picked up on it. We again have a deficit in the ability to manufacture such things at scale. The ability to manufacture antibody production is an area that needs looking at.

The final point is that people often say, "Can't you just have lots of drugs ready to go, that you screen?" and you hope you are going to pick the right one at the beginning. People always do that in a pandemic. We did it for Ebola and for all sorts of things. It is worth doing, but it has a low success rate in terms of pick-up.

Professor Whitty: The platform we have not talked about, and which is absolutely critical, is the NHS. In all four nations, the NHS and equivalents have a real tradition of doing trials and of being very evidence based. When I and the other CMOs wrote to all the hospitals and GPs and said, "We do not want anyone using experimental drugs without trials because trials are the way you do it," that was accepted as a completely normal thing in the UK. I think that would have been quite difficult to do—in fact, it was very difficult to do—in many other countries. A strong tradition of evidence-based medicine and people doing trials, and then paying attention to the results, has saved us from doing a large number of things in an ad hoc way with drugs that were either useless or even dangerous.

Q805 **Neale Hanvey:** It would be fair to say that everyone breathed a huge sigh of relief when the vaccines came on stream and started to be administered yesterday, but we have quite a journey from where we are now until we have sufficient safe levels of immunity.

I want to return to testing and the science of lateral flow testing. We know that the Innova test is not licensed by the MHRA for asymptomatic use, although the Liverpool study did that. It is widely reported that the sensitivity or accuracy of those tests is disputed. There is a growing

chorus in the scientific community raising concerns about that.

To get from where we are now to where we need to be, and prevent the risk of furthering the spread of Covid while we are so close to eradicating it, do you think lateral flow tests, as they currently stand, are sufficiently robust to allow for test and release over the Christmas period?

Professor Whitty: I will go first, but I think Patrick will want to come in because SAGE has looked at that specific area.

The thing to understand with all the tests is that none of the tests we have at the moment is ideal. You have lateral flow tests that are easy to use in the field and have good specificity. They do not pick up huge numbers of false positives—I might come back to that—but they have a lower sensitivity. The PCR is a good test but is tethered to a laboratory, and you have a delay in getting a result back. Neither of those is ideal.

Of course, what we would ideally have is a lateral flow or equivalent near-patient test that was very fast and entirely reliable. We do not currently have that. Rather than pretending that we can do things that are not theoretically possible, the right thing to do, with the imperfect tools we have, is to say what the best strategy is, and that is what we are trying to do.

Q806 **Neale Hanvey:** We have covered the role of PCR and lateral flow tests extensively in the Committee. I am not asking for advice about that. I am talking specifically about the use of an unlicensed test for asymptomatic testing, and the clinical data that supports that and therefore informs political choices. It is really about the rigour and reliability of the clinical information that is being presented to Government.

Can you describe the research protocol that was used to collect the data in the Liverpool trial, if I can call it that? Which research ethics committee approved that study? Can you give us an update on the outcome?

Professor Whitty: I think you are probably conflating several different things. It is important to separate them. In all four nations, we are trying out a variety of different approaches to minimise risk for the population. Some of these things will be done as part of formal trials in the classical way. That is particularly true for drugs, which absolutely have to go through very strict ethics because of giving people things that actually can do them harm.

Q807 **Neale Hanvey:** Can we please stick to the area I am asking about? I am asking about the use of lateral flow tests, specifically for test and release, and the clinical data from the Liverpool trial and how that supports the current strategy.

Professor Whitty: I am trying to answer the question. Trials of lateral flow tests happen to be one of my own specialist areas. It is something I understand reasonably well. I am trying to lay it out.

The thing to understand with these kinds of lateral flow devices is that they are used in almost all settings. I am not just talking about Covid or

the UK. It is just as true if you are talking about lateral flow tests for malaria in Tanzania as it is for Covid in the UK now. What you are trying to do is minimise risk by trying a variety of different things where the operational questions are one set of questions, the behavioural side is another set of questions and the sensitivity, specificity and how the tests work under operational standards is a third set of questions.

One of the things we found with the Liverpool study, for example, is that the operational sensitivity is lower, possibly unsurprisingly, than the operational sensitivity you would get under ideal laboratory conditions. That is an example of the kind of thing that it is very important to identify, and then to feed into what you subsequently do.

Q808 **Neale Hanvey:** But we know all of that, Professor Whitty, with respect. What is the reliability of the evidence from the Liverpool study? The only information I can find about that is at the back of "Community testing; a guide to local delivery" in annex B of that document, which states that in the Liverpool study the lateral flow test missed 50% of PCR-confirmed cases and 30% of high viral load cases. My concern is that the population are being advised, based on those data, that it is safe to be tested and then to go out into the community over Christmas to engage with vulnerable relatives. What evidence supports that it is safe to do that?

Professor Whitty: Now I think I understand the point you are making. The first thing is that I agree with the general thrust of what you are saying. The thing to understand, as with so much of Covid, is that perfection is a zero possibility. What we are trying to do is find imperfect solutions that are the least imperfect we can get. If you are using an imperfect test to reduce risk, you are going to be doing something helpful. If you do it in a way that is going to increase risk, you make it unhelpful. That fundamentally is the issue.

Let us say that people were going to go to the hairdresser anyway, and you do a lateral flow test with a 50% sensitivity and people who are positive do not go to the hairdresser. You are reducing the risk to the hairdresser and to the other customers by 50%, not by 100%. If what they are used for is to reduce risk, lateral flow tests have a very substantial benefit. If, on the other hand, they are used to increase risk, so that people start doing in a very risky way things they otherwise would not have done, it becomes a lot more complicated. That is what a lot of this is about. It is trying to work out in what situations it will reduce risk and in what situations it will increase risk, and where it makes almost no difference. All three happen.

Neale Hanvey: That is a much more circumspect and balanced response. In Scotland, the advice that is being reflected is in that balance. My concern is that that is not the message being transmitted by the Secretary of State.

Q809 **Dr Evans:** Dr Harries, Professor Whitty and Sir Patrick Vallance, can I say a profound thank you for getting the vaccine into the place where it should be? Given all the evidence we heard at the start, that is an

incredible achievement. I thank you sincerely for that.

My questions are about the modelling. We hear a lot about particularly SPI-M and the modelling that goes on there. I am more interested in SPI-B. Professor Vallance, could you explain the balance between the data modelling and the behavioural modelling that SAGE uses?

Sir Patrick Vallance: As you say, SPI-B is the behavioural group that has been working from the beginning of this. At SAGE, we get inputs from both of those groups, and indeed from other groups. Whenever we are considering a problem, where it is appropriate to do so, we try to get both the mathematical modelling and the behavioural input. Very often, when we can, we put together a sub-group that might work between those groups, plus other groups, to try to come up with advice. We are trying to insert behavioural science into most of the decisions that are made.

Q810 **Dr Evans:** Could you comment on the weighting between the modelling that you see and the actual behavioural aspect that happens? This is lessons learnt. Has that changed over time? Are we using more behavioural modelling, given that we know how people react to lockdown?

Sir Patrick Vallance: The balance is a difficult one, because it is rather situation dependent as to how much information we have. The modellers often say, "The biggest unknown I have in my model is the behaviour. How can I get a handle on what that might look like?" There are some studies that look at that; for example, one of the models that comes in through the SPI-M group is the CoMix study, which actually looks at contact patterns. We also get information from the ONS study, which looks at some behavioural aspects as well. We get some data.

There is also the body of knowledge through behavioural science. It does not deliver data but it delivers experience, understanding and insights from what they have seen before. That will also feed in. It has got better. More data is arriving now, but it is still very imperfect. Trying to predict behaviours with mathematical accuracy is fraught with problems, and it creates a lot of uncertainty in the models.

Q811 **Dr Evans:** We have seen the tier system change several times. How much has behaviour influenced those tiers?

Sir Patrick Vallance: We have given behavioural advice at every stage. We obviously do not design the tier system—that is a policy choice—but we try to give behavioural insights into what the impact will be. For example, one of the things that ONS told us recently was that adherence seemed to be much greater in tier 3 than it was in lower tiers because people understood things better. That sort of information would be fed back, along with the way in which we think certain things will be received, and the unintended consequences.

One of the things we have seen throughout this is that you can get unintended consequences of certain suggestions, indications and actions. Trying to get that clear is one of the things that we look at as well. I

absolutely do not want to give the impression that we have good data sources for the behavioural stuff, because we do not.

Q812 **Dr Evans:** Looking forward, you and Professor Whitty mentioned that as the vaccine starts to roll out, we get 20% of the population covered. How does that impact the behavioural aspect around the NPIs and the implications there? What modelling have you done of that impact?

Sir Patrick Vallance: We are looking at the impact of different degrees of vaccination on the overall epidemic, whether it is just the vulnerable people or a transmission gap and so on, and the behavioural science group are looking at what the behavioural changes might be in response to vaccination. That work will then come together for us to look at.

One of the things that I think is clear—the behavioural group have been really consistent on this from the beginning—is that the messaging becomes incredibly important, as it does in most of the other areas. There are some principles of communication that will be important. The behavioural group have not only written papers on that but, increasingly, are using the method of giving teach-ins to allow people from different Departments across Whitehall to come and hear it live.

Q813 **Dr Evans:** The worry is that, as people see more people vaccinated, their behaviour will change and become more lax. What is your response to that?

Sir Patrick Vallance: That is one of the risks. Chris alluded to it earlier. The biggest risk we face now is that everyone thinks it is all over, and it is not all over. We have a very important light at the end of the tunnel with vaccines. We have a lot to do to roll out the vaccines. We have a lot to do to make sure that the vulnerable are protected. We are a long way off knowing how we can move it to the rest of the population. That is dependent on things like whether the AZ vaccine gets approved. It is not the time to suddenly say that we relax everything. If that happens, we will have a big surge.

Q814 **Aaron Bell:** I thank all three of you for your time today. Sir Patrick, you were talking about the ONS just now. Did you see the reporting yesterday from Robert Peston on ITV about the retrospective changes to the models of daily incidence in England? Do you have any comment about that? Does it concern you at all that the model seems to be so volatile when being corrected?

Sir Patrick Vallance: I think the ONS issued a rebuttal and explained what was going on there. It is quite important to know that that point was specifically about the incidence modelling, which is obviously one bit of it. Incidence modelling is by far the most difficult bit to get right. It is bound to jump around a bit. I think the way they do it is to look back over a six to eight-week period, and average over that period, so it will change on a rolling basis.

Much more important are the data on the percentage positive and the number positive that they get in that study, to be able to look at the

prevalence data. That is the reliable bit that we want to look at. The data were clearly showing, for example, at the point that the intervention was speaking to, that levels were going up at that time. The numbers were going up. Modelling is always modelling. We are trying to look at data, where we can, rather than just the model.

Professor Whitty: The bit where Mr Peston got a little bit confused, if I am honest, was implying that it was just the ONS data that was driving all the decisions in Government. That is a complete misunderstanding. I would like to correct that.

I would like to give you some numbers, for example. I could do the same thing for people in hospital, people in ITU and people who sadly died. Let's take people who are on oxygen. On 1 September, it was 181. On 1 October, it was up to about 790. By the time we got to 14 October, when tier 1 was considered, it was 1,752. By the time we got to 31 October, when Patrick and I were put in public to discuss this, it was 3,626. By 5 November, when the new things came in, it was 3,954. By 20 November, when the numbers had carried on going up because there is always a lag, it was 5,140. Those data are hard data. Those are people in hospital on oxygen.

It is very important that people do not think it is all just theoretical modelling. Certainly, from my perspective, my advice has been based, as far as I possibly can, on hard data: this is what is happening to patients and this is what is happening in the population. These are not models; these are real people in a bed unwell. We need to understand that lots of different bits of information come—

Q815 **Aaron Bell:** I wanted to get that on the record, because it is obviously out there.

Sir Patrick Vallance: The other way to look at it is that in August Covid was the 24th commonest cause of death in the UK. In September it was the 19th commonest cause, and in October it was the third commonest cause.

Q816 **Aaron Bell:** Looking at the tiers and the second lockdown, did we have enough information about how well the previous tiers were working? You have both spoken since about the need to strengthen those tiers. Specifically around hospitality, because there has been an awful lot raised about that, have we properly modelled the changes that the hospitality industry made between the initial outbreak and over the summer to become Covid secure? Were those modelled appropriately when we considered what to do with the different tiers, both pre-second lockdown and the tiers we currently have?

Sir Patrick Vallance: I do not think we have very good models on exactly the impact on different environments and different locations. I do not think anyone has. If you look at the data around hospitality, there is a series of environmental factors, such as the fact that people cannot by definition wear masks; you are meeting lots of people you would not normally mix with; you are in an indoor environment; and, in some

cases, ventilation may not be adequate and so on. Those are environmental factors.

The second area is that, although case control studies are not very strong, they suggest that there is an increased risk in those settings. It is much stronger if you look at occupational risk, where you can clearly see that there is a risk to those who work in hospitality. Again, that suggests there is a risk in that particular sector. If you look at outbreak data from across the world, on events from specific hospitality environments, you will see super-spreading events and outbreaks.

There is a range of data. It is not possible to model all of that with any degree of accuracy and say what differences there are now from—

Q817 **Aaron Bell:** You say there is data from across the world, but Public Health England has specific Covid-secure guidance for restaurants and other hospitality venues to follow. Do we have data that is directly relevant to the UK rules that we are using to feed into what we are doing with the tiers now?

Sir Patrick Vallance: First of all, it is brilliant that the hospitality sector has adopted those rules and done it really well. That is important. We do not have data that shows exactly what the impact of that is in a measurable way. It is not possible to get it.

Professor Whitty: If you look around the world, there are very few places that have managed to control things while hospitality has been open and unaffected. What the hospitality industry has put in place has allowed some activity in the hospitality sector in the lower tiers, and will make it easier to open things up in a safe way earlier than if those things were not in place. As an insurance, it is going to allow us to open up as the vaccines and the change in seasons and so on improve things. It is not wasted effort.

I completely join Patrick's view; we really admire and appreciate what the hospitality industry has tried to do. Unfortunately, we have a virus that thrives when people from different households are coming together indoors. That is what the hospitality industry does as part of its business model, which is why we all enjoy it so much. That is the problem we have with the hospitality industry.

It is a global issue. Again, you could look everywhere around the world; every country that has strong science has come to the same conclusion. It is not a UK thing.

Sir Patrick Vallance: France, Germany and so on. The other thing is that, when you look at the effect of the tiers, it was only when hospitality was shut that you could see cases coming down. Again, it is all circumstantial evidence, but it points in the direction that Chris alluded to, and that is the conclusion that countries across the world have come to.

Q818 **Chair:** A lot of people who work in and owe their living to the hospitality

industry are frustrated that they do not see a forensic level of evidence that justifies, for example, a particular curfew hour. They feel that there is a major impact on their lives and prosperity on the basis of evidence that can be ambiguous and not very deep. What do you say to them? Is there something that can be done on the structure of scientific advice that can be a bit more forensic about interventions that have a very big impact on certain people?

Sir Patrick Vallance: We are trying very hard to get data. It is, of course, not an experiment because you do not have randomisation. In some cases, it is necessary to look at cases and controls, and those things are fraught with difficulty, to make sure that you have the right matching of those subjects. As much as we would love to get detailed information on this and to be able to give you the answer, we cannot give specific data on that, other than the things I have talked about, and nor can anyone else across the world. A summation of association and the evidence base I have described points to that being a sector that is particularly likely to be part of spreading.

It is not on its own. There are many others, of course, that do that. In all of this the challenge has been over which bits you are prepared to keep open, knowing that every single bit carries some degree of risk with it, and at what point you want to stop. There is always a case in every area for saying, "I would like this bit to be open," or, "I would like that bit to be open," or, "I would like to have more of this." Eventually, you end up with the disease spreading.

In terms of curfews, it is even more difficult to say, and there is no hard evidence on curfew times.

Q819 **Chair:** So why did we introduce a curfew?

Sir Patrick Vallance: What you can see across Europe, and indeed in this country, is the notion that actually keeping people together longer in an environment where there is alcohol is likely to increase risk. Therefore, that was a policy decision around trying to reduce the potential for interactions. It is not something that you can model with a degree of accuracy and say that a particular time will give you a particular result.

Q820 **Katherine Fletcher:** Dr Harries and gentlemen, I hope you have had the opportunity, perhaps not in hospitality, to sit on your sofa and take a quiet moment of reflection on the triumph that has occurred in the last week. It was a multidisciplinary effort, and I will happily buy you a glass in hospitality in the future when the opportunity arises.

I want to turn to the response of people to the restrictions that have been keeping us all safe. What have you learnt about the public's tolerance for those restrictive, non-pharmaceutical interventions, as you call them?

Professor Whitty: The biggest thing, which is extraordinary, is the fact that the British public have responded, as they always do in emergencies, with extraordinary generosity and altruism towards other people. Lots of people have considered that their own risk is probably relatively small,

but to protect others they have taken dramatic changes in what they do that have affected them socially and, in some cases, as we have just been discussing, economically. They have done that to protect other people who are vulnerable, to protect the NHS and to protect the lives of other people. Some people will also do it, hopefully, to protect themselves and their families as well, but the altruism of the British public cannot be understated.

It has been of long standing. It has gone on for a long period of time, and people are still doing it. Because of that, many people have been saved who otherwise would have died from the disease. The line of sight between people taking those actions collectively, as a society, in all four nations of the UK and people not dying is absolutely clear. We all owe huge thanks to everybody in society who has done that over such a long period of time.

Of course, the longer it goes on, the more people are going to think, "Well, when will this end?" There are two possible responses to the fact that we now have vaccines and are heading into spring 2021 in much better shape than we were three or four months ago. The first response is to say, "Well, that's it; it's done." That would be disastrous because then the wave would come back again incredibly quickly. We are all very nervous about January and February, which is the highest risk period for the NHS, as well as March in particular. The alternative is to say, "There is an end to this, but we just have to get ourselves through this last period." We really must be self-disciplined, as we have been all the way through this year. What all of us would say is, please, please take the second of those approaches.

Q821 **Katherine Fletcher:** Does that imply that you are seeing some of the public's tolerance for these restrictive practices starting to wane, and you are urging people to stick with it for the last few steps? Is that fair?

Professor Whitty: I think it is some people. If you look at the actual behaviour of people and the polling about what people are intending to do, what is interesting is the degree of stability in people's decision that they wish to do it. It is impressive. Of course, you will always find some people who push the boundaries. I could cycle around London and probably find somewhere I could take a photograph and send it to the newspapers, showing lots of people crowding together. Of course, you can do that in some places, but overall the response has been consistent across the country, across all parts of society, and prolonged. That has been remarkable, and it has saved a lot of lives.

Q822 **Katherine Fletcher:** Dr Harries, do you have anything to add?

Dr Harries: We can see some of the effects if we look at face-covering use, for example. With increasing evidence around transmission, people have gradually adopted them. It is actually very unusual now not to see people wearing a face covering in areas where it makes sense to do so—in confined circumstances and meeting other people.

I do a lot of work on the clinically extremely vulnerable group. I recognise there that a slightly different position has occurred. Some want to be out in society more, and others have found it very difficult to go out. We need to recognise that there are very different responses in different groups.

As the CMO said, we have learnt about the really important role of community leaders, whether it be directors of public health or some of the religious leaders in communities, in encouraging local people and to help them understand some of the reasons for the NPIs. That is also helping us to help them to stay safe. I am just adding to the points that the CMO has made.

Q823 **Katherine Fletcher:** That's brilliant. It is quite a good segue into the follow-up question. This is a hearing to look back on evidence that we have received previously. I was very struck by the evidence of the behavioural modellers who are part of Sir Patrick's scientific advisory team. They were thinking so early, back in March and April, about how to keep people's tolerance for these public measures going. The phrase that came up time and time again was, "It must be fair." Professor Vallance, what have you learnt about how to make measures feel fair to individuals in the country, so that they can respond in this collective effort?

Sir Patrick Vallance: You are absolutely right to highlight how early and clear the behavioural group were about both the construction of interventions—fairness was certainly one of the things they kept raising—and how to communicate them, where they were also impressive and consistent. They said right from the beginning that you have to engage people. You have to co-create the solutions and the ways you deliver them so that people feel part of it. You have to have special care to look at ethnic groups and certain other hard-to-reach groups to make sure that you design things appropriately. Importantly, you need to explain the underlying reasons behind things. There needs to be simplicity, clarity and consistency and, where possible, you need to enable people.

The enabling example is important when it comes to things like isolation. It is relatively easy to self-isolate if you are in a job that allows you to work from home, and you can sit in your bedroom, office or wherever it might be to do your work, and still get paid and perform in the way you wish to. It is clearly very different if, as a result of you isolating, you do not have a job during that period, you are not being paid and you cannot contribute. As a result, there is inequity in the ability to do something that is a fundamental part of the response. That is why the behavioural advice was clear right from early on, and remains consistent, that you need to enable these things. The enabling, to try to reduce unfairness where it inevitably exists, is an important part.

Very early on, we made the statement, which I think remains starkly true today, that this virus feeds off inequality and feeds inequality. It makes inequality worse and it feeds off it. I think that is a really important part of the fairness thing that was flagged up earlier.

Q824 **Katherine Fletcher:** I think we all agree that lots of people in lots of different ways have hugely done their bit. I have a lot of concern about different areas being in different tiers. It often comes back to a sense of fairness about the public measures. Is there any reflection you would make about helping to build the case for what is fair to each individual area? I am sure you have heard this, but for more rural areas next to areas where there are higher concentrations of disease, it feels unfair. Is there more we could do, if, God help us, another pandemic comes along, to make that messaging clearer?

Sir Patrick Vallance: There is something about explanation, but what you are also touching on is the question of geographical boundaries. It is not a science question so much as a political one as to where the geographical boundaries are. Clearly, wherever there is a boundary, there will be an issue either side of it as to whether somebody is in exactly the right one or the wrong one. I do not think that is a science question, but you raise an explanation piece that is important. I do not think the question of how the boundaries should be drawn is primarily a scientific one.

Professor Whitty: I did the initial analysis on this, along with many colleagues in the JBC. The decision about how big the unit should be is, in my view, fundamentally a political decision. How small should the area be? If you make it too small you are asking for trouble. If you have a very small area that has low rates, surrounded by an area of high rates, the small area with the low rate gets a high rate. We have tried that experiment several times and it always ends up the same way. That's the way it goes.

Political decisions need to be taken about the unit that is appropriate. A lot of that is around organisation and the human geography of things. Those are decisions for local and national leaders to make. Then you can say that, within those kind of patchworks, this is where it is very high and this is where it is very low.

As Patrick says, there will always be people just one side of the boundary or the other, both of whom will complain that it is not quite right for them, as there are for every single one of the decisions we have to take. With all of these decisions, you can always say, "Why have you drawn the line here?" The answer is that you could have done it slightly higher or slightly lower, but you would still have an equal problem either side. It would just be in a slightly different place. We need to accept that at some point the line is drawn and that the boundary is going to be tricky.

Q825 **Jeremy Hunt:** This has obviously been a very tough year. I want to start by putting on record my thanks for your incredible service to the country over the course of the year.

We have learnt an enormous amount this year. What do you think you have learnt most, particularly if we look right back to the start and the advice that SAGE gave between January and March? What would you do differently, both in terms of the content of the advice and the structures

around which that advice was given?

Professor Whitty: I will divide that into three different blocks. It is an absolutely fundamental question, given that this is a lessons learnt inquiry.

There is a block of things where we and many other people who gave science advice would, with the benefit of new science, give different scientific advice. An example might be mask wearing, where our advice initially was, "We don't think this is going to help much." Our advice now is, "Actually, we think this is a useful part of the toolkit." The science has changed. The data has not changed much, but the scientific interpretation of the data changed in that particular example. There is a series of answers where we have new science. We know more about the virus and we have a better understanding.

Many of the areas that are most contentious were where the fundamental scientific understanding was not incorrect, but the data streams were incomplete. If you start with incomplete data, you end up with incomplete answers. The classic example is the question of the optimal time for lockdowns at various stages. It was not a single event but a rolling event. There were also questions around people coming into the UK from around the world and where they should quarantine. The problem we had on the quarantine side is that we did not realise how widespread it was in Europe, because there wasn't testing in many of the European countries. We knew it was in Italy, but we did not realise how extensive it was in Spain and France for a while. That is an example of lack of information.

Internally, because we had very limited testing capacity, we did not realise quite how far along the curve we were, because we were having to use people in intensive care and who had sadly died, which is quite a late event. If we had the capacity on testing then that we have now, we would have come to very different conclusions using exactly the same science. The science is not different; it is the information that goes in. If I look back over both this pandemic and Ebola, in which I was heavily involved in west Africa, lack of testing was one of the biggest barriers in both situations to being able to make rational decisions early on.

One of the big learnings I would have from that is that we have to build our capacity to do testing. It is not from the initial science to the test; we were really strong on that, and I pay great tribute to my PHE colleagues who were getting tests done experimentally early on. It is about the big scale-up—the capacity to do it at scale—and we need to think quite seriously about that side of things. That is going to be a problem with any pandemic we have in the future. It is going to be an issue again. We do not want to find ourselves in that situation. We have been caught out twice now with lack of testing, and three times would be too many.

The final thing is the question about structures. Broadly, I think our structures have been pretty good compared with where we might be. SAGE has had some difficulties transitioning from something that had a small number of sessions. I have been involved in SAGEs for a decade

now, and most of them last for two or three meetings and are just to advise Cobra. Patrick might want to talk about this. Having a continual process has stretched the system. There is quite a lot we could learn about that. Those are process questions.

Broadly, our building blocks—the NIHR, the NHS, the MHRA and so on—have shown their capacity. We should celebrate the things we have that are good, while learning from some of the things that we clearly would have done differently with different capacity and different knowledge early on.

Sir Patrick Vallance: First of all, I agree with what Chris said. I want to add one point on testing. The other capability area was not just testing but the ability to do contact tracing at scale. That requires people in place, trained and ready beforehand. That is one of the lessons that SARS and MERS taught in some places. They had a public health system that enabled them to do that at scale. That is one of the points I would add to that.

Professor Whitty: There is a view—the co-Chair expressed it—that the reason we were not doing contact tracing at scale early on was that we thought this was flu, and it was actually SARS. That is a misunderstanding. To be clear, I am an infectious disease epidemiologist, and in general I have dealt with large numbers of infections. The last one I had to deal with at scale was Ebola. That was entirely based on contact tracing and isolation, so I fully accept the absolute need for that. It was basically a capacity compared with size-of-problem issue.

It is very easy to be wise after the event and say, "Why did we not invest in this previously?", just as it is easy to be wise after the event in multiple other areas. Actually, I think the speed of the upswing early on would have overwhelmed any realistic scale of contact tracing we had. Nevertheless, for the future it is an area where we probably need greater capacity. Germany in particular has shown how that can stand you in good stead, even in the European context. I think some slightly shaky comparisons are drawn with the eastern part of Asia, where for a variety of reasons the parallels are not very exact. The German example is very good, but even in Germany, and even with experience, they are now struggling a bit with the numbers of cases that are happening in winter.

We need to realise that there is a scale problem. At a certain point, however good your system is, it is going to be overtopped by the scale of the epidemic. We should not try to pretend that somehow you can build a perfect system. Classically, when you try to build the perfect system, you end up with some variation of the Maginot Line. It is very expensive and does not work.

Sir Patrick Vallance: I will answer the other part. There are three things I would pick up on. One is really important for all resilience areas. Very early on, we were dealing with imperfect data. You are always dealing with imperfect data, but we could not get our hands on enough data; it was not interoperable, and it was not linked in the way it needed to be

linked. That is much better now. The lesson from that is that we look down the national risk register and ask, "What are the data sources, data flows, data owners and interoperability we would want in order to look at the top 10, and have we got that in place?" Getting that in place early is an important lesson.

The second point is that science advice needs to dock into the machine appropriately. It is not always easy to dock into all the right parts of the machine. As Chris said, it is somewhat easier when you are dealing with a three-SAGE meeting with three Cobra committees and the system is trying to respond to something fairly clear and straightforward in terms of the output you require. It is much more difficult to get that right across the whole of Whitehall on a continuous basis.

Ensuring clarity in the docking mechanism is important. One of the things we have started, which I think has been important and successful, is to get open teach-ins across Whitehall from some of the experts and science groups. They come and talk to whoever wants to hear it. That is as well as clarity of docking into Cabinet Office and other places.

The third thing is duration. I do not think that we were well prepared for the duration of SAGE stand-up. The consequence of that has been that in the Government Office for Science, for example, we have had to rapidly build numbers to try to cope with this long-term problem. We did not necessarily have the right surge capacity to get it right. The people who have worked on both main SAGE and the sub-groups have now been at it since January. They are full-time academics with research and teaching commitments, and all sorts of other things. We did not have things in place to provide them with some sort of resilience and support for what they need to do. We had to make it up as we went along, to try to support them. They have been heroic. I want to put on record here that they have worked enormously hard on this, and all of them have done it for nothing.

Their universities have also been supportive. I have had to phone people at universities, and they have all been supportive and said, "Yes, these people must continue." I do not think we really knew how we were going to support them from the beginning over a very long period. That is an important lesson to learn.

Q826 **Chair:** Dr Harries, could you give some personal reflections in the same vein as your colleagues?

Dr Harries: I would reflect many of the points that have been made. Some of the early learning about what we know now and did not know then about the disease is significant. We perhaps did not have plans for thinking through the risks of asymptomatic transmission as much as symptomatic transmission. Much of the design of our previous plans related to people who presented with symptoms and how we would manage them. That is important for potential new respiratory viruses in the future.

The CMO made a point about face coverings. That relates very much to increasing ongoing understanding around aerosol transmission, which starts to bring in points about ventilation and building design. That might be something for us to focus on in the future.

We have heard a lot about existing building blocks and systems. In research, for example, they put the UK in a strong position for continuing forward. One area that I have been supporting clinically where that has not been the case before is the social care system. It is very much easier to link up, roll things out and understand what is happening in the NHS, than perhaps it is in the social care system. That is an important point going forward.

That links to the point Patrick made about data and digital flows. It is not just about the science. It is actually about evaluating change, so that we can put in interventions. For example, if our basic data does not strongly record ethnicity or learning disability, when we start seeing groups that are impacted differentially, it becomes much more difficult to understand what the appropriate interventions would be to protect them. Increasingly, as we go forward through any disease, digital and data flows are important.

Professor Whitty: I completely agree with the points Jenny has made. The issue about asymptomatic spread is an example where we drew comfort, wrongly, from SARS. In SARS the great majority, if not all, of the transmission was from people who were symptomatic. While we accepted that asymptomatic spread might happen, we thought it was much more likely that almost all of it, or the great majority, was likely to be people who were symptomatic, based on the fact that SARS had been like that. That was an error of understanding. The majority were still probably people who at some point were symptomatic, and although we theoretically thought pre-symptomatic spread might happen, we underestimated the importance early on. That was not just in the UK but more widely.

The second point is to strongly endorse what Jenny has just said about social care. Social care research in the UK is nowhere near as strong as we need it to be. There are many areas of science where our research is outstanding, as we discussed, and I feel very proud of that. Social care is such an important part of the health and social care system, but if you look at the amount of research that goes on in that area, there is far too little of it. It is perfectly respectable, but there is far too little of it. We need to look at that across the board. That is an area, in science terms, that we now have to take really seriously.

Chair: We are going to come to that a little later, if we may.

Q827 **Taiwo Owatemi:** I would like to put on record my thanks to the panel for all their multidisciplinary efforts and achievements.

Professor Whitty, my question is about public health messaging. In March, the public health message was, "Stay at home. Protect the NHS. Save lives." That was understood by 90% of the population. In May, the

messaging changed to, "Stay alert. Control the virus. Save lives." That was only understood by 30% of the population. What lessons have been learnt throughout the pandemic on the importance of having clear and consistent public health messaging?

Professor Whitty: The first thing to say is that we cannot take credit for the slogans that worked, and we cannot take blame for the slogans that did not, because communications is not our great strength. There are many people who do these campaigns. You are absolutely right that the clarity of the initial message was absolutely essential in people understanding what needed to happen, and then doing it. You are completely right.

Having complete consistency of message is an area that is operationally quite tricky for us. This has gone on for a long period of time. If you look around the world, there are places that have had the same person doing the communications the whole time, and there are places where a group of different people have taken turns at it. In England, we have taken the second approach. I have to say that if I was the person doing it day in, day out, which is one of the possible models, it is doubtful that I would have had much time for anything else. There are some real operational difficulties with that. There is a question about whether you have a good message, and then there is a question about consistency of the messenger, because people tend to have a particular messaging style.

There are quite a lot of things we need to look back on and ask the question, "Which bits of this worked and which bits simply confused people?" I do not think I am the right person to do that. I do not think that Patrick or Jenny would say they were the right people to do it, but we would all agree that there is a lot that worked but also a lot where we could do a lot better.

There is one thing Patrick said earlier that we really need to look at again. I do not think we got our messaging right for some of the ethnic minority British groups early on and, indeed, some smaller groups. We did not have a clear campaign in those areas. That is something we need to look at fairly self-critically and work out how we can do it better the next time round. It is still not perfect, but at least it is a lot more systematic. That is an area where I think all of us could say, "Could have done better."

Q828 **Taiwo Owatemi:** I wanted to move on to communication regarding vaccination. Polling has shown that one in six people are either unlikely to, or definitely will not, be taking the vaccination. That is due to their beliefs, attitudes and values, or scepticism about science.

In order for us to be able to achieve the vaccination aim, what is currently being done to address some of the recommendations by the Royal Society, particularly around open and transparent messaging, in order to ensure that public expectations are met? How will the general population be able to spot and report any misinformation?

Professor Whitty: I will start because this is very classic chief medical officer territory, but I suspect that Jenny and Patrick both have strong views.

There is a very small group of people who have very weird views about vaccines. In a sense, they are not worth worrying about in public communication terms because nothing will persuade them that it is the right thing to do. It is their right, as competent adults, to make those choices.

There are a lot of people, though, who have legitimate questions of any vaccine and any medical treatment. Vaccines are no different from that. What people want to know are three different things. The first question is, "Is the problem I've got, either as a risk in the future for vaccines or disease now, big enough to do something about it?" If you have a trivial problem and you are offered a major operation, you are not going to do it. It has to be a big enough problem.

The second question is whether it actually works. Will it cure or prevent the disease? In the case of vaccines, will it prevent it? That is where the efficacy comes in. What proportion of cases will be prevented?

The third question is what the side effects are. Aspirin and Paracetamol have side effects. Every drug has side effects. Vaccines will have some side effects, for sure; some people will have them. What they want to know is whether those are proportionate to the thing it is reducing. The Royal Society rightly said, and I think we would all agree, that we need to be as transparent and honest as possible so that people are not surprised; they can ask straight questions and get straight answers. For example, my outstanding colleagues Jenny Harries and Jonathan Van-Tam have been doing a great job answering lots of questions, but we need to carry on doing that as more information emerges.

If we divide those three up, I think most people who are vulnerable think this is a big enough problem to prevent. The efficacy data are clear, and now we need to be clear about any issues around side effects and so on, so that people feel they can make a balanced and reasonable decision. A lot of the people you are talking about are just waiting to see, and that is entirely reasonable. These are new vaccines. They are waiting to see, and with the right information they will think, "Yes, actually this feels right to me," and that is what they will do.

Sir Patrick Vallance: I completely agree on the point about transparency and clarity. People want to make informed decisions and to be treated as adults to do so. In order to do that, we need to be very clear about what the effects are and what the unwanted effects are. We need to be clear when there are things that crop up that change any of those positions, and to do so in the most transparent way possible. That is the way we will build confidence and trust around this. There is experience in other vaccine programmes as to the importance of doing that. It is critical. We must make sure that we do it in the right way for the right groups. I do not think, in some cases, it is enough simply to

say, "We've got our message and we've translated it into these languages." We also need to deal with the other issues that may make people understand it.

Professor Whitty: It might be worth asking Dr Harries, because this is her specialism.

Dr Harries: I tend to put my old director of public health hat back on and think of it from the person upwards. Once we have the national messaging clear and correct, what is important is who gives that message locally. We obviously work with directors of public health to ensure that there is a consistent message, but for the person in their home or in the street it is primary care, their GP and particularly the practice nurse, working with them to ensure they understand it. If healthcare workers and social care workers take up the vaccine, that is a very clear message to the public. We saw that on the TV screen yesterday.

One of the first lessons I learnt as a public health director in south Wales was that you needed to find the critical person in your community. In a south Wales mining village, the person you needed to influence was the grandmother of each family. If they thought vaccination was all right, every single grandchild had all their immunisations. It is about doing both the national messaging and the local as well.

Chair: I am sure that is not just true in south Wales.

Q829 **Taiwo Owatemi:** I want to ask about social media misinformation going around online. What is being done to address some of that? As a healthcare professional, I found that, in order to be able to convince any of my patients to take a new drug they had been prescribed, I had to dispel some of their concerns about that drug. What is being done to address some of those anti-vaccination conspiracy theories online?

Professor Whitty: I would divide it into broadly three groups. The group which is, in a sense, the responsibility for Dr Harries, me, Jonathan Van-Tam and Professor Vallance to address, along with many other healthcare professionals all the way through the system, is people who are asking very legitimate and reasonable questions about a vaccine that is going to be given to them, their parents, their children and so on. Those questions should be taken seriously and answered honestly, as you and everyone would agree.

There is a group of people who have very strong views on vaccines that are not always, let's put it this way, scientifically founded. I think it is reasonable to address those as best you can but accept that you may not end up with them coming round to agreeing.

Then I am afraid there are also some people who, for a variety of reasons, are deliberately going for misinformation, many of whom, bluntly, are not based in the UK. That is definitely not a medical issue; it is an issue for others to take seriously, but it is very serious because those people are deliberately trying to sow uncertainty about vaccines,

which is in the long term not in the good interests of the citizens of this country. That is not for this discussion, but to acknowledge that that happens for a variety of reasons, including a well-funded anti-vaccination movement in certain countries and other reasons that I think are widely known from the newspapers.

Q830 **Sarah Owen:** I want to pick up a point that Sir Patrick made about emergency planning and preparedness, before asking some questions about mass testing. Back in the early 2000s, I remember multi-agency emergency planning discussions taking place that contemplated mass deaths caused by SARS. I was relatively young then, and the prospect of mass burials really struck me.

Emergency planning budgets were cut by 29% from 2010 to 2017. Do you think we could have benefited from, and do you think we need in the future, greater investment and focus for emergency planning for pandemics, especially with regard to testing and contact tracing?

Sir Patrick Vallance: I have said that, if you look at what happened in some other countries, there was preparation in some of those things after SARS and MERS that was beneficial. The public health system needs to be properly supported. It needs to have the right ability to respond. I am afraid what we are talking about is resilience that allows spare capacity.

One of the tensions—we are outside science here—is that, if you run a system that is at absolutely full capacity the whole time, by definition you do not have the surge ability to grow into something new. This is going to be true, and exactly the issue we need to face, around vaccines. We want to have vaccine capability in this country. It is probably not realistic to assume that you have a big vaccines capability that sits there being kept warm waiting for the next thing to happen.

Somewhere between having nothing and having something you unrealistically expect to be sitting there ready to use when you need it, but you might not need it for a decade or more, is where we have to get to. That is going to require the question about how much extra capacity you want, how you would fund that and what you do to keep the bulk of it going while you know that you are only going to need the surge bit for certain things. That is an issue for vaccine planning, but it is also an issue right across the public health sector.

Q831 **Sarah Owen:** Before the summer, Luton was subject to higher restrictions, and a key part of us coming out of that was local contact tracing. Liverpool has also been trialling mass testing. Do you think we are going to have to continue with the capacity for mass testing? How is that impacting things at the moment?

Professor Whitty: The approach that my colleagues—the directors of public health—advocate and support, and I think most people would support, is that what we should be trying to do is to work out the most efficient way to do what is called mass testing. Mass testing can mean lots of different things. I will make a point that is obvious, but it is just to lay that out.

Let us say that 3% of the population at any particular point have Covid, which would be a high rate relative to the national average. In theory, you could design a system that tested 97% of the entire population and not find a single case or, in fact, remove them from risk to others. You could test 3% of the population, if you had perfect knowledge, identify the 3% who had it and remove all of them. The size of the testing is not the question. The question is what proportion of people who are positive do you get. The sensible thing is to start off in the places where the highest risk is, and then move out from there. That may mean the whole population eventually. Various people have tried that.

There are lots of academics who are currently debating this quite forcefully, some of whom say you should test absolutely everybody and some of whom say it is not a very good idea. They all use different examples to back up their case. The reason we have a debate is that we are not absolutely certain about the ideal model. How do you get the maximum number of people who have the virus but do not end up doing a large amount of testing that has almost no chance of picking up any positives? Fundamentally, picking up a negative is pleasant for the person to know, but what you are really trying to do is pick up the positives. That is the key. That is what we have to do by whatever system we use.

Q832 **Sarah Owen:** I have two more questions following on from that specifically about testing. What evidence is there for the Government's decision to allow family members into care homes, subject to a negative test?

Professor Whitty: That is a question that has been debated among doctors, nurses, SAGE and the general public all the way through this pandemic.

There are two things in serious tension with one another. There is the fact that allowing people in to visit relatives increases risk, not only to that person but importantly to all the other people in that resident's home. On the other side, there is a group of older citizens who can get very lonely. Quite a lot of them have early or even later dementia, and many are in the last six months of their life. Saying that you cannot see your family is a very bad thing for them individually, and societally it is something we feel very uncomfortable about. The trouble is that those two are in absolute opposition to one another.

The question is how to get the balance right in a way that does not put people unnecessarily at risk but allows some degree of contact[1]. What you have to do is reduce the risk as best you can. You basically do that by doing three things. You do different things in very low transmission areas compared with very high transmission areas, simply because the probability of someone walking through the door with Covid is different depending on which level of transmission you have.

[1] Note by witness: Witness meant 'social contact' not 'contact'.

The second is things like PPE, pod visiting, and things with barriers and so on, to try to minimise physical impact[2]. On top of that you can layer testing. A question was asked earlier about the tests not being 100% sensitive, and that is completely right. It will reduce the risk further, but it will not take it to zero. What we are trying to do, as so often with Covid, is not to find the perfect answer—there is no perfect answer—but to find the least bad answer, from the many bad answers we have in front of us, that takes the risk down as far as we can, accepting that there will still be some residual risk. If we took a zero-risk approach, the result would be that no one could visit anybody. If you think about that for a year of someone's life, for many who are towards the end of their life, as all of us will get to, that is something all of us are really uncomfortable about. That is the balance of the decision, and there isn't a perfect answer.

Directors of public health, GPs, nurses and care home providers, as well as political leaders, all wrestle with this. It is not a straightforward situation.

Q833 **Sarah Owen:** What levels of testing and vaccination are we going to need before that risk is a decision that we can take about whether we can hug our grandparents or elderly relatives again?

Professor Whitty: In a sense your implication, which I completely agree with, is that, in terms of the point when we can get back to something where the level of risk is sufficiently low that you can interact in the way we would all want to interact with our older relatives and friends, a vaccine is by far the strongest tool we have in our box. Getting care home residents vaccinated is the No. 1 priority where it is logistically possible. The Pfizer vaccine, because of the way it is delivered, is going to be harder in terms of that.

The second priority is care home staff because the biggest risk—not through any fault of their own—is that care home staff live in society and, therefore, some of them will catch it. The risk is that they can introduce it. That is the reality. The vaccination side will help us reduce the risk, I hope, over the next two to three months.

What we really want is for care home residents, care home staff and the visitor all to be vaccinated. In that situation, the risk will be much lower. Jenny Harries has been leading a lot of the thinking on that. Would you like Jenny to give an additional answer?

Chair: We have some more ground to cover, so perhaps Dr Harries could give a very brief addition.

Dr Harries: Chris has covered most of the key points. I want to pick up on the earlier question on balance of risk. I highlight that it is not something that has not been considered in some detail. There is a SAGE sub-group, which I chair, where we have tried to look in a scientific way at balancing the risk of visiting with the loss of quality of life in a

[2] Note by witness: Witness meant 'physical contact' not 'physical impact'.

quantified way, in order to give support both to relatives visiting and to the care homes that finally make the decision about whether visiting can occur or not. As Chris said, it is a really difficult one to manage. Testing, as we have all said, reduces some of that risk and allows a better balance, but it does not remove the risk completely.

Q834 **Graham Stringer:** Earlier in the evidence session, Dr Raine told us that she thought dexamethasone had saved 1 million lives around the world. I guess that is not a very precise figure, but it is a good figure. Do you have a similar figure in relation to how many lives the test, trace and isolate system has saved?

Professor Whitty: Dr Raine is very careful, but atypically I would be more careful than Dr Raine about putting any of these kinds of numbers out because I think they have to make so many assumptions. Let's imagine a world in which there was no test, trace and isolate. I am confident that we would have a worse epidemic than we have at the moment. I am very confident about that. It is a significant component of our response.

The proportion is going to be greater the lower the rate of transmission. We have said that all the way through. Test, trace and isolate has its greatest efficiency when rates are low. At that point, it can pick up large numbers of cases. This is exactly why some countries, including countries that coped incredibly well like South Korea and Germany, once they get above a certain point, all accept that the amount of the load that can be taken by it is lower. The proportion will be lower at this point than it would have been in the summer. My hope is that, by the spring, test, trace and isolate will be helping to reduce the residual risk. The vaccines are not going to take the risk to zero. They will reduce it. Test, trace and isolate will take it on top of that. Even now, it is certainly contributing significantly.

Could I put a number on it that I would stand up and say confidently that this is what it is? No. That is just because I think it would be making so many assumptions that it would be very flaky science.

Q835 **Graham Stringer:** This is unusual for the health service. Generally, the way you decide whether a medicine can be used is by assessing how many life years will be saved and how much it costs. The national test, trace and isolate system has cost a percentage of what the whole of the NHS costs. It is a huge amount of money. I am rather surprised that you do not have a ballpark figure for that, particularly as the last time you were here Jeremy asked about the SAGE advice that the impact of the test, trace and isolate system was marginal.

Professor Whitty: Patrick might want to deal with the second point, and I can come back to the first if he has not answered the question.

Sir Patrick Vallance: I think that was a reference to a particular time. It is exactly the point that Chris made. When prevalence is very high, the ability of test, trace and isolate to make a material impact on the epidemic is low. At that point it is low; it is not that overall test, trace and

isolate does not work. It works much better at low prevalence levels and low incidence levels. It becomes relatively ineffective as you get to high incidence and prevalence levels. That is what that comment referred to.

Professor Whitty: All the way through this I have been cautious about putting numbers into the public domain that I consider essentially speculative. This is one where I really would not want to do that.

Q836 **Graham Stringer:** Let me try to get at the issue another way. There was a decision taken some time between 23 March and the end of May to move to a centralised laboratory system—a centralised test, trace and isolate system—as opposed to a decentralised system based mainly on public health officials. Can you tell us what the assessment was of the effectiveness of the two potentially different systems at that time?

Professor Whitty: What we had coming into this epidemic was a good PHE system. I think PHE have come in for some really unfair flack. I pay a lot of tribute to them; a lot of what has gone right has happened because they have done a very good job in many areas, but they are quite small in size, relatively speaking, and their budget is a fraction of what test, trace and isolate now has. That is appropriate, but I am just making the point that they were much smaller.

Local authorities are also very good at doing it at a relatively small scale, but we had a new disease with limited diagnostic capacity. The decision was that the only way you could ramp it up very quickly—this was not my decision; I am just giving a description of it—was in a pretty fast, top-down, centralised way. That is true in most emergencies. That is how you start off, but a huge amount of the expertise resides in local authorities, with directors of public health and local public health teams. They have consistently provided very high-quality things; they just did not have the ability to do it on the scale that was needed.

The shift from a more centralised to a more decentralised model is exactly the right thing to do and is more durable. My hope is that over time the balance and the centre of gravity will move further towards a more localised system. That seems to me the right approach. I do not think it was incorrect to start off that way. We had to stand it up fast, and doing it centrally was a lot easier. People often forget quite how fast this hit us and, therefore, quite how fast things had to be set up.

Q837 **Graham Stringer:** It was done very quickly. I accept that, but focusing on a centralised system itself caused problems. The Science and Technology Committee and the joint Committee have heard evidence about the failure of the centralised system, both the Lighthouse laboratories and PHE, to communicate with local teams. There is also evidence from local teams that have used their own testing and isolated people; they know the communities and it has been much more effective. As lessons learnt, wouldn't it have been better to invest more and earlier in those local teams?

Professor Whitty: I am cautious. It is one of the areas I tend to stay out of.

Graham Stringer: That is a shame.

Professor Whitty: I consider that investment decisions are fundamentally political decisions.

Q838 **Graham Stringer:** It is an investment decision, but it is also about the effectiveness of public health.

Professor Whitty: I was going to come on to that. I face two ways on that organisationally. I speak every week to the directors of public health. I very strongly think that they have been the bedrock of so much of the best bits of the response. They and their public health colleagues have really responded extraordinarily, as has the local government system across multiple other domains.

I also look out towards JBC, Test and Trace and PHE. They have done a very good job. The balance of that is shifting and will continue to shift, and it should shift. Trying almost to play them off against one another—I realise that is not what you are trying to do—

Q839 **Graham Stringer:** That is absolutely not what I am trying to do.

Professor Whitty: No, it is not what you are trying to do. I am trying to say that I would not want the public debate to be, "These are good, and these are bad." What we have are basically two good organisations doing their best in very difficult circumstances, and the balance between them should shift, and is shifting. I do not think that means that at any point in time you can say there is a perfect solution between the two. There is always going to be a need for a mix of some central capacity and some local capacity. Where that balance sits is going to shift over time.

Sir Patrick Vallance: Could I make a lessons learnt point? Whatever the system is, one of the things that is crucially important is to get the data in one place. What you cannot do with local systems is end up with local variation in how data are collected and how things are pushed into a central system. The ability to monitor things has been really important. Whether it is local or central, that data point is something we need to get right going forward.

Q840 **Graham Stringer:** I want to follow up the question Jeremy asked earlier about lessons learnt, which you answered comprehensively. What you did not answer, because scientists never like answering these kinds of questions, is how it impacted on you. You have spent nearly 12 months on it. You have come from being famous in your own fields to being nationally famous. How has that affected you? For any successor in this situation, what advice would you give to them? You must have learnt personal lessons throughout.

Professor Whitty: I would say I am a pretty typical medic, doctor and scientist, and you are right that I do not like talking about these things, but I will give two answers. The first thing is that if you go into a senior job in Government you have to expect a certain amount of public scrutiny. Of course, nothing can prepare you for the level of it. All of you as senior politicians are used to it the whole time, but for those of us who

operate more at a slightly below the radar level, it came as a bit of a shock. You have to accept that that is just the way it is. You have chosen the job and you are in post, so you have to do it.

The positive thing is the enormous amount of support from the various professions, both on the science and medical side and from local and central Government. That is what makes it possible. It is being part of a team of people who have been very supportive of one another. The same is true of my outstanding NHS colleagues. They have also been going through this, day in, day out, very much more face to face. I feel much more concerned about them than me. They have been working incredibly hard, and will have to continue to through this winter.

It is being part of a team and realising what you are doing to improve things that really makes a difference. That makes it possible. I would not want to whinge. The people on the frontline in social care settings, care homes, hospitals and GP practices have done a terrific job. They have done it as teams and for their fellow citizens.

Sir Patrick Vallance: It is an important question and thank you for asking it. I completely agree with what Chris said about the importance of the team, and the recognition that other people have had real frontline experience of this in a way that we have not. Going back to an earlier question, people have been affected right the way across the UK. Everyone has had a difficult year, whether it is in hospitality or other areas.

There are some lessons that are quite important. I will speak from a personal perspective and then say what I think might help going forward. From a personal perspective, the answer is that you have to stay focused on the science. In other words, you must not get drawn into the other areas.

The second thing is that it is very important during this sort of problem to have time to think about the big strategic questions. The most useful thing I think we have done around SAGE has been periodically to take time to try to focus on big issues like where this is going, what it is going to look like in a year's time and, early on, what winter was going to look like. When we were running at full pelt trying to keep up with things, that time out, with colleagues from a variety of backgrounds, was incredibly important. We often brought in different people to challenge us. That was not a full SAGE meeting; it was a much more informal thing. I think that was important.

The third thing—again it is a personal thing—is that drowning out the noise but listening carefully has been important. By that, I mean there is an awful lot of noise, whether it is on the Twittersphere or elsewhere. Just drown it out and stay on the things that really matter.

The fourth thing—I am going to embarrass Chris now—is that, frankly, I could not have done this without a colleague sharing exactly the same series of experiences. That has been important for all sorts of reasons.

That was a personal comment, but I think close working between the Government chief scientific adviser and the CMO is really important in this kind of emergency.

Professor Whitty: It might be worth hearing Dr Harries's view because she is a little bit more touchy-feely than me, but not much.

Q841 **Chair:** Dr Harries, you have had quite a billing there.

Dr Harries: Thank you. My touchy-feely perspective is that I share many of those points. Although Chris came into post just after I did, I had not worked at this level or with this exposure at all before. It has been quite a shock but also a real privilege. I absolutely endorse all the points. It really encourages cross-Government working. We always say in public health that there is nothing like an emergency for team building. I think that has worked to the extremes.

One of the real points, as you will have seen from the answers here, is that, certainly in the CMO's office, the CMO and the DCMOs all have slightly different experience to bring to the table. That has proved very useful. We come with our different expert areas, but obviously all from a clinical and medical background. Going forward, that is probably an important point to learn if we do this again. I can think of circumstances where that would not have been the case, but it feels as if we have been ideally suited as a team to support this going forward.

Q842 **Laura Trott:** Particularly in light of those comments, thank you all for your public service throughout this and on an ongoing basis.

I want to pick up the questions from Sarah about mass testing, particularly in Liverpool and what we have learnt from that. Professor Whitty, you were discussing the ongoing debate about the best way of doing mass testing. What lessons has the NHS specifically learnt from Liverpool, and how are we applying those lessons to tier 3 areas at the moment?

Professor Whitty: The first thing to say is that we are still learning on the Liverpool side. I do not think we have yet got to the point where I can say, "Here are the key lessons learnt." There are some obvious things we have learnt like, operationally, the sensitivity of lateral flow devices is lower than it is under lab conditions. That is probably obvious, but the actual percentage was not obvious.

The difficult bit has been getting to the people who are at the highest risk. In medicine, there is a general principle called the inverse care law: the people who need healthcare least are the ones who can most easily access it, and vice versa. The same applies to testing.

We have to think about the groups who are the most disadvantaged, the most likely not naturally to engage with authority and centralised systems and those who are at the highest risk. They often overlap; in fact, they are often the same people. We must think about how we can do it in a way that works for them so that they feel bought into it. That

goes back to a point we have come across several times. It is co-creation; it feels like something that belongs to people.

Where things have worked in Liverpool, it has largely been because they have been owned by the citizens of Liverpool and local leaders in Liverpool. Where things are seen as imposed, it is much less likely that they will be bought into. Even there, there will be groups who do not feel fully bought in. It is largely around thinking about the most marginalised groups and the ones with the highest risk, and working out how to go from there.

Sir Patrick Vallance: What Liverpool has learnt that is useful is that the digitally excluded are predictors of low uptake. Deprivation is a predictor of low uptake, and young adult males are less likely to engage. There are some things that are coming out of it that have yet to be fully looked through, but those are the sorts of lessons. The other thing that has come out is that confusion and misinformation on social media and so on need to be tackled.

Professor Whitty: The reason that things went down so fast in Liverpool was the leadership locally, not just political leaders but the whole society. Liverpool took it really seriously, and that is the reason why they got rates down so fast and so early from very high rates. It was local buy-in.

Q843 **Laura Trott:** I am from Kent. If we think about Kent as a whole at the moment, what strategies are in place to help address exactly those issues— helping the council to reach out to difficult-to-access groups and some of the digitally excluded? How are we helping to address that now in real time?

Professor Whitty: From my perspective, a lot depends on the director of public health. Of course, as several people, including our Chair, have pointed out, Kent is a big and varied county with a number of different challenges. It is also facing all the issues that are going to be arriving in January. The local authority has a lot on its plate. Nevertheless, we have to look very seriously at using local intelligence. There is no point in someone from outside Kent trying to say, "This is what you should be doing locally." *[Interruption.]*

Chair: We need to suspend the Committee—I hope temporarily.

The Committee suspended.

On resuming—

Chair: The joint Committee is back in session. Thank you, everyone, for your patience and response to that particular non-emergency emergency. We are coming towards the end of our session and we are very grateful to our witnesses for agreeing to stay on a bit longer to finish our questions. Laura Trott was in the middle of her questioning, so we will go back to her.

Q844 **Laura Trott:** Thank you, Chair. I have one last follow-up question on the

potential for mass testing to reduce the quarantine period. This Committee heard recently from Professor Sir John Bell about a potential policy of enablement being trialled whereby contacts of infected people are tested regularly but otherwise allowed to go about their normal lives. Has that been looked at in Liverpool? Are you examining it at the moment, or is there more widely a possibility that testing can be used to reduce the quarantine period?

Professor Whitty: The four UK CMOs have agreed in principle that it is a very good idea, but we need to work out whether it works in practice. The principle would be that, if it works—there are pilots going on at the moment that colleagues from Test and Trace are running—instead of people having to self-isolate if they are a contact, they would do daily testing, and only self-isolate if they are positive. Quite a lot of details need to be worked out. Because they are not fully sensitive tests, we need to be absolutely confident that we will pick up a large enough number of the people who are positive. If that could happen, it means that lots of people who currently have to self-isolate but do not go on to develop Covid would be able to go about their ordinary business and only self-isolate if they become positive. That is the hope, but it needs to be tested in reality. That is being done as we speak.

Q845 **Laura Trott:** Do you have any idea about the timing of the trials and when we might be likely to see results or any change in the quarantine regime for contacts?

Professor Whitty: It is always a mistake to say when something is definitely going to end, because we need to be absolutely confident that it is the right thing to do. I do not expect that we will be in a position to give a firm change this side of Christmas, which in reality means this side of new year, but my hope is that we will accumulate enough evidence over that time. It might well be that we start it in particular groups and then roll it out on a more widespread basis subsequently if the—trials is probably a bit too strong—studies and pilots look as if they will be effective. They will not be perfect, but they may well be better on balance than asking large numbers of people to self-isolate for a period of time.

Laura Trott: That is good news.

Q846 **Barbara Keeley:** As other people have done, let me say that yesterday was a momentous day, and I would like to thank you all for getting us to where we are.

Professor Whitty, can I take you back to a point on the lateral flow tests and care home visits that you were asked about earlier? I take your point about the balance of risk on visits, because the damage to people of not having them is enormous, as we know, but is it safe to use only lateral flow tests to allow care home visiting to go ahead? Is 50/50 good enough odds for that, or are we now risking seeding infection back into care homes?

Professor Whitty: Dr Harries has been leading on care homes, so I suggest she starts and, if there are additional points you want me to make, I will.

Q847 **Barbara Keeley:** Could you answer the point about the tests? You mentioned earlier something called layer testing. My local public health team has proposed using a PCR test three days before and a lateral flow test on the day, but that is not what the Minister announced, and it is not the way the Department has been liaising with care homes. There has been a great deal of confusion and it has caused a great deal of worry. Given your comments about lateral flow tests, we need to know if they are good enough in themselves.

Professor Whitty: The first thing, which is an obvious but critical point, is that the only way to keep care homes safe is to get the rates of Covid in the community down. That is the only way. You can reduce risk by all the things we have tried to do with care home workers and visitors. Jenny may want to come back to that. Fundamentally, if the rates in the community are high, it will get into care homes. If rates are low, it is much less likely to get into care homes. Getting it right down until we can vaccinate is the most important thing. Everything else, in a sense, is secondary. That is the most essential thing, and it is worth giving that preamble.

Regarding the best way to do the testing, there are several different ways to achieve it. The advantage of a PCR test is that it is more sensitive. The disadvantage of a PCR test is that you have a longer delay. You could easily have a situation where someone, between the first and second test, develops Covid, which they legitimately did not have the first time. The test was rightly negative, but they subsequently went through the incubation period and it came out. There are lots of different ways you can do it, none of which are perfect.

As with so many things in Covid, it is not what is the perfect answer. There is no perfect answer. It is what looks like the least bad option of the ones we currently have available. This is one of those examples. There is more than one way you can do it, and it is not illegitimate to look at other alternatives.

Q848 **Barbara Keeley:** The difficult point is that the Government made an announcement and started sending lateral flow tests out to care homes. That is the risk. If the decision, as I think you said earlier, is down to care homes, they get the test and could go ahead with it. That seems incredibly risky given what you said earlier. It seems like such a risky solution to the problem of visiting.

Professor Whitty: The idea that there is a risk-free solution is not viable. There will be risks either way. The risks fundamentally are either that you lower the risk, but still do not take it anywhere near zero, to residents from Covid, and they are never visited, or you have a slightly higher risk, and they are visited. These are difficult choices. There is no right answer. That is the key thing to realise.

Q849 **Barbara Keeley:** What reflections would you make on the treatment of people with learning disabilities during the pandemic? Data from Public Health England suggests that, after adjusting for age, people with learning disabilities are six times more likely to die from Covid than the general population. What are your reflections on that, now that we understand the situation that group is in?

Professor Whitty: Again, this is something where Dr Harries has led, and I think it is sensible to ask her first. I am very happy to come in afterwards if there are additional points.

Dr Harries: I think you are referring to the Public Health England mortality report. There has been another report, the LeDeR report, which is annual, carried out by the University of Bristol for NHS England looking at the impact of Covid on a sample of learning-disabled deaths. That is not a very pleasant term, but it is—

Q850 **Barbara Keeley:** I am sorry to interrupt you, but we are short of time. I understand this. I have just spent the last three years as my party's spokesperson on this, and I know all about LeDeR.

Dr Harries: On the Public Health England report, you may recognise that the biggest problem is the fact that the data—this goes back to many earlier comments in this discussion—is not very good. Many of the comments have had to be built, very professionally, on extrapolated data. There clearly is a very strong signal about learning-disabled individuals being impacted adversely by Covid, but one of the main problems we have is digging underneath that, in a similar way to looking at ethnicity impacts from Covid and understanding specific risks.

You will be aware that Down's Syndrome adults, for example, have been included in the clinically extremely vulnerable group. That is because, in our learning evidence around risk, we have noticed that. It has been ascertained through the work that Oxford University has done with the acute Covid risk stratification tool looking at the early evidence.

For other learning-disabled individuals, there is a complex mix around some underlying conditions that the Public Health England report does not address, such as whether people are resident in care homes or not, which in itself has a risk attached, and whether there is a separate risk as well. It can be much more difficult for people with learning disability, in some cases, to be able to follow some of the rules.

One of the important things goes back to data. When we look at, for example, primary care data in the future, we need to be absolutely clear that the learning disabled are represented proportionately and appropriately, and, therefore, that we can draw much tighter conclusions and have better interventions to protect them as we go forward. Certainly, Down's Syndrome adults have been identified; the grouping has been changed and they are prioritised within the vaccination group as well.

Q851 **Barbara Keeley:** We heard, earlier in our inquiry, from people with

learning disabilities and their families. They are often seen as an afterthought for Government, despite probably being more vulnerable to Covid-19. Are you satisfied that enough has been done to keep people with learning disabilities safe in this pandemic? If not, what more could be done?

We heard that support staff cannot even attend hospital with a person with learning disabilities. We know there are issues when a learning-disabled person cannot communicate what is wrong with them, what they are feeling, and what their symptoms are. What are your thoughts on that?

Dr Harries: It is not my personal responsibility on some of the points around access to a hospital, for example, but I can certainly comment on some of those points. You will know that the LeDeR report highlighted the fact that it is likely that individuals with learning disability appear less able to distinguish some of the symptoms of Covid, and, therefore, they potentially access services later.

There is a lot of opportunity to improve some of those issues as we go forward, certainly from the work that I have supported with the social care team at the Department of Health and in the discussions at the SAGE sub-group. The group started off looking at mortality and opportunities for intervention in the elderly and in care homes because of the very high fatality rates there. We have extended that to ensure that, for example, learning-disabled adults of all ages can have evidence considered at that group. That then feeds directly into some of the policy making. Guidance has been produced. PHE has created guidance with easy-read versions particularly designed for different groups of individuals.

In relation to hospital visiting, it is for local hospitals and the NHS, but it is written into policies that visitors need to draw particular attention when there is a communication requirement.

Q852 **Barbara Keeley:** To be clear, I was not talking about visitors. I was talking about support staff. The difficulty is that, if a learning-disabled person is admitted to hospital, unless support staff are allowed with them, there is nobody to interpret what is wrong with them. Let's leave that point.

One of the issues we heard about in relation to learning disabilities was that people in supported living were often treated the same as people in care homes, with blanket bans on visits, despite them living separately in their own flats. Has our approach to date done a good enough job of distinguishing between different types of care that people might like to use? There is a difficulty—we have even seen it today—in that we refer all the time to care homes. There is a great deal of care provided, like supported living, that is not in care homes. Are we doing a good enough job of distinguishing between the different types of care that people might use and handling it appropriately, because it does not seem as if we are?

Dr Harries: A lot of work has been driven by risk, and it is entirely appropriate that the attention went initially, as you will see now, with the elderly because that is where the highest risk levels are, and that is retained. The care home environment is difficult. It is a contained environment, and the elderly are particularly impacted by Covid. That does not mean that other environments have not been considered at all. I tend to view it as a spectrum that goes from care homes for the elderly, nursing care—even within that, there is a spectrum between nursing and residential—right through to an individual with a learning or a physical disability receiving care in their own home. It is a continuous spectrum.

Guidance and consideration has been provided for each of those different areas. As you say, it is a very mixed picture, which is why it is so important to consider the individual in their setting and those risks. It is very difficult to provide national guidance on that. The different settings are recognised, but, clearly, work with directors of public health around risk assessments for care is an important area.

Q853 **Barbara Keeley:** We heard evidence that blanket bans on visiting people in their own flat in supported living is causing problems to their families. Let me leave it there because we have a few other things to discuss.

Professor Whitty, you made observations earlier about social care and the need for research. Could you tell us how SAGE is working with the social care taskforce? Your earlier evidence to the Committees has suggested there was not ideal working and ideal advice earlier in the pandemic. How is work going ahead now to address issues arising from the pandemic?

Professor Whitty: I can talk about the research. Dr Harries chairs the SAGE sub-group on this, so she is still the best person to answer.

Dr Harries: There are a number of sub-groups feeding into SAGE on different topics. The work that I just described was in a care sub-group. It was a care home sub-group right at the start of the pandemic. I have extended that, as I have just described, to all forms of care in order that the evidence around infection risk and potential interventions to support and to reduce harm can be included in those discussions. It is a scientific group, as is SAGE, but it links directly to, and has a specific remit to feed rapidly into, the social care policy team at the Department of Health specifically in order that any new evidence that emerges can be fed as quickly as possible into policy making.

For example, the sorts of things it has been looking at and has fed directly into are risks around care workers and multiple occupations, and around the size of care homes. We know, for example, that in the second wave care homes that have not previously experienced deaths are more likely to have uncontained outbreaks now. There is a lot of learning from that, and we have been feeding into the group some of the main studies as they progress. The Vivaldi study, particularly looking at care homes and care home staff characteristics, feeds into the SAGE sub-group.

From that, you will, hopefully, appreciate that the ongoing research work is put through a SAGE sub-group that feeds directly into SAGE more

generally—into wider discussions—but it also feeds directly into the social care policy teams so that they can respond with policy making.

Q854 **Barbara Keeley:** This has been touched on, but how has the scientific advice you offer the Government changed to try to mitigate the disproportionate impact of the pandemic on people from black and ethnic minority groups? You may have touched on that earlier, but it is something that we wanted to ask about today.

Sir Patrick Vallance: We picked up on it quite early in April. We saw the difference and started working on it at that point. The behavioural group has given quite specific advice around making sure that other groups are included in the way that communication and policies are developed and taken into consideration. We now have a specific sub-group, much in the way that Jenny described for care homes. We set up a sub-group looking at it specifically, so that every bit of work that is done can have a lens of making sure that we pick up on the ethnic minorities' issues and tackle them head-on.

There is a way to feed it into all the discussions, and specific work has been done trying to understand why we see the BAME excess in terms of infections, admissions to hospital, ICU, and mortality, which has led to some quite important observations. We have linked that through to ONS, who are doing work on this, looking at things like household size and multi-generational households as risk factors. A lot has been going on, and it has been feeding through into policy making across Whitehall. That has evolved from about the middle of April, when we started working on this and realising it was a big issue.

Professor Whitty: I will add three points, if you are happy for me to do that. First, the biggest difference between wave 1 and wave 2 in terms of impact on ethnic minority groups is that in wave 1 there was a lot of impact on people of British black Caribbean, black African and south Asian heritage. In wave 2, there has been a very large impact in particular on people of British Pakistani heritage, but much less so in people of black African and black Caribbean heritage for reasons that are slightly complicated, and we do not fully understand, but partly to do with where the epidemic has been greatest.

It has not been universal. It is important not to see ethnic minority groups as a single entity. You have to see them as several completely distinct cultural groups, as well as distinct where they live. There is an occupational element as well; some of it is certainly to do with being highly represented in high-risk occupations for Covid.

The second point is a research point. NIHR has additionally put in research funding to try to look at this because it is a big issue. When we look back on this epidemic, it will be one of the areas where we really want to learn how to improve. It will help both for this epidemic and subsequently.

To build on something Patrick said, there is quite a big difference between the set of risks as to why people from different ethnic minority groups have a high risk of acquiring Covid and, subsequently, the set of risks that lead to someone who has Covid having worse outcomes. They should be seen as distinct. The ideal is to stop people getting Covid in the first place, but even when people have Covid, people from several ethnic minority groups have had less good outcomes. We need to understand and counteract the reasons for that. There may be some biological element, with propensity to other co-factors like diabetes, but it is not just explained by that. We need to look at that quite carefully.

Q855 **Barbara Keeley:** Professor Whitty, you said earlier that communications to those sorts of groups in the community—black and minority ethnic groups—were an area of learning. As happened in high-transmission areas in different parts of the country, do you think that working with local public health teams would have been the better thing to do? Clearly, a local authority and a local public health team understand their local communities and probably could get the messaging to them right.

Professor Whitty: I work very closely with directors of public health. Jenny and I speak to them on a weekly basis at least, and individual ones significantly more frequently. You are completely right: the local teams have the best understanding of this. There are quite a lot of things that are obvious in retrospect, and some that are probably less obvious in retrospect but we still should have done. They range from the really simple—that things have to be translated—to recognition that not everybody reads leaflets or even, in some cases, can read leaflets, and translating is not enough.

As previous witnesses have said, a lot of it is about finding locally respected leaders and those who people will listen to. Channels of communication that people will listen to are at least as important as the rather more mechanistic questions about things like language. It is all very well having things in the right language, but if it is not going to the right people, it will have no impact at all. The message should be tailored appropriately in a way that means that people are getting an equal amount of information.

When we look back, this is one of the areas where we have the most to learn. It is not unique to this particular pandemic. There are some things that are going to be unique to Covid. This will not be unique to Covid. This is something that will happen again, and we need to learn from it.

Q856 **Chair:** On that theme, there is a question from our colleague, Dawn Butler, who is a member of the Committee but cannot make today's meeting. She has asked whether the new vaccinations have been trialled with a particular view to people with blood disorders like sickle cell and thalassemia. Professor Whitty, are you in a position to comment on that? Do you happen to know whether that has been looked at?

Professor Whitty: With UK trials, the answer is that there is not sufficient information on quite a lot of sub-groups, as with most trials,

because there are so many different groups of particular medical conditions, some of which are highly concentrated in particular ethnic groups. Sickle cell is an obvious example. In the case of the AZ vaccine, one of the trials is in South Africa. That gives access to a wider group of people of different ethnic groups. There is also a trial in Brazil, so that again widens it out.

It is one of the many reasons, in my view, why an international approach to things and trialling things in different parts of the world is clearly important, because that allows us to build up an understanding of what works in different ethnic groups, in different age groups, and in different cultural and social settings. We should see science as international, and that is an example of why.

Q857 **Zarah Sultana:** I want to start by thanking the University Hospitals Coventry & Warwickshire for playing a historic role yesterday in administering the first vaccines. Thank you to NHS staff in Coventry and across the country.

I want to look at why ethnic minority communities are less willing to trust Government communications on pandemic measures. This low trust has meant that only 4.3% of Asian people and 0.5% of black people participated in the NHS's Covid-19 vaccine registry out of almost 362,000 people.

Is vaccine hesitancy the same as the anti-vax and anti-lockdown protests that we have seen and that we talked about earlier? It has to be seen through the lens of the relationship that different BAME communities have with Government institutions on things like black Britons being nine times more likely to be stopped and searched by the police, the Muslim community's historic grievances with Prevent, unethical medical experiments on black communities in the past in the US and the UK, as well as rumoured perception of risk, the speed of vaccine development and distrust of big pharma. There is a whole complex web of issues. Dr Harries, have you given any advice to the Government on how to address those very specific hesitancy issues?

Dr Harries: It is probably more for the CMO to comment on those. My colleague, Dr Jonathan Van-Tam, has been leading the work on it. I recognise that there is a wide array of concerns that you have raised. Many of them will impact people from all ethnic groups. The CMO has already recognised vaccine hesitancy. Many of the things that he suggested can contribute to helping that and are being attempted, and will help all ethnic groups.

The point that was made earlier about leadership in local communities and understanding local populations is critical. As he said, we have liaised in quite some detail over, for example, why people in some ethnic minority groups do not come forward for testing. It is not just vaccine hesitancy; it is an engagement issue. We have mentioned communication as well, and that comes out in the first PHE ethnicity report.

It is not my specialist area, but I understand that something of particular importance is some of the social media, which is quite ethnically specific. I have not been involved with that. I do not know whether Chris can confirm, but I am confident that the Government's communication team is looking at that.

Q858 **Chair:** Professor Whitty, would you care to comment?

Professor Whitty: Obviously, I completely agree with what Jenny has just said. One group, incidentally, that we should not forget are people of white European non-British backgrounds. For example, there is quite a lot of anti-vaccination literature in Polish or from other eastern European countries targeting particular groups in the UK—not deliberately, necessarily, but it ends up being read by them—who are not Asian or black British. We need to be sensitive to all of them and think about all of them at the same time.

Some of the points you raised in your preamble are slightly beyond my capacity to do anything about. The point you are really making, which I completely agree with, is that we have to talk to as many different communities as we can, understand what their concerns are, and then address those concerns honestly and straightforwardly. Obviously, individually they will vary, but they may well vary by groups. Some groups may have much greater concern about certain issues than others, and we need to take that seriously and give them honest and straightforward responses whatever they are.

The first stage is asking the question. That is where local directors of public health and local health leaders—GPs and nurses—are in the best position, because they often know what really worries people in their area and the groups that come to them from different communities. They are the frontline.

Q859 **Zarah Sultana:** Thank you for that response. It touches on my next question. The official gov.uk Covid guidance page on the NHS website on coronavirus, which gets mentioned quite often during the press briefings, is still only in English. For people who are not proficient in English, including many older first generation immigrants—a demographic at significant risk—that affects them. The press briefings provide a brilliant source of single, authoritative information, but there are communities that do not watch mainstream TV and find themselves informed, as you mentioned, by international media channels, social media, and WhatsApp. Professor Whitty, you said that the messaging with BAME communities was not right early on. How has it changed since then?

Professor Whitty: I think it has got better, but not from an ideal place. I do not think any of us would say it is where we would really like to have it. Of course, there is some degree of differential. We cannot stop that completely. We have got better at it, but we have certainly not got to the point where we would all want to be. I agree with you that, for the major languages spoken by people in the UK in addition to English, the ideal would be that we ought to have as much communication as we can, so

that people who find it easier to read in different languages feel as confident getting to that information as anyone else.

Q860 **Zarah Sultana:** Sir Patrick, you mentioned research being done in sub-groups in SAGE on policies and actions to address the Covid-19 impact on ethnic minority communities. Have the Government taken any of that on board? Quite honestly, I cannot see much change in Government action towards ethnic minority communities, or any community in particular. I am thinking of the need to increase financial support to self-isolate, anything specific to address multi-generational households, overcrowding, and all those issues. Is there anything that you can identify that has changed?

Sir Patrick Vallance: We have produced evidence and papers on all of those things, and we have docked into what now is a very clear central mechanism to look at that across Government. It is very good that that is in place to look at the policy implications.

For the precise policy outputs, I would have to defer to others. The information is there. It is very clear that there are things that need to be done. The multi-generational household bit has been recognised. Many of these problems, as you will know very well, are long-term structural issues that will not be resolved overnight. The challenge from a policy perspective is which things can and should be done now, and which things are longer-term resilience and fairness points that need to be addressed over time.

Q861 **Zarah Sultana:** My final question is about the easing of restrictions over the Christmas festive period. Does modelling suggest that that will lead to an increase in transmission, a third wave of infection, unnecessary deaths, overrunning of hospitals, and potentially another lockdown? In a few months, will we be looking at Christmas as some are looking at the Chancellor's Eat Out to Help Out scheme and saying that it contributed to a significant rise in transmission and deaths?

Sir Patrick Vallance: I think we are clear that the increased contacts over Christmas are likely to lead to an increase in numbers. It is likely that we will see an increase in numbers. The flip side is that it is a period when schools are not together, so there may be a decrease as a result of that. Overall, you would expect there to be an increase in numbers, and that is why it is so important that what we all do over this period is take the rules very seriously. Three households may literally mean parents and two children, because they are in different households. That is what it means. It does not mean three great big households.

We need to make sure that, where possible, we do things outdoors, pay attention to things like ventilation in the household, keep windows open, make sure that we obey the basic rules around hand hygiene and wear masks where appropriate. If people are coming into contact with elderly relatives for the first time, and they have come straight from a school where there have been outbreaks of cases, they should think hard about

whether that is a sensible thing to do and certainly think very hard about close physical contact in that situation.

Yes, there will be an increase in numbers, and we all have to make sure that we minimise the chance of that being a big increase.

Professor Whitty: We should view the next three months as a period at risk, of which the festive season over Christmas is one of the risks. There are several others, and the biggest one is that the most difficult time for respiratory infections in general, and for the NHS, is historically and likely to be this time, if we are not careful, January, February, and the beginning of March. The whole of the period between now and the spring is a period at risk, of which this is just a component. That is why it is absolutely essential that people take the remainder of this seriously and do not feel that it is all over, because it is absolutely not. The vaccines are going to help us in the long term and, hopefully, in the medium term, but, in the short term, there are the things we have at the moment. We must stick to the individual things, as people have done so well: the hands, face, space approach and the societal things.

On the relaxing of rules around the Christmas and festive period, the point that both Patrick and I have made, and Jenny would make as well, is that, just because the rules allow you to do something, it does not mean it is a good idea. It is a realisation that society needs a balance between risk and non-risk. We really encourage people to be very, very sensible over the Christmas period. I do not think people saying that it is a fantastic opportunity to hug every elderly relative is a good idea. It is an opportunity for people to be serious and say that over this period, unfortunately, we still have to stay incredibly constrained to protect other people, including other people in our own families.

The natural tendency is always psychologically to think it is strangers who are the bigger risk. When it comes to infections, it is your family, your friends, and your workmates who are your biggest risk. That is the group we all have to protect. We have to protect ourselves from them and them from us, and, by protecting ourselves, protect others we come into contact with. People have to think about that when they think through their actions over the Christmas period.

Q862 **Katherine Fletcher:** There has been breaking news this morning about changing advice on the BioNTech vaccination for those with historical anaphylaxis reactions. I understand that two medical workers have had an anaphylactoid reaction, which is not as serious as full anaphylaxis. Professor Whitty, is this withdrawal or recommendation advice an abundance of caution or is there an underlying issue with a novel vaccine type?

Professor Whitty: I have not seen the breaking news alert, so I am not absolutely clear what is in the public domain. One of the things I am absolutely determined never to do is give patient-identifiable information. That is entirely inappropriate, so I need to be a little careful.

Dr Raine talked about the fact that she and I talked last night with several other senior clinicians. I have talked to the other CMOs about events, as we will continue to do throughout the roll-out of this vaccine and every other vaccine. We will look at anything new that arises. What you expect to happen with any new drug or vaccine is that, as you go through time, you accrue bigger and bigger numbers of people who have them and you identify issues that, maybe at 1 in 100 or 1 in 1,000, you do not pick up, but it might be 1 in 10,000, or whatever. The larger the number of people who have the drug or the vaccine, the more likely you are, as you go on, to pick that up. We will continue to do that.

With a new vaccine, as would be true for any other kind of drug, we all think that it is better to be cautious at the beginning and take fewer risks than you would once you really understand the drug. There are many drugs that GPs now give perfectly routinely that, when I was a medical student, we used to admit people to hospital to start them on—ACE inhibitors, for example. The idea that you start off a bit more cautiously at the beginning is completely standard practice, as it would be in any other area of life. As you accrue your understanding of risk, of course you are a bit more cautious. That is the right thing to do initially. Possibly unsurprisingly, people who are much more likely to have a bad reaction to anything else might be at a slightly greater probability of having a reaction to this vaccine, and indeed to any other new drug.

The sensible thing to do, knowing that fact, is to be a little more cautious. We are beginning. We have far too many people to vaccinate with too few vaccines. Let's start off in a sensible and safe way where the risk/benefit looks best. It is just a way of pragmatically moving through. Patrick might want to add to that because drug development from another side is his background. It is very much about pragmatism. Safety and the risk/benefit is an ongoing responsibility. It does not stop the minute you have a drug that has been authorised for emergency use.

Q863 **Chair:** Sir Patrick, do you have anything to add?

Sir Patrick Vallance: Chris has said it. You carry on monitoring drugs and vaccines the moment they are out there and used widely. You need to keep doing it, and you need to adapt depending on what you see.

Chair: Katherine, does that cover your inquiry?

Katherine Fletcher: Thank you for taking the extra question, gentlemen.

Q864 **Chair:** A last question from me. Sir Patrick, you have reflected on the pressures on SAGE, and we want to learn the lessons for the pandemic. Some lessons have been applied. A new structure, the Joint Biosecurity Centre, has been adopted during the course of the pandemic. Was that something that you recommended, and has it been helpful?

Sir Patrick Vallance: Yes, we recommended it. We thought it important that there was a body that managed all the data and the information inside DHSC, the Department of Health, to look after it in an operational

sense, and that it needed lots of scientists in it and lots of ability to access the data quickly. We are very enthusiastic about JBC.

Q865 **Chair:** It is an example of learning as we go, learning lessons and applying them during the course of the pandemic.

In front of the Science and Technology Committee, you have been a great champion of transparency and publishing the papers that SAGE has considered. When SAGE considered the Joint Biosecurity Centre, it said it should pursue a reputation as an organisation that the public can trust to be an exemplar in terms of honesty, openness, competence, and independence. Would you reflect, given the experience that you have had in SAGE in publishing the papers, that that should apply to the JBC in the same spirit?

Sir Patrick Vallance: Getting the information out and making it open is the best route. Particularly in this sort of situation—a pandemic—there are lots of other scientists who, when they get access to the data, will help with the interpretation and add to it. It is the right thing to do.

Chair: Thank you very much indeed. You have been very generous with your time, interrupted by the false alarm of a fire alert. We are very grateful to you for your work and to Dr Harries, who is still on the line.

You gave some personal reflections on the demands that come with your job, especially during the course of the last year. I want to put on record our appreciation for that extraordinary hard work. It is fitting, as we get towards the end of the year, that we can point to a significant breakthrough that has come from science in which the three of you played a very important part right from the outset.

Thank you for your work during the year, as this is probably the last time we will see you during this calendar year. Thank you for your help with the inquiry on lessons learnt and for the help that you have given to our separate Committees over the course of the year.