HOUSE OF COMMONS

Science and Technology Committee

Oral evidence: UK science, research and technology capability and influence in global disease outbreaks, HC 93

Tuesday 14 December 2021

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Watch the meeting

Members present: Greg Clark (Chair); Aaron Bell; Dawn Butler; Dehenna Davison; Katherine Fletcher; Rebecca Long Bailey; Carol Monaghan; Graham Stringer.

Jeremy Hunt (Chair, Health and Social Care Committee).

Questions 2622 - 2796

Witnesses

I: Dame Kate Bingham, Former Chair, Vaccine Taskforce.

II: Dr Angelique Coetzee, Chair, South African Medical Association.

III: Professor Wei Shen Lim, Chair, COVID-19 panel, Joint Committee on Vaccination and Immunisation.

IIII: Dr Paul Burton, Chief Medical Officer, Moderna.

IIIII: Dr Susan Hopkins, Chief Medical Adviser, UK Health Security Agency; and Professor Steven Riley, Director General for Data, Analytics and Surveillance, UK Health Security Agency.

Written evidence from witnesses:

– [Add names of witnesses and hyperlink to submissions]

Examination of witness

Witness: Dame Kate Bingham.

Q2622 **Chair:** At this morning's hearing, the Science and Technology Committee will look at Omicron, the concerns it raises and the plans we should be making in respect of that. As well as members of the Science and Technology Committee, I am pleased to welcome Jeremy Hunt, who is Chair of the Health and Social Care Committee.

We have a number of witnesses this morning. We are starting with Dame Kate Bingham, the former chair of the Vaccine Taskforce. Then we will hear from South Africa, from Dr Angelique Coetzee, the chair of the South African Medical Association. Then we will welcome Professor Wei Shen Lim, the chair of the Joint Committee on Vaccination and Immunisation when it comes to its Covid-19 work. After Professor Lim, we will hear from the United States, from Dr Paul Burton, the chief medical officer of the vaccine company Moderna. Finally, we will hear from Dr Susan Hopkins, the chief medical adviser of the UK Health Security Agency, and from Professor Steven Riley, is the director general for data at the UK Health Security Agency.

We have a lot to get through. We will start with Dame Kate. Welcome back to the Committee. You have been very helpful with our inquiries in the past. You left the Vaccine Taskforce in December 2020. Everyone now recognises the extraordinary foresight that you and the taskforce had in ordering multiple quantities of different vaccines, which have served us well since last Christmas and through the last year. This Christmas, should we have had a similar plan for winter 2021-22 for the new variants that are now presenting themselves?

Dame Kate Bingham: Thank you for having me. The three tasks that we were given by the PM last year were to secure vaccines for the UK, to secure vaccines for the world, and to put in place provisions to ensure that we are better set up for next time. Those still work. There is no question but that we have sufficient vaccines for the UK.

Pandemic preparedness planning is things that are put in place because we do not know what new variants are going to come, how much the vaccines will need to be tweaked, and whether or not there will be new pandemic viruses we will need vaccines against. We therefore started to prepare a manufacturing capability in the UK that could be flexible to deal with both variants and potential new viruses.

That is where the focus needs to be. Everything suggests that this is an endemic virus. It is going to stay here forever, and we are going to need to be able to use all different types of approach to tackle it. Professor Wei Shen Lim will join you later. The recent data I have seen on heterologous boosts—mix and match of vaccines—looks very positive. Having that breadth of capability in the UK is important. It is not just for the UK; we

can manufacture for abroad, too. Some of that is being done, but my view is that right now we are probably not doing enough.

Q2623 **Chair:** What more should we be doing?

Dame Kate Bingham: We need to recognise that, specifically for vaccines, it is not just about procurement. We have done plenty of procurement, and that is now working well. The reason we did well in getting out of the blocks quickly was that we already had capability in UK medicine manufacturing. That is because we had invested in it in the long term. We need to continue doing that; it is not just a matter of a quick procurement, waiting around for a bit and then going back to procure again. We need to stay ahead of the curve so that we can produce variant vaccines in 100 days or less, which is the goal, and do so with resources, capabilities and teams that exist and are working on it, rather than bringing people together in a hurry.

Q2624 **Chair:** Have we retained and built on that capability, or has it been downgraded or disbanded since your time at the taskforce?

Dame Kate Bingham: I am not part of the VTF—I have been out of it for a year—so I do not know exactly what is happening.

There are discussions about what happens with VMIC, which you set up. There are two aspects of VMIC—the Vaccine Manufacturing and Innovation Centre. The clue is in the name. Manufacturing is being scaled to deliver bulk vaccines; that is obviously helpful and is an important role. The bit I am concerned about is the process development and scale-up. Again, I am not in the room, so I do not know to what extent it is being addressed. That is the bit that is complex and difficult, and it is the key to getting bulk manufacturing working well. You will need to ask people who are in the tent to know exactly what is happening there. If I were there now, I would be focusing all my attentions and energies on the advancement of manufacturing, the skills and the process development capability, and not just on procurement.

Q2625 **Chair:** How worried would you have been about Omicron had you still been leading the Vaccine Taskforce?

Dame Kate Bingham: Of course we expected to get variants. That is the nature of vaccines, so that itself is not a surprise. Actually, it is not a surprise that it looks like it originated in an immunocompromised individual in South Africa. This is a global pandemic, so we have to get vaccines out to everybody who needs them, especially the immunocompromised. Was it a surprise? No.

The data that I have seen, which is only public data, suggests that we have not seen severe cases yet in South Africa. It is a younger population, and it has had heavy levels of infection. None the less, we have not seen high levels of infection, so it may be a milder disease. We need to wait and see whether that translates in its severity, or lack of severity, here.

It is clearly quite widely divergent from the original Wuhan strain. If Omicron becomes the dominant strain, it would be prudent, in my view, to develop variant vaccines so that what I think will be annual boosts, certainly for the vulnerable, will be against Omicron as opposed to Wuhan, which is 38 or so mutations different from where we are now.

The Government are right to be taking this very seriously, but let's see how severe it is. Data I saw last night suggests that the South African incidence seems to be coming down, so it may be that it is super high transmissible but, hopefully, not as severe as we fear.

Q2626 **Rebecca Long Bailey:** Thank you, Dame Kate, for your time today. Can I push you a little on what you know about transmissibility and the effect that vaccines have on that? I know you were heavily involved with the work that was done on the Delta variant and the impact that vaccines had on transmissibility there. Are you aware of the impact of particular vaccines on transmissibility of Omicron at this stage?

Dame Kate Bingham: No. That is something you should ask Wei Shen about. I have been out of this for a year. You need to get detailed data from somebody who is living and breathing it.

Q2627 **Rebecca Long Bailey:** What assessment would you make of the Government's approach to vaccine procurement and manufacturing since you left the taskforce?

Dame Kate Bingham: Procurement has been good. Two major things have been done since I left: one was the additional doses that were secured from Pfizer; the second was the deal with CureVac. The first generation of CureVac has not worked out; they have partnered with GSK, and I am optimistic that the next gen will be positive. The Pfizer procurement has gone well. Relationships with Pfizer have been great; part of that was because Pfizer was embedded with the team right at the beginning. We had a very close working relationship between industry and Government, which was helpful.

Procurement has been fine. As I said, I am less convinced about manufacturing. What matters is that we have a breadth of capability that is maintained. I mentioned VMIC. We need to make sure that the innovation, scale-up and process development—all the difficult stuff—is maintained. I listened to Sarah Gilbert's Dimbleby lecture, and I know that there are funding struggles to maintain the vax labs, which were the very reason that they were able to manufacture their clinical trial batches and get out of the blocks quickly. We need to look very hard at that capability, which is distributed around the UK, not just Oxford, so that we can act quickly as and when we need to.

Another group it was very positive to work with last year was CPI—the Centre for Process Innovation, the high-value manufacturing catapult up in Darlington. Again, their capability is about process development and

industrialising novel manufacturing approaches. That group should be central to the preparedness of manufacturing capability.

We need to look at the relationship with the private sector. On the manufacturing side, we struck deals with Oxford Biomedica, Fujifilm, Diosynth and Valneva. Not all of those relationships are continuing. Again, I am not in the room, so I do not know the exact background behind each of those, but I think that having a close relationship with the bulk advance manufacturing industry is important. They have capabilities that go beyond the UK, so it is not little Britain trying to solve everything just for ourselves. They have the capability to become big export industries. From an economic resilience perspective, as well as a public health resilience perspective, they play important parts.

Q2628 **Rebecca Long Bailey:** Finally, do you think that the Government have a well-developed variant plan? Do you think it is being successfully deployed in a timely manner?

Dame Kate Bingham: The answer is that I do not know in detail. I know that when I left Clive Dix put together a pretty comprehensive variant plan, which was really good. Basically, it looks ahead, figures out what the potential variants are and tests those variants against the vaccines that we have. Of course, we funded Porton to scale up industrialised assay testing to do exactly that. If the vaccines do not work, we can start making tweaked vaccines before the variants potentially emerge. I know that there was a plan. I do not know to what extent it is being followed.

Rebecca Long Bailey: Thank you.

Q2629 **Jeremy Hunt:** I would like to follow on from Rebecca's question. Dame Kate, the theory of why you have a vaccine programme is that by having population immunity you can avoid a cycle of lockdowns. You were generally thought to have done an excellent job when you set that programme off. Here we are a year later, and we are facing more restrictions. Reading the papers today, many people think that there will be even more restrictions to come, beyond what MPs will be voting on this evening. With your bird's-eye view, what has gone wrong?

Dame Kate Bingham: I am not sure that it is a matter of what has gone wrong. The virus is ahead of us. What we have are vaccines that are pretty effective against the Wuhan strain and less effective, with a two-dose protocol, against the Omicron strain. The data that I have seen suggests that three doses work very well against Omicron. It is not a matter of what has gone wrong. It is a matter of how we make sure that the vaccines that we have stay ahead of the curve, and we do not just keep buying lots of vaccine against Wuhan when actually we need to start thinking about what the new variants look like. If that means three doses, that is what we need to do now, but again, that is not adequate going forward.

If you look at the Public Accounts Committee's report, you see that the cost of deployment last year, when I was in post, was about the same as the cost of buying the vaccines that we bought last year. We cannot be in a position where we have to go through this monumental logistics challenge of actually getting vaccines into arms. The other area that we must be pushing forward is how we improve the format of vaccines so that they are much easier and cheaper to deploy. Whatever it may be—patches, pills or sprays—we need both to find the tweaked vaccines that can address the viruses and to deliver them in a way that does not cause the country to have to pay billions more to be able to get them into people's arms.

Q2630 **Jeremy Hunt:** I will ask the question in a slightly different way. Obviously, it was not part of the plan that we would be going back into restrictions at this stage in the cycle of the pandemic. With the benefit of hindsight, and accepting that it is with the benefit of hindsight, what should we have been doing differently three months ago or six months ago?

Dame Kate Bingham: Again, this may have been done; I just do not know. I would have enacted the variant plan that Clive put together, which was to start predicting what potential mutations we could face and what diminution of protection you get from the existing vaccines with those variants, and I would have started making them.

One reason that we worked with Valneva was to have the capability to grow up variant vaccines. It is not trivial, and not every virus can be grown, but that is one idea for how to get ahead of the mutations of the virus. It may have been done; I certainly read in the press that the different vaccine companies are creating Omicron variants, but what we should have been doing historically, and should be doing in the future, is predicting what the variants will be and making vaccines accordingly—and testing of course. We have the capability to test head-to-head how effective the vaccines are against these variants.

Our focus last year was very much about speed. It was not about getting the perfect vaccine. It has become clear that the rate of mutation here is quite rapid, so speed was the right instruction for us to have been given. That is correct. We just have to be nimble in how quickly we can manufacture variant vaccines, because I think that we are going to have to produce the variants.

Q2631 **Carol Monaghan:** Both you and Dr Clive Dix have been critical of the Government's decision to cancel the Valneva contract. Could you tell us a bit more about that? Why was it problematic?

Dame Kate Bingham: It was problematic on various counts. This is the whole virus-based manufacturing capability in Livingston, Scotland. One of the things that we were keen to do was to make sure that the UK has flexible, state-of-the-art manufacturing capability to deal with whatever potential current or future pandemic virus comes along. By cancelling the

contract, we lose that capability. That plant is not fully built yet, and without completing the funding, per the contract, we will not get the capability, the jobs or the people trained to manufacture vaccines.

These plants are flexible. It does not mean that you can only manufacture whole virus-based vaccines. You can manufacture mRNA, adeno, protein-based vaccines and even antibodies. To me, it was short-sighted to cancel capability in a state-of-the-art advanced manufacturing plant that would have brought skills, jobs and economic benefits to the UK, over and above any vaccines that we may or may not procure.

Capability is one shortcoming. The second is that, precisely as we have seen with Omicron, until we vaccinate the world, we will continue to get variants. Even if we did not want the vaccines that we could have bought from Valneva, the world may have wanted them. The phase 3 data that Valneva produced was strong; it looked more effective than the AstraZeneca vaccine. The decision seems to have been based just on whether or not we in the UK wanted to use those vaccines for boosters. Clearly, the decision was that they did not want to use them for boosters, and therefore they cancelled the whole contract. I think that was short-sighted. The issues are capability, skills and economic benefits, and the distribution of vaccine around the world.

Q2632 **Carol Monaghan:** Can you say a bit about the difference with the vaccine that Valneva was producing? It was a more adaptable vaccine. Is that correct?

Dame Kate Bingham: It is a whole virus-based vaccine, which is literally what it says on the tin. You throw up this pandemic virus in a highly contained environment. You then inactivate it and combine it with an adjuvant. An adjuvant is a bit like a cup of coffee in the morning; it wakes you up a bit. It wakes up the immune system and says, "Pay attention to this. This is what you now need to create an immune response against."

Its adjuvant was a very novel, modern adjuvant, developed by a US company called Dynavax, which is more advanced than the adjuvants that are being used in the Chinese vaccines. The Chinese vaccines are also whole virus-based vaccines. They are not as potent as, for example, an mRNA vaccine, but because they combine the whole virus, as opposed to just the spike protein, they should give a broader immune response than just an immune response against spike. In a portfolio of different vaccines, that seemed to me to be a pretty interesting capability to have. The adjuvant gives it the edge over the other whole virus-based vaccines out there.

Q2633 **Carol Monaghan:** It is surprising that it was cancelled. Before leaving the Vaccine Taskforce, Clive Dix reportedly said that he had presented a plan to No. 10 to fast-track vaccines targeting new variants but, "I never received any responses at all." Are you surprised by that?

Dame Kate Bingham: Yes.

Q2634 **Carol Monaghan:** Who do you think was making the decisions when Clive Dix presented that plan to No. 10?

Dame Kate Bingham: I don't know because there was an interregnum after Clive left and before Richard Sykes took over. The VTF will have made the decisions, I imagine.

Q2635 **Carol Monaghan:** Before you left the Vaccine Taskforce, did you make any legacy recommendations to the Government? If so, what were they?

Dame Kate Bingham: Yes. There is a report that is published on the Government website that absolutely gave an account of what we did last year. Part of that, which was not published, included our recommendations. Yes, we gave recommendations last year, in December.

Q2636 **Carol Monaghan:** Have they been implemented?

Dame Kate Bingham: All of them are now. I would need to pull them up to remember. Basically, it was about how we keep going with the things that we were doing. Again, it is about continuing to invest in advanced medicines manufacturing, precisely to deal with all the things we are talking about today. How do we deal with variants? How do we deal with waning vaccine efficacy? How do we deal with improved vaccine format, stay ahead of it and make sure that we understand what are called the correlates of protection? What precisely about the immune response is protecting people? It is about understanding the detailed immunology.

In the headlines that get reported in the press, we are talking just about neutralising antibody responses. As a headline, that is fine, but it does not give the whole picture. Antibodies are a useful marker of how effective vaccines can be, but they do not tell you anything about the cellular response. Antibodies bind viruses before they enter the cell. Cellular responses, or T cells, will target cells that have been infected. We need to understand what the cellular response is and how we can boost that over and above antibody responses, so as to maximise the effectiveness of vaccines. Without an understanding of the detailed immunology, you cannot do that. Part of our recommendations, beyond the manufacturing capability, scale-up and flexibility recommendations, was about immunology.

Q2637 **Carol Monaghan:** I have a final short question. You have mentioned manufacturing capability a couple of times. Are you disappointed with what we see on the ground now in terms of our ability to manufacture vaccines?

Dame Kate Bingham: I am absolutely disappointed about Valneva. I still cannot understand why we would not want to continue with a state-of-the-art, brand-new manufacturing plant that we have largely built, but not yet completely built. I am disappointed by that.

I do not yet know where we will end up with VMIC. Again, I see only public statements. I am very anxious to be assured that the innovation part of VMIC will be retained, not necessarily in bricks and mortar, because we are starting to get more of that capability around the UK, but because we must have people and capability to take on approaches to new vaccines, formats and variants and to do all of the process development, which is so difficult.

Scaling up from a research lab-based scale to manufacturing millions of doses is highly complex. It cannot be done overnight. Last year, we benefited because of the Government's success in the past in investing in advanced medicine manufacturing. I want to see that not just continued—I hope that it is continued, despite what Sarah Gilbert said in her lecture—but reinforced and expanded, because we are good at it. We have the skills.

I went to a bioprocessing manufacturing conference in Cardiff a couple of weeks ago, and I was completely gobsmacked. Here is an industry where you have competing companies with people who enjoy working with one another and want to work with one another. This was an industry where they got together and worked co-operatively for something like six months without contracts, supported by the work led by Sandy Douglas in Oxford. He completely drove how the Oxford vaccine was scaled and got out. That is the sort of industry that we should treasure and support, rather than cut it off at the knees by cancelling contracts and alleging breach.

Carol Monaghan: Thank you, Dame Kate.

Q2638 **Dawn Butler:** Thank you very much for your time, Dame Kate. I have a couple of quick questions. First, could we have the recommendations you spoke of just now sent to the Committee, please?

Dame Kate Bingham: Yes. I just need to find them.

Q2639 **Dawn Butler:** Brilliant. Thank you. What was your reaction when you learnt that the Government threw away 600,000 vaccines? Did you have anything in place that would have stopped that happening?

Dame Kate Bingham: It is not really my area. We had astonishingly positive relationships with the Department of Health and the teams there, but they were responsible for deployment, not us. Our job was to get vaccines to them for delivery.

Q2640 **Dawn Butler:** Were you shocked that 600,000 were thrown away or disposed of?

Dame Kate Bingham: I am afraid that it is not just the UK. Vaccines are being wasted around the world. It reinforces the need for all Governments to be ahead of the curve. If we are not going to be able to get those vaccines into arms, we should get them to places where they need the vaccines and can get them into arms.

Dawn Butler: Brilliant. Thank you.

Q2641 **Katherine Fletcher:** Thank you, Dame Kate, for everything that you have done and for your candour today. I want to return to the production of vaccines against variants and different areas. Do you have any insight into timescales and when we can look to have a new jab that is a bit whizzier and more all-singing and all-dancing?

Dame Kate Bingham: The 100 days is not crazy. The new vaccines quickest to be designed will be mRNA. They will be quite quick to design. You then have to scale and to demonstrate clinical efficacy and safety. It is a stretch, but it could be done in 100 days. Thinking about March next year is not beyond the realms of possibility, but we need the capability to do it, rather than just relying on companies always being ahead of the game to do it. That is the sort of forward thinking we need to enable that to happen.

Of course, we use the brilliant NIHR. Our national clinical trials capability was completely game-changing and will continue to be game-changing. We should be able to continue to deliver that side of things. For me, it is about making sure that we can do the manufacturing, scale-up and process development. Of course, the regulator, MHRA, cannot approve a vaccine until it knows that the manufacturing process is completely consistent and safe and meets all the standards. That, rather than the clinical development, is now the slow bit.

Katherine Fletcher: I understand. That is brilliant. Thank you very much for that.

Q2642 **Chair:** I have a couple of final questions, Dame Kate. In the lecture that you gave a couple of weeks ago in Oxford, you reflected on your time leading the Vaccine Taskforce, which everyone acknowledges was a huge success and an example of how to do things. You said: "It is interesting to reflect that the behaviour of the Government appears to have changed significantly from my time in the VTF…it now appears that the waters have closed over" the approach that was taken, which was close working with businesses, "and officials have reverted to their usual practice, and the pre-existing culture of distrust of business. It is hard not to think that a massive opportunity to win has been lost." Can you say why you formed that concern and what can be done about it?

Dame Kate Bingham: Part of it was informed by Valneva. That a small company that was busting a gut to try to support us last year, to build new plant, scale up manufacturing capabilities and develop vaccines for us, then gets sent a letter from the Government alleging breach of delivery so as not to pay the costs that they have incurred to develop the vaccine for us, is not a good signal for me. If the Government want to cancel contracts, they can cancel contracts; I have no issue with that. But they should pay their debts where they are due. We are a small industry. That sort of behaviour does not carry well.

The other example I gave in the Romanes lecture was plant-based manufacturing. Again, there was a huge opportunity to work with very capable and keen companies that would have established a very rapid manufacturing capability in the UK. The decision, not by industry people but by Whitehall, was no, we have to go through a normal procurement process, which is basically going to take forever and means that we are not going to operate in the nimble, quick, collaborative way that was so effective last year.

I worry about that. I worry that the team of experts that we put together to do all the due diligence, whether it is manufacturing, science, regulatory or clinical, has not been used since I left. It is that sort of thing. It is difficult to work in an environment where you do not have people skilled in the areas in which they are working. You need people who are scientists, with operational experience and links to industry, to be able to think about some of the long-term strategic problems and be creative about how you solve them. If we do not have the skills and do not have the industry relationships, and where we do have industry relationships we do not look after them, it does not put us in a very strong position.

Q2643 **Chair:** Thank you very much. I have a final question. In answer to my first question, you described where we are with the virus as entering a period in which it is endemic. Can you say how you respond to an endemic virus as opposed to the pandemic that we have experienced for most of the period so far?

Dame Kate Bingham: It means that the virus is going to circulate forever. I hope that it will circulate in a less virulent form. It means that we have to manage it as we would flu, which is also an endemic virus. That means we have to identify who is most at risk, and we need to continue to protect those people forever. You have Wei Shen coming up; he will be a lot more thoughtful about it than I would, but my expectation is that those who are most vulnerable should be vaccinated regularly. That may be only yearly now. That, to me, means all adults over the age of 50 and all adults under 50 with severe underlying disease, and anybody else that the JCVI recommends. They would be given routine vaccinations. Depending on the severity, it may need to go beyond those high-risk groups, but I think initially we are going to have to think about how we keep those high-risk groups protected forever.

Some level of viral presence may provide a natural boost. That itself is not necessarily a bad thing, but we need to understand what the strain of virus is and what the consequence of it is in terms of what the vaccine is going to need to look like and who will need to get it.

Chair: Dame Kate, thank you very much indeed for your evidence to us. We are very grateful, as is the country, for your work in leading the Vaccine Taskforce. You have been very helpful to the Committee throughout our inquiries, and we are very grateful for your evidence today. Thank you.

Examination of witness

Witness: Dr Angelique Coetzee.

Q2644 **Chair:** I now welcome our next witness, who I am very pleased to introduce. From South Africa, Dr Angelique Coetzee is the chair of the South African Medical Association and was one of the first clinicians in that country to have detected what turned out to be the presence of the Omicron variant.

Thank you very much for joining us, Dr Coetzee. Given your experience of about five weeks now in South Africa, could you summarise how much more transmissible Omicron is compared with the Delta variant? What have you found on that?

Dr Coetzee: Good morning and thank you for asking our opinion. The transmissibility of the Omicron virus is most probably equal currently to Delta and it might be more transmissible than Delta. We will only know as time progresses and we reach the top of our curve whether it would have been more, but for now it is definitely on a par and, as I said, it could even be more transmissible at the end of the day.

Q2645 **Chair:** I have a similar question about the severity of the disease that is associated with Omicron compared to Delta. What is your experience so far in South Africa?

Dr Coetzee: I am going to answer that in two ways. First of all, regarding primary healthcare, the predominant picture that we are seeing here is of a mild disease. However, we see a different picture in hospital admissions, especially around unvaccinated people—the majority are unvaccinated. Unfortunately, in our hospitals in ICU, we do not have the stats to determine whether it is Omicron versus Delta. We do sequencing in about one per 200 patients. We only look at the clinical picture. If we look at current cases in the ICU, our ICUs are still not overwhelmed by Covid cases. When we report our hospital admissions, there is a mix of people incidentally found to be positive with Covid-19 admitted for other diseases than Covid-19, and there will be people in ICU who are there predominantly with Covid-19. Our death rates, unfortunately, are also reported as just Covid-19 death rates. Although our death rates are quite low, everyone admitted to ICU is always a severe case, but we cannot comment on whether it is Omicron versus Delta.

Q2646 **Chair:** Reflecting on the pattern of severe disease and hospitalisation from Covid, given that you cannot necessarily split them between the two, and we are now a few weeks since the first detection of Omicron, what has been the experience in terms of hospitalisations from Covid more generally across South Africa during that time?

Dr Coetzee: To give you some of the stats from 9 December, our death rate on 9 December was 22 patients; on 10 December it was 49 patients; on 11 December it was 36 patients; and on 13 December it was 11

patients. We do not have a huge death rate currently, and we are extremely grateful for that.

If we look at our positive cases in the general public, however, on 9 December it was 22,390; on 10 December it was 19,000; on 11 December it was 17,000; on 12 December 18,000; and yesterday it was 13,992. Our positivity rate depends on how many people go and get tested during a specific day. Yesterday was a high positivity rate because not a lot of people went for testing. It was 31% but the average for our positivity rate is around 25%. However, yesterday, hospital admissions across South Africa were 422 and, as I said earlier, that includes a mix of incidental findings as well as sick people.

Regarding the oxygen needs of patients, we have seen patients who have been admitted incidentally. Our public sector system, if there is a problem at home and the patient presents and is positive, keeping in mind what we have seen with Delta, will admit them just to observe them. There are no oxygen needs. The length of stay for these mild cases is less than half of what it is for Delta-related cases.

We do not really see cytokine storm at primary healthcare level. However, it is still early days regarding what is happening at ICU level. We are quite comfortable that the average patient in primary healthcare, whom we are examining on a day-to-day basis and who comes into our surgeries, will recover within five to a maximum of seven days. We have not so far encountered long Covid with these specific patients. We are not talking about patients in ICU.

Q2647 **Chair:** Thank you. As well as being the chair of the South African Medical Association, you are a doctor in clinical practice. I think it was that practice that led you first to suspect that there might be a new variant. Could you summarise very briefly how you came to that thought?

Dr Coetzee: I always say I am an old GP—33 years in private practice. I am old school—I do not go on social media, the Zoom platform or HealthID; I normally see my patients physically. I have personally treated 600-plus patients with Delta. Then we had the break from Delta. About eight weeks later, patients came back in with complaints that did not make any sense at all. There was a young patient, early in the morning—it did not fit. He was tested and was positive. Incidentally, his whole family made an appointment, which is unusual in our system. The rest of the family was positive, and that day I saw this mild picture.

The picture predominantly for the past four weeks has stayed exactly the same. The three major complaints will be what we call myalgia, which is sore muscles or body aches and pains and headaches, and there can be a bit of fatigue for a day or two. Normally the patients will come, but we ran a campaign where we asked people, "Please get tested. Even if you wake up with a slight headache and are not feeling well, please come and let us double-check." Consequently, we noticed that if you wake up in the morning and you have headache and body ache—myalgia—it would be

prudent to wait 24 hours for a rapid test, as it can give a false negative in that first period of less than 24 hours. But after 24 hours up until five to six days later, the rapid test is more than sufficient to detect positive cases. We do, however, have patients that wait for up to a week and then come in and say they are not sure and need to double-check. They have a headache and are not feeling well, so we double-check and then we do a PCR. Normally, that will be positive. The symptoms are very similar for most of the patients.

However, unvaccinated patients seem to experience a severity of myalgia as well as more intense headache than our vaccinated patients. Yes, we see a lot of patients who have been vaccinated and unvaccinated with mild disease, although, as I said, it seems that the vaccinated people recover more quickly than the unvaccinated people.

Q2648 **Chair:** Thank you. Finally from me, given the experience of the last few weeks in South Africa, have any new restrictions—non-pharmaceutical interventions—been taken by the South African Government in response to Omicron?

Dr Coetzee: No. We are still on the same level of restrictions, with curfews at night and early morning, and on the gathering of people outdoors and indoors. Nothing has changed there. We will wait until this weekend to see whether our President, who incidentally has also contracted Covid—we are quite sure it is Omicron—will bring in any stricter restrictions. For now, it has already spread to all the provinces, so inter-provincial travel is not going to really do anything. From the South African Medical Association side, if there is anything that we would advise the President to do, it might be to extend the curfew just one hour at night and in the morning, and look at social gatherings.

I have been asked this question of lot of times: "What will the Government do? What are they going to do on restrictions?" My answer is the same the whole time. The Government can provide you with vaccines. They can tell you to get vaccinated. The Government can bring in certain regulations, but what are you, as a responsible citizen, going to do? You, as a responsible citizen, need to adhere to the regulations and the non-pharmaceutical interventions. You, as a responsible citizen, need to go and get your vaccines because we have seen that the vaccines at this stage, although there is a scope for the vaccines, still protect you against severe disease. We see that in our hospital cases in ICU.

Q2649 **Chair:** You are chair of the South African Medical Association. Is that view as to what should be done widely shared by the association, or is there a hot debate about it?

Dr Coetzee: I normally consult with my board regarding this. If you look at what is happening at ground level, cases are predominantly mild, and if we do not have a problem in the family practitioner space as well as in the hospitals, we do not see the need for stricter restrictions. There is an economic downfall to it as well. As I have said, there is no use putting

any restrictions around movement because the virus is everywhere. Maybe, in a way, we need to learn how to live with it. If it becomes endemic going forward, if people are infected, we need to get the boost from antibodies as well as getting the boosters themselves to help and assist.

Chair: Thank you very much indeed.

Q2650 **Aaron Bell:** Thank you for coming on today, Dr Coetzee. Thank you also for your willingness to engage with the UK media. It has been quite helpful for us to hear about your experiences from South Africa.

On that note, you have written in the *Daily Mail* today. You said that you have been astonished by the extraordinary worldwide reaction. You said that, with respect to Britain, the reaction is out of all proportion to the risks posed by this variant and that it verges on hysteria. Could you explain why you believe that, given that countries in Europe have a very different population structure and different exposure? We have not had a Beta wave and so on. Is it not the case that the countries in Europe are taking a precautionary approach for a few weeks until we know more?

Dr Coetzee: The current picture in the primary healthcare space in South Africa is that of mild disease. We have said right from the beginning that we do not have all the answers and that we still need to see how this virus progresses and what the clinical picture is, but in less than 24 hours we were slammed with international travel bans from the UK. We were trying to say, "Please guys, there is a new variant out there." At that stage, at primary practitioner level we had one week's—seven days'—experience when this happened. We were still figuring it out as well, but already during that time we saw that the symptoms were definitely not the same as Delta. Yet there was an international travel ban less than 24 hours after an announcement.

We understand that Governments want to protect their populations and their people, but before you start doing those types of knee-jerk reactions, let's first get people to start wearing their masks, look at social distancing, look at gatherings of people and start with the non-pharmaceutical interventions. Simultaneously, you can identify people who are at high risk. If they need boosters, get them to have the boosters. If they have not been vaccinated, get them vaccinated. I think that is much better protection, especially in the light of this mild variant.

What will happen is that you will test me today—remember what I said about the rapid tests—and I will come in but will not feel that sick. The test will be negative, and only tomorrow will I be positive. If I travel and I have done my test early before I have any real symptoms, I will test negative. By the time I end up in another country, I might be testing positive. With a virus that is so transmissible, you will spread it in any case. It is difficult to stop it.

Q2651 **Aaron Bell:** Given that community transmission is now widespread, I

think the case for travel bans has probably changed. To go back to what you said in the article today, you said it is completely over the top to be talking about plan Cs or lockdowns.

What we are voting on today in the House of Commons is not a plan C or a lockdown. It is essentially extending the requirement to wear a mask, which you have just mentioned, and also to have a Covid pass. Some people are calling it a vaccine passport, but a negative test will also allow you to get into larger events. Do you think that that is a proportionate reaction in the UK?

Chair: Just at the crucial point, Dr Coetzee has frozen. Dr Coetzee, did you hear the question from my colleague, Aaron Bell?

Dr Coetzee: I didn't hear the last part.

Chair: Let me ask Aaron to ask it again in summary form.

Q2652 **Aaron Bell:** I will go from the start. Sorry, we lost you for a moment, Dr Coetzee.

You said in the article you wrote today that it is completely over the top to be talking about plan Cs or lockdowns. What we are voting on today in the House of Commons is not a lockdown or even a plan C. It is an extension of the mask mandate, which you have already mentioned, and there is a Covid pass. Some people are calling it a vaccine passport; vaccination, a negative lateral flow test or a recent recovery from Covid will enable you to get into larger venues. Do you think that is a proportionate reaction to the threat of Omicron in the UK?

Dr Coetzee: What I think it is important to do is, first, get your people to be vaccinated. As I said, the boosters are necessary. Get people to wear their masks. Get people to stay away from big gatherings. That should be the biggest plan to have in place at this stage, not to have restrictions such as closing all the borders, closing shops and all of that. First, look at what is going to happen with your aged population. We might have a different population in South Africa, but remember that even in South Africa we have people who are not vaccinated. Most young people with severe diseases like HIV and TB are not vaccinated. We have a huge burden of that, and a lot of those people did not get their treatment, especially during the past year.

Get people treated who have comorbidities. Make sure that they follow the protocols. Get your non-pharmaceutical interventions, and then you can start looking at how much your healthcare system is being overburdened by people. Always remember that you will have the worried well, but for us the most important place to look at is what happens at the hospital level. That is where the problem will be. If anything is going to happen, it will happen at hospitals. There, you need to plan and make sure that everything is in place. People who were supposed to go on leave may have to be on standby. That would help much more than bringing in blanket restrictions going forward.

Q2653 **Aaron Bell:** I want to ask you about severity. You have said that it presents much more mildly. There is some data out this morning from the South African Medical Research Council, together with Discovery, which is a South African insurance company, suggesting that the severity is 29% lower than the original D614G wave. Is that a figure that makes sense to you? Is it milder than the original first wave by about 29%?

Chair: We may have temporarily lost Dr Coetzee again. Did you hear the question, Dr Coetzee?

Dr Coetzee: Yes, it makes sense to us.

Q2654 **Aaron Bell:** It is about 29% milder. The same published data said that a double dose of Pfizer, not the booster—most of our elderly have been boosted in the UK—instead of having an 80% protection against infection is down to 33%, and instead of 93% protection against severe disease it is down to 70%. Again, are those numbers that make sense based on the South African experience as you have seen it?

Chair: We now seem to have lost Dr Coetzee altogether. She is back. Let's have one more try. Did you hear the question, Dr Coetzee?

Dr Coetzee: Can I turn my video camera off?

Chair: Yes; let's see if that gives us better audio. Please do that.

Aaron Bell: Did you hear the question, Dr Coetzee?

Dr Coetzee: I think this is much better. Would you repeat it, quickly?

Q2655 **Aaron Bell:** The same data that was published this morning had information about the effectiveness of a double dose of Pfizer, but not with a booster, which most of our elderly have had. The two figures I wanted to put to you were the reduction in effectiveness against infection. There is 80% from Delta down to only 33% against Omicron. For hospital admissions it is down from 93% effectiveness against Delta to only 70% with Omicron. Are those numbers that you recognise from your experience in South Africa?

Dr Coetzee: If I look at my own stats of the patients, I have personally seen 88 patients. The vaccinated patients are 39 versus 43 unvaccinated patients. Yes, we know that the patients can get breakthrough infections whether or not they are vaccinated, or they can get reinfected. Patients who had been infected before and fully vaccinated can still get breakthrough infections. However, the breakthrough infections that we are seeing at primary health level are mild. The symptoms experienced by those patients are less severe and intense than the unvaccinated.

At the hospital level with patients who are admitted, as I have said before, the majority—between 88% and 90%—are unvaccinated. That is why it is so important for us to understand the vaccinated group in the hospitals and whether they have had Omicron or Delta before, so that we

can determine how well the vaccines are protecting against those two variants. We do not have that data.

Chair: We will try Dawn Butler. We are reaching the limits of the bandwidth. Dawn, perhaps some short questions that might get through.

Q2656 **Dawn Butler:** Thank you, Dr Coetzee. How many weeks has it been since you discovered the Omicron variant?

Dr Coetzee: On Thursday it will be four weeks—two days from now.

Q2657 **Dawn Butler:** Thank you. What is the population in South Africa who have been vaccinated? What is the percentage, please, and the percentage of the population who have had a booster jab in South Africa?

Dr Coetzee: The percentage in South Africa who have been vaccinated is about 23%. We have not started with the boosters for Pfizer yet. We will start with that. With Johnson and Johnson, we started the boosters last month. Quite a few doctors and healthcare workers have been vaccinated. The fully vaccinated under the Sisonke2 trial—the healthcare workers—is around 200,000. They have already been vaccinated with their second or with their booster on Sisonke on Johnson and Johnson. In South Africa, under the age groups that we have allocated, the fully vaccinated are 38%. There are still a lot of people, as I said. In total, 23% of our population have been vaccinated.

Q2658 **Dawn Butler:** I know that South Africa is quite advanced in genome sequencing. It has been said that the variant was in Europe before you discovered it in South Africa. Is that correct?

Dr Coetzee: I cannot comment on that. I did not see the stats. It could have been anywhere. If you take the UK as an example, you have seen so many Delta cases that you can easily miss the picture at primary healthcare level. It could be in any other countries. I do not think there is anyone who can claim that it first started in their country. I do not think so.

Q2659 **Dawn Butler:** That was going to be my next question—whether it was correct to say that it started in South Africa. Thank you very much for your time today. My last question is: do you do any antibody testing or T cell testing in South Africa?

Dr Coetzee: We do not do it routinely. It is done at scientist level and not routinely. T cell antibodies are quite a difficult field. It is an expensive field. One of the things one needs to look at going forward is to make sure that there is more investment in science to improve healthcare, and especially studies around T cell immunity as well as the normal antibodies. Unfortunately, what we have seen with Covid is that your antibodies, instead of taking six months to get your IgG positive, can get positive within two to three weeks. It is very difficult. The antibody test is not really going to tell you how good your T cell immunity is. I think there

is a need for this field and for science to be reinforced, and for trials to be conducted.

Dawn Butler: Thank you so much for your time today, Dr Coetzee.

Q2660 **Chair:** As a final question from me, Dr Coetzee, perhaps I could follow up an answer you gave my colleague, Aaron Bell. He was asking you about lockdown restrictions, or non-pharmaceutical interventions as they are called. Am I recalling what you said correctly? You said you would be against restrictions that might be a lockdown, but that people should avoid crowded places. Have I captured that correctly?

Dr Coetzee: Yes, you have captured it correctly.

Q2661 **Chair:** One of the proposals before the House of Commons today is that in larger venues people should either have to demonstrate a negative lateral flow test or show that they have been double vaccinated. What is your assessment of those proposed measures?

Dr Coetzee: They can help and assist a lot. Unfortunately, I come from South Africa where we know how easy it is to counterfeit anything. As long as you have checks and balances in place to make sure that original passports or mandates are being shown wherever you require them, that might work, but there are always people who will look at how they can fool the system. You have to have a foolproof system.

Chair: Thank you very much indeed. We are very grateful to you for joining us from South Africa this morning and persevering despite the technical difficulties. We managed to get your answers to all our questions. Thank you very much indeed for joining us and helping us in this important session this morning.

Examination of witness

Witness: Professor Wei Shen Lim.

Q2662 **Chair:** I now invite our next witness to give evidence to the Committee. I am pleased to welcome Professor Wei Shen Lim, who is the Chair of the Covid-19 panel of the Joint Committee on Vaccination and Immunisation. Professor Lim, thank you very much indeed. Again, you have helped the Committee several times with our inquiry. We are very grateful for your appearance today.

I will start with a question about timings. Boosters were authorised by the JCVI, or at least the JCVI gave a recommendation that they should be authorised for all adults, on 29 November. What stopped that recommended authorisation being earlier?

Professor Lim: Thank you. Could I make a slight correction? Boosters were advised by JCVI for people aged 50 years and above on 14 September, and for people 16 to 49 years old in a clinical risk group also on 14 September. Boosters were advised for people aged 40 to 49 years old on 15 November.

Q2663 **Chair:** My question—correct me if I am wrong—was that for all adults it was 29 November. Is that correct?

Professor Lim: For adults under 40 that came in on 29 November.

Q2664 **Chair:** Indeed. That is my question. Could that recommendation have come earlier?

Professor Lim: It could, but I do not think it would have been appropriate to come earlier. On 29 November, we set out a set of advice as immediate response measures to Omicron. Omicron was identified by a lab in South Africa on 23 November. It was declared as a variant of concern by WHO on 26 November. JCVI met as a committee on 27 November in the evening; it was a Saturday. On 29 November, three days after WHO declared it as a variant of concern, we advised a set of immediate response measures, one of which was to accelerate the booster campaign across the board. The acceleration of the booster campaign came three days after this was recognised by WHO as a variant of concern. We could have potentially called it two days earlier, but I do not think we could have called it before Omicron was identified.

Q2665 **Chair:** The heart of the question is that obviously, as you have described, you responded very quickly once we knew that Omicron was circulating, starting in South Africa, but the decision to give boosters to over-50s, as you said, happened on 14 September before anyone had ever heard of Omicron, and probably before it was even in existence. I assume your mindset was anticipation of pre-empting during the winter a variant or a susceptibility to infection for people who had been vaccinated twice.

The question is, would it have been better, now looking back, as a precaution to have used the autumn to vaccinate the whole population with the booster rather than waiting for evidence of a dangerous new strain?

Professor Lim: The simple answer is no. The decision in September to offer vaccination to people over 50, for example, was based on the Delta variant that was circulating and the amount of waning of protection against severe disease. The data from UK Health Security Agency showed that there was starting to be some waning against severe disease, hospitalisation and people sadly dying from about six months onwards, particularly in older people. The data for waning protection against severe disease for younger people who are otherwise well—not in a clinical risk group—remains very good against Delta up to six months. They have over 90% protection against severe disease even six months from their second dose. Therefore, in so far as protection against Delta is necessary, we only need to boost people whose protection is waning. We identified those in September.

Your question about hindsight, or foresight, is different from foreknowledge. Foresight is trying to identify something that will transpire given a set of circumstances. Foreknowledge is prophetic knowledge of something that did not exist that will then exist. The booster campaign

for Omicron is a response to the threat of Omicron, and that needs a different way of thinking.

Q2666 **Chair:** A very important distinction. Thinking of foresight and foreknowledge, what would have been the downside of vaccinating the whole adult population during the autumn in anticipation of the possibility that there might be something worrying presenting itself during the winter, like Omicron? What would have been the downside of doing it in anticipation?

Professor Lim: As you know, protection wanes. We have seen that with the older population. At any point that we give a vaccine or a booster, we will see an improvement in the level of protection but, potentially, we then see that level of protection dip over time. Therefore, one does not want to give boosters unnecessarily too early because, if you really have good protection at one point in time, there is no point giving extra protection at that time. It is better to wait for the appropriate time so that you extend your durability.

As I explained in September, when we launched the booster programme, we were not thinking only about this winter. We were also thinking about next winter. Putting aside Omicron and just thinking about Delta, if somebody only needs to have a booster at six months, giving the booster at six months might mean that their protection lasts for much longer. If the booster were given at three months, for instance, first it will wane earlier and, secondly, a shorter time to boost might mean a lower peak of protection, which also has an effect on durability. It is not necessarily true that giving a booster sooner is better. If anything, all things being equal, giving a booster as far apart as possible gives the best immune response. One wants to choose the furthest time point, if one can, depending on the amount of waning.

Q2667 **Chair:** Thank you. That is very clear. Finally on this, suppose one did as a precaution give a booster earlier than might have been optimal, would there be any problem with then supplementing it with a fourth dose in the spring, if it had waned by consequence in the spring rather than in the summer?

Professor Lim: We are not looking at just one vaccine. We are looking across the board at the effort to give a vaccine. As you heard from Dame Kate earlier, the cost of deploying a vaccine in the vaccine programme is extremely high—almost as high as procuring the vaccine. Deploying millions of doses of vaccine has a cost in services, GP time and many other things, not least public effort. I do not think it is a free ride to give a vaccine once and then give it again very quickly thereafter. All of these need to be considered in terms of their wider effects as well.

Q2668 **Chair:** Would you accept that the costs of vaccines and administering them, while significant, pale into insignificance against the cost of the incidence of waves of infection and perhaps hospitalisation that they might prevent?

Professor Lim: That is only if you know that something like Omicron is occurring. You could take the precautionary principle and say, "I am not going to chart or look at the amount of waning. I am simply going to give a vaccine in three months because there might be a variant occurring at four months' time." After three months I might again give another vaccine boost because a variant has not appeared but there might be a variant coming in the next four months. That could go on the whole year, giving a booster every three months because you do not know whether a variant is going to occur four months later. I cannot see that that is a sustainable programme for a country going into just one year, much less a few years.

Q2669 **Chair:** Although if the alternative is three-monthly impositions of restrictions, that also has its downsides. I think you would accept that.

Professor Lim: I would but, as I said, you only impose, or consider imposing, the restrictions if there is a variant, whereas what you are suggesting is that you might want to give boosters every three months just in case, not knowing if you will ever need boosters every three months at all. This is on the off-chance of a variant occurring or emerging that would require widespread social restrictions. We have not reached that point yet either.

Chair: Indeed. We will go further into the detail. I am very grateful for the clarity of your answers.

Q2670 **Carol Monaghan:** Professor Lim, you talked about giving boosters every three months. Maybe I understood you wrongly, and please correct me if this is the case. Did you say that if we start giving boosters more frequently there will be quicker waning of antibodies, so that we would require to give boosters more frequently?

Professor Lim: No, I did not say that at all. The principle is that if you have a bigger gap between two doses you are likely to get a higher immune response. You might remember that back in December last year the UK decided to extend the interval between dose one and dose two to 12 weeks rather than three to four weeks. In that year, we now have data to show that by extending the interval between the two doses one gets a stronger—that is a higher—immune response. The level of waning is affected by the peak immune response. If the level that is attained after the second dose is higher, one hopes that therefore the duration of protection is longer. Similarly for a booster dose, if a six-month booster gives a higher level of protection than a three-months boost, one starts to wane from a higher level so it takes longer to wane.

The second way of extending the protection is simply that, if you give a booster at six months rather than three months, you have already gained three months. You extend your total level of protection. I hope that makes sense.

Q2671 **Carol Monaghan:** It does make sense, but you are saying that if you

give the booster too soon it will wane more quickly.

Professor Lim: That indeed might be the case. If you give the booster at six months and you reach a higher level—let's give a number—say you reach the level of 200 and that wanes at a certain constant rate, to drop from 200 to 50 would take a certain period of time. If we give the booster at three months and the peak level it can get to is lower, say 150, and it wanes at the same rate, you will reach 50 at an earlier time point.

Q2672 **Carol Monaghan:** That would then necessitate more regular boosters.

Professor Lim: Indeed, and that is why generally, if possible, we try to push out the duration between two doses.

Q2673 **Carol Monaghan:** The JCVI is now offering a booster to everyone over the age of 18 and the interval has been shortened to three months. What evidence was that based on?

Professor Lim: The current booster campaign and the interval is not based on waning; it is because of the threat of Omicron. The principle here is that, if you give a booster, you get a high immune response. We think that a high immune response is what is needed to bridge the gap of the mismatch between the new variant, Omicron, and the vaccine strain that was based on the wild type or Wuhan variant. You need a higher level, hence the booster.

The second principle for the booster campaign for Omicron is that you want to give the booster before the wave comes. There is less benefit in giving a booster in the middle of a wave or after a wave. We want to bring the booster dose earlier if we think the wave is going to come earlier.

When we looked at this as soon as Omicron was declared, we felt that there was a high chance that the Omicron wave would come soon. Therefore we wanted to bring forward the booster dose so that it occurred before the wave. We chose three months because we have data from a trial to show that at three months from the second dose the boost still gives a very high immune response.

Q2674 **Carol Monaghan:** So it is a precautionary booster in order to pre-empt this wave.

Professor Lim: Yes; that is right.

Q2675 **Carol Monaghan:** For example, I had my booster on Friday. When should I need another booster?

Professor Lim: We do not know that. If you had your booster on Friday, which is excellent, it will take about a week for you to have the full benefit from that booster dose. That is how we estimate the peak protection from the boost, but it is too soon now to advise when the next booster needs to be given.

Carol Monaghan: Thank you, Professor Lim.

Q2676 **Jeremy Hunt:** Professor Lim, you—the JCVI and the MHRA—were acclaimed around the world for being the most nimble regulators anywhere when, a year and a week ago exactly, we gave the first clinically approved vaccine to any patient anywhere in the world. You did not have foreknowledge, for example, of all the possible side effects, of which there turned out to be one or two. You made a balanced judgment that it was right to proceed. Israel made the same balanced judgment that it was right to proceed with booster jabs for all adults in September. You have made that judgment now. With the benefit of hindsight, Israel was right, weren't they, and we were wrong?

Professor Lim: No, I am sorry but I disagree, as you would expect me to. We judged that the most vulnerable people should be boosted. If you look at the booster campaign data from Israel, the protection that they obtained from the booster in terms of preventing hospitalisation and people dying against Delta, which is what we were facing then, was almost entirely in people above 40 years of age. We went down to 40 years of age. We had not excluded the possibility of boosting people under 40 years, but in September there were not that many people under 40 years of age who were healthy and were still six months from their second dose anyway. The data we had was that they had very good protection for six months, over 90% protection. We were going in a useful and regulated—

Q2677 **Jeremy Hunt:** I am sorry to interrupt, but I am struggling. My wife is getting her booster this morning. She is under 50. Omicron transmission is 200,000 a day. You are really saying that it would have made no difference if you had given the instruction to give the boosters to under-50s earlier, as they did in Israel. It seems to me, as a non-scientist, and with the benefit of hindsight, totally obvious that it would have been better if we had had those instructions earlier. That is what I am asking.

Professor Lim: I don't think you can predict that a variant like Omicron would have emerged.

Q2678 **Jeremy Hunt:** Well, they did in Israel. They made a precautionary judgment. Let me ask another one. We have had for the whole autumn very high transmission rates in schools. That is one of the reasons that our death rates have continued to be consistently around the 100 mark or above during the autumn.

France made a balanced judgment to vaccinate teenagers in June. You refused to make that judgment even in September. In the end, we had to do a workaround using the chief medical officers. Again, with the benefit of hindsight, didn't France get that balanced judgment right and weren't we wrong?

Professor Lim: I think with the benefit of extra data we would have moved earlier, but we did not have the extra data on safety that we felt was necessary.

Q2679 **Jeremy Hunt:** But they did not have that data in France either. Let me

give you another one. America has already made a decision that it is safe to vaccinate the over-fives with Pfizer. We have not made a decision yet.

I suppose the question I am really asking is this. Having been the most nimble in the world and received plaudits everywhere for being fleet of foot, can you understand why people are worried that with not just you but the MHRA our regulators have been dragging their feet and therefore putting the NHS at greater risk this winter than it might otherwise have been?

Professor Lim: I have been asked that question before. If you look at the different decisions that have been made, I believe there is a time to be extra fast and there is a time to move extra cautiously. We moved very quickly at the start when there was a need to. We moved very quickly when Alpha emerged and we needed to change the advice. We moved very quickly when Omicron emerged, and we have changed our advice. Where we need to move very quickly, we will do so. Where we feel that we do not want to outpace the data for safety reasons, we will do so. Although these are obviously judgments as to how quickly one moves, we have made those judgments based on the best available information.

Q2680 **Katherine Fletcher:** Professor Lim, thank you very much for your time. You are giving brilliant answers, as usual. I want to go back to something that maybe people in the community are talking about more than the science advice.

It is not unusual for me to have heard, "Oh, I had it back in June or July. I was Covid positive, so I don't need a booster for a while." Could you talk about the assessment that you are making of previous infection and how that plays into the need for boosters for a given individual? I might then follow that up on a broader scale.

Professor Lim: Thanks. That is a very good question because, as you say, it is being discussed by a lot of people. If we look first at the laboratory data on antibodies, for example, what is found is that if somebody has had prior infection and then has one dose of vaccine, their immune response after one dose is actually very good and almost similar to somebody having two doses of the vaccine. The same is true for somebody who has a prior infection and then has two doses of the vaccine. Their immune response is similar to somebody who has had three doses of the vaccine.

What is happening is that, on recovery from natural infection, a protective immune response is generated. That appears to act almost like a vaccine-generated immune response. It is called natural immunity compared to vaccine-induced immunity. For somebody who has been infected once, data from the first wave and some from the second wave show that those people are protected from reinfection for a long period of time, just from natural immunity.

Q2681 **Katherine Fletcher:** Could you enumerate that long period?

Professor Lim: It is about six months.

Q2682 **Katherine Fletcher:** We were talking in the previous session about Valneva as a whole attenuated vaccine producing a much stronger immune response. If you have had it and got over it, how long can you be confident that you are protected for?

Professor Lim: The data suggests that the protection is about six months at least. The studies do not go too far out beyond that for natural protection, but I want to draw attention to the difference with Omicron. In general, if you just take people who have had previous infection and no vaccines whatsoever and measure their immune response, it is lower than somebody who has had two doses of vaccine. With Omicron, there is concern that there is a much lower protection from natural immunity alone—that is, if somebody has had previous infection and has not had any vaccines whatsoever; whereas they would have been reasonably well protected for Alpha or a wild-type variant in the past, they may not be quite so well protected when it comes to Omicron.

Q2683 **Katherine Fletcher:** Would you agree with the following statement, "Having had it prior, Omicron is a game-changer, so even if you feel you have immunity from prior infection, it is still important that you take up the offer of a booster"?

Professor Lim: Exactly, yes. That is absolutely right. That is the current thinking.

Katherine Fletcher: Brilliant. Thanks very much for your time.

Q2684 **Chair:** There are a couple of final questions. Going back to our conversation earlier, you talked about the cost of the vaccine programme, both the vaccines themselves and the work incurred in vaccinating people. Does the JCVI consider cost-effectiveness in making its decisions or is it entirely in terms of clinical effectiveness?

Professor Lim: Usually we would consider cost-effectiveness, but we have not considered cost-effectiveness because the vaccine procurement has been occurring on a different level.

Q2685 **Chair:** In terms of the timing of the decisions, was the cost of vaccination a factor that was considered in not proceeding with earlier vaccination, or was that entirely on clinical grounds?

Professor Lim: Chair, could I ask for some clarification? You say "not proceeding," but we have never made a decision not to proceed. We have been looking at when to offer vaccinations rather than when not to. What are you referring to?

Q2686 **Chair:** As you pointed out, on 14 September there was a recommendation that over-50s and vulnerable groups get vaccinated, but not people under 50. Was the decision not to recommend that under-50s were vaccinated on 14 September partly at least a consideration of the cost of so doing?

Professor Lim: No. It was because the over-50s were the group that we felt needed a booster at the time. Other people did not need a booster at the time.

Q2687 **Chair:** Indeed. It was entirely on clinical grounds. Thank you.

My final question goes back to one of the points my colleague Jeremy Hunt made about the decision that the US has taken to now vaccinate children from the age of five. When might an assessment be made by the JCVI about the desirability of doing that in the UK?

Professor Lim: We are discussing that at the moment. We are also waiting for the vaccines to be approved by MHRA.

Q2688 **Chair:** Would you expect to make a decision before Christmas on that?

Professor Lim: I would expect so. We try to keep in step with the approval process.

Q2689 **Chair:** Do you have any insight as to when the MHRA might make that assessment?

Professor Lim: I do not think I should be trying to double-guess when they might do that.

Q2690 **Chair:** You say you are considering it. Is that the next decision, and a live decision? Are you contemplating it now?

Professor Lim: Indeed; yes.

Q2691 **Dawn Butler:** I have a very quick question, Dr Lim. We need to prepare for future pandemics. How can we best do that?

Professor Lim: That is a very broad question. There are all sorts of ways we need to do that, and how we need to do that ranges from surveillance mechanisms to science and to public education. Is there a specific area that you were thinking about?

Q2692 **Dawn Butler:** I was thinking about how we manufacture vaccines and ensuring that we have control of that rather than the big pharmaceutical companies, so that, first, we will be able to not just vaccinate people but share the vaccine, and it is not on profit but on keeping people well. The second thing in relation to where we are now in regard to this current pandemic is the boosting up of the testing of antibodies and T cells.

Professor Lim: I am probably not the right person to talk to about vaccine manufacturing. As a general principle, if you have control of the manufacturing, that is always better but, as Dame Kate mentioned, it may be better that it is based in the UK. Again, that is outside my area of expertise so I am not going to discuss where manufacturing should occur.

In terms of the testing of immunological responses, yes absolutely, the better we are at doing that, the better the science. It is not just vaccines or immunology. There are other therapeutics and interventions. All of this is going to be important as we move forward.

Dawn Butler: Thank you, Dr Lim.

Chair: Professor Lim, thank you very much indeed for your evidence today. These are very important and, I am sure in some cases, difficult decisions. We want to understand some of the thinking behind them, and you have been very clear and very candid about that. We are very grateful for your evidence today, and for your work chairing the panel. Thank you for that.

Examination of witness

Witness: Dr Paul Burton.

Q2693 **Chair:** We now turn to our next witness, who I see has joined us on the screen. I am very pleased to welcome Dr Paul Burton, who is the chief medical officer of Moderna. Dr Burton is appearing virtually from Boston on the east coast of the United States, where I think it must be shortly after 6 o'clock in the morning. It looks dark outside. Thank you for getting up especially early to appear before us this morning, Dr Burton.

To kick off the questions, obviously the Committee, and indeed the UK Parliament today, is considering Omicron and the response to it. How effective is a booster dose of Moderna against Omicron according to your research?

Dr Burton: Good morning, Chair and Committee members. Thank you for having me today. It is a privilege to be here and to be able to talk on behalf of Moderna.

It is clearly a key question. It is one that we still do not absolutely have the answer to. Data will begin to come in over the next few days. I was listening to Professor Lim earlier. What we know is that with Omicron, because of the 51 different mutations, with 30 of them in the spike protein alone, many antibodies do not bind effectively to Omicron as they do to prior variants. What we are also seeing from data that is coming out of different laboratories around the world is that that is holding up, whereas people vaccinated with a variety of different antibodies were able to neutralise the Delta variant, the originator Covid virus, even some months after being vaccinated, that does not appear to be the same with Omicron.

I think we have to wait for further data to come out. My guess, though, is that for people who were vaccinated some time ago with any type of vaccine—the Moderna vaccine included—their immunity will have waned.

The data that we see time and time again—I go back to Dr Faust's COV-Boost study conducted in the UK and published recently in *The Lancet*—shows that giving a booster of the Moderna vaccine, as we have seen from multiple other studies around the world, very effectively increases antibody levels and very effectively enhances vaccine effectiveness certainly against the originator strain and all the other variants of concern as well.

While I think we still need some data to come in, I am confident that we will be able to boost the levels of antibody with the Moderna booster, either at the 50 microgram boost dose or indeed at the 100 microgram enhanced level that we use in immunocompromised people.

Q2694 **Chair:** When do you expect that data to be available in sufficient depth to be able to make an assessment?

Dr Burton: I think we are looking at days now. There are labs around the world and my R&D colleagues are running those experiments in collaboration with different laboratories around the world, including in the United Kingdom. Our feeling is that those will be in within the next few days. They are difficult experiments to do. They have to be done very carefully and the data analysed carefully, but I think they are imminent.

Q2695 **Chair:** This Committee has taken evidence before and has heard that before Omicron was identified, and indeed suspected, the course of a virus like Covid is that it is going to find ways to evade vaccines in transmission, but the evidence that we heard was that the vaccines are likely to protect against severe disease. Is that a general characterisation that you would recognise and that would accord to your expectations?

Dr Burton: Yes. I think that is a good characterisation of the natural history of the viruses and what the vaccines are able to do. With our platform we are trying to estimate what the key variants of this virus are, and then make newer vaccines in the future that will combine those so that we try to get protection against them. Yes, I think your summary is very correct.

Q2696 **Chair:** Given that, and if Omicron outcompetes Delta in transmissibility—we are seeing some early evidence that it is essentially crowding it out and is becoming dominant—if a less severe variant in its effect on health replaces one that is more severe, over time does that amount to some cause for optimism rather than despair? I do not want to look for silver linings where there are none, but how would you assess that as a hypothesis?

Dr Burton: There are a couple of things. I think, broadly, yes, if we could have a far less dangerous Sars-2 Covid virus that would be a good thing. I actually do not think that Omicron is a milder or less severe version of the current virus.

I also think that the idea that essentially it will push Delta out of the way and take over may occur in the future, but certainly in the coming months the two viruses are going to co-exist. Omicron, which again I would maintain is actually a severe disease, will now infect people in a background of very strong Delta pressure. It will also lead to a situation where individuals will become co-infected, and there is certainly documented evidence of that from earlier variants and infections. That gives the opportunity for these viruses to further evolve and mutate, which is a concerning and worrying situation.

If we could get to a situation with a far milder virus, that would be a good thing. I do not think it is going to occur in the near future, but we certainly do not have to panic; we have many tools at our disposal. We have learnt so much about this virus over the last two years. I think we can continue to fight it, but Omicron poses a real threat.

Q2697 **Chair:** Before I turn to colleagues, let me probe a little on that. You said something very important, which is that you do not think that Omicron is likely to be, or is, less severe than Delta. Why is that your view?

Dr Burton: There are a few pieces of evidence. Dr Lim mentioned this. People who have been infected with Delta typically do not get reinfected with it. You have just asked me about this. We know from the data that Omicron evades antibodies. Data from South Africa recently showed that Omicron is quite capable of reinfecting people who have already been infected with Delta, which is concerning. The doubling time of three days is far faster than we have seen with prior variants of concern. The data from Denmark over the last few days also now show that the hospitalisation rates with Omicron are not dissimilar to—in fact even numerically slightly higher than—what we have seen with Delta. Those data are still early, but that is concerning.

When you look at the data in South Africa, which is well collected and published daily, about 15% of people who are hospitalised are in the intensive care unit. While there is variability, if you look back earlier in the year at a time of real Delta surge in August, those numbers are about the same—15%. While the mortality rate that we are seeing right now is mercifully lower, as a disease it is a very fit virus and it is severe.

Q2698 **Chair:** You talked about dual infection. Do you mean that people could be simultaneously infected with Delta and Omicron?

Dr Burton: Yes. There is certainly data—some papers have been published from South Africa earlier in the course of the pandemic—that show that immunocompromised people certainly can harbour both viruses, and that would be possible here, particularly given the number of infections that we are seeing now.

Q2699 **Chair:** Is the consequence of that more than the sum of its parts? If you have both together, is that much worse than—

Dr Burton: It certainly could be. That is what we will begin to understand. It certainly gives an opportunity for the two viruses to what we call recombinate. They can now begin to share genes and swap genes over. The biology of Omicron and the situation we are in given the Delta pressure right now is really important to think about.

Chair: Thank you very much.

Q2700 **Aaron Bell:** Thank you, Dr Burton. Following up on that, you suggested that there could well be co-circulation of Delta and Omicron, and we do not know that Omicron, even though it is much more transmissible, is

ultimately going to displace Delta. Given that prior infection of Delta does not give you that much protection against Omicron, what do you think the likelihood of the reverse is? Will being infected with Omicron give you protection against Delta or other variants?

Dr Burton: It is a great question. The best answer I can give you is that it might do. We know that Omicron harbours a variety of mutations seen in the other variants of concern—Alpha, Beta, Gamma and Delta. It could be that people who are then infected with Omicron could get some degree of protection against the other variants, but we have to wait and see.

Q2701 **Aaron Bell:** I know colleagues are going to ask about a variant-specific vaccine, but is the implication that we might need multivalent vaccines or vaccines that target something different, given the possibility of co-circulating variants?

Dr Burton: Yes. At Moderna, we have talked about this, and my colleagues in the R&D organisation are working on these. We have published some data over the summer from a multivalent candidate that covers both the original strain and Beta. The issue will be trying to understand how we can outsmart and predict where the variants will go in the future and then be prepared to produce and manufacture those vaccines in time. But, yes, to get past this phase of the pandemic, we will need those types of vaccines.

Q2702 **Aaron Bell:** Following on from what you just said, was the extent to which Omicron was different to Delta a surprise?

Dr Burton: I think it was. I am certainly not a vaccine expert, but from talking to colleagues who are, and from reading reports of people around the world and in the United Kingdom, the extent of the mutations, the evolutionary shift that it made and the potential for the severity of those mutations was surprising to many people.

Aaron Bell: Thank you.

Q2703 **Dehenna Davison:** Thank you for being so open with us today, Dr Burton. I want to touch on the point about variant-specific vaccines. Clearly, this is something that you guys are currently investigating to try to come up with something that is even more effective against Omicron. Can you explain to us how that process works? I want to come on to the regulatory side after that.

Dr Burton: The platform that Moderna has is essentially able to take different pieces of mRNA and combine them into a single lipid nanoparticle. The company was founded 10 years ago. It has developed extremely safe and effective lipid nanoparticles, and it has perfected the ability to bring these pieces of messenger RNA together. We can give high amounts of mRNA. As we know, these are injected into your arm somewhere. They are taken up by the cell. Then the cell produces a

protein that the messenger RNA tells it to produce, and it produces it exactly like your body would. It is very reproducible and predictable.

We manufacture the mRNA. Rather than the process becoming the product, as people talked about in years gone by, this really is a very predictable and synthesisable vaccine. We can bring all sorts of different pieces of messenger RNA against all sorts of different variants together to make double, triple and quadrivalent vaccines. It is a platform that can adapt quickly and can then be scaled up.

Q2704 **Dehenna Davison:** You said that we are awaiting the newest data and it will hopefully be available over the next few days. Realistically, looking at the current regulatory regime, how long would it be between getting that data and having a vaccine approved that could be specific to the Omicron variant?

Dr Burton: Just to be clear, the data that we will get in the coming days will say how good our mRNA-1273 vaccine is against the current originator strain of Covid and how well that deals with Omicron. We have seen pieces of data come out around the world looking at other vaccines, so we will be able to be part of that puzzle and fill that in a little bit more.

We announced late in November, as soon as the world became aware of Omicron, that we were going to begin working at risk to develop a specific booster against Omicron. My colleagues in research and development and manufacturing have been doing that tirelessly over the past few weeks. We should be ready within the coming weeks—we are making the messenger RNA and recombining it—to begin testing it in humans to see if it makes an antibody response and how well those antibodies then bind to Omicron and neutralise it. Realistically, that is going to take until early 2022, and then we would begin to manufacture.

From listening to earlier comments, the Vaccine Taskforce, JCVI and MHRA in the United Kingdom have been remarkable to work with. They have been very fast to review data. I would imagine that they and other regulators around the world will be in a similar position.

Q2705 **Dehenna Davison:** If we find that this variant-specific vaccine really is necessary to give the maximum possible protection, do you think it will be approved, manufactured, distributed and in people's arms in time to have a substantial impact on the Omicron wave, or do you think that process is a little bit too long?

Dr Burton: It depends how long this goes on for. It is doubling very fast. We have seen cases rising throughout the world. The best things we can do right now are the simple measures of hand sanitisation, mask wearing, social distancing and getting vaccinated and boosted either with the 50 microgram or 100 microgram dose. If Omicron continues to surge in March and April, it may be possible that we could have small amounts of vaccine that is specific available by then; otherwise it may need to be later in the first half of the year.

Q2706 **Chair:** Thank you, Dehenna. To follow up Dehenna's last question, since it will take a bit of time for a specific vaccine to be developed, are measures being taken in the United States now, where you are speaking from, to impose new social distancing restrictions because of Omicron?

Dr Burton: People are being advised by physicians and local state regulators to take appropriate precautions. As we went through the summer, globally everybody felt that there was some light at the end of the tunnel and those were being relaxed, whereas now many people are walking around with masks on the street again, at least around here.

Q2707 **Chair:** What do you think are the appropriate responses before any vaccine is available? What would you advise your friends and colleagues to do?

Dr Burton: Delta is a severe disease. Even before we had heard of Omicron, it was surging and causing high rates of hospitalisation that were straining already overstretched health systems, and as we go into the winter that is getting worse. Omicron is spreading very fast, and, as I said, it is an important and serious virus. Simple things like frequent hand washing, wearing a mask and keeping social distancing as appropriate are very effective. Those are simple things that we can do and will protect people.

Getting vaccinated and getting boosted really is the way forward. While the levels of antibody or their effectiveness against Omicron will be lower—we have seen that—they will still afford protection and they will still protect people.

Q2708 **Chair:** You may or may not have seen that there are some important votes in the UK Parliament today on some measures taken in response to Omicron. They include extending the requirement to wear masks in certain places and to isolate subject to testing. One is about having certification to enter venues where there are large crowds. In your experience and your judgment, is that an appropriate response at this stage of knowledge about Omicron?

Dr Burton: It is difficult to comment on. I have not really seen that situation. I do not think I am qualified to give an opinion on it.

Chair: I understand. That is fine.

Q2709 **Graham Stringer:** Dr Burton, did you hear the evidence given by Dr Angelique Coetzee earlier on? Were you online then?

Dr Burton: No, I was not.

Q2710 **Graham Stringer:** That rather wrecks my question but I will still ask it in a different way. You have given a much more pessimistic view of the interpretation of the statistics on Omicron than Dr Coetzee did. You used Danish statistics. She used her experience in South Africa and South African statistics. Does that mean it is too soon to tell or that something different might be happening in Denmark and South Africa?

Dr Burton: First, I have great respect for her and for the healthcare professionals in South Africa. They are on the ground right now trying to tackle this disease, and they are seeing patients coming in. It is summer in South Africa. The demographics of people in South Africa are different. The virus can reinfect and has taken off. If you think back to early November, there were maybe 250 cases a day in South Africa, and now there can frequently be 20,000 cases a day, so it is spreading. Those rates of intensive care bed use among hospitalised people in South Africa are worrisome to me. As the virus moves here to the northern hemisphere, to winter, and to situations where there are 50,000, 60,000, 70,000 cases of Delta a day in some European countries, including the UK, to bring Omicron on to that background of Covid is concerning. But I have full respect for her being in there fighting this disease today.

Q2711 **Graham Stringer:** Thank you. You explained very clearly why your company has opted for RNA-based vaccines; it gives you speed and flexibility compared to the adenovirus vaccines that Oxford and AstraZeneca have developed. Is it fair to say from the statistics that we have that more traditional viruses that use dead virus or very dilute virus are more effective in the long term than either adenoviruses or messenger RNA-based vaccines?

Dr Burton: I do not think I can answer that. It will probably depend on which disease manufacturers want to try to tackle and how complex are the antigens that they need to tackle. The vaccines we have from a whole variety of manufacturers today are all very effective. Clearly, I represent Moderna, and I think that the vaccine that we produce is very safe and very effective. If people are able to get any vaccine today, they should make that choice and get it, and they should get boosted.

Q2712 **Graham Stringer:** I take the point that you get what vaccine is available and it will give you some protection, but do you have any insight into the differences of effectiveness between the different platforms?

Dr Burton: I do not think I can comment on it. When you think back to the start of this pandemic, a vaccine that had 50% effectiveness would have been quite gratefully received. All of them, whichever platform, have substantially greater effectiveness than that. I think they are all very good. Over time, I think different platforms will be tailored to different diseases.

Q2713 **Graham Stringer:** Thank you. You were reported to be developing vaccines that were specific against the Beta and Delta variants. What happened to that?

Dr Burton: We have one that is in development and has been tested in humans. Those data should be available. My research and development colleagues are running those studies and developing that vaccine. It is called mRNA-1273.213. Those data should be available later this year.

Q2714 **Graham Stringer:** Is that against Delta?

Dr Burton: It is against Beta and Delta together. The other one, which is .211, is against the original strain and Beta. In, addition, at risk, we are making the one against Omicron.

Q2715 **Graham Stringer:** Some time ago, the predecessor Committee of this Committee had an investigation into flu vaccines, and the experts we had in then said that they hoped for and were working on the possibility of a universal flu vaccine within 10 years or so. Do you think there is any possibility of the development of a universal vaccine against Covid?

Dr Burton: I do. I think the technology exists. As time goes on and we understand the mutations that this virus goes through, and which are the most important for public health, we will be able to engineer such a vaccine. For now, we have to just keep reacting to it and moving as fast as we can, working with regulators, health professionals and Governments around the world, which is clearly what we are doing now.

Graham Stringer: Thank you.

Chair: Thank you very much indeed, Dr Burton, for joining us. It is very useful to have your perspective both as a chief medical officer of a company but also representing one of the principal vaccine developers. We have heard, during our inquiries, from your equivalents in AstraZeneca and Pfizer as well, so it is very helpful to hear from you. I am particularly grateful for you joining us early in the morning in the United States, and we will leave you to go for breakfast now.

Dr Burton: Thank you.

Examination of witnesses

Witnesses: Dr Susan Hopkins and Professor Steven Riley.

Q2716 **Chair:** We will invite our final panel of witnesses to come forward. I am pleased to welcome Professor Steven Riley, who is the director general for data, analytics and surveillance at the UK Health Security Agency, and Dr Susan Hopkins, who is the chief medical adviser at the UK Health Security Agency. Thank you very much for joining us today.

There is an important set of votes in the House of Commons later today. Perhaps one of the more contentious votes is the question of the certification that is required to access larger venues. Dr Hopkins, what is the purpose and intention of that requirement?

Dr Hopkins: The Government are making a decision today on certification. Certification has been looked at long and hard for many months. Clearly, for those vaccinated prior to Omicron, there was evidence that vaccination with two doses prevented symptomatic and asymptomatic infection. Vaccination prevents things at different levels of different space. It is best at preventing severe disease. It is next best at preventing milder disease that we see in the community. Underneath

that, it has less effectiveness at preventing asymptomatic disease, but none the less, prior to Omicron, it does that.

With Omicron, from the vaccine effectiveness results that we released last Friday, we are seeing very minimal protection after three months post vaccine in preventing symptomatic disease, and therefore we would expect to find absolutely minimal protection against asymptomatic disease in that group. However, we would still expect the vaccines to prevent severe disease, so going into a venue like this, if you are vaccinated, especially within less than 12 weeks, or you have had your booster, that is good to prevent infection and transmission. None the less, for all of those individuals, it will reduce the risk of severe disease.

The Government are also making a decision today on whether that also includes lateral flow devices. They will detect asymptomatic as well as symptomatic infection, and they have been used very effectively for almost one year in the UK population. We know that overall they will detect about 50% of cases compared to PCR, but they will detect about 80%, or even more than that, of people who have high amounts of virus and therefore have the highest risk of transmitting to others. That is why lateral flow devices are being added to this.

While the certification will talk about vaccine or lateral flows, our strong public health recommendation is that, if people are going out to venues to socialise, they should do a lateral flow before they go to reduce the risk of going into that venue with asymptomatic infection and therefore transmitting to others.

There are parts on both sides. It will be strengthened when more people have had their booster, as will happen over the next couple of weeks, because that will strengthen the immune response to Omicron.

Q2717 **Chair:** At the moment, Dr Hopkins, as you say, using your words, there is minimal protection against infection from the two doses. That may increase with a booster. It is not that security that a venue is safe comes from knowing that people have had two doses of a vaccine. Is part of the intention of asking for proof of vaccination to nudge more people to have the vaccines?

Dr Hopkins: First, up to 12 weeks after you have had two doses of Pfizer, you look like you have a pretty excellent response. It is just that immune waning happens after that. For many young people, they will be within 12 weeks of their second dose. The results that we released last week show that that group had quite a good reduction in symptomatic disease post vaccine. It wanes after 12 weeks, and that is why the vaccinations have been brought forward to three months. We would recommend that people take lateral flows before they go, and we recommend that people get their booster as fast as they can.

Q2718 **Chair:** Is it part of the plan, or the aspiration, that making it a requirement to have one or other of these certificates will encourage

some of the 10% of people who have not been vaccinated to have the vaccine to be able to access a football ground, say?

Dr Hopkins: The current certification is allowing people to have lateral flow, so I do not think it is going to necessarily get over those individuals who do not want a vaccine. My belief, from a clinician and public health point of view, is that we constantly have to talk about the science of vaccination and show what those vaccines do in order to overcome individuals who are vaccine hesitant or cautious due to side effects. That is why we release data every week.

Q2719 **Chair:** You are not expecting that requirement to have a big change in the final 10%. That requires other methods.

Dr Hopkins: That requires us explaining the science and being very clear on the benefits of vaccines.

Q2720 **Chair:** I see. Turning to the other limb of the new policy, which is the ability to show a negative lateral flow test for entry, if that were universal, if everyone had to show a negative lateral flow test, that would at least provide some security that that was a safe venue for Covid transmission, would it not?

Dr Hopkins: The public health advice at the moment is to take a lateral flow before you go out to socialise. We would recommend that. The Government certification policy that has been discussed for many months includes certification or a lateral flow test, but it does not preclude people doing a lateral flow test in addition to being vaccinated.

Q2721 **Chair:** Why are the two combined? If everyone took a lateral flow test, that would convey a degree of security about the prospects of infection in a venue. If some people take a lateral flow test and some people have proof of two doses of the vaccine, as you said earlier, if you have had that some time ago, you will have quite limited protection against transmission, including to other people. You have a mix of two different things and therefore different policies. Does it make sense to have these as alternatives?

Dr Hopkins: Again, I come back to the vaccination and being vaccinated. If you are within 12 weeks, that will be much more effective than beyond 12 weeks. Many young people who will be going to these venues will have had a more recent vaccination. Everyone can now get a booster at 12 weeks, and we recommend that people come forward for those as soon as possible.

Finally, having a vaccination reduces your risk of severe disease. We are promoting the idea that all of these are important measures and everyone can do a lateral flow test before they go. It is just people who are not vaccinated who will not be able to enter a venue without one or the other.

Q2722 **Chair:** Is the logic of what you just said that people should be admitted if

they have had two doses within 12 weeks, in which case their protection against transmission is still high, or a negative lateral flow test? Would that not be the logical transposition of what you have just said?

Dr Hopkins: This will be for Government to make a decision on.

Q2723 **Chair:** You are the Government agency that advises the Government on this. What would your advice be?

Dr Hopkins: Apologies, I keep getting Skype calls. We have continued to advise the Government on the evidence for policy making. We have continued to advise on the importance of vaccination to prevent severe disease and the importance of boosters; we are taking the advice of JCVI, as the experts for vaccination, that those boosters are now at three months; and we have continued to advise on the utility of lateral flow tests.

Q2724 **Chair:** Have you advised on the regulation that is before Parliament today, which requires either a negative lateral flow test or proof of two vaccines in order to access venues?

Dr Hopkins: We have advised that the optimum is being vaccinated, and we also recommend that people have lateral flows before they go.

Q2725 **Chair:** Specifically on the regulation, is your advice that this is the right regulation to put forward?

Dr Hopkins: We have not been asked to agree with the regulations proposed. That is for Government to do.

Q2726 **Chair:** Who drafted the regulations?

Dr Hopkins: I do not know.

Q2727 **Chair:** Whose idea were they?

Dr Hopkins: As far as I understand, the regulations are drafted by Government. We give public health advice.

Q2728 **Chair:** They are literally drafted, but, conceptually, who had the idea of giving an alternative of proof of vaccine or proof of a negative lateral flow test? If it did not come from the UK Health Security Agency, where did it come from?

Dr Hopkins: We have continued to advise Government that we recommend that people take lateral flows before they go out. The current public health advice is that people should use lateral flows before they socialise. We continue to advise that people get vaccinated and that we optimise the vaccination uptake.

Q2729 **Chair:** I understand that, but we have a debate and a vote at the end of it. Many Members of Parliament will be looking to the UK Health Security Agency, which is there to give that expert assessment of what is in front of them. If you have not caused the regulation to be put before Parliament, as an agency have you been consulted on the regulation as

to whether you think it does the job?

Dr Hopkins: We continue to recommend, as I have said, that everyone should take a lateral flow before they go.

Q2730 **Chair:** I understand that, but, on the regulation itself, have you been consulted on whether this regulation is fit for purpose?

Dr Hopkins: No, not personally.

Q2731 **Chair:** You are here as a representative, as the chief medical officer, of the UK Health Security Agency. Has the agency?

Dr Hopkins: We have continued to recommend that the strongest public health intervention is vaccination—

Q2732 **Chair:** I do understand that and you have been absolutely clear about that. You have been crystal clear on it. On the regulation that is before Parliament today, has the UK Health Security Agency advised on it?

Dr Hopkins: We have continued to give our consistent advice that we believe that people should have lateral flow tests before they go into a venue and that they should be vaccinated.

Q2733 **Chair:** We understand that, but you said that you personally have not advised on it. You are the chief medical officer of the agency. It would be odd, would it not, if someone other than you or you were not involved in a conversation as literally the head medical adviser of the agency?

Dr Hopkins: I reiterate that we have continued to advise that having both is the strongest, having one or the other is the next strongest, and having neither is very weak.

Chair: I understand that. I also understand that you said that you have not advised on the specific regulation on large venues that is before Parliament today. Let me turn to Katherine Fletcher and then Aaron Bell.

Q2734 **Katherine Fletcher:** Thank you, Chair. Before we get into some scientific nerdery, I have witnessed Dr Hopkins doing her thing on Friday, Saturday, Sunday and Monday, and I want to say thanks very much for all the hard work you are doing on this Omicron wave that we are facing. Professor Riley, I will come to you shortly. For the public, could you summarise what we know about this Omicron variant, why it is different and why we should be worried from your perspective, Dr Hopkins?

Dr Hopkins: Thank you. Omicron is a new variant that was first identified in samples from genome sequencing and uploaded on to GISAID, which is the global sequencing database, on 22 November. It has more than 50 mutations compared to the original variant that emerged from Wuhan in January 2020. The mutations are predicted to make the virus more transmissible, bind more tightly to the receptors that allow it to bind to the back of our throats, and also to evade the immune system to some extent.

We have been studying this virus for three weeks. In that time period, we have shown that this is growing very fast in the UK, with an initial growth rate of two to three days, and that growth rate seems to be shortening rather than lengthening at the moment.

We have also shown that the virus in the laboratory is not effectively neutralised by people who have had a vaccine or prior infection compared to other variants. We released vaccine data on Friday evening to show that, 12 weeks after your initial vaccine and before you have had a booster, your risk of acquiring this infection—at least mild disease—in the community is very, very low, and much, much lower than we have ever seen before.

Currently, 10 individuals have been admitted to hospital with a diagnosis of Omicron before or on the day of admission. We are watching those numbers carefully. We do not have enough individuals in hospital in this country to be able to give an understanding of severity. We hope that our high uptake of vaccine will make the severity of this less than we have seen in the previous waves, but we are concerned about the large volume of individuals in the population who are being infected every day. We are going to have a very difficult four weeks ahead with cases in the community that will cause individuals to need to stay off work and school, and then for those cases to transfer into admissions to hospital.

Q2735 **Katherine Fletcher:** There is a lot in there. I hope we have the opportunity to unpack it. Thank you.

I am going to start with the ability to get it again. You are suggesting that these 50-odd mutations—the tightness of the binding—mean that, even if you have had it before, you are likely to get Omicron again. What is the likelihood of you becoming severely ill on reinfection? We can see the case rates spiking. What people are worried about is their likelihood of severe disease or giving someone vulnerable that level of severe disease. Dr Hopkins, can I start with you? Then, Professor Riley, I might dive into some numbers if that is all right.

Dr Hopkins: First, less than three weeks since we identified the first case we are seeing reinfections, and a higher rate of reinfections in Omicron compared to Delta, with a rate of three to eight times the reinfection risk for Omicron compared to what we had seen with Delta. We do not yet have a signal of severity, but we would expect people who are reinfected to be similar to people who have had a vaccination. To make the assessment of vaccine effectiveness against severe disease for Omicron, we will have to wait until we have cases in hospital.

In making it for Delta, we had seen that the vaccine effectiveness against severe disease was above 80%, and when you had been boosted it was above 90% for all individuals. That means that, essentially, if you had 10 individuals who would have come into hospital before they had been vaccinated, only one individual would come into hospital now. That makes a significant difference to the population in getting severe disease.

The issues are that we have very high rates of infection in the population already with Delta. We currently have, on average, across the UK between 700 and 1,000 people coming into hospital every day. Increases there will put the healthcare system under pressure.

Q2736 **Katherine Fletcher:** Thank you, that is very helpful.

Professor Riley, welcome. Thank you so much for your time today. The key to this, as Dr Hopkins and other experts have talked about, is the volume of people coming into hospital with this new variant who require medical intervention. If you're a clumsy bugger like me and you trip and fall over and smack your head on the pavement, you are not able to get the treatment that you need in that environment.

Part of encouraging people to take the threat seriously is to allow them to understand their individual risk. If you are over 80, your risk of severe disease, even if triple jabbed, is very different from if you are over 18 and triple jabbed. When you add over-80 risk, over-70 risk, over-60 risk—I am sorry, I am going to do some numbers—over-40 risk and under-40 risk together, plus the people who have chosen not to take a vaccine, can you give me an idea of the scale of the pool that could, with a very rapid spreading wave, end up in hospital in the next four to six weeks?

Professor Riley: Thank you very much for inviting me.

Katherine Fletcher: You don't mean that, do you?

Professor Riley: I mean thank you for the invite and for the opportunity to try to explain some of the findings that we are all working together on at UKHSA to try to assess the risk posed by this new variant and help Government form policy that will mitigate and reduce that risk. So, genuinely, thank you for the opportunity.

You phrased the key question in a very efficient and specific way. Unfortunately, for this variant, we cannot yet make an accurate calculation of that.

Q2737 **Katherine Fletcher:** I am sure there is a range in it. I think the British public want to know whether it is everybody or 1 million people. Help us out without impugning your scientific integrity.

Professor Riley: It is not about scientific integrity; it is about making sure that we give the most useful numbers when we can. The key question is: for the UK population and across all the different age groups with a different vaccination status, when and if they get infected with the Omicron variant, what is a reasonable proportion of those infections that will go on to need hospital treatment? That is the number that we all want to know. It is very difficult to estimate.

Numbers were mentioned during this hearing this morning that are being reported today that we have not had the chance to drill into yet. Earlier on today, a 29% reduction was mentioned in the risk of people attending

hospital in South Africa with Omicron compared to Delta. I do not have any additional details on that. That sounds like perhaps one of the most useful early numbers to come out. With the greatest of respect and apologies, I cannot give you an estimate for that pool of susceptibles other than to say there is a very real risk, which is large, that a substantial proportion of people in those age groups could possibly require medical hospital treatment if they are infected.

Q2738 **Katherine Fletcher:** Thank you, Professor Riley. Given that pool of uncertainty, can we make assumptions, or have you made assumptions, to try to say, "If it is 25% less effective than our models for Delta, what does that produce?" How are you trying to fill out the edges of the trajectories of this Omicron wave in the pandemic?

Professor Riley: Working together with colleagues in academia and groups within the UK Government, we are doing two parts to the risk assessment. The first is to try to characterise the speed of growth—to see just how fast the epidemic is progressing and to get a sense of how quickly the number of infections will increase. Beyond that, we are thinking about a number of scenarios and, as I say, working with partners to see what the likely impact of that is on hospitalisations.

I probably would call out some very helpful work by colleagues at the London School of Hygiene and Tropical Medicine—

Katherine Fletcher: Yes, I read it.

Professor Riley: —that has gone specifically through a very reasonable set of assumptions covering a broad range and has outlined a very useful set of scenarios that show the potential for the number of hospitalisations to approach and surpass the levels—peaks—of hospitalisations that have been observed in the past two years.

Q2739 **Katherine Fletcher:** I am desperate to try to make this session accessible to non-turbo nerds. The summary of that is: if it spreads really quickly and a lot of people get it really quickly, and it is similarly virulent to Delta, you are pouring a pint into a half pint pot. Is that fair?

Professor Riley: Yes. A very large number of infections does not need a very large proportion of those to go to hospital to be a problem. As has been expressed by the Prime Minister and others really effectively in the past few days, if you get very many infections, it only needs to be a small proportion who go to hospital for there to be a really high demand on healthcare services.

Q2740 **Katherine Fletcher:** Dr Hopkins, is there anything you would add to my grilling of the numbers of Professor Riley?

Dr Hopkins: What Professor Riley said is absolutely right. We will only know the proportion who require hospitalisation when we have that number available to us. If we have 1 million infections a day, even a very

small proportion of those individuals requiring hospitalisation will have a significant impact on healthcare.

Q2741 **Katherine Fletcher:** It is a frightening number to come out with, but given that 1 million infections a day is something that you are considering—we are potentially at 250,000 already—to what extent is that going to flash and burn through the population very quickly? I have heard colleagues point out that there aren't 400 million people in the UK when they do that doubling time. Where is the timing and the rate-limiting step on this flash transmission and exponential growth because no one has any immunity? I do not know who to ask that to.

Professor Riley: Should I jump in on that?

Katherine Fletcher: Yes, go on.

Professor Riley: You are absolutely right. If the exponential growth continues for very much longer, we will expect other processes to come into play, and we would not necessarily expect it to be a very rapid epidemic.

If we look back through the earlier waves, what we observed in the behaviour data and the movement data, and later on reflected in the disease data, is that people adapt their behaviour and the rate slows down. When prevalence gets very high, the evidence from the UK and around the world is that people tend to change their behaviour and naturally reduce infection. It is very difficult to say how fast a peak would be, but we will certainly be watching very closely in countries that have been affected earlier than we have such as South Africa.

Q2742 **Katherine Fletcher:** At a very basic level, if we run at 1 million a day and there are only 70 million people on our small island, it cannot go on for longer than 70 days, which is just over two months.

Professor Riley: I would expect at the very least there will be good short-term immunity. You are right; very high levels of infection are time limited, but the speed with which we peak out, looking back through patterns observed elsewhere in the world, is not always as fast as some of the theoretical studies suggest.

Q2743 **Katherine Fletcher:** Right. So it is a: "Get a jab and try to flatten the sombrero with your personal behaviours in the intervening period."

Professor Riley: That is definitely one way of putting it.

Katherine Fletcher: Fair enough. Thanks, Chair.

Q2744 **Chair:** Before I go to Aaron Bell on the subject of statistics, Professor Riley, you obviously have a very important job as the director general for data and analytics. The public are looking to you to have a way to understand what is going on. Hospitalisation is clearly very important—and Dr Hopkins has mentioned that—because it has implications for whether the NHS can cope. But it is not just the question of whether

someone goes into hospital that is relevant; it is how long someone stays in hospital, is it not? What is the evidence so far of the length of time that people with Omicron, whether in this country or overseas, are staying in hospital?

Professor Riley: You are absolutely right; that is a key quantity to estimate because it links those admissions to the overall volume of people in the NHS, which is the constrained resource that we are most concerned with. At the moment, for the UK, given that we have very few confirmed in hospital right now, I am not aware of any estimates of duration in stay from the UK data. I believe there are some initial reports. In fact, your earlier witness today, I believe, may have mentioned some observations from South Africa that the length of stay may be shorter there compared to prior waves.

I would also comment that hospital stays also depend on the healthcare system. There are different protocols, different traditions and slightly different approaches to treatment. It is one of those variables that is not very straightforward to map across from one healthcare system to another. On that one, we will have to develop our estimates as rapidly as we can from data from the UK.

Q2745 **Chair:** They need to be rapid because some important decisions rest on these, and you have a responsibility in public office responsible for the accuracy of data in terms of people's ability to understand it. This is a very important calculation, is it not? If people are spending five days in hospital rather than four weeks in hospital, that has huge implications for what steps we may need to take to protect the NHS. When are you going to publish your estimates of this, given that your models of hospitalisation are already in the public domain?

Professor Riley: You are absolutely right; it is a very important quantity. We will work with partners across Government and external academics in order to help provide those estimates. I cannot give you a timeline for publishing an accurate version of that number today.

Q2746 **Chair:** Your role, as we have been talking about with Dr Hopkins, is to advise, with transparency, the Government, Parliament and the public what the rationale is for measures. You lead the data profession within the UK Health Security Agency. Do you recognise your personal responsibility to make sure these data are out there, however inconvenient it might be in some cases, for a case that the Government or others might be willing to make even if it undermines it?

Professor Riley: Yes, I recognise my personal responsibility.

Chair: Thank you very much.

Q2747 **Aaron Bell:** If I could stay with you, Professor Riley, you just mentioned the London School of Hygiene and Tropical Medicine model. Under their most likely scenario—and I accept that we need to look at worst-case scenarios as well—they outlined a peak of 6,000 hospital admissions in

the new year compared to 4,000 last year, and potentially 40,000 to 50,000 deaths by the end of April, but that was assuming a similar case fatality rate to Delta, which looks like an incorrect assumption now. Is that fair?

Professor Riley: I would probably need to clarify the most likely scenario because I thought they were fairly even-handed across a number of different scenarios. I recognise the numbers that you are giving. Yes, the underlying severity in these models—as in some baseline intrinsic severity for the new strain—is assumed to be similar to Delta. So, yes, I agree with that.

Q2748 **Aaron Bell:** The 29% that you referenced and I mentioned to Dr Coetzee earlier was mildness compared to the original strain. I think you may have misquoted that. Obviously, it is new data to you. How much more severe than the original strain is Delta? Therefore, if that 29% is to be believed, how much less severe is Omicron relative to Delta?

Professor Riley: There are some good studies and a number of different estimates on the relative severity across the variants. I apologise, I do not have that to hand. We can seek to find a summary of that and provide it afterwards. My understanding is that there are estimates of slight increases in severity across those prior variants, so it would perhaps be a slightly larger decrease if that were the case. Given the Chair's prior comments about my professional responsibilities, I am a little hesitant to speculate too much.

Q2749 **Aaron Bell:** That is fair enough. I was googling to try to find that number, and I could not find it easily as well.

To go to the same topic that Katherine went on about, the size of the peak and the fact that exponential growth will eventually have to become logistic because you have only so many people to infect, what is your current estimate for peak number of cases? It will obviously be broad, but what sort of peak are you expecting: 200,000 official cases a day, the official case numbers, not the background infection level?

Professor Riley: That is right. You raise a very important point. There is a massive difference between the number of infections that might occur on any given day, which we try to get at through studies such as the ONS infection survey or the REACT survey, versus the number of cases that are reported, because people have to be able to get a test and have it reported. For the levels of infection that are being looked at here, the peak number of cases will probably revolve around peak testing capacity, which is not something that I can speculate on right now.

Q2750 **Aaron Bell:** Okay. I will turn to Dr Hopkins now. Following on from what we were discussing with Dr Burton of Moderna, do you think that Omicron will displace Delta, or do you think they will end up co-existing, in your professional judgment?

Dr Hopkins: The earliest signal that we can have from this is what is happening in London right now. The report we released yesterday showed

that just over 44% of all cases in London are Omicron. In those that have been tested for the S gene, and it is a good representative sample of what is happening in London, we are seeing increases in the total number of cases in London. London has doubled its cases over the last four weeks. We expect to see Omicron displace Delta, but they are going to live together in parts of the country for longer. We are going to continue to see hospitalisations from Delta for the next two weeks baked in from the numbers that we have, and we will then start seeing the Omicron case numbers coming to hospital.

Q2751 **Aaron Bell:** Are we expecting exposure to Omicron to give people protection against Delta? Is that baked into our modelling, or do we not know yet?

Dr Hopkins: We know that if you have had a prior infection, up till this point, reinfection was extremely rare, and the SIREN study, which I lead, has shown that very effectively as well. Reinfection with vaccination is even better. If you have had infection with vaccination, your protection is much higher. In South Africa, they have reported that individuals who are infected in their Delta wave were more likely to get infected with Omicron. We are seeing a higher rate of reinfection than we have seen before. Therefore, there will be protection from severe disease if you have had one variant or the other, but new variants may not protect you from mild disease and may not protect you from transmitting to others.

Aaron Bell: Regarding the practical implications of this Omicron surge, we have already seen that lateral flow tests are flying off the shelves and people have not been able to get them delivered because the booking slots have already gone. There is something of a fuel crisis about that perhaps. Secondly, we only have a capacity of about 600,000 PCR tests a day. Are we going to have to stop recommending that contacts of people get a PCR test, because it seems to me that we are just not going to have the capacity to deal with the numbers that Omicron implies over the next fortnight or so?

Dr Hopkins: We would recommend that contact testing, which is where people do seven lateral flow tests, takes priority over PCR tests if we run short on PCR capacity, but we would want to maintain PCR capacity for people with symptomatic disease, those being admitted to hospital, those in care homes—staff and residents—who get tests regularly, and in situations where we were investigating an outbreak or a cluster in a high-risk environment.

Q2752 **Aaron Bell:** Are we confident about the quantity of lateral flow tests that we have on hand?

Dr Hopkins: The testing team have assured me that we have plenty of lateral flow tests in warehouses and plenty more on order to service the demand from the population over the coming weeks.

Q2753 **Aaron Bell:** One way or another, given the transmissibility, we are going to know where we are in six to eight weeks for the reasons that Katherine

discussed in her questions. Does that mean that the measures that we have announced and are being debated are probably going to get eased one way or the other? The real question over the next eight weeks is how much impact it has on the NHS. At the end of six to eight weeks, most people will have been exposed to Omicron and either caught it or not caught it, depending on their previous immunity. Is that a reasonable assessment of what is going to happen over the next six to eight weeks, Dr Hopkins? I will come to Professor Riley afterwards.

Dr Hopkins: It comes back to the point about how much we slow the transmission spread by changes in behaviour over the coming weeks, how we reduce our social contacts and therefore reduce transmission so that that wave, which is coming very fast, may slow down with all of those measures. That is good because that slows down the doubling time for any admissions that we may see in hospital. We will know the ratio of hospitalisations to cases better at some point.

Ideally, the wave goes a bit slower rather than rapid increases in cases over the next two to three weeks, which could cause major challenges for the NHS. However, if the measures work, if cases slow, if the NHS is able to cope with the hospitalisations, there is a point in the future—it is very difficult to predict the time—where we will return to how we were before the start of December.

Q2754 **Aaron Bell:** Okay. Professor Riley?

Professor Riley: I agree with Dr Hopkins's comments and would make a general point. Throughout the last two years, epidemics caused by the virus have been much slower than we would have expected at the beginning. I would emphasise that, if this places high demand on healthcare services, we are likely to see more substantial changes in behaviour and therefore a considerably slower wave, but it is very difficult to quantify and predict that in advance.

Q2755 **Aaron Bell:** Have you made any estimates of the effect on the R rate of both what we are doing today and the behavioural changes that will happen regardless of what the Government do?

Professor Riley: We have not made any precise estimate of the behavioural changes that are being made today. I believe that they are available. I will try to get back to you with some estimates of those. The behaviour changes are very difficult to predict, but we will be keeping an eye closely on proxies for that.

Aaron Bell: Thank you.

Q2756 **Dawn Butler:** I have a couple of quick questions. Thank you both for coming in. On 3 December, you said that none of the Omicron patients was known to have been hospitalised or died. The European Centre for Disease Prevention and Control also drew the same conclusion. Is that still the case?

Dr Hopkins: As we released data yesterday, we have 10 patients who have been hospitalised with the diagnosis prior to, or on the day of, admission with Omicron. One individual who was diagnosed in hospital, within their hospital stay, with Omicron has sadly died. That is updated information that we released yesterday.

Q2757 **Dawn Butler:** Thank you. Did the person who sadly died have underlying conditions?

Dr Hopkins: As you know, we try not to release any data about individuals for confidentiality reasons.

Q2758 **Dawn Butler:** I understand. Thank you very much.

To pick up on some of the earlier questions for clarity for me as a non-scientist, are you basing any modelling on what is happening in South Africa?

Dr Hopkins: I will ask Steven to lead on that for the modelling question.

Professor Riley: The main work that we are doing at the moment is to measure the speed of growth and then to extend that and project forward a little bit to try to get a good understanding of what is happening right now. In terms of measuring the growth we see in the UK, we have also looked at speeds of growth elsewhere in the world, and we have seen similar speed of growth in South Africa. They had a very rapid increase in cases in the period just when we were starting to work on the virus. There are other examples around the world. Denmark is also reporting very rapid rates of growth. Not so much in actually making a model, but in the key characteristics that we are trying to study, we are seeing similar patterns elsewhere in the world.

Q2759 **Dawn Butler:** Isn't the growth in South Africa because they only have 23% of people vaccinated as a population?

Professor Riley: Even though we have much higher levels of vaccination here, we are seeing very similar growth rates. The immune state of the two populations is definitely different, and that will have an impact, but we have not seen something substantially slower here yet because of our vaccination.

Q2760 **Dawn Butler:** Dr Hopkins, on some of the questions that the Chair asked, is it correct to say that the Prime Minister is implementing new legislation today that he has not consulted UKHSA about? Is that a correct statement?

Dr Hopkins: We have been consulted. We have given our advice. The decisions on what goes into regulations are decisions that are made across a number of Government Departments with the different advice that goes in. We are one part of that. We have consistently given advice that we recommend lateral flows before people go into venues. That is the current public health advice that we highlighted last week. We consistently give advice that vaccination will prevent against severe

disease, but, currently, two doses of vaccination more than three months ago will not prevent transmission or people acquiring this infection based on the results that we released at the end of last week. It is important to recognise that we are one part, but there are multiple other parts, and Government and the regulations take in all parts of our views while making those regulations.

Q2761 **Dawn Butler:** I understand that you consistently give advice. Did you give any specific advice for the announcement that was made on Sunday?

Dr Hopkins: The announcement on Sunday on vaccines or certification? That is a point to clarify.

Q2762 **Dawn Butler:** The Prime Minister's statement to the country. Did anything trigger that from you?

Dr Hopkins: The Prime Minister's statement to the country on Sunday evening related to vaccinations.

Q2763 **Dawn Butler:** Yes, vaccinations and testing capacity, which you say is consistent in the advice that you have been giving. Was there anything specific that would have triggered that announcement?

Dr Hopkins: I do not know. No, not that—

Dawn Butler: Don't worry. Thank you very much for your time.

Chair: Thank you very much.

Q2764 **Graham Stringer:** Professor Riley, I understand what Dr Hopkins said before about patient confidentiality, but, overall, one of the statistical irritations, to me at least, during this epidemic has been the statistic about dying within 28 days of a test. I can see that is statistically consistent, but it does not tell you how many people died with the prime cause being Covid. Do you have those figures?

Professor Riley: The official statistic that we use to track deaths directly caused from Covid is dying within 28 days of a positive test. There has been a lot of discussion and debate about that especially last year, and that was arrived at as the recommended official statistic. Obviously, it is not the only thing that we track, and it is not the only thing that scientists and epidemiologists around the world track in relation to Covid deaths.

Another key statistic is the excess mortality. That is not specifically looking at people with a positive test for Covid. That is comparing patterns of deaths within countries regardless of the cause of death during a period of high circulation of the virus compared to the time series in the years before. When you do that, you see some very substantial discrepancies around the world. In the UK, just to reassure members of the Committee, we have fairly good agreement—not perfect—in the patterns of excess mortality compared to the patterns of

deaths within 28 days of a test. Certainly, at the population level, we have good reason to have faith in the statistic that has been agreed upon.

Q2765 **Graham Stringer:** We had a whole session with David Spiegelhalter on the statistics of excess deaths. You come to a point where your excess deaths are negative because people die earlier, so it is not the greatest statistic in the world. Deaths within 28 days obscures things, does it not, because you are partly measuring the infectivity and infections caused in hospitals? If you go into hospital because you are dying of cancer and you pick up an infection—there are high infection rates in hospital—you come out as part of that statistic, whereas you were always going to die of cancer. I think it is important to know not just from a statistical base, which has all sorts of oddities about it, as I have just mentioned, how many people are dying and that the prime cause is Covid. Why can we not get at that statistic?

Professor Riley: These are epidemiological studies. They sometimes go in detail through case records and try to come to the type of judgment that you have just outlined. You need multiple people to review case notes, to have a discussion and arrive at a somewhat subjective opinion about the precise cause of death for each individual. The concerns that you have just raised can be addressed, but that very much happens within a research setting. To give an initial response, I cannot envisage a process such that we could try to do that for every single potential death caused by the virus.

The short answer is that to get that for every single case I suspect would be enormously resource intensive. Even though I certainly accept that Professor Spiegelhalter will have given very good comments on the use of excess mortality, I was not necessarily saying that was perfect. My main comment was that the statistic we have agreed to use in the UK has very good mapping to it relative to decisions that have been taken in other countries. It was more to reassure you that it is a pretty good measure. You are right: in individual cases and in small studies, it may be possible to get at more detail.

Q2766 **Graham Stringer:** Dr Hopkins, almost exactly this time last week, the Deputy Prime Minister was telling us that there was no need to implement plan B. Did you give any advice to say he was talking nonsense and things were going to change very quickly, or that he was right? Did you give any advice immediately after that statement—because the Government's actions changed dramatically within 36 hours?

Dr Hopkins: We review the data with Government Ministers as a part of our daily review of the Omicron data on a daily basis. The Government look at what we say and what other experts say across Government to make decisions.

Q2767 **Graham Stringer:** I understand the relationship between advice and Government policy making, but did you give any specific advice that led

to the change in policy over that 36-hour period?

Dr Hopkins: No new specific advice; just a daily review of the advice; the measures that were available, which the Government knew—they had plan B already under discussion since the summer—and of course the regular review of the input from SAGE.

Q2768 **Graham Stringer:** I have a very different kind of question, if I may, Dr Hopkins. It is something that has puzzled me throughout the epidemic. We got rid of our isolation hospitals perhaps 30 years ago. Do you think we would have done better in this epidemic—I know it is a hypothetical question, but it is an interesting one for the future planning of the health service—if we had had isolation hospitals? A lot of infection took place in hospitals.

Dr Hopkins: You are absolutely right; some infection took place in hospitals. Having special wards in hospital is critical. What we have seen in this pandemic is that, despite the NHS repeatedly doing tests on patients as they come into hospital on admission, day 3, day 5, day 7 and regularly thereafter, individuals who come in negative on the first day can subsequently become positive because they were incubating disease on admission. Therefore, the segregation of these individuals would not have been completely possible. While you can segregate individuals who are in A&E and can get a diagnosis and are positive on that day, those individuals who are negative on that day and need treatment for their cancer, kidney disease or cardiovascular disease, and subsequently either develop symptoms or test positive in hospitals, could not have been averted by having separate hospitals.

We also know the complexity of care that we deliver in the NHS is much greater, often requiring very complex multidisciplinary teams. As somebody who worked in Coppetts Wood infectious diseases hospital many years ago in their high-security unit, the fact is that we rely on multidisciplinary experts in our hospitals to provide excellent care for our patients.

Q2769 **Graham Stringer:** Do you expect the development of antivirals to help in the coming rather critical two months or so? There have been a number of antivirals under test. Do you think they will help, and have they been taken into account in your projections of the number of people in hospital and the length of stay in hospital?

Dr Hopkins: We have yet to see large-scale roll-out of antivirals. Molnupiravir will start being used very soon. We have monoclonal antibodies. We are worried about the effectiveness of one of those, Ronapreve. That is taking away a drug that we have been using in the NHS for the past number of weeks and months to treat people who come into hospital and are antibody negative. That is a challenge. Whereas we have new antivirals, we also have some drugs that have been in use that may be less effective. We will be watching and monitoring with our NHS colleagues the safety, efficacy and effectiveness of these drugs in

reducing length of stay and ICU admissions, and sincerely hope that they will have an effect, but we will need to wait and monitor that.

Q2770 **Graham Stringer:** Thank you. Professor Riley, there have been very useful statistics about the number of lives saved by vaccines. As far as I have seen—and you can tell me there have been other stats put out—it has only been lives saved by vaccines, not by other, either pharmaceutical interventions or non-pharmaceutical interventions. Why have those statistics not been produced?

Professor Riley: Let me think for a moment.

Q2771 **Graham Stringer:** Let me not hide behind the question. It seems to me that from the Government's point of view the vaccine roll-out has been great and they have saved a lot of lives, so three cheers. But some of the other interventions have not worked so well, so we do not get statistics on those areas.

Professor Riley: There are two very different types of calculation. I think there is some work on the efficacy of non-pharmaceutical interventions, but that has to be done at a population-by-population level. The reason why we are able to make more precise estimates of the effectiveness of the vaccine is because it applies at the level of an individual and we can gather data at the level of an individual, we have pretty good confidence in tracking those outcomes, and there is a very well-worked-out set of methods for us to do those calculations within UKHSA and with other colleagues. The short answer is that we can give really good answers to individual-level interventions.

In order to assess the impact of non-pharmaceutical interventions, you have to look at a population-by-population level, which makes them much more difficult. I might just call out mask wearing here, which has been notoriously difficult as an intervention to try to assess even before this pandemic and then during it. What has shifted the needle is a couple of well-designed, community-level studies of mask wearing to show that there were observed drops in transmission in some communities that used increased mask wearing compared to those that did not. The basic answer is that it is much more difficult to assess community-level interventions compared to individual-level interventions.

Q2772 **Graham Stringer:** My final question goes back to the questions that the Chair was asking about the statutory instruments before us today, and it is to both our witnesses. How do you work with other parts of Government to ensure that the Government have fully assessed the impact of these measures?

Dr Hopkins: We work with our colleagues in the Department of Health and Social Care and with other Government Departments to ensure that the evidence that is being put into any of their impact assessments is up to date.

Q2773 **Graham Stringer:** But there are no impact assessments with the SIs.

Dr Hopkins: For the statutory instruments—

Q2774 **Graham Stringer:** On the instruments before us today, at the end of each of these statutory instruments, it says no impact analysis is being done. Does that mean you have not done the work, or the work has not been provided?

Dr Hopkins: From my point of view, we input into any of the documents that are shared with us from Government colleagues. We have provided the evidence for the interventions to the best of our ability.

Q2775 **Graham Stringer:** Have you assessed the impact with other parts of the public sector?

Dr Hopkins: The Department of Health and Social Care leads on the impact assessments for SIs. Where they have asked for our input, we have given our input.

Q2776 **Graham Stringer:** I am going to draw the conclusion, if you are not more explicit with the answer, that the Government are withholding impacts that have been done. Would that be a fair assessment?

Dr Hopkins: I am unaware of this.

Q2777 **Graham Stringer:** I don't understand that.

Dr Hopkins: I am afraid I do not know if there is information that is being made available or not on impact assessments.

Q2778 **Graham Stringer:** But you have made the information available to Government.

Dr Hopkins: We have provided the evidence for the interventions where we can.

Graham Stringer: Thank you.

Q2779 **Chair:** Thank you, Graham. Going back to the one of the questions that Graham asked Professor Riley in terms of the recording of deaths of Covid rather than within 28 days of a Covid test, did I interpret your answer correctly that, although they are not published, there is a dataset that you have of deaths where Covid is the cause of death?

Professor Riley: No, I am sorry if I was unclear in my answer.

Q2780 **Chair:** That dataset does not exist.

Professor Riley: I will clarify just to make sure. I was referring to alternative methods that are sometimes used in research.

Q2781 **Chair:** The research studies that you have referred to.

Professor Riley: Yes, but I was not in any way referring to any specific data that I am aware of.

Chair: I see. That is very helpful and very clear. Thank you very much

indeed. Finally, Rebecca Long Bailey.

Q2782 **Rebecca Long Bailey:** Thank you. The World Health Organisation said this week that, whilst there is limited data available, there was a reduction in vaccine efficacy against infection and transmission based on preliminary evidence. We also know that, even with the Delta variant, vaccinated people could still transmit it, although their viral load dropped far quicker than unvaccinated people. So that we can be perfectly clear, in a venue where everybody who has accessed it has only provided a Covid certificate, can you confirm whether there has been a decrease in the risk of transmission or whether there is still a significant risk of transmission of both the Delta and Omicron variants? Dr Hopkins.

Dr Hopkins: As I have said, and as we released last Friday in our vaccine effectiveness studies for mild disease in the community, the vaccine effectiveness to reduce mild disease in the community—symptomatic disease—was high if you were vaccinated in the previous 12 weeks with Pfizer and also after 24 weeks. Given that everyone in the population has been invited to come forward after three months and a large number of young people are still within three months of their second vaccination, we would expect that in the population effect of people going in there will be a level of protection for people who arrive with the vaccine. That level of protection will be increased if they use a lateral flow test.

Q2783 **Rebecca Long Bailey:** Just to be clear, in a venue where people have not taken a lateral flow test but they have just gone with a Covid certificate, is there still going to be transmission of Covid, either the Delta or Omicron variant? I do not think that was made clear in your answer, Dr Hopkins. I understand that the impact of the severity of disease might be reduced in vaccinated people, but ultimately we are not clear on whether having the vaccination reduces the transmissibility of the Omicron and Delta variants.

Dr Hopkins: We know that vaccine effectiveness for mild disease from Delta is much higher than it is for mild disease from Omicron. It is the mild disease or the asymptomatic disease that causes people to transmit to others. The vaccine does not stop transmission; it stops people having infection that they can transmit. The current vaccine effectiveness that was released last Friday showed that within 12 weeks, or after your boost, you had above a 70% reduction in mild disease. There will be protection against mild disease in that situation if you are vaccinated in that period of time. Therefore, that will help reduce transmission in the venue and, of course, the severity signal. I cannot give you a percentage reduction because that depends on the population in that venue, the time since they have been vaccinated and the amount of disease in the population.

Q2784 **Rebecca Long Bailey:** In terms of access to that venue, would you say it would be more likely to reduce transmission if everyone had taken a lateral flow test before entering the venue or more likely to reduce

transmission if everybody went in with a vaccine certificate—because it is obviously an either/or option that we are being presented with on our regulations today within Parliament?

Dr Hopkins: We do not have studies that can tell you which one is the most effective. We know that the lateral flow devices remain as effective against Omicron as against Delta, and that vaccine effectiveness is reduced especially three months after your vaccine or before you have had your booster. The recommendation from a public health point of view remains the same. I will not be able to tell you which one is safer, one versus the other.

Q2785 **Rebecca Long Bailey:** What data and evidence do you have in relation to the transmissibility of Omicron specifically at the moment? Is that still very much an unknown situation and you are basing a lot of your assumptions on the Delta transmissibility evidence that we have on vaccines?

Dr Hopkins: Last Friday, we showed that in household studies there was a higher attack rate in individuals in households with Omicron compared to Delta—two to three odds of transmission in Omicron compared to Delta. Sometimes, at the beginning of a wave, you see different types of people infected. We need some time to make sure those data points are reliable and valid. We have also seen a higher secondary attack rate in Omicron compared to Delta, but, because case finding often occurs at the start of a new wave, that may be slightly higher than what it will transpire to be. None the less, because of biological characteristics, we expect that there is a degree of increased transmission with Omicron over Delta.

Q2786 **Rebecca Long Bailey:** Thank you. Finally, what advice did you give to Government on the mandatory vaccination of healthcare workers?

Dr Hopkins: The advice that we gave is that healthcare workers are a high-risk population for transmission among themselves and to and from patients. Vaccinations protect them from severe disease, and they should be highly recommended to healthcare workers. Vaccination is an important factor in mitigation to prevent nosocomial transmission and nosocomial transmission within staff. It is unknown how much mandating will increase uptake among healthcare workers or whether healthcare workers will stay or leave if they are asked to mandate. It is a challenged and nuanced moment. It is very important that every healthcare worker takes up the offer to get vaccinated. If they are working on the frontline with vulnerable individuals, vaccination is essential for them. Mandation decisions are for Government.

Q2787 **Rebecca Long Bailey:** Thank you, that is really helpful. Just to be clear, you did not provide advice that advised the mandation of vaccination for healthcare workers; it was rather that you highly recommended that healthcare workers should be vaccinated.

Dr Hopkins: The mandation decision is for Government. We provided advice on why it is very important that healthcare workers get vaccinated and the ways to increase that uptake in healthcare workers.

Rebecca Long Bailey: Thank you, that is really helpful.

Chair: Aaron Bell has a follow-up question.

Q2788 **Aaron Bell:** On the number of unvaccinated people in hospital for Covid treatment—it might be one for Professor Riley—there have been some numbers in the press. What proportion of those in hospital for Covid are unvaccinated at the moment?

Professor Riley: I am sorry, I do not have that number in my prep for today. That is a number that we track within a common internal document.

Q2789 **Aaron Bell:** I have seen in the press that it is around 80% to 90%. Is that a level that you recognise?

Professor Riley: I would have to go back and check. That number fluctuates as the infection rate rises and falls and with the dynamics of people being vaccinated themselves.

Q2790 **Aaron Bell:** That is fine. What estimates have you made of the number of people who are refusing to have the vaccine as opposed to some people who cannot have the vaccine? What is your estimate for the number of people who are refusing, for philosophical reasons, to have the vaccine in the United Kingdom—let us say no vaccines whatsoever? What is the estimate you are working with on that?

Professor Riley: I will make a few comments, and I may ask Dr Hopkins to come in as well because I know that she has worked on this a lot. Over the course of the epidemic, we have tracked through a variety of mechanisms. We asked people their propensity, what they felt about being vaccinated. In the very early days, there was some reluctance, especially among younger age groups. As we progressed through the very successful vaccination programme last year, the overall intention to receive the vaccination improved a lot, and the pool of people actively saying they were refusing was much reduced.

I do not think we consider it to be a permanent pool of people who are refusing. As Dr Hopkins outlined so clearly earlier in our session, we try to focus on explaining the science and the benefits repeatedly in as clear a way as we can so that, as has happened throughout the pandemic, people continue to change their minds and take advantage of the vaccine.

Q2791 **Aaron Bell:** Dr Hopkins, do you want to come in on that?

Dr Hopkins: I think that number has been very variable over time and there have been repeated studies looking at it. The number of people who are vaccine hesitant has been reducing. We expect to get to very high numbers as people are assured about the vaccine effectiveness and

safety and can see the changes it brings to them in their lives. It should be noted that we have very high vaccine uptakes, for example, for childhood illnesses and for vaccinations that we give to other groups, and have done for a very long time. We continually believe in reiterating the science around the vaccine to ensure that the benefits of the vaccine are well illustrated. We are also open and honest about any adverse events or side effects so that people will know that we will be there and highlight a problem if there is one.

Q2792 **Aaron Bell:** Is there an estimate of, currently, how many adults in the UK are refusing full stop? The implication we have heard is that the pressure on the NHS is coming from unvaccinated people. The reason we are having to make restrictions and take measures is to avoid that pressure on the NHS. It is a very different scenario ethically from the one we faced in March 2020 when we were protecting everybody. Obviously, we need to protect the NHS for everybody, but if the reason we are having to take measures is because of people who have refused to have the vaccination, we need to get a handle on that number and work out what measures we think are appropriate through Parliament. Is there a number on what percentage of adults are basically point-blank refusing?

Dr Hopkins: That number is not recorded in detail. People are repeatedly asked and invited for a vaccine. Anyone can walk in at any time and take up the vaccine. We are seeing people who decided they did not want it a month ago change their mind. That is a moveable number.

Q2793 **Aaron Bell:** Yes, of course, but there must be a number. You know how many people have been vaccinated.

Dr Hopkins: We know that there are 5 million people who are eligible for a vaccine who have not started their vaccine course today. Each day that gets smaller and smaller. It is not a number of people who are refusing it. It is a number of people who are hesitant, looking for information and changing their minds.

Q2794 **Aaron Bell:** Is there a number for how many people simply cannot have it because of their background conditions?

Dr Hopkins: That is very small. The estimate for that number is less than 1 million. That changes depending on this. We would still advise the vast majority of people who we think will not have a very good immune response to the vaccine to have it because they may have sufficient responses that we cannot detect very well in their blood to make their disease milder. There are very small numbers of individuals who we would say should not have these vaccines. These vaccines are safe and effective. It is mainly those who potentially have a drug allergy or who are in the middle of severe treatment for other things where any additional side effects would be difficult to understand.

Aaron Bell: Overall, that is around 4 million who have not taken it up yet. And like you, I would encourage everyone to take it up, but within that there are clearly some people who have decided that they are not

having it. They may yet change their minds. I hope they change their minds. That 4 million is roughly the number. Thank you.

Q2795 **Chair:** Thank you very much indeed. A final question from me. We have these important votes in Parliament this afternoon on applying the plan B measures. Dr Hopkins, what is the exit route? Suppose we find that Omicron is more infectious and leads to people being hospitalised. Are we going to have to live with these restrictions indefinitely? What will cause them to come to an end?

Dr Hopkins: We know that there will be a wave of infections. This is the fourth time we are going into something like this. The waves last a period of time. The more the restrictions are effective, the smaller the peak, and therefore you can reduce them and return life to normal.

Having the population boosted and getting the population boosted will be an additional advantage to reducing hospitalisations. If the boosting of vaccinations affects hospitalisations so that they are able to maintain full care for all individuals, and primary care is able to deliver what it needs to do at a rate that we have seen, recognising that we have seen 700 to 1,000 admissions a day since July for six months with very few restrictions on our way of life, I would hope that we would be able to return to that. It is balancing being able to deliver healthcare and have sufficient amounts of delivery of that in order to get back to normal.

Q2796 **Chair:** Based on the modelling that you have seen so far, when do you expect the restrictions to be able to be lifted?

Dr Hopkins: Based on the modelling that the London School has done, I would expect that there will need to be some level of restrictions in place for the next four to eight weeks.

Chair: Thank you very much indeed. I am very grateful to both Dr Hopkins and Professor Riley for their evidence today. We have run over time, but these are very important matters, and they will be debated in Parliament this afternoon. You have done a service not only to this Committee but also to the House in appearing before us today. That concludes this meeting of the Committee.