Hi good afternoon, everyone, my name is Justin Placide. And I'd like to welcome you to another great session that's going on during Civil Service Live. This session if you didn't already know, and I know we've had quite a lot of people registered for this one is COVID-19 science at the heart of policymaking. Now we have a great panel, which I'm going to quickly introduce. And then of course, I'm going to hand it over to Sir Patrick. So for all of the panel, I hope you enjoy the rest of this session. We're going to try and make it really nice and warm for you. We're all here today to help our audience understand a number of different things. The questions are coming in already. But without further ado, I would like to just quickly say who's on the panel. So of course, as I mentioned briefly, we have Sir Patrick. We also as well have Jonathan from the Department of Health. We also as well have Professor Brooke. And then, finally, Professor Dane Angela. So I'd like to welcome you all to this great session. I hope you enjoy it as much as I am already. And without any further ado, I'm going to hand you over to Sir Patrick.

Thanks, Justin. Well, hi, everybody. And I want to first of all, thank everybody across the Civil Service for what many, many different departments, individuals, groups have done during this very difficult time. And I know that many people on this call will have been affected personally in all sorts of ways, ranging from tragedy through to difficulties with working environments through to the extra workload and it's been remarkable to see how the Civil Service has really stood up and responded to this. I'm going to kick off saying a word about SAGE. What is SAGE? SAGE is an organisation that is stood up in emergencies to provide advice to Cobra and thereby to ministers. And its membership, not really membership, its participants for individual meetings are dependent on what the topic is. So in my time as government Chief Scientific Advisor, we've had SAGE for Salisbury events, so around Novichok for obviously, not in the public domain in terms of the output. We had a meeting for SAGE on the Toddbrook dam problem last summer, where we met once to give advice on that emergency. And we've met to discuss and decide what the government response might be when there was another outbreak of Ebola in the Democratic Republic of Congo. So, SAGE meets in response to emergencies. The participants are a mix of internal science advisors from government and external academics and the external academics are all completely independent. They are not paid. They're not contracted members of the government. And they are there to bring expert advice and to be forthright in their opinion, and to make sure that we hear the latest scientific evidence as it pertains to the emergency being considered. So what happened in this particular example, on I think it was the second of January, I sent a text to the SAGE team to say, we ought to keep an eye on what's happening in Wuhan. There seems to be an outbreak of a strange new respiratory virus and the team started working through January. Increasingly, it became obvious that we should call SAGE and we had our first SAGE meeting in the third week of January. Since then, we've had 47 SAGE meetings. So quite unlike any other emergency SAGE has ever had to be called for. And, as always, it was called at the behest of Cobra in the first instance. So, SAGE exists to provide advice and I'll come back to that point in a minute. And it doesn't do it alone. So, as well as the participants in the SAGE meeting, mix of internal or external independent people are able to speak their minds. People are also able to speak outside if they wish to on their own personal research, but not repeating the discussions in SAGE. We have subgroups and those subgroups are expert and deal with the real detail of what's required. So in this emergency, we've had a subgroup on modelling which brought together mathematical, biological modellers, epidemic modellers, from a number of universities around the UK and from Public Health England, and they formed a group called SPI-M, which looked at all of them modelling of the epidemic and gave advice on what that could tell us about potential actions that might need to be taken or ways in which the

epidemic might unfold. We had a group on behavioural science called SPI-B and Brookes here today, he was absolutely instrumental in that and she'll tell you more about how behavioural science was a really critical part of how we thought about the response to this, but we had many other subgroups too. One that dealt with new and emerging respiratory viral infections as a standing group that exists even outside an emergency and reports into Department for Health and Social Care. That's called Nerve Tag, a mixture of clinicians, virologists, immunologist, others who can give advice on emerging respiratory viruses

A group dealing with clinical matters, a group dealing with schools and children, a group dealing with environmental transmission and modelling, trying to see how the virus might spread during different, in different environments and over different periods of time and so on. So a multiple subgroups that do a lot of the work and then feed into SAGE. In total, it was over 100 scientists working on SAGE, feeding into SAGE any one time. And it also involved all of the devolved administration's and I think it's really important to note that the advice from SAGE has gone to all of the devolved administration's and they're very keen to keep that mechanism so that there's one central source of advice that goes to all of the DA's of course they make their own decisions in terms of policy, but they get the same science advice. And of course, it also has the Chief Medical Officers from the different nations and Chris Whitty the Chief Medical Officer co chairs SAGE with me. What's the output? Well, the output of SAGE is quite important to understand because we're not an operational group. We don't determine how things are actually run or operationalized. We're not a management group, we don't manage the pandemic. And we don't make policy decisions. What we do is provide science advice, which then has to dock into policymaking and operational frameworks. And that's the point I'll come back to but that's very key. Traditionally, this would dock in through the Civil Contingencies Secretariat and into Cobra. And in this instance, it had to dock into many departments across the whole of Whitehall. What were the challenges that we face? Well, the first big challenge is we were dealing with an unknown, we were dealing with a brand new virus, about which nobody knew anything. And we had to therefore garner as much information as we could from around the world and from our own scientists. The second challenge which became even more of a challenge, as we went through is undertaking all of this in the spotlight. And clearly, it became very much in the spotlight of the news, that causes its own problems for sure. And whilst it's welcome to have many conflicting views, that's what science is, looking at many different views and trying to decide what the right answer is. I have to say that the challenge it provides is to stay focused on mission, stay focused on the key things without being deaf to the things that other people are saying because we need to listen to them very carefully. But without letting the cacophony drown out your ability to focus on what we need to focus on. Two other challenges, I'd highlight were one link to policy and the second to link to operations. This is a really tough thing to get right. And it's worth thinking as we think about science at the heart of policymaking. What that docking mechanism is, how the two things fit together. Because the science advice is only one part of what needs to be taken into account, but it's a really crucial part. And fortunately, there's a big reception for science now. And we must take advantage of that. But that docking mechanism needs to be clear. It needs to be effective. And there needs to be leavers that can be pulled the other side of it. I'm sure that's something that we'll pick up on as we go through this session. What are a few of the lessons that I think that we might learn from this before we go on to the panel. The first is, never waste a crisis. And I think there's no doubt that one of the things that this has done is put science right at the heart of government and at the heart of policymaking. And we need to make sure that that continues, and that we understand how

science right the way across government can be utilised as effectively in policymaking. The second thing is don't assume the next emergency is going to be like the last one, and it won't be. So whilst we absolutely need to learn lessons from this one, we shouldn't assume those lessons are the only thing that we need to care about. The next emergency will be something different. And then three other points. Data flows are key. You absolutely need to know for any emergency where the data are coming from, who owns those data? How you get into operability with data across Whitehall to get the integrated data you need? And can you do that quickly enough. And I think there's a real lesson in there relevant to all emergencies and indeed many other aspects. Be clear about the data flows, data systems that you will need. Second one is transparency is key. We made a mistake earlier on. SAGE never normally publishes its its papers until after the event and that's what we were advised to do this time. In the end, we decided to publish the papers and push that through that turned out to be a good decision. I wish we'd done it earlier. And the third is diversity. Diversity of thought is incredibly important. Diversity of the makeup of science advice is important. And it's one of those things that you need to keep looking at and make sure it's right all the way through. And I think it's one of the areas where in tough situations in crises, it's easy to forget that, and it's wrong to forget it. It's a crucial part of what gets the good science advice to make sure you're pulling from multiple different sources. I will stop there and hand back to you, Justin, and over to the panel. Thank you.

Thank you very much, Patrick. I had the opportunity to host a panel session yesterday with Professor Whitty and he said exactly, it was similar word is with regards to the data flows, and how important that is. So it's really good that both of you not only know each other also, as well have that same opinion and value on data. So without further ado, this is when I get to speak to the panel and give the other panellists opportunities to ask questions. And Brooke if that's okay, I would like to start with you. And my first question goes as how do you think your input as an external expert on behavioural science, alongside other academics supporting SAGE has influenced government policy and decision making?

And it's a good question. Thank you very much, Justin. I would say that the SAGE response has been and will continue to be both challenging and very, very interesting as an external independent scientist. And it really brings to a head some of the conversations that I've had in other advisory roles across government pre COVID-19 and recognising that we are dependent on the skills and knowledge from the worlds of the physical science of neurology, epidemiology, modellers, in this case, to understand the virus spread through our systems and environments. However, physical science and technology can only take us so far and pre COVID-19 and especially during COVID-19, there has been growing recognition that the human, psychological and behavioural elements must be considered as a fundamental part of the more traditional physical science approaches and solutions. If we don't understand how people are going to respond to the solutions or to the advice or to the rules that we're setting in place, they are not going to be as effective as they can be. Some of the themes that have come up as we consider our options in terms of response within the UK, they come up repeatedly within the behavioural science subgroups, and we keep on giving similar advice and adapting it in order to make different areas response more effective. The themes include the need to communicate decisions clearly including the rationale, timings and impacts that the changes will have on daily life. We've developed a number of evidence based principles for communication that can be applied to just about any aspect of the COVID-19 response. So we've created tools that policymakers and practitioners can use when thinking about their area of response. We've also identified the need to be

aware of the many factors informing adherence. So it's not always about compliance, we prefer the word adherence. And this has led to conversations of how best to enable communities and individuals to engage in protective behaviours. And recognising that the vast majority of the members of the public have been adhering to the advice and trying to keep themselves in one another safe. When we see low levels of adherence, we've had some very interesting conversations around the challenges that different parts of society and individuals within society are facing. So how can we make it easier for them? How can we understand the moments when we're seeing lower levels of adherence? And what can we do in order to understand how they understand the threat, the risk, what their perception of that risk is? What is capability, are they able to follow the advice? And also what are the levels of trust in the people who are giving the advice? We've also constantly highlighted and brought evidence to bear on the need to be aware of existing inequalities within society, that may be and in some instances had been enhanced or brought about as a result of our guidance and policy decisions. In order to try to keep the nation safe, are some aspects of our society carrying a heavier burden because of that. We've also identified and provided advice and support in encouraging co production. So instead of just giving advice and a top down way, to actually engage with stakeholders, be they community stakeholders or if we're thinking about schools, with teachers, with parents, with students. And to try out the different solutions that you're putting in place. And again and again, we're looking at evidence from infectious disease outbreaks and evidence from other extreme events as we move forward.

Thank you very much, Brooke. And while, I've got this opportunity if I could just ask you just a quick little supplementary question, and then I'll go on to Angela. And for me, especially because we've got such a large audience, it really helps if we could just give them a bit of a takeaway. So are there any takeaway lessons you feel or think about that science and policy can learn from our COVID-19 response?

I think that Patrick has identified several of the takeaways that I would have identified in terms of the need for transparency where it doesn't create a security risk, and it is very, very easy to assume that we can be transparent, but a lot of the takeaways are from day to day engagement with the government as well as during COVID-19 in terms of needing to ensure that science and evidence are embedded in policy and practice. I'm really really keen to see us take a systems approach to policymaking both within and across departments to think about the different types of science that can best support them in their work and in what ways, so much of the work is responsive and reactive. Recognising that science isn't always about generating evidence, it can also be about identifying approaches that will help you unpack those questions. And recognising that science can make our approaches much more effective, stop us from recreating the wheel, and create awareness of potential unintended consequences. Finally, I think that we need to stop constantly relying on the more traditional physical sciences and think about anthropology, behavioural science, ethics, etc. and take a multidisciplinary approach to science that can be embedded in every part of the policy process from creation to development to delivery and assessment.

Brooke, thank you very much for that. And, and I'm hoping that all of the audience as you're listening and also as well, as you're giving us those questions via Slido, and for those who didn't know, you still have an opportunity to raise some questions. I can totally understand that Brooke. And definitely, as you're saying with about the fact of aligning our science and our policy and looking at different methods,

because definitely going forward into this, this new norm, world, we do need to think about those kinds of things. So thank you very much for answering that, that that cheeky little supplementary. And so, Angela, I hope you're okay? If that's all right, I've got a question also as well for you. Would that be all right? Absolutely fine. Excellent. Thank you, Angela. So my question goes as follows. As a scientist working in government, what has what has been your biggest challenge in the COVID-19 response? And how have you overcome them?

Thank you very much. That's a great question. I suppose my first answer might have been getting hold of the data we needed. But we've already sent that one. So I'm going to do a different one. So my day job is, I'm Chief Scientific Advisor in the Ministry of Defence. And I happen to be an academic modeller. So along with Graham medley, and Paul Allen, I'm one of the CO chairs of the subgroup of SAGE called SPI-M where we do mathematical modelling. And my biggest challenge there, I would say, has been getting the right question asked by policymakers. And I don't mean getting the question I want to answer. I mean, having this long, long conversation with the people who are trying to get advice to policy about what is the way to couch the question that is of interest to you in a way that we can best use our skills, our data, our subgroup, to give you a helpful answer. And early on in the process, I suppose we didn't know each other at all. And the questions would arrive, quite long and very, very detailed questions. And we would send back fundamentally just very large numbers of squiggly lines saying if you do this it'll turn our like this and so on, and I don't think either side was really having a very good time, actually. I expect they were very frustrated with us. We sometimes did feel quite frustrated with the questions, but in fact I remember sitting right in this room, looking at the list of questions, thinking, gosh, how on earth do they think we're going to answer that? And I'm really glad to say that through time, I think both sides have really worked quite hard together in order to get the questions into a form that our techniques are able to address. And also to get our answers into a form that really has to have the most richness in terms of things we do know. So, you know, there are certain things about this virus that we know reasonably well. So but in particular, I would say we know quite well, how different bits of society mix with each other, particularly by age. So things like that. So how to make an answer that makes the most of the things we do know. But it's also very clear about here are some things we don't know. But if it was, but don't say therefore I can't answer say, I don't know this, here are four different possibilities, here's how it would look different. So that's definitely been the biggest challenge, a really interesting intellectual challenge, actually. And I think that's always I think, for a mathematical modeller that's always one of the most interesting bits of the job is how do I turn. In my old life I tend to be talking to medics or biologists, how to turn this medical question into a mathematical model. And here is how I turn this policy question into a mathematical model. And I'm certainly I would certainly like to think that that was something we did together. So that's us by them on one hand and CS on the other hand, very much a collaboration between us. How do we do that? Well, obviously, I mean, you know, first of all, we talked on Zoom, we even met once, and we still talk. I think that's been really a very rewarding piece of work. And not really science. It's about one part of that science policy interface. It's not what you get. It's not what you give the advice, it's where you figure out what's the question.

Excellent. Angela. Thank you very much. And I'll probably have a lot more questions for you later on when we do a little bit of question time. And I just want to quickly like to introduce Jonathan who, probably for the audience is probably wondering who he is, but Jonathan has kindly kindly stepped in

for the Perm Sec. I know he was on the bill, and I apologise for anyone on his behalf. He was unable to attend today, but we've got Jonathan standing in his place. Hopefully being able to answer questions, which I know he will and I'll try to be gentle on you, Jonathan, don't worry. But would it be all right? I've got a question ready. But if you could just give a little bit of an introduction to yourself, just so the audience know, you know your background.

Thank you. Thanks, Justin. So hello, everyone. I'm Jonathan Marron, I'm a Director General in the Department of Health and Social Care. And over the course of the COVID crisis, I've largely been responsible for personal protective equipment so that our efforts to secure equipment and then to make sure it's available to the public and indeed some of the advice more broadly on wearing face coverings, for example, so been at the heart of it and seen quite a lot of the outputs that Patrick and Angela, have talked about.

Excellent. Jonathan, thank you very much. You've may have opened yourself up because you're talking about face coverings. And we all know it's currently in the media about actually now the time of when we should actually introduce that you know, in the shops and potentially publicly. But hopefully, the audience will probably have a bit more of a better understanding now, now that we slowly, you know, shared that information to the public. So I've got a quick question for you, if that's all right. And it's probably a bit more of a hypothetical kind of question. But there's a bit of, you know, there's a bit of background behind it. So of course, we've had multiple departments having responsibility for responding to COVID-19. And probably each one of those departments has taken their own different way of handling it. So even though there's communication between them all, they're probably imparted some of their own individual likeness to it. So can I just ask, based on the experience that you've mentioned, especially with regards to PPE, what would you like to highlight to the audience any similarities in the ways that civil servants responded to that and also as well with the conversation around returning back to the office, how maybe we can get the communication a little bit more streamlined just to give our civil servants, you know, a bit more reassurance.

Thank you.

So look, I think that they experience a cross Whitehall. The exposure that I've had is that it's actually that we've worked really, really quite closely together. I mean, those who work in the sort of central Whitehall departments will be used to the, you know, the scripture, the media, of the silos and all of the rest. But I think, actually, as the crisis has hit, I've had a real sense that we've worked very closely as a Civil Service to try and solve these problems together. Be that, you know, health and education thinking about children and how that might impact or broader sections about working with the Department for Transport or the Department for Energy and Industrial Strategy about the wider economy. So it really felt that we have come together. And really interesting that the structure's Patrick talks about to really give that common central set of advice of how do we understand the challenge before us, I think has been massively helpful so that we've all had access to the same advice.

And then I think that's allows them to work on what sensible set of solutions. Now of course, you're right, we all bring a little bit of our own. So you know, the Department of Health and Social Care that I am most familiar with, and it's always quite a science friendly department, you know, evidence based

practice is the heart of medicine. That's what we like to think we do. And this experience has been a real challenge in if you think back to January, none of us really understood much about this virus. Patrick, and some of the experts in SAGE probably had a better inclination than your average polished civil servant in the Department of Health. But I think we've made a very rapid set of learnings to understand the virus and actually it's been really clear that our understanding has really deepened over the last three months. And that's allowed us to develop a policy agenda. So I think something there around, there's something to learn about how do you continue to change and learn as your understandings deepen. I think the bit that I have found most interesting is the way the science has opened up the space for the conversation about policy. So you know, some of the things are done. But if you'd asked me last August to pluck a random month out with the time that we would enter a lockdown of the whole country, I just wouldn't have believed it. And the only reason that that happened is the science and the modelling work were showing scenarios that simply weren't acceptable to the government and meant it was possible to take those decisions. I mean, even a very smaller level face coverings, which now I think are going to see much more use of, again, something that our culture was very opposed to if you asked us again last year, probably people wouldn't think of wearing them. But I think that science based evidence that actually it makes a difference. And actually really, it makes a difference to other people. And how can you take your part in that altruistic active, trying not to spread, I think has really helped. I think our understanding of asymptomatic transmission that you know, the people have this virus without knowing it has also kind of added to that. And then the behaviour then changes as you worry about, you might be doing something that affects others. So I think there is something here about learning from the science and just when we reflect back how we've used the science in this crisis situation to open up policy opportunities that we might not have been there before. And really, how do we do that, in slow time over the election? Know, when it's not facing a crisis that we must fix today, how do we make sure the science allows us to open up policy answers that perhaps weren't there before? I mean, I think that's the bit that I'm really interested in.

Excellent. Thank you very much, Jonathan. Thank you for that. So for the panel. This is Thursday, as we all know, this is also as well, the last day of Civil Service Live. But also as well, this is the day that question time is on. So I'm going to try and pretend to do a really bad Fiona Bruce impression and give you some rapid fire questions. And hopefully each one of you will feel comfortable answering that not only directly to me, but also as well to the many people, our many friends and family in the Civil Service that are currently tuned in now. So once again, I'm going to try and answer, I'm going to try and ask a couple of those questions that are currently in the media, so that reassure some of our staff. But also as well, they get to hear your opinions on that. So as I mentioned, we we all know about the face coverings. And Jonathan, thank you for giving your views on this. And I would like to direct the first question if that's okay, Patrick to you. And once again, this is about the conversation. We all know that the PM has said that he would like to encourage as many people to return back to work as possible. But then there's conflicting information that some departments are, are not ready for their staff to come back. So, Patrick, if that's okay. Could you answer this question when staff begin to return back to work, of course, or to the building to do their work? Because of course, we're all working. And we know that sometimes in the building social distancing may not be possible. Do you think people will be wearing face coverings?

Well, first thing to say is that I think that social distancing is here to stay for a while, and this virus hasn't gone away. And we are potentially going to get a significant upswing in the winter, and therefore, the more we can do to keep the numbers down now, the better and my own view is that the evidence suggests that homeworking remains a very effective way of stopping transmission routes. So that's my first comment. Then in terms of where a mask is most useful, they're most useful in situations indoors, where you may encounter crowding, where you can't keep two metres apart, and where you're mixing with people that you don't normally mix with. They are also most useful when you're not wearing them for very long periods of time. Because when people wear them for long periods of times they fiddle with them, they stopped wearing them properly, they take them off, and so on. And it causes problems because you're forever touching your face. So in general, and wearing them all day inside in an office environment is not easy and doesn't work well. So I don't think indoors office environments are the place where it's going to happen. I think you can imagine the places where I think they're useful in particular are things like theatres, cinemas, shops, other indoor environments where you might come across crowding unexpectedly, that's when masks going to have their biggest effect. They have much less effect outside where the transmission is much less.

Thank you very much, Patrick. Okay, I'm going to move on to Angela. Angela, if that's all right, there's a couple of questions that have come up in Slido that been quite similar. So what I'll do if that's okay with you, is just amalgamate a couple of those questions. It's all to do with the former GC SA Sir David King. And a couple of questions about the, what is the added value and that he is added to the independent SAGE panel? Angela, would you be happy to answer that?

Well, I will answer it.

Ah, what like, I think it's really good that people have a voice everybody is entitled to have a voice and saying what they think science has to add. I think Patrick outlined very clearly that the point of SAGE is to give science advice, and not set policy. And I think that's, that's a principle that is really important particularly. When elected, we're not here to set policy. We're here to lay out the relevant information that we have access to and with those funded scientists who've been working to help SAGE, that's access to a lot of information. But at the end of the day, it's other people who make policy decisions. So I think that's an important difference between real SAGE and independent SAGE. And then I think the other thing was, it was perhaps a mistake to use the same name, because I think that has caused some confusion. And let's face it, more confusion is absolutely the last thing we need at this stage of things.

Angela, thank you very much. And now I'm going to move over to Brooke. I think we all know that the ministerial stand ups involving people such as Professor Whitty has been, on one hand really reassuring to some who even though they're finished now, but when they run we're really reassuring to some and one of the questions has come up is and Brooke I'm hopefully you'll be happy to answer this is do you think it would be good if scientists could do a once, you know weekly TV session to explain what they've learned about COVID?

We've been discussing this amongst ourselves as well in terms of the voice of the scientists who are providing the advice through SAGE and the SAGE subgroups. I will say that I have found the media

interest in the scientists who are involved quite uncomfortable at times and have tried to do my best not to undermine the advice that we're giving in the knowledge that we are publishing that advice. So that transparency was really, really key to me. I feel that our voice can be heard through the publications, you can see the advice that we're giving. Whether or not all of the people who demanded that transparency which we were scrambling around behind the scenes trying to clear for going forward. Now want to read it is another question. So I do feel that sometimes, I wish that we could make that advice even more in the spotlight, that we have issued new advice, that there is something that they might want to pay attention to, in a very simple way because they don't always want to read all the reports. I'm not against having some more conversations as a science panel, possibly weekly is a lot to ask. We are working nights, long nights, through the nights and weekends in order to do this work. But I also think that there needs to be some respect given to the fact that we are giving advice and we are not making the policies and that the advice is there to be read. It should be read before they start challenging our integrity.

Excellent. Thank you very much, Brooke. Okay, I'm going to move over to Patrick. Now if that's okay. So, Patrick, once again, we know that this is, you know, partly making sure that the people who listen to us understand the importance of science, and whether that can then factor into our decision making and how important it is to add to policy, and so on. So if guided by science, why did we not close the borders earlier, at the start of the epidemic? They reference here in the question that New Zealand government showed that this was an effective strategy. We know that, you know, publicly, people have said that the government should have acted earlier. I just want to set that up as a bit of a scene. And also as well to let the audience know that this is your view. And you you're not speaking on behalf of a government in general.

No, very happy to answer that. Yeah, and again, it's a very interesting one because it speaks to the difference between science advice and policy decision. So we were very clear that one way you can stop an epidemic from occurring is to completely close your borders. If you stop everyone coming in, it will not get to you. We thought very early on that China could have done more to stop its borders because it could have contained this in China and didn't. So one option was complete sealing off of the UK, which is the third most connected country in the world, in terms of our travel and international links. And that choice wasn't taken, quite you know for all sorts of reasons that you can imagine why it wasn't taken. We also said and this is important to remember, it's quite easy to look in retrospect and think what might have happened but at the time, the whole focus was on people coming from China. In the event, it's turns out that the vast majority of the imports of this disease into the UK came from Spain, France and Italy. So we would have had to, in February, early February, have stopped any travel into Europe or anywhere else in the world. And that, of course, was an option that was there. But that was not one that was taken at the time and not one that perhaps would have seemed reasonable at the time either. And I think to have taken a decision to have stopped travel to say China and Singapore and Hong Kong would have made very little difference. So these are really important things to look at in retrospect and see what could have happened. New Zealand, of course, is in a totally different position in terms of its international connectivity and what that means. And I think this international connectivity point about the UK, and many other things are things that needs to be looked at in terms of the overall size of the epidemic and what happened. I mean, there are many reasons why countries look different in this epidemic.

Patrick, thank you. Okay, Jonathan, I'm bringing you back into the conversation as one of our standing panellists. So this one is about of course, the UK's decision to opt out of the EU vaccine sharing initiative. Do you think it will have a detrimental impact on our shielding population?

So I think we are working very hard on securing vaccines for the country both obviously the science of establishing an effective vaccine and we are sponsoring, through the <inaudible>, a set of trials in the UK doing that, the Oxford one you will read about in the press quite far ahead. And we are working very hard to ensure that if an effective vaccine is developed that we will be able to make it available. So I think the government is totally across that challenge. And that is something that we should be able to do. So I think we're ready. And we're across that particular challenge, I think is the the answer that I would get.

Excellent. Thank you very much, Jonathan. So, Angela, if that's okay, I'm bringing you back on again. And so this is a question from one of the lovely audience, how can I use my maths degree to get a scientific orientated job in the Civil Service?

Well, great question. Um, do I know I've only been a civil servant for 10 months and we need you, we definitely need you.

If you were in defence, I would say come and see me and we'll find the right person to talk to, I think, yeah, ask your CSA so in your department, there should be somebody called the Chief Scientific Advisor like I am for MOD. And I think that that's a person who will know your department. And you can have a talk to them about, well, you know which bits of your department's work are of most interest to you, and your CSA will know which bit of your departments work is crying out for a mathematician, which will be all of it, of course. I think that's the place to start.

I know that if well, if you were in MOD come to me.

Excellent. So I hope that person is currently smiling there. They feel that they've got that connection. And I hope that they can get that worked out based on Angela's advice.

If for some reason you don't have a CSA, or your CSA doesn't answer, come to me.

Yeah, go to the science and engineering profession team as well. They'll help. Absolutely keen to make sure that we get people with science degrees in the right place.

So thank you, Angela. Thank you, Patrick. So I'm going to go to Brooke again and just trying to stick on the sort of education theme of some of the questions. Do you think there should be an increase in education to the section of the public who may not have a very basic education of germ theory science?

Well, I have to say that I've learned a lot about germ theory science along the way as well. So we do work very, very closely and collaboratively with our different groups SPI-M, with nerve tag and the modellers. So they're learning from us, we're learning from them. Again, it's about taking your skills and

trying to apply it to the situation and in a combined way. I am always in support of increasing scientific understanding and education across the general public. In the school systems whilst recognising the big ask that they already have in terms of educational delivery across the board. I would I try to be a champion of bringing science into everyday conversations with schools, I go into schools. I've worked more closely with the Department for Education through this and I would love that have conversations about that. I'd also like to say that I saw one of our modellers from SPI-M actually helped write a children's book about this virus, which which I've shared around my community, and it's quite popular. So we are thinking about that. And we are trying to find ways to break this information down for different parts of the community. A lot of it can be done through very carefully considered evidence based communication. But I think we can look further upstream at what we're doing with science and how we're doing science in our educational programmes all the way through.

Thank you very much, Brooke. So I'm looking at the time I'm going to try and see if I can quickly fit in two more questions around the sort of looking forward theme. So, Jonathan, if that's okay, I'm going to quick fire these ones and if you can say in less than, your answer in less than a minute, that'd be really helpful. And then after that, I'm going to end with the final question for you Patrick. So get ready to prepare yourself. So, Jonathan, what scientific advice is being given to ensure that the UK is prepared for the second wave? Should people and businesses prepare now for future lockdown? And also is the NHS ready?

Okay, so thanks. So trying to do a very quick answer. And as Patrick said at the top of the presentation that the virus hasn't gone away. And I think we should be thinking about how we prepare for a subsequent wave. The NHS is taking this very seriously and is planning, with the help of the modelling that our colleagues have talked about, of what kind of scale of wave it should look for. There has the capacity available, has the PPE put aside. So we are taking it very seriously. And I think the advice to the public is to carry on with the social distancing, the hand washing and making sure that we're safe as we can possibly be. And the fewer cases we have going into the winter, the better. So I think it's not just preparing for a second wave, it's how do we keep up our vigilance in tackling this virus over the summer months, and put ourselves in the best possible position for the winter, which as we all know, is always the most challenging time for the health service.

Thank you very, very much, Jonathan. Okay, this is going to be last one for you, Patrick. And then as I said, I want to pre thank everyone who's been listening. I'm hopefully, it's been a great session for you. We've managed to get some of the questions answered. But don't worry, there's still the poll that you can also as well pull some other questions in. And, once again, please feel free to keep on sending questions through I believe there may be a forum being set up, but we'll see. So finally, Patrick, if that's all right, I'm going to ask you one more question. And this is about the latest science on antibody tests and vaccine development. So there's been a number of mixed messages in the news on their effectiveness. And I would just like to ask if that's, what what are your views on the antibody tests and vaccine development?

Okay, thanks very much vaccine development. First of all, there's something like 100 or more vaccine projects around the world. There are some in the clinical ready that the most advanced actually is the UK vaccine from Oxford. It's in large scale clinical trials. Now, most vaccine projects fail. So that's the

first statement. And so far so good in the ones that are going ahead here, it's important that we don't put all our eggs in one basket. My own view is it's highly unlikely we will get a vaccine that will completely stop this disease, we're much more likely to end up with one that modifies it in some way so you get a less severe disease and it spreads a bit less. And I don't think we'll get that this year at scale. I think it's going to be next year. But I'm reasonably optimistic we will get some sort of vaccine. Now, will it last for a lifetime? Probably not. And it may be that this turns out to be an annual vaccine that needs to be repeated in some way. So there's a lot still to learn about that. But I think things are headed in the right direction. But don't dream of a magic bullet that's going to stop this virus dead in its tracks. I don't think that's the sort of vaccine we're going to end up with. Antibody tests, we know that the vast majority of people who get this infection get an antibody response. We suspect but don't know for sure that that antibody response confers some protection. We don't know how much protection and we now see that some people who've had an antibody response start to lose the antibodies after a few months. So this may not give a very long lasting antibody response, which again is why if we look at the vaccines, it may be that we need to give vaccines more often. So getting yourself an antibody test off the shelf is probably not very helpful. Because it doesn't really tell you that you're immune from the disease. It doesn't tell you how long you'll be immune from the disease. It may tell you whether or not you've had it. But that's about it.

Patrick, thank you very much. And I'm going to apologise to all of the audience because we have gone over time, but I truly believe that it was worth it. And we've had some great panel members. We've had Jonathan who's flown in like Superman, and stepped in to cover for the Perm Sec. And so I would like to personally thank Patrick, Brooke, Angela, and Jonathan, and to all of you who have tuned in to Civil Service Live Online. And I hope you stay safe. I hope you stay well. I hope you've enjoyed this session as much as I have. So please take care and enjoy the rest of your day.

Thanks, Justin as well. Thanks.

Thanks, everybody.