Q. And you refer to something called the MRC Centre for Global Infectious Disease Analysis.
A. Yes.

Q. Is that a research body entirely within Imperial College London; is that right?
A. Yes.

Q. Is that a post you've held for some time?
A. Yes, I think since 2016.

Q. We've heard from other witnesses, and no doubt you'd agree, that Imperial is one of the main centres of infectious disease epidemiology in this country?
A. Yes, that's correct.

Q. Also on the staff at Imperial is Professor Neil Ferguson, from whom the Inquiry will be hearing later today.
A. Yes.

Q. You give us some detail of your career in your witness statement, Professor, and we can see, amongst other things, that earlier in your career you worked on the SARS outbreak of 2003?
A. That's correct.

Q. And you explain that you conducted work at that stage assessing the transmissibility of that particular virus?
A. Yes, that's correct.

Q. Then subsequently, is it right, you worked for some years at the University of Hong Kong?
A. That's correct, from 2004 to 2010.

Q. And you explain, therefore, that you were in Hong Kong during the influenza pandemic or epidemic in Hong Kong of 2009?
A. That's correct.

Q. Subsequently, you have been back at Imperial College since 2010?
A. That's right.
bilateral relationships. There was a lot of -- a lot of work was done going in many different directions globally.

Q. Thank you.

Now, we're now becoming increasingly familiar with the structure of scientific committees. At the time, of course, SPI-M-O reported to SAGE. You were not on SAGE, is that right?

A. That's correct.

Q. We'll come to a more recent period where I think you did attend some SAGE meetings, but in your role as academic modeller in the early stage of the pandemic, you were simply attending SPI-M-O meetings?

A. That's correct.

Q. You also were lead investigator in the REACT programme.

We've heard something about this programme already. In full, it was the Real-time Assessment of Community Transmission programme, and it went through various phases, but they were all, one way or another, designed to get a richer picture of the extent of transmission of the virus throughout the country?

A. That's correct. So in collaboration with colleagues at Imperial, we had a number of different studies under the REACT umbrella, and I was most concerned with the REACT-1.

We'll come back to that in a little while when I ask you about the ways of working of those committees.

Q. And that was the element of REACT which was involved in sending PCR tests or obtaining PCR tests throughout the country, and through that means --

A. That's right.

Q. -- an understanding of the rate of transmission?

A. Trying to have as least a biased sample as we could of how many people were positive for SARS-CoV-2 at any point in time.

Q. Just give us an idea of the scale of that: how many thousands of tests were being done how frequently?

A. I think in the end we approached -- I think we approached 16 million people and we received, I think, over 2.5 million testable swabs.

Q. So a lot?

A. Yeah.

Q. Then lastly, and I mentioned this, since October 2021, so some way into the pandemic, your role changed quite dramatically. Tell us about that.

A. Yeah, so since October 2021 I've been seconded at 90% to the UK Health Security Agency, where I'm part of the group that looks after data, analytics and surveillance.

Q. So, to all intents and purposes that was your main job?

A. Yes, yes.

Q. Did you continue to be a member of SPI-M-O from that time?

A. I did continue to attend SPI-M-O. So I think I did maintain membership. To be perfectly honest, it's not 100% clear to me in the capacity, but I did contribute to meetings and do attend.

Q. But presumably you didn't have the time to be doing the research and the modelling work that you had done previously?

A. That's correct, and I stepped back from the REACT Study when I joined UKHSA.

Q. It's in this capacity that there was that caveat about SAGE attendance, because you mention in your statement that later in the pandemic you did attend, I think you said, two SAGE meetings, as, as it were, a UKHSA representative?

A. That's correct.

Q. We've heard something, Professor, about the -- I don't know if "clash" is the right word, "tension" might be a better word, between those academic scientists, if you like, who were members of SPI-M-O, and other committees, on the one hand, and government scientists, government civil servants, who were also part of that system.

First of all, do you recognise that description?

A. Yes. I think there are different roles. I think acting as an independent scientist providing advice to government is quite a well defined and different role from being -- acting as an official for the government and working with those scientists, but also working -- potentially working directly with ministers.

Q. You have experience of, as it were, seeing the workings of these committees from both sides, having occupied both roles?

A. That's correct.

Q. We'll come back to that in a little while when I ask you about some of the matters you've raised in your statement about the ways of working of those committees.

I want first now to turn to your involvement right at the start of the pandemic, and we heard from Professor Woolhouse yesterday, and indeed from Professor Costello, about their developing understanding of the virus early in those first few weeks, really, in January and early February of 2020.

In your statement at paragraphs 4.11 and 4.12, perhaps we can call them up, you've copied a couple of tweets that you sent, I think.

A. Yep.

Q. Which, as it were, record your initial developing understanding of the pandemic.

A. Yes.

Q. So on 9 January, you say:
“It's better in many ways that this incarnation appears to be less severe once infected. However, our ability to control it is driven by our ability to find cases. If being 'mild' makes it harder to find, it could pose a greater health threat.”

Then if we can just look at the other tweet, which is on the top of the next page, I think. So you're referring to a further report, and you say the characteristics seem to be -- presumably this is one of the cases:

- did not visit the market
- returned on the 6th
- already recovered

And then you say: "A version of SARS with a lower infection fatality rate could be a much bigger public health problem."

Could you describe, perhaps in lay terms, what the concerns you were expressing in those two tweets were, particularly with regard to the lower infection rate?

A. Yeah. So thinking back to SARS-CoV-1, the virus that caused the 2003 outbreak, it had a very high infection rate. It wasn't evident at the time, but afterwards we became sure it really was very high, and it also became evident there was very little transmission from people who -- prior to exhibiting symptoms or from that small proportion of people who didn't actually have symptoms, and it was very small for SARS-1. So when we did a lot of that work, and we kind of did some wash-up work thinking about exactly why we'd been able to control SARS-1, we started to think about properties of similar viruses that would make them much more difficult to control. And I don't have a really good published reference for this but, recalling those conversations, if it was a bit more mild, and because it's more mild there's less severe disease and possibly less disease at all, there's asymptomatic transmission, that would make stopping it much more difficult. And it's -- the overall impact is about the number of people who were infected times the severity. So the overall impact could be much, much higher, even if it was less severe.

Q. Exactly. So, I mean, one might have thought that a lower infection fatality rate would be a good thing, but what you're pointing to is that the milder symptoms could make it much harder to stop --

A. That's --

Q. -- and so even if there is a lower infection rate, it could still involve the deaths of a far larger number of people?

A. That's right. So from the point of view of a virus, when you're trying to optimise your success, having a very high fatality rate is not necessarily good, from the point of view of the virus.

Q. Thank you.

A. Let's move on. In your statement you make a couple of observations about the work of SPI-M-O during February 2020.

Q. If we could go, first of all, please, to paragraph 2.9. Thank you. If we could enlarge that paragraph. Paragraph 2.9, that's it.

A. So just picking it up in the second line you say: "It's my view that during the early period of the response, some key commissions were too narrow."

Q. But when we see the term "suppression" used in other documents, that's the same thing?

A. Yes.

Q. If we can keep that in mind, and just go, please, to another paragraph, which is 2.5, on a similar theme, you say that:

"[You] do not believe that SAGE and its sub-groups took sufficient account of international experiences during the early stages of the pandemic. In particular the possibility of a national lockdown should have been actively considered from 23 January onwards.

So bringing those two paragraphs together, you appear to be saying that the thinking was not, perhaps, on a large enough scale, or that you weren't addressing, in particular, the possibility of a lockdown early enough?

A. Yeah, I mean, it was my view then, and I think it's kind of evident elsewhere in the evidence, that the Wuhan -- on 23 January, that was when the public health officials in Wuhan decided to try to contain the virus there. We certainly did not know that that would work and we did not know that that would be a good policy in the end for China, not by any stretch of the imagination, but it was...
Q. Is that the point you make about international experiences, it's the comparison with China that you're talking about there?
A. Yeah, so I think that's one example. I think, you know, somewhat later, you know, much later in this timeline, there were comparisons with Italy as well.
Q. Yes.
A. But for me, because of -- because Wuhan happened first, it's perhaps the most important.
Q. So that brings us back to what you said in that first paragraph we looked at, that on SPI-M-O you were being asked about modelling school closures and other, perhaps more micro, matters. You felt, did you, that there was a bigger picture that should have been considered even at that early stage?
A. Yeah. It's not to say they weren't also important 4.22 together, that might make it slightly easier. So first of all you say that you and he discussed the likely speed of the pandemic in the context of vaccine investment decisions. Tell us how those two go together.
A. Yeah -- a quick comment, that just to say that with Professor Ferguson and many other members of the team, we agreed on many, many things, but that's not the business of science; the business of -- the practice of science is to talk about what you disagree with and trying to figure it out. And I'm emphasising for very deliberate reasons here some of the things that we didn't agree on.
Q. And you probably realise, Professor, that quite a few of my further questions will be about things that you and Professor Ferguson did not agree on, so we can -- it's an important point to start with, that there was an awful lot that we won't be talking about where there was a consensus between you.
A. And a lot of that is extremely valuable.
Q. Yes.
A. So, yes, so very early in the pandemic I was involved in some email discussions in very broad terms thinking about the global speed of the pandemic, and I took the view in those early discussions that we couldn't assume that it would be very rapid in the same -- without -- and that there may be behaviour change whether mandated or otherwise. So I thought it could be slow enough that it was worth spending a lot of vaccines that might not be ready for nine, 12 months.
Q. And this idea of yours, of behaviour change, is something that we'll see that you came back to in a report in early March that we'll look at.
A. Yep.
Q. But when you say behaviour change, I think what you're describing is people in society reacting to the pandemic for themselves, as opposed to being told to do things by the government?
A. Not quite. So I would -- the -- we should really talk about them separately.
We can measure pretty well how people are behaving with respect to the transmission of these pathogens, and that may or may not be influenced by government mandation or advice, but it's kind of important to be clear; it doesn't matter how the behaviour changes, if people observe the risk and make significant changes to their own behaviour.
Q. So perhaps a better way of putting it, the point you were wanting to make, is that even if the government...
doesn't, for example, impose a lockdown or other NPIs,
it may well be that people will still change their
behaviour in a similar way?

A. That's also a point that I make in lots of places, yeah.
Q. That relates, in terms of paragraph 4.21, to the speed
of the pandemic because if people change their behaviour
it will slow the pandemic down?

A. Yes.
Q. Then on a related point, we see at paragraph 4.22 you
and Professor Ferguson discussed whether that lockdown
experiment in Wuhan would succeed or not?

A. Yes.
Q. And what was your view?

A. I did not know that it would succeed, whatever a measure
of success was, but I thought there was a reasonable
chance and a ... partly because I wouldn't have expected
them to try unless they thought they had a pretty good
chance. So I thought there was a reasonable chance that
it would.

Q. These are discussions that you describe having with
Professor Ferguson during late January and into
February. It may be that they involved other colleagues
at Imperial as well. But are these the types of debate
that you're saying perhaps ought to have been happening
at SPI-M-O and SAGE but weren't?

A. Yeah. As you mentioned a few moments ago, I've had
the opportunity to see the process as an independent
scientist feeding in through SPI-M and then as a member
of UKHSA, and when I arrived at UKHSA in October 2021
the resourcing around government in terms of supporting
policy was probably at its maximum, and I could see

the size of teams, the quality of work and the amount of
work that was being produced in order to support
decisions at that point. And as -- you know, under
simple assumptions of how much resource there would have
been operating during the early phases, trying to
support even more difficult decisions, then I think
the Institute for Government's statement is good.

Q. What follows from that, if the point is that SAGE is
doing work that it shouldn't be doing, because it ought
to be really being done by government, does it follow
that SAGE either was or might have been actually
involved in developing policies that didn't part of its
role, or are you really more talking about a sort of
capability issue?

A. So I'd probably speak better to the capability issue,
and I think there's a difficult question here about how
much standing capacity a government should maintain to
provide this kind of support, because it's -- the level
of resource in October 2021 was very high, and it's
probably not appropriate -- it's definitely not
appropriate to maintain indefinitely. So I think
the difficult question here is, and I'll address the
capability rather than necessarily policy, the difficult
question is: what are the right mechanisms for
the standing level of support and what is the right

level of confidence in scalability of support in those
eye stages?

Q. Thank you. We can take that down.

I'd like to move on with you, please, Professor, to
address the period a few weeks later, in early March of
2020. Just by way of context and summary, we know, do
we not, that the national lockdown was announced on
23 March, and that that represented a change in
government policy from the mitigation strategy that it
had pursued previously, flattening the peak, towards one
of suppression or ongoing containment, depending on the
terminology.

You were, as we shall see, centrally involved in
the discussions at SPI-M-O that led towards that
decision, and in fact again, as we shall see, you
proposed the pivoting to a policy of suppression right
at the beginning of March, and that is what we will look
at now.

Can I start on this, please, by asking you to look
at your statement. It's paragraph 5.6 on page 23,
starting three lines -- actually on this copy it's a few
more than three lines, but five or six lines down, where
it says:

"On 1 March 2020, [you] drafted and circulated a report ..."
And you give its title, "The potential benefits of ongoing containment", which we will remind ourselves means suppression.

You say you "hoped [that this report] could become an Imperial College Response team report". We talked about that team at the beginning, and was it the case that the team generated reports which then went to SPI-M-O?

A. We -- the team did generate reports that went directly to SPI-M-O. The type of report I'm talking about there is a public report.

Q. Right.

A. So it's worth a quick comment that, compared to prior outbreaks, the speed and transparency with which the evidence came from academic groups like Imperial was much, much better. So my primary concern was the -- us publishing reports on the website because then they were -- they could be available to SPI-M and to people all around the world as well.

Q. Right. But in any event, it was like a badged product of the response team that you hoped this report would become?

A. Yes.

Q. And you mention that it was an early version of a report which was in the end circulated a week or so later, and

never want to do it. We had to consider that possibility at that point. And that justifies that very strange looking comparison of what we were apparently planning for versus what one could conceivably think might be an option for us. Might be. Not was, but might be.

Q. Yes.

Now, you go on to describe, in summary, Professor Ferguson's sort of negative reaction to this report, and you actually quote him, you say: "Professor Ferguson's view at the time was that 'everyone in policy circles' knew that R could be brought below 1 ..."

Pausing there, do we mean they knew that this suppression policy was at the very least?

A. Yeah, so in the crudest level of success that you could -- if your restrictions were severe enough, you could make the incidence start to decline.

Q. Yes. And then reading on: "... but that there was no appetite for the draconian measures that would be required."

Presumably no appetite amongst those people in policy circles, that's how we take it, is it?

A. You will be speaking to Professor Ferguson later today, so ...

we will talk through the chronology of all of that.

Dropping down a few lines, the crux of it, you describe, is that you pointed out that a rapid wave, similar to the realistic worst-case scenario, could lead to 464,000 deaths. But by contrast, you were positing that if there was a successful policy of immediate suppression, that could reduce it vastly to only 148 deaths?

A. That's right.

Q. So was that your sort of core thinking at that stage, you were simply --

A. Yeah.

Q. -- positing those two alternatives?

A. -- And it -- I mean, as you present those numbers, it looks strange, in -- I mean, it felt strange to be writing that at the time, and it still looks a little bit strange to be reflecting on it.

I think on 28 February, WHO China delegation published their report and within that they state China's policy is to maintain control and restart the economy, so on the 28th China had committed to going full bore for economic productivity and containment.

So, to me, that meant that we had to consider the possibility of ongoing containment without it being unachievable or without it being so bad that we would...
to what is meant, but it certainly doesn’t seem to be

the government.

This group that he's describing was in charge of

pandemic policy at the time?

A. Could you repeat your question? I'm sorry.

Q. The text says:

"... we were currently driving UK preparedness and

planning and that we were trusted by the government."

A. Yes.

Q. So I appreciate that you don't want to be drawn on

stating what Professor Ferguson --

A. Okay.

Q. -- meant by that, but he appears to mean that a group

other than the government is driving the policy.

A. Yeah. Yes, that is what it appears to be. There's

a lot of -- there's potential importance on the word

"driving" and exactly who the "we" are. I agree that

that's -- that's how I would have understood it at

the time, but I wouldn't -- as I say, the aspect of

Professor Ferguson's reply that kind of struck me was

"everyone in policy circles", which is why I repeated it

back in quotes.

Q. Yes.

A. I think my understanding is clear from how I've replied.

Q. All right. Well, let's just pick up another part of

... we were currently driving UK preparedness and

planning and that we were trusted by the government."

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Professor Ferguson's reply that kind of struck me was

"everyone in policy circles", which is why I repeated it

back in quotes.

Q. Yes.

A. I think my understanding is clear from how I've replied.

Q. All right. Well, let's just pick up another part of

might suppression work, you were looking at much more --

the smaller but important issues, for example, about

school closures and so on; is it possible that

the reason SPI-M-O wasn't being asked to consider those

matters at that stage was this point you're making here,

which was that there was almost a deliberate decision

being taken not to engage with those issues, or --

A. That is possible, yes. Yeah, and certainly

the sentiment, yeah.

Q. Moving on in the chronology, then, we were looking at

that part of your statement where you describe drafting

the note on 1 March, and Professor Ferguson's reaction,

not agreeing with it. I think it's also right, I'm not

going to take you to this part of your statement, but

tell me if it's right, that he indicated around that

time that he didn't want the report to become

an official Imperial College response team report. Is

that right?

A. Yeah. And can you check your dates for that one? But

that's certainly -- that discussion did occur -- it

might be worth checking the dates.

Q. I think what you say in your statement is that that

occurred a few days later, around the 7th and 8th of

March --

A. Yes.
Q. We can see from the start that it was sent, is this right, to the sort of SPI-M-O group email address and also to Graham Medley, who was one of its chairs?
A. No, I think it was sent to the SPI-M secretariat and to Graham. I don't think this was sent to the full distribution list. I don't think all my colleagues had the opportunity to comment.
Q. Okay, that's helpful, thank you.
If we look at the second paragraph down, we see you stating:
"It is my considered scientific opinion that we should implement school closures and working from home where possible and any other social distancing measure we can for the next three weeks. Starting as soon as possible."
A. Yes.
Q. You refer to school closures and working from home, but then you say -- and everything else.
A. Yes.
Q. Did you in fact mean a lockdown or something equivalent to that?
A. Yes. Well, the "any other ... measures we can".
I wasn't aware of what would be possible.
Q. Well, we've heard that the word "lockdown", which we're now all so familiar with, wasn't used at the outset of lockdown, and then what might happen afterwards?
A. Yes.
Q. But in that context, you say:
"If you look back three weeks ..."
So to, let's say, mid-February --
A. Yes. "... the world was a very different place."
Q. "... the world was a very different place."
A. Yes.
Q. I wanted to ask you whether what you're saying there is that this issue about the likelihood of NHS collapse, if nothing changes, was different on 9 March when you sent this email as opposed to the middle of February, three weeks earlier, which here you're saying was a very different place?
A. As a scientific point I don't think the -- there was no new understanding about what the demand would be on healthcare if behaviour did not change. I don't --
I think that's established by the 1% infection fatality rate and the associated hospitalisation rate. So, as a scientific consensus, I don't think that changed during that period.
What I'm referring to there, and I'm not being very specific about it, is our shared understanding of what this is going to mean, you know, in and around me and in our community in the UK and probably across Europe and

elsewhere, has changed dramatically in the previous three weeks, and I would expect a similar change in understanding, possibly behaviour and attitude, in the following three weeks.
I think from recollection that's kind of what I was trying to say, but I'm not very precise there.
Q. Sure. We might come back to that point about the developing understanding of NHS collapse in due course.
Just finally on this email, I think, a rather more general point: you do refer in the third paragraph to numerous models as a basis for your understanding that you're expressing in the email. But equally, in the final paragraph you make the point that this view you're expressing is based on something rather broader than merely modelling, if I can put it that way.
A. Yeah.
Q. Is that right? Can you explain what you're trying to get at here?
A. Yeah, so I consider my scientific discipline to be the study of the transmission and control of infectious diseases. That involves properties of the virus --
Q. Don't go too quickly, Professor.
A. That involves properties of the virus, that involves the behaviour of people, it involves the design of
A. Yes, that's correct.

Q. Was that a problem which, in your view, continued?

A. Yes.

Q. Thank you. As I say, we'll come back to that.

I can understand that.

A. That's correct.

Q. And essentially you're asking him for his advice?

A. Correct.

Q. Can you expand on what you were asking him and why?

A. So, it felt to me -- it must have felt to me at the time that there was a reluctance to put some of these ideas on paper in a very formal way, and I -- in the other evidence that I've submitted, you can see me having been frustrated with that over, like, the preceding period of time. So at this point I'm considering emailing my paper to the entire SPI-M, where I think it would attract a lot of attention. I didn't know -- I did not

know for sure what the right policy was. I felt

If we can see the two lines below that he's talking about the full lockdown option, but he says:

"... we will have saved lives but at enormous cost (health, economic etc)."

This is one of the points which we will come on to see again and again, but the objection to a lockdown on the basis of economic impact, and with that in mind, if we can look up at the top of this page, and your response back to Professor Medley, there's a paragraph starting "To be honest", you say:

"To be honest, I have not seen any economic analysis of an ...

Then you describe I think an unsuppressed pandemic.

But you say:

"... but it keeps being implied to me by Neil and others. I am happy to go sit in a room somewhere and review that evidence or to give an opinion on email. An awful lot of our decisions seem to rely on the idea that the above scenario has some kind of economic advantage over the alternatives."

Are we seeing here, and I think we see it in other emails, Professor, a level of frustration on your part about assertions being made relating to economic impacts without any evidence being provided to support those assertions?

LADY HALLETT: Can I just intervene there? Sorry, Mr O'Connor.

You're sitting as an independent scientist on a committee but you felt that you shouldn't send what useful, I could see that this would massively disrupt -- potentially disrupt the work of the committee, potentially need a whole load of people to divert and handle it, if you like, in some way, so I could see that this would potentially be a distraction for other people and -- and it was a risk, so I was --

I valued Jeremy's opinion and I was asking him whether he thought I should do it.

LADY HALLETT: I can understand that.

A. -- in the 48 hours prior to that. But there's an awful lot of people doing a lot of work and I didn't assume my
view was the only view or completely correct or, in the
fullness of time, would be judged as useful, I wasn't
sure that was the case. So I thought this would be
disruptive. That was my sense, that it would be
disruptive. And, you know, somewhat risky to me.
I mean, honestly, in a slightly personal professional
capacity, somewhat risky to me, and I was looking for
a little bit of advice from someone I trusted.

LADY HALLETT: Thank you.

MR O'CONNOR: Thank you.

Also, let's not forget, someone who was himself on
SAGE?

A. Yes, absolutely, and that's not incidental to me
choosing Professor Farrar.

Q. Now, we don't have, as far as I know, an emailed written
response from Jeremy Farrar to this email. Did he
respond?

A. Yeah, I think he did. I then went to sleep for a couple
of hours after this and then I decided to send it when
I woke up anyway, and I think Jeremy did reply
afterwards, but I'd already decided to send it in at
that point. And I think in Jeremy's book he does
mention a positive response a little bit later.

Q. It's -- we don't need to worry about this, it's cut off
on the version on the screen, but this email to him was
sent at 6 o'clock in the morning?

1. A. That's right, that's before I -- yeah.

2. Q. As you say, you did shortly after that then, an hour or
two later, circulate the paper to the members of
SPI-M-O?

3. A. Yes.

4. Q. That then provoked an email discussion which I'm going
to take you to. Before we do that, I'd like to take you
to the paper itself briefly.

5. A. Yep.

6. Q. So for those purposes can we go to --

7. A. Yep.

8. Q. We've got it, thank you.

9. Professor, I don't want to spend too much time going
through the detail of the paper, but the passage in bold
here is a summary, is it not?

10. A. Yes.

11. Q. Is it right to say that in essential terms, like
the email that you sent to Professor Medley, you are
here calling for a switch from the mitigation strategy
to a suppression strategy?

12. A. Yes, that's correct.

13. Q. What this paper does, which perhaps the email didn't, is
to add a level of sort of modelling support for that
call?

14. A. It does two things. It certainly does add some
illustrative modelling. I think I repeat in this paper
in another paragraph that I didn't believe that
modelling was required for that switch, but I thought
that it was useful nonetheless. And it also expands on
the reasons that I held the views that I did on how
behaviour may or may not change. So I -- yeah.

15. Q. If we just pick this up three lines down, you say:
"The primary benefit of mitigation is that the
epidemic will be over more quickly than might otherwise
be the case, with the population having acquired herd
immunity and also having experienced a relatively low
peak."

16. What you're describing there is what is the sort of
perceived benefit of the mitigation strategy?

17. A. Yes.

18. Q. Squash the peak?


20. Q. Get it over with still relatively quickly?


22. Q. And achieve herd immunity?

23. A. Yep.

24. Q. And you, in this paper, challenge that thesis on two
grounds. One is the argument which we were looking at
a few minutes ago, which is that the NHS would collapse
in the course of that wave; is that right?

25. A. The sheer number of deaths implied by the wave I think
is the first point. So the implicit health impact if
that wave were to happen is very, very large over such
a short period of time.

26. Q. Yes. There is a sentence about eight or nine lines down
which says:
"We show [that's presumably in this report] that
critical care facilities in the UK would be saturated
quickly."

27. A. Yes.

28. Q. Is that the point?

29. A. Yes.

30. Q. But then there is a separate point which takes us back
to those discussions you were having with
Professor Ferguson in January --

31. A. Yes.

32. Q. -- that maybe the mitigation strategy wouldn't quite
work out as expected anyway?

33. A. That's correct.

34. Q. Can you expand on that?

35. A. Yes.

36. Q. Or just explain it.

37. A. So, the benefit -- and again, given the numbers in this
paper, it's strange to talk about benefits of strategies
with those health impacts, and it felt strange at the time, and I would -- you know, anyone watching this now who thinks that we were writing these numbers and not believing them to be strange and understand their implication, that was not the case. It's just these -- this -- these were the apparent choices in front of the people looking at it.

So the benefit of a successful mitigation is that it's over quickly, but the population would have to -- could only change their behaviour somewhat in order to land just the right amount of immunity so the virus couldn't come back. Forgetting about all the other issues about immunity and things. So if you got it just right, you'd have to somehow bring transmission down through changes in behaviour.

If the population responded by changing even more, even more than you wanted them to, they wouldn't have to change that much more to go down to a threshold where the virus wouldn't grow, to get R to 1. And that's a break point analysis, it's -- in olden days of this kind of science, when we used differential equations and not simulations, this was quite a common way of looking at a problem to identify a key parameter and say: what's the implications of that taking a different value? And at that point the rate at which you would accumulate broader than just the UK potentially. So that's -- the style then is to go to some very general points at the end. And yes, I think the point I wanted to make here is that even though there was useful evidence contained in the modelling in this report, I didn't -- my view was not that it was necessary, and that actually there were -- other evidence was sufficient to arrive at a similar policy conclusion.

Q. Thank you.

Then if we can just finally --

LADY HALLETT: Before you do, could you just tell me what you meant by "fixed-term social distancing"? Sorry, could we highlight the passage again? The penultimate line:

"... [we should] adopt stringent fixed-term social distancing."

A. So that's -- I've mentioned -- I mentioned three weeks.

I thought that there should be a time limit imposed on any stringent social distancing, not because we knew for sure what the impact would be by that time, but because earlier imposition had such high value that essentially the information that we would gain would put us in a different place at some known future time.

Because ...

LADY HALLETT: And what measures exactly did you mean by stringent social distancing?

A. So I think I'd probably go back to the email that I'd sent the previous morning for the meaning, so it was school closures, work from home, and whatever else we had, and I didn't really know what we might have at that point.

LADY HALLETT: Okay, thank you.

MR O'CONNOR: Professor, you don't like using the word, but may we use the shorthand --

LADY HALLETT: Lockdown.

MR O'CONNOR: -- lockdown?

A. You may.

MR O'CONNOR: Could we then turn to page 6, please.

Now, could we get as close as we can to the graph on the right-hand side, please.

Professor, there is a reason we'll come back to why this graph may be of some extra significance, but for the purposes of the report -- well, perhaps you can tell us in summary what these different lines show?

A. Yeah, and this is obviously -- this is intended for my scientific colleagues. I mean, it's not the most accessible presentation, it's on a log scale, so powers of 10 on the vertical axis rather than -- rather than the linear scale. And the red line is showing some hypothetical completely unmitigated, no behaviour...
Q. So that's the turquoise line, and that's the --
A. Sorry, turquoise, yeah.
Q. -- sort of unilateral decision within the population to
dramatically reduce their movement that's -- the problem
that you were identifying potentially?
A. Yeah, yeah. If every time the ICU was saturated we all
changed and reduced then we started back again,
that's what it would look like.
Then the green line is the scientifically kind of
trivial -- let's say we managed to bring the R down and
keep it down, then it's the green line.
Q. Thank you.
So that's your report, and as I indicated, when you
circulated, it generated a debate amongst the members of
SPI-M-O, and particularly you and Professor Ferguson.
So we can turn to that now, please, and that is
INQ000269369. Thank you.
So we've gone first to this page, where -- do we see
here, halfway down, Professor -- so we'll recall that it
was 6 in the morning when you sent that email to
Sir Jeremy Farrar, I think you said that you thought
about it a bit, maybe had a cup of tea, and then two and
a half hours later you are deciding "I'm going to send
this to the whole committee"?
A. That's correct, yep.

1. Q. So that's what you've done and that's the report we've
   just looked at?
2. A. Yes, correct.
3. Q. Then if we can go forward, please, or scroll up to
   the next page, within less than an hour, we see
   Professor Ferguson's response, which is not a positive
   one, Professor. I wanted particularly to pick up on the
   third paragraph, where he says:
   "I do feel strongly that we should focus on
   providing an evidence based assessment of what the
   policy choices are and their likely impacts, rather than
   advocate for a particular policy. At least in our role
   on SPI-M."
   Professor, this is a point that you expand on in
   your witness statement, the issue about scientific
   advocacy or scientific evidence. What was
   the difference of opinion here and what was your take on
   it?
A. So I think we should be very careful describing a view
as advocacy and another view as evidence-informed
scientific opinion, and I think -- I don't think I say
so explicitly here or in the other evidence but I think
I probably show, I felt that I had an evidence-based
opinion that covered recommendations on interventions.
As I've mentioned before, our scientific discipline
includes the study of interventions and I had
an evidence-informed opinion for one intervention over
another.
I think here Professor Ferguson has chosen to
describe my view as advocacy, and by implication
the view of others as being more valid or more based in
evidence. And I think that's what -- that's my
understanding of what Professor Ferguson is saying here.
Q. Linked to that then is also the point which is debated
in these emails about whether a proposal such as yours
should be made without explaining exactly how it's going
to work?
A. Yeah, and that is a different -- that's a different
point, but linked. We disagreed on that, and I don't
think that's any more complicated than my view was,
having studied interventions against respiratory viruses
for many -- my view was that other countries had decided
to adopt this approach without necessarily knowing
exactly how it was going to work, but acknowledging that
the timing, the speed with which you adopt it is
important. So there is a trade-off between
knowing exactly how it's going to work for you,
but -- or doing it quickly, and my view was it was
justified to move quickly, even -- and again, even if we
didn't really know exactly how it was going to work.
Q. It might also be thought that the mitigation strategy that was in place, and which, as we will see, Professor Ferguson was defensive about, I mean, there were also some quite serious doubts about how that was going to work at the time?

A. Yeah, I think that's true.

Q. Let's move on in the exchanges, if we can, which are all -- in fact, if we can move to page 3, there is an exchange between the two of you about this point about the extent to which the workings of a policy need to be demonstrated.

Then I want to come to -- thank you -- this one, which -- we can see we're now on the next day, it's 11 March now, and so the first paragraph is the continuing debate about exactly what your role is or the role of you and Professor Ferguson and SAGE and the government and so on. But I want to come particularly to the second and third paragraphs, where Professor Ferguson said:

"I would also note that there is now significant momentum behind the current strategy. A huge amount of effort is going into operational planning right now. Government is aware of the projected incidence, health system demand and mortality impact. Though I ... would like to be reassured that the Cabinet is aware of what"

1. got the right reference here.

2. This is -- sorry, let's just be clear about this, this is Professor Ferguson.


Q. He says:

"I understand your view. But just bear in mind the Treasury advice is that 6 months of intense social distancing -- sufficient to achieve R<1, is predicted to drive deep recession and massive business failures and job losses."  

Then he refers to talking to someone from the US federal interest committee, and so on.

Do we see here again an example of the economic impact of lockdown being used to challenge that possibility?

A. Yes, we do, and can I comment on my --

Q. Yes.

A. -- response?

Q. Yes.

A. People who were supportive of lockdown did not for one moment think that it wouldn't have lots of massive negative consequences, but the point I make here in reply to Professor -- to Neil is that we don't have a counterfactual, we don't -- there seems to be an unstated implicit assumption that if we don't do something we're going to have a better economic outcome.
and a better outcome across all those other different
dimensions, and I -- I didn't know why people assumed
that.

Q. So there are two points, perhaps. The first is the one
you've made, which is that it's all very well to say
that a lockdown will be very costly, but how expensive
will that turquoise unsuccessful mitigation policy -- or
even the successful mitigation policy be?

A. Yep.

Q. But the second is: did you actually see these Treasury
forecasts or Treasury modelling that you occasionally
are being told about?

A. That's correct, yeah, that's another point, yes.

Q. And in that regard, can I take you to a further
document, please, INQ000103475.

So this is an email from several weeks later,
the end of March, so we're into lockdown by this stage,
and you're discussing, on this occasion with
Professor Medley and Professor Woolhouse, some further
aspects of social distancing policy.

In fact if we can go to the next page, please, it's
the paragraph starting "There are no easy choices here",
you say:

"There are no easy choices ... While understanding
that the stated government objective is to save as many
lives as possible, economic impact is also important.
But has any other branch of government done a detailed
assessment of what the economy would look like with
a prolonged period of virus circulation at or near
maximum NHS capacity?"

So that's the counterfactual point again. But you
go on to ask:

"Is there a treasury team to whom we can send
a plausible set of scenarios and ask directly how much
better one scenario might be than another? We have a _little_ bit of time and this question has arisen many
times."

So did you get an answer to that question as to
whether there was a Treasury team you could engage with?

A. I don't think that I did. I think I may have put in my
statement that I searched and was unable to find any
answer. Or it may have been a slightly different email.
But I don't think -- I don't believe I did.

Q. Moving away from this particular email, your general
experience of that time when you were sitting on SPI-M-O
as an academic scientist, did you ever find the answer
to this question of: where was the economic modelling
that you could look at to help understand your advice on
policy change?

A. No, I did not.
developed.

The other part of the narrative that we should perhaps make clear is that Dominic Cummings was at that SAGE meeting where your paper was discussed a few days earlier.

A. I think I checked the minutes and a member of his team, Ben Warner, was at that meeting. I don't know if Dominic Cummings --

Q. Sorry, you're right, that was it, it was Mr Warner.

Thank you, we can take that down.

Then lastly for the moment before we have a break, Professor, I want to ask you about a report that was published by the Imperial College response team the next week, so after your report was circulated, after Friday, the 13th, after that whiteboard, the next week there was a report published known as Report 9, and we can see from the top that Professor Ferguson's name is the first name on the list of authors, and was he the principal author of this document?

A. Yes. Yes, he was.

Q. We do see your name, the penultimate name on the list.

A. That's right.

Q. So you were also involved?

A. That's right.

Q. I'm not going to ask you about this document in any detail, Professor, because we will be dealing with it with Professor Ferguson, but I did just want to ask you about the last two or three perhaps.

So if we can go to page 16, please.

So just in summary, the penultimate paragraph, there is a striking sentence:

"We therefore conclude that epidemic suppression is the only viable strategy at the current time."

So we saw those emails the week before where Professor Ferguson had been resisting your suggestion of a pivot towards suppression, but by the time of this report he has himself changed his mind and is advocating for that policy; is that right?

A. That's correct.

Q. In the paragraph that's at the top of that section we can see why he is now saying that suppression is the right policy, and that is because of the NHS overwhelm problem --

A. Yes.

Q. -- in summary.

A. That's correct.

Q. So if we can go to page 16, please.

A. Yes.

Q. "In the UK, this conclusion has only been reached in the last few days, with the refinement of estimates of likely ICU demand due to COVID-19 ..." I want to ask your view about that paragraph. You can see from the top that Professor Ferguson's name is the first name on the list of authors, and was he the principal author of this document?

A. Yes. I felt -- and I do remember having discussions at the time and certainly thinking this, that once we had lab-confirmed deaths in ICU with no travel history, no obvious connections to any out-of-country social networks, even a handful of those would indicate that we were -- we would be rapidly progressing in our epidemic. I think -- yeah.

Q. Just to be clear, on the basis of the answer you've just given, and of course the documents, this view that you're expressing here is one that you had at the time, not just with hindsight?

A. That's correct. I mean, the -- I think the introduction to the note circulated on the 10th kind of captures this, even if it's not stated explicitly.

Q. Yes.

Lastly, Professor, on this, your view, please: if a lockdown had been implemented two or so weeks earlier, what can you say about the different effect that might have taken place?

A. So we've got a lot of data about how social mixing changed over this period, and actually the -- on or around 16 March seems to be when everybody did start to change their behaviour. So I think the best way to talk about this is to say: had we achieved that rapid reduction in mixing earlier than the 16th, then the peak...
bottleneck?"

A. So my understanding of the process is that onwards from SAGE it is primarily the CMO and GCSA who take that forward. I think Stuart Wainwright described this in his testimony, there is written minuting of SAGE and then the oral communication of CMO and GCSA going forwards. So what I'm -- my comment here is that, looking at the volume and complexity of the scientific information that was funneling into that SAGE process, I -- the fact that it went forward through such a restricted mechanism to the most senior levels of decision-makers does seem like a bottleneck.

I acknowledge there will be working-level relationships all around SAGE as well, but I think the formal structure is also important in addition to those working level contacts that will also propagate information.

Q. And do you -- if you're right, what you say has obvious sense about it, do you have any ideas as to how that bottleneck might be removed?

A. I think there are examples in other countries where they have broader panels meeting directly with ministers in a more formal way, and I would again emphasise there's lots of informal communication that will be going on around this process, so at a very basic level something that has more people involved in the formal communication, because it just seems like two isn't -- it's an enormous load on two individuals.

Q. As you say, the system as it stands, you have the debate at SAGE amongst that broad group of people, fed into by the subcommittees, and debate above that at the policy level, but just those two people acting as the link between the two, and if one was to have some sort of larger organisation where policymakers and scientists, more than just those two, could communicate about the scientific advice, that might be a better approach?

A. I think it might be, yes.

Q. Moving on, Professor, in fact on the same page of your statement, paragraph 2.6, you refer to a lack of diversity amongst SAGE and its subgroups, illustrated -- sorry, during the early months of the pandemic, and you say that's illustrated by the under-representation of women on SAGE and its subgroups during that period, although you go on to say that that was corrected as the pandemic progressed.

What about diversity in terms of representation of other ethnic groups?

A. So, just to comment, I've not reviewed data on this. This is a topic where, you know, looking at the number of people attending meetings and their diversity
characteristics is a very valuable exercise. I have not
done that, so I'm commenting from my impression, and
that's actually what I was doing here in the statement.
And I'm suggesting that looking at gender was a --
illustrated the overall lack of diversity, not -- I'm
not saying that's the only important aspect of
diversity.

Q. No.

A. And from recollection, with -- you know, in a seria --
you know, I would -- there is very little ethnic
diversity that I'm aware of within the system. So yes,
I'd imagine that is an issue that should be addressed as
well.

Q. Do you think that that lack of ethnic diversity within
the SAGE and its subgroups, and I take that it's fair
for you to say that that's just a sort of observation,
it's nothing sort of scientific about that observation,
but taking that as read, do you think that that may have
had any actual substantive impact on the way in which
scientific advice was provided, bearing in mind
of course what turned out to be the disproportionate
impact of the pandemic on certain ethnic groups in this
country?

A. I think it's entirely possible that it did have
an impact, yes.

Q. Did you raise the possibility of red teaming
afterwards I raised the possibility of groupthink, and
then -- and used the term "red team" to just ask whether
anywhere else in government they had a bunch of people
in a room trying to figure out if there was a better way
to be doing -- to be thinking about the stuff that we
were doing.

And it was -- I was very tired, I was quite
frustrated, and I was kind of -- I was flailing a little
bit, but, you know, that was a thought that occurred to
me then: given the stakes here, I hoped at that time
that there might be people I didn't -- that we weren't
aware of who were actively considering the same issues.

Q. We certainly haven't seen any evidence of management
consultants being brought in to SAGE during
the pandemic. I take it that nothing came of your
suggestion at the time?

A. I'm not aware of -- no feedback was given to me, and,
you know, I wouldn't have expected it. This was
an informal conversation after a long meeting.

Q. But looking back on it now, and in particular with the
extra perspective you've gained from UKHSA, do you think
there is a weakness in the system here? Do you think
that the system would benefit from having some form of
formal internal challenge mechanism?
A. I think effectively that was addressed very quickly. I'm not sure it was ever -- so, yeah, I'm not sure it was ever referred to as a red team existing that hadn't existed before, but if you look at the structures across government that were -- sprung up immediately following March, and certainly by the time I could observe them in October 2021, effectively there were numerous red teams that were capable of providing advice.

So I don't feel that's something that was overlooked, beyond that moment I mention there.

Q. I'm going to move on, just two more topics left. The first is transparency and for these purposes if we look at paragraph 11.1 of your statement on page 38, please.

You here refer to the suggestion that the government, the UK Government, "did not see transparency of evidence as an integral part of managing the Covid-19" question, and you say that in your experience that was a fair criticism, at least in the early stages, but that, perhaps a little bit like the red teaming, the position improved later on in the pandemic.

Why do you say it was a fair criticism early in the pandemic?

A. So I think the details -- you know, the details of the SAGE considerations weren't made public initially. It was a fair criticism. It's a subject that some of the earlier witnesses have touched on already.

Q. If we can go down, please, to paragraph 11.3, you refer there to Professor Edmunds, who is coming later in the week, stating:

"... that it was a 'massive failure' of the government not to share the economic evidence or to explain how this evidence informed its decision-making."

And you say you agree with that agreement.

Is there a contrast to be drawn between the transparency which came to be adopted in regard to the sort of more infection-based materials on the one hand and the economic evidence on the other?

A. Yeah, I think there is an interesting contrast between those two areas of analysis.

Q. Your view, you seem to agree with Professor --

A. Yes, so I think we mentioned it before, I -- my view is that there was -- I was -- I never -- there was insufficient public evidence about the potential economic trade-offs with some of the -- with many of the policies that were considered.

Q. On a similar theme, if we could look, please, at page 42, 12.14 of your statement, you again come back to the question of transparency and public scrutiny, here in the context of modelling, and I think what you're saying here is that perhaps the whole -- and this is a broad topic which we will have to cover very quickly, but the headline is that government could do more to explain or could explain better the whole modelling process and how that advice feeds into decision-making?

A. This -- yeah. Briefly, this reflects perhaps my own kind of professional bias. I try to be very careful, using a phrase "the model says". I would rather give my view, which is sometimes very heavily informed by a model, other times draws on lots of other evidence.

But I think that phrase "What does the model say?" The model says this" is sometimes not helpful.

Q. Yes. Another lesson that could be learnt for the future.

Then just finally, Professor, I want to ask you a few questions about the need, from a scientific point of view, for defined policy objectives against which to set scientific advice. It's a subject that some of the earlier witnesses have touched on already.

Could I ask you to look, please, at paragraph 11.5 of your statement on page 39. It's another one of these parts of your statement where you have been asked to address an observation made by the Institute for Government, here about chaotic decision-making.

Picking it up about five lines down, you say you have no comment on whether lack of clarity delayed decisions or made it harder for scientific advisers to provide useful advice, but you go on:

"... on reflection and with hindsight, it may be
possible to define objectives that would drive government strategies for some specific scenarios."

Could you explain what you mean by that.

A. Yes, so -- and here I am thinking about viral respiratory pandemics to some degree, that we should be able to decide in advance what those objectives would be. And, you know, a particular scenario is where there is a reasonable expectation of a vaccine, and where the way we behave, our social mixing, affects the speed of transmission. That's a reasonable future scenario. And we -- I think it would be good to try to agree collectively what the objectives should be.

Q. That's what you explain in the rest of this paragraph, and it's striking, the objective that you propose, just as an example, to:

"... maximise the number of at-risk individuals who receive an effective vaccine prior to being infected naturally, while minimising any indirect harms of the interventions that [you] employ ..."

It's still at fairly high level, but you think that even that sort of policy objective would help as a structure for scientific advice?

A. Yes, yeah, I think that it would, and I think many of the other witnesses have commented on how difficult it was to scope the scientific advice in the absence of that kind of framework.

Q. So without getting into specifics, even that type of high-level objective was missing in the early stages of the pandemic; is that a fair point to make?

A. Yes.

Q. Then very lastly, Professor, and you've already mentioned that these objectives could be at least debated now, if we could go to paragraph 12.15 of your report, please, it's actually the last paragraph, and you come back to the point about the economic trade-offs of these measures, and the need for co-working. But you say:

"At the very least, with the benefit of hindsight, it should be possible for different disciplines to agree on how they could have better assessed trade-offs between the economy and health at key moments of the acute phase of the ... pandemic."

And:

"If this work were public, it could inspire substantial progress in academic collaborations between health scientists and economists."

At the beginning of the paragraph you make the point that there is no reason these steps shouldn't be taken now?

A. That's right.
East Asian countries and their use of face masks?

At that time, had you looked at, for example, other countries which had been considered useful and you would have forgiven yourself if you hadn't. So I just want to give what I perceive to be the key points of the report, because there was a reason I was asked to do that and it's because I had looked at some of the evidence from influenza, studies of influenza. For example by combining it with digital contact tracing?

Was this a report that was commissioned by SAGE?

I'm glad I'm not the one having to set those objectives, Professor.

So was it your conclusion that now would be quite a good time to gather more evidence about the efficacy of face masks?

A. So I don't recall commenting on that explicitly in the report, so I'm not sure that I did.

Q. It's dated 20 April 2020, it's called "Potential impact of face covering on the transmissibility of SARS-CoV-2 in the UK", and just for the transcript reference, it's at INQ000236296.

A. Yes. So, Professor -- the co-chairs of SPI-M-O asked me to write a report.

Q. Thank you. I think we can see from the minutes of SAGE on 21 April, that's SAGE 27 -- again, I'm not going to ask you to look at it, but it's INQ000062295 -- that they did in fact discuss the impact of face coverings, and Graham Medley from SPI-M-O was at that meeting. Thank you.

So you've produced a paper in April 2020 on the use of face masks in the community for asymptomatic members of the public. Is it a fair summary to say that there was no obvious reason why surgical face masks couldn't be used in closed community settings, for example buses, public transport and shops, based on the limitations you'd observed from the widespread use of face coverings in other countries which had been considered useful and successful in containing Covid-19?

A. So I just want to give what I perceive to be the key points of the report, because there was a reason I was asked to do that and it's because I had looked at some of the evidence from influenza, studies of influenza.

Q. Yes. Pre-pandemic studies?

A. Yes, so I went back to look at those, and the key point that I thought I was making in the report was, even though those studies suggested quite low effectiveness of face masks for influenza, there were a number of issues around the design and interpretation of those that said maybe it could actually be better and we shouldn't necessarily rely too heavily on those as negative results.

Q. That's helpful, thank you.

A. Then if we just come to your question, you asked quite a specific list of things about use in other countries. I don't know whether I commented on those in the report.

Q. At that time, had you looked at, for example, other East Asian countries and their use of face masks?
Q. There may be utility to using surgical face masks in
closed community settings?
A. Yes.
Q. Thank you.
How did you expect that paper to be used by
policymakers? Was it just for SAGE or did you expect it
to have any wider impact?
A. So it was commissioned as a rapid review over just one
weekend, a rapid review to support the discussion at
SAGE, and I could see from the SAGE minutes that there
was an extensive discussion of face masks and there were
clearly many other points raised -- I was not there --
there were clearly many other points raised in that
meeting in addition to the material that I provided in
that report.
Q. But from your report, was there any scientific, as
opposed to resource, reason not to advise the public to
use surgical face masks in closed community settings in
April 2020?
A. I did not find a reason in the work that I did, no.

MR KEITH:
Good morning.

Questions from LEAD COUNSEL TO THE INQUIRY

PROFESSOR NEIL FERGUSON (affirmed)

Good morning.

Could you commence your evidence, please, by
providing your full name?
A. Neil Ferguson.

Q. You are, Professor Ferguson, a mathematical
epidemiologist, and you have worked on the subject of
emerging infectious disease outbreaks for many years.
A. Yes.

Q. Much of your research has focused on using statistical
and mathematical models to understand infectious disease
dynamics and control; is that correct?
A. That's correct.

Q. As a world-leading specialist in this field, you are the
director of the MRC -- is that Medical Research Council?

MR O'CONNOR:
That does bring this witness's evidence to

a close.

LADY HALLETT: Thank you, Mr O’Connor. Sorry, I’d missed
the one sheet.

Thank you very much again, Professor, really
grateful to you.

(The witness withdrew)

MR O’CONNOR: My Lady, the next witness is
Professor Ferguson.

LADY HALLETT: Thank you.

Thank you, my Lady.

MR O’CONNOR: My Lady, the next witness is
Professor Ferguson.

LADY HALLETT: Thank you.

Thank you very much, Ms Morris.

MR O’CONNOR: That does bring this witness's evidence to

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The emails which the Inquiry has, as you are aware, can give more informative advice.

and constraints under which policy has to be made, you mean that if you have more sight of the objectives saying we should be advising or advocating for a policy. That rather suggests that it is impossible for a scientist in your position and the position of your colleagues, who were providing this vital line of advice, not to become engaged, themselves, in expressing views on strategy, on policy, bluntly, what the government should be doing.

A. I would distinguish between exchanges with fellow scientists, particularly within the Imperial College team, where there was clearly a diversity of views, and we are -- we all had our views -- and then how you express oneself in interactions on committees such as SAGE.

Q. You expressed yourself in very forthright terms about the economic impact of lockdown. You informed your colleague, Professor Riley, that you'd spoken to, the economic impact of lockdown. You expressed yourself in very forthright terms about "We need to do this now". What I tried to do was, at times, which was stepping outside the scientific advisory role, to try to focus people's minds on what was going to happen and the consequences of current trends.

A. I mean, it's a personal view, and I have plenty of colleagues and -- we might take a different view. My view is that, I mean, we have expertise to give to inform policy responses, but we are just citizens in society, and for something as consequential as a pandemic, where everybody will be affected by the decisions made, fundamentally, it is for kind of policymakers to make those decisions, not for scientists.

So I'm quite happy to inform policy, but not, certainly in the -- as a member, for instance, of SAGE or NERVTAG, to advocate for a policy.

Q. In reality, in practice, was that an easy path to tread?

A. No. As I outline in my statement, there were many -- well, many -- there were a number of occasions where those lines got blurred. And clearly we are all human beings and we're experts on infectious diseases, so we had more sense than many of what was about to happen, both in the spring of 2020 and in the autumn of 2020, and there were occasions where, you know, frustration built up, let's say, at the apparent slowness of decision-making.

Q. You yourself were not averse to appearing in the press.

I think you appeared on perhaps the Today programme, in April 2020, you gave a number of interviews. In reality, was that self-imposed purdah difficult to apply?

A. I mean, certainly in giving media interviews, for instance, I always try to take the line that it was for, you know, scientists to advise on policies and for policymakers to decide upon them.

Q. Is the basis of your decision in part that you believe that, as a scientist, it's your role to advise and you have, therefore, no greater right than anybody else to determine policy?

A. Indeed.

Q. We will be coming back to the specific position of SAGE later, and we want your views as to how that system of advisory -- scientific advisory/government policy interface can be made to work perhaps better.

But in a general sense, do you feel that you did confine yourself to the provision of scientific advice, or did you become, despite your best endeavours, irrevocably involved in the determination of policy?

A. It's a difficult question to answer. I know I'm associated very much with a particular policy, but as you will be aware from the evidence I've given in my statement and the statement of others, the reality was that self-imposed purdah difficult to apply. It's a difficult question to answer. I know I'm associated very much with a particular policy, but as you will be aware from the evidence I've given in my statement and the statement of others, the reality was that self-imposed purdah difficult to apply.
for example, a US federal interest committee about the economic consequences of lockdown. You expressed views whether or not there was a clear-cut best strategy and whether the government was following it. My point to you is: should one just not recognise the reality, which is that scientists are placed in an impossible position if they are expected to and they self-impose an obligation not to express clear views on policy outcomes and strategic options and what should be done?

A. I think there's a better balance that can be struck in that regard than was struck at certain times in the pandemic. I mean, I read carefully Chris Whitty and Patrick Vallance's statement and they express some of the same concerns as I do about that disconnect. Do I have a perfect model for it? No.

Q. Do you believe that, in drawing that very difficult balance between providing advice and intruding into policy decision-making, you personally kept to that line?

A. I do. Clearly I've thought in retrospect of whether I should have been more forceful at times. I think the official business of the group, more as informal conversations between, you know, fellow scientists.

Q. well, that comes to another issue, that the recommended option will depend on the policy objectives and/or red lines the government wants to set. That's where, you know --

LADY HALLETT: That's where the needing to know the objectives comes in.

A. Yes.

LADY HALLETT: I follow, thank you.

MR KEITH: Professor, you were asked relatively narrow questions as a member of SAGE about the likely impact of individual interventions, but to a very considerable extent you and your colleagues had no option but to answer those narrow questions rather more widely; is that a fair summary?

A. In some cases, yes.

Q. Is that why, as we will see in a moment, in March in particular, you became involved so intimately in the debate about the strategic options open to the government, the likely course of events, what their best strategy might be, what might happen, that were way beyond a narrow technical, epidemiological, mathematical, modelling answer?

A. Yes. I mean, that was really not on SAGE, it was the SPI-M group, which then -- and had discussed it before informally. I mean, clearly we did discuss -- and we were reviewing what was happening in other countries, we did discuss the policy options and strategies available. But rarely as part of the official business of the group, more as informal conversations between, you know, fellow scientists.

Q. That, therefore, leads one to this conclusion, does it not, that there is something wrong with the system when the formal requests made of SAGE and, to a lesser extent, SPI-M-O, are framed in relatively narrow, technical, commissioned questions: what is your
A. Engage I think is fair. I mean, I was certainly aware of the policy debate and I was aware that we needed to have a policy which was actually able to be implemented.

Q. Professor Ferguson, your emails show, do they not, that you expressed forthright views at various times on lack of urgency, on caution on the part of government officials, on whether or not the strategies adopted by the government were leading us, effectively, to ruin?

A. You didn't hold back in those views.

Q. Why were they not communicated as part of the formal SAGE process, of which you were an important member?

A. I mean, I think because the formal SAGE agenda was -- I mean, the meetings were relatively formal, with a formal process for considering evidence and providing advice. They were not -- until much later -- generally open debates about -- certainly about policy strategy.

Q. The SAGE minutes, of course, are consensual minutes. They reflect --

A. No, I mean, I had, certainly, concerns.

Q. Why were they not communicated as part of the formal SAGE process, of which you were an important member?

A. I mean, I think because the formal SAGE agenda was --

Q. Yes. Professor, is the primary aim of modelling to understand of epidemic trajectories.

A. Whereas at the same time the email strings between you and your Imperial colleagues, Chris Whitty, Patrick Vallance, Ben Warner (special adviser in Number 10), show that you were engaging much more significantly in the overall policy debate.

Q. Professor Vallance engaged -- you know, had email exchanges and conversations with many, many scientists and government officials, on whether or not the strategies adopted by the government were leading us, effectively, to ruin?

A. Indeed. But the use of personal email to speak to individuals in government outside the SAGE and then the CMO/CSA funnel was a process that had no visibility to it, and of course those emails were not published in the way that the SAGE materials were published?

Q. Yes, and I believe both Chris Whitty and Patrick Vallance engaged -- you know, had email exchanges and conversations with many, many scientists with the government outwith the SAGE and then the CMO/CSA funnel was a process that had no visibility to it, and of course those emails were not published in the way that the SAGE materials were published?

A. Yes. But the use of personal email to speak to individuals in government outside the SAGE and then the CMO/CSA funnel was a process that had no visibility to it, and of course those emails were not published in the way that the SAGE materials were published?
A. It's to understand the patterns of spread but also to estimate certain key quantities which relate to that, such as the incubation period of transmissibility and things.

Q. Those are all facets, are they not, of the disease?

A. Yes.

Q. A second aim of epidemiological analysis and modelling is to work out prospectively, in the future, what might be the impact of measures taken by the government. So it's not an analysis so much as the painting of a scenario: what might happen if this is done or this is not done. Is that a fair summary?

A. Yes, the examination of a range of what are technically called kind of counterfactual scenarios about the potential impact of different policy options or other interventions like vaccines and treatment on -- on a disease.

Q. Could you give, please, the Inquiry a feel for how -- and as you answer, could you please try to keep your voice up, it's been a bit hard to hear you.

A. Yeah.

Q. Could you give the Inquiry a feel for how great, wide a field this field, this science of modelling is?

Organisation, a meeting across multiple countries earlier this year, including low-income countries, Kenya for instance, and every country represented had some degree of modelling applied to inform its pandemic response.

Q. The role of modelling in the United Kingdom was plainly a vital one. It's obvious from Professor Riley's reports of early March, your own and the ICL report, Report 9 of the middle of March, that the mathematical modelling work product played a vital role.

What about Far East and Asian countries? So it's well known and common ground, if you like, that South Korea developed a diagnostic test around about the same time as the United Kingdom. They of course were aware of the incipient outbreak, as we were, and they -- the evidence shows -- put into place rapidly a very sophisticated test, trace, contact, isolate, support system to keep control of the virus.

Do you know to what extent those governmental choices made in South Korea were determined by mathematical modelling?

A. I think mathematical modelling was one input into it. I think a larger input was their experience of the MERS coronavirus outbreak in -- which was very disruptive, a few years before the pandemic. And that led them to understand, in the most basic lay terms, the spread of the disease, of the pathogen?

Q. Is modelling or has modelling been driven by the well known rapid expansion in computer science, for example, which has enabled you to produce much more complicated and complex work than hitherto?

A. So I prefer kind of lumping analysis and modelling together, because most of what we did in the pandemic, frankly, was epidemiological analysis rather than modelling interventions.

You're completely right, the field has grown dramatically in the last 20 years. It's less about being able to use more complex models, more about a revolution in what's called Bayesian inference, the ability to calibrate models against epidemiological data in a way which allows them to be used in a more predictive sense -- and I use "predictive" in a -- I don't mean literal predictions in that sort of scenario analysis sense -- than was possible in the past.

Q. By and large, do all governments in the face of an epidemic rely upon modelling scenarios? How widespread is its utility and use?

A. So the UK has been in the lead in its use, throughout my career, but I co-hosted, with the World Health
Professor, you don't need mathematical modelling if you're a government to know that if the virus spreads to your land and is out of control and cannot be contained, you're going to have a very serious problem indeed?

\[Q.\] I mean, once you know what the infection fatality ratio and the reproduction number of the virus is, you can get away with, I would say, very simple models, and as you say, maybe for -- you know, intuition to some degree about what the consequences would be. You still need that epidemiological analysis, though.

\[Q.\] You mentioned there the need to know the infection fatality ratio. We'll come back to that in a little detail later. But that infection fatality rate, that is to say the knowledge of the number of people -- the ratio of the number of people in the population who will die amongst those who have become infected, was an issue which you, particularly with ICL, were looking at alongside the infection hospitalisation rate throughout the second half of February and the early part of March?

\[A.\] Yes.

\[Q.\] That was a separate workstream, if you like, from the pure epidemiological mathematical modelling?

\[A.\] Yes. The two are very -- obviously very tightly linked.

\[Q.\] In general terms again, well, we'll come back to the detail later, you became aware by mid-February, 10 February in

\[A.\] Yes.

\[Q.\] By contrast to working out more bluntly and more broadly the number of people who are likely to die amongst an infected population, modelling of how a virus transmits through that population requires information to be understood on how that infection works, so how an infection progresses in a person and how variable it might be; correct?

\[A.\] Yes.

\[Q.\] So that would require you to know something about the latent period, the infection period, the incubation period, symptoms and the like. You also need to know quite a lot, don't you, about the consequences of infection, so clinical severity, how many people are going to require hospitalisation or an intensive care unit bed?

\[A.\] Yes, and we worked on all of those things you've just listed.

\[Q.\] You need to know the reproduction rate, how rapidly the virus spreads, you need to know about viral loads, how easy transmission is, whether there are people who

\[A.\] Indeed.

\[Q.\] Modelling, epidemiological modelling, is of course complex. Does it depend upon a number of different pieces of information or variables in order to enable the system to produce a sensible and workable product at the end of it?

\[A.\] Yes. I mean, mathematical models, even the most sophisticated models of epidemics, are highly simplified representation option of much more complex phenomena, of course, but over many years we've learned that superspread; you need to know about the demography, age distribution, health, how it all impacts upon a population; and you need to know something about likely population behaviour, how will people respond to being infected, and living in a country that is --

\[A.\] Yes, the latter we know very little about in any sort of predictive sense, and I should say, whilst everything you list there is correct, in reality if you're doing this in real time, that information builds up slowly.

So one tends to take data from related diseases -- and here we used a mixture of SARS, MERS and influenza data -- before -- you know, parameter estimates, and applied them to Covid, before having all of those available estimates, otherwise it would be the end of the epidemic by the time you knew everything.

\[Q.\] You also need to know about what the effectiveness is likely to be of intervention, so you need to work out what the impact will be of antiviral treatment, for example, I don't know, dexamethasone, which was a UK-invented brilliant treatment. You need to know about the impact of vaccines. You need to know the impact of non-pharmaceutical interventions. You need to know the impact of immunological aspects; you know, once you get infected might you be reinfected? And you need to know about viral genetics: will the virus change?

\[A.\] Yes. We had our first estimates at around that time. Indeed, I gave a Today programme interview where I explained the consequences of that.
So putting all that together, a system of government response that rests upon and waits for answers to be given by mathematical modelling is likely to be a fairly drawn-out and, you used the word yourself, slow process?

A. Well, I don't think that's necessarily the case. You ... everything you list is important, but not all equally important and not equally important at the same time for decision-making. I mean, I see modelling more as a tool for synthesising different sorts of information together, to draw conclusions. And, yes, initially you're doing that on the basis of very little data. If you're referring to: do we need to have a playbook before we have very much information, a policy playbook which is automatically enacted?

I wouldn't disagree with that, and clearly in that respect Korea and the UK differed markedly in what their policy playbook was.

Q. The issue of whether the government had a playbook, so a list of strategies or policies that would be automatically introduced if a red line was crossed or if certain trigger events happened, is another debate.

I want you, please, to focus on what you believe was the impact in terms of the government's overall response of waiting for the outcome of such modelling.

You are aware that on 28 January at SAGE SPI-M was directed to provide assistance and advice as to how, in general terms, the government could respond to the virus, whether it could control it, what it would do.

The point I want to make to you is: by directing quite a relatively large or quite a relatively important part of its response upon the outcome of the modelling, we built into this response system a delay, because you didn't have the information, you didn't know enough about the virus, you didn't know enough about NPIs, the genetics, the behavioural aspects, to be able to produce work product for a while?

A. Yes, 28 January, but I would also comment that 28 January we didn't have an estimate of the infection fatality ratio either.

Q. No, indeed not. You didn't start to investigate that or be able to understand the likely parameters of the infection fatality ratio until 10 --

A. Well, that's when we -- we were working on it throughout January, but ...

Q. We'll come to that a little later.

Do you agree, though, with the proposition that by waiting for the product of mathematical modelling there was then baked into, built into the response system a delay?

A. Not entirely. I mean, I think the more general question was around how long you wait to clarify, have uncertainties around the new threat reduce before making a decision. So it was a broader issue about the certainty with which we could characterise this new threat which I think played a bigger role.

Now, modelling clearly played a part of that, but I don't believe it was the most significant issue.

Q. But it's clear, isn't it, that the modelling process had to await a great deal more information, which was information that became gradually apparent through the beginning of February, the rest of February and the beginning of March, to be able to produce the worked-up scenarios, the thinking about what the impact would be of the various options the government might have had at its disposal, for example?

A. Yes, there was kind of certainly lots of iteration of those scenarios, I would agree.

Q. You are aware that a number of other scientists have questioned the reliance upon modelling as part of the government's response?

A. I am.

Q. What do you say to what Professor Woolhouse has said, for example, by way of the over-reliance upon modelling and the fact that you don't need modelling or epidemiological modelling, certainly not mathematical modelling, to be able to understand that you have to try to control a virus and put practical measures in place to stop it?

A. I mean, I would agree with that last quote, certainly. I think modelling gives some benefits in terms of understanding the likely absolute magnitude of the impact of different interventions, which in its absence you are rather guessing at.

Q. Can we just now debate the scope of the modelling. You've referred to the fact that the mathematical modelling produced answers in relation to what the impact might be of non-pharmaceutical interventions. To what degree of detail or specificity could those models go or did they go? For example, a number of the core participants ask in their Rule 10 questions about the degree to which models focused on the impact of shielding methods, on the impact of non-pharmaceutical interventions on ethnic minorities, and on the elderly. Was it a necessary part of the modelling that all these sectors of the population were considered and the impact upon them understood?

A. So, to explain, rarely do you actually include in a model the operational details of how a policy is implemented. So, typically, if we were modelling, for
instance, shielding, then it is modelled as a reduction
in contact rates in a certain subsection of the
population, for instance the elderly, by a certain
amount, and you might look at how much that varies. How
you translate that operationally into policy is really
for public health specialists.

So we certainly looked at age and shielding.
I don’t think any of the models, up until quite late in
the pandemic, stratified by any other, you know,
sociodemographic, you know, category, other than age,
and we can get into why that was, but there were
da number of reasons, mostly around data and
computational feasibility.

But just to put — it’s — they’re not in some sense
Sim City simulations of people walking around, I mean,
they’re much, much higher level than that.

Q. So the answer is there was a general understanding
of course of the likely impact of whatever intervention
you were modelling upon such sectors, but there were no
models specifically designed to look at in detail what
the impact would be?
A. I mean, looking -- none of the models looked at the --
let’s say, the indirect consequences of interventions,
they were all focused on the impacts, potential impacts
on virus transmission and health consequences.

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behavioural change were the imposition and relaxation of
government-imposed restrictions. What he states is that
the modelling presumed that the only way in which future
behaviour of the population would alter would be as
a direct result of the government-imposed restrictions
themselves, as opposed to being spontaneous. So,
for example, the population changing its behaviour in
advance of a lockdown because it can see the lie of the
land.

Is there any basis for the belief that your models
did not pay appropriate attention to spontaneous
behavioural changes and relied exclusively instead upon
behavioural change brought about by government
restrictions themselves?
A. So, I mean, models don’t distinguish between whether
there is messaging to encourage the population to change
behaviour and mandate to force them to do so.
Models model changes in contact rates in
the population which suppress transmission, so there’s
no prior assumption made about whether something is
an advisory measure or a mandatory measure.
With respect to spontaneous behaviour change, and
which is a slightly different thing, there you’re
saying --

Q. That’s because the primary aim, to come back to your
earlier evidence, of modelling is to work out the spread
of a virus, its transmission, how it works, how it
operates, and the likely impact of whatever measures are
taken in a broad sense to combat it, and that primarily
concerns clinical aspects, or how many deaths, how many
people are hospitalised?
A. Yes.

Q. Is that a fair summary?
A. Yes.

MR KEITH: Good.

My Lady, is that a convenient moment?

LADY HALLETT: Certainly. I’m sorry we have to break, but
I think you were warned you would have to be here some
time, Professor, so if you will forgive us, we will now
break for lunch and I shall return at 1.55.

(12.57 pm)
(The short adjournment)

(1.55 pm)
LADY HALLETT: Mr Keith.

MR KEITH: Professor Ferguson, just a few more questions on
modelling.
A further point or issue raised by
Professor Woolhouse is his belief that there was
a default assumption that the only drivers of

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to go a little slower. You’re speeding up. It’s my
fault, but I must try to restrain you.

A. With respect to spontaneous behaviour change, that’s
a much more — so how do populations respond to risk,
a perceived risk in the population. There are no --
well, there is lots of speculative modelling of how that
might happen, but no validated models or no validated
models, frankly, of that type of behaviour. I mean,
this is something I highlighted all the way back in 2006
in an essay in the Nature journal, but — there is
research under way but it’s still in its infancy and
it’s actually a very difficult thing to predict.

So, no, the models didn’t try to anticipate how
populations would completely spontaneously respond.
Q. The modelling is designed to ascertain what might
happen, and behavioural changes are a significant driver
of what might happen. Does it therefore matter in
modelling terms whether the behavioural change is
spontaneous or mandated?
A. Not in terms of its effect on contact rates, no. But
of course it’s hard — may be harder to predict what
voluntary change will do in terms of the magnitude of
change of those contact rates compared with mandatory
changes.

Q. But whether a population spontaneously changes its

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1. behaviour is hugely relevant, isn't it, to the policy debate about whether a lockdown is therefore necessary?
2. A. It is certainly very relevant to the debate around the extent to which mandatory versus voluntary measures are required, yes.
3. Q. I'm going to call it a lockdown. You call it mandatory, Professor, but we all know we're talking about a lockdown.
4. A. Now, just finally on the question of modelling, there are important passages in your witness statement in which you speak of the care that must be taken in assessing the consequences of or the value of scenario modelling.
5. Scenario modelling, what might happen if we do this, is not a direct or an accurate guide as to what will happen, because the outcome is entirely dependent on what steps you take to meet the eventuality.
6. Q. In truth, Professor, it is a very complex but broad science.
7. A. Yes.
8. Q. It must be put into its proper place as a tool for what steps you take to meet the eventuality.
9. A. Agreed. And beyond that, throughout the pandemic we never had a sufficiently precise understanding of the exact impact of any one intervention to be able to make firm predictions.
10. Q. So may it be said that the strategic reliance upon a flu playbook, certainly on the London School of Hygiene and Tropical Medicine, and Warwick University later in the pandemic, was following a pandemic flu playbook, certainly on the existence relatively limited?
11. A. In my understanding of what was going on, the modelling considered scenarios where those interventions would be used for the duration that they were deployed to meet a coronavirus.
12. Q. So it's true that the strategic reliance upon a flu pandemic approach had an impact upon the availability of learning about the possible measures that might be deployed to meet a coronavirus?
13. A. I think one can exaggerate too much the idea that we were following a pandemic flu playbook, certainly on the scientific front. I worked on both SARS and MERS coronavirus extensively, we were quite aware of the biological and potentially epidemiological differences. But I would argue the single most important difference between Covid-19 and something like SARS-1 was that a high proportion of those infected have relatively mild symptoms, some no symptoms at all, which talks to the relative effectiveness of different types of control measures at containing the community spread of the virus.
14. Q. I've not suggested to you that there was a flu playbook guiding governments to respond; would you agree with that proposition?
15. A. I would agree with it, yes.
16. Q. The way in which SPI-M-O looked at models and the way in which the government responded to models was dependent, wasn't it, upon a process of taking a number of models together? So if, for example, the government wanted a medium-term projection of what the outcome might be, the impact might be of, say, closing schools, did it seek a specific model from a particular research institute such as Imperial College London or did it rely upon an ensemble, an amalgamation of reports, models from the various institutes who provided them?
17. A. So just to clarify there, I mean, you're talking about two different things. The medium-term projections were things updated every week and they were as close as we got to forecasts. They weren't true forecasts, because we assumed things stayed the same. And there, upwards of 10, 12 different models were combined in a formal, statistical sense. The second aspect is the use of modelling for, let's say, scenario modelling of intervention options, and typically what happened during the pandemic there is that the question was posed to SAGE, to SPI-M, a request came in, and modelling groups which were capable of answering the request did. So
Q. In that strategy, what was intended to actually contain was intended to actually delay strategy?
A. I would agree with that.
Q. So in the beginning of February, would you say that there was a general doubt expressed by you and others as to whether or not containment would ever work to deal with a coronavirus, the coronavirus that we faced, because there was very little by way of learning or structure to be able to contain the virus when it became apparent that it was spreading?
A. I think it's more nuanced than that. I mean, so first of all, obviously globally containment did not work. The -- I ... I was more sceptical than some that the measures adopted in China would be as successful as they turned out to be. I was -- changed my view. That scepticism was altered by the data on the ground from ... the -- you would have to be more -- in terms of the long-term suppression of the virus, I think you're right in the fact that it hadn't been well studied, but I don't think that necessarily affected our evaluation of necessarily feasibility. It did affect the extent to which, for instance, Public Health England was equipped to be able to implement containment measures.
Q. I ask because in your statement you say: "I felt the Contain phase [and that's a reference, is it not, to the government's Coronavirus action plan, mandated contain, delay strategy] never had any significant chance of preventing the infection entering the country or even significantly slowing its establishment here."
Then you go on to say it was further impaired by the lack of testing capacity, which I'll come back to. That would seem to suggest that, at a broad strategic level, the efficacy or the success of a containment policy was always in doubt in your mind?
A. I would distinguish there between the measures the UK adopted and labelled as the contain policy, and what other countries adopted, which was much more successful. I mean, I'm happy to elaborate on the UK situation.
Q. Yes.
A. We implemented, which was limited by testing, very limited border controls, and you may come along to that evidence shortly, which were only ever going to prevent a small fraction of, you know, infected people coming into the country, had low sensitivity and then had very limited contact tracing capacity.
Q. Because there was no complete closure of the border, because there was, in the early days, merely symptom screening, and then restrictions imposed by reference to the destination or, rather, the overseas country from which the traveller was coming, and because there was no scaled up or significant testing process, you're saying containment, that is to say stopping the virus from spreading round the United Kingdom, just didn't work?
A. Not using the measures which were adopted at the time, no.
Q. When did it become apparent to you that containment was, to use your words, never going to have a significant chance of preventing infection entering the country or significantly slowing its establishment?
A. I mean, almost as soon as I heard that measures were -- what the measures were and what was being done.
Q. Late January?
A. Yes.
Q. Why then did you -- or perhaps that's unfair. What did you make, then, of the government's published strategy a month and a bit later, on 3 March, to have a contain and delay strategy?
A. I was always unsure quite what contain -- as described in that strategy, what contain was intended to actually do.
Q. I mean, that's why I felt we needed to accelerate planning for other non-pharmaceutical interventions. I would say just in retrospect as well, I mean, there have been a number of studies of this, that community transmission of this virus -- I mean Covid in the UK probably started in late January, and that's been estimated using quite comprehensive genetic analysis. So, put in context, the effectiveness of the strategy.
Q. There was a SAGE meeting that you attended, it's the second SAGE, on 28 January, where there is a reference in the consensus document to control measures, ideally infection control in healthcare settings and rapid detection of cases.
Why did you not say "I doubt whether any form of containment strategy will work, given the porous nature of the border and the lack of any significant testing capacity"?
A. Well, actually the example you gave of infection control in hospitals and testing was something I did advocate for. I strongly felt we needed to set up sentinel surveillance for the virus within the country. I mean, there was a period in February, January and February, where it was always being reported publicly that, you know, the UK has 20 cases, for instance, all of whom
were travellers. Well, that was axiomatically true, because we were testing nobody but travellers, but -- and I didn't feel it was informative of what the true situation was.

Q. If containment outside the healthcare setting was never likely to work, then why was the government producing a strategy based on containment five weeks later?

A. You know, to be honest, I mean, I did not have prior sight of that document and SAGE was not consulted about it.

Q. Did you express views around that time, that's to say the end of January, as to the degree or the likelihood of control measures working or what sort of control measures should be considered?

A. I might have to be more specific, but yes, I expressed my view of the likely effectiveness of a variety of border measures, and what proportion of cases coming into the country might be detected, and there were initial fairly general discussions about what types of measures might slow spread within the UK.

Q. Could we have INQ000148974, please.

This is an email string, Professor, between yourself and Professor Sir Chris Whitty, copied in to Professor Sir Patrick Vallance and Professor Sir Jonathan Van-Tam, who was then the Deputy Chief Medical Officer.

Chief Medical Officer.

You can see that the top of the page is a forwarding of a lower email and more substantive debate to the persons I've mentioned, and also Professor Edmunds. In the middle of the page, you can see an email from John Edmunds.

Over the page, on page 2, there is an email from you dated 29 January, 11.12:

"... delaying arrival requires either stopping travel from China or very intensive screening and follow-up of travellers. We can provide some crude estimates ...

"If you are more referring to delaying the peak of the epidemic via public health interventions, it is harder to produce predictions. There are two broad classes of such interventions ... case based such as isolation of cases and contact tracing; and ... community level interventions -- principally school closure."

Professor, in principle, there were, of course, other measures which can be put into place to deal with a spread of a disease with an outbreak of pandemic, not just principally school closure.

Why did you not mention the possibility of other perhaps more stringent whole society interventions?

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Professor, in principle, there were, of course, other measures which can be put into place to deal with a spread of a disease with an outbreak of pandemic, not just principally school closure.

Why did you not mention the possibility of other perhaps more stringent whole society interventions?
restrictions, you've got to consider, as a government, how effective they are, how irritating they are, what they'll cost travellers and the public, against how effective they will be in stopping the influx of the virus?

A. Yes.

Q. It does appear, Professor, that you are engaging directly in the policy debate as to the imposition of a measure and therefore straying beyond the mathematical modelling or the epidemiological modelling side of things.

A. I was pointing out that, you know, what turns out to be true, the effectiveness of measures would depend on the epidemiological situation. I wasn't, I don't think, there expressing any value judgement as to what measures should be adopted.

Q. At the time of these emails, at the beginning of February, was there a general acceptance, Professor, that the virus was unstoppable, that it would inevitably infect the United Kingdom, and that very little could be done to stop it washing through the population?

A. I mean, again you've combined, you know, multiple different concepts there. I think we felt it would be extremely difficult to prevent it entering the UK.

You'll find reference in later SAGE minutes to the risk that the virus would enter the United Kingdom, that it would essentially get out of control, and steps would have to be taken to control it? Where is the general debate at this stage of what sort of control measures, NPIs, might have to be considered?

A. I mean, I think the debate -- well, if there was a debate, it was occurring within government. There wasn't a debate in terms of -- well, I mean, my perception is it wasn't the role of SAGE to, you know, determine strategy, so there wasn't that debate. You'll see in all of these instances, and you have many instances, I addressed the questions being asked.

Q. But these are private non-SAGE emails where you're not bound by the self-imposed constraints of SAGE, you are discussing control measures, you refer to schools, why wasn't that debate being held in this alternative forum of your communications with your colleagues?

A. Well, it's more than just a colleague, if it involves the Chief Medical Officer and both Deputy Chief Medical Officers, it's a communication between me as an independent scientist and government employees.

Q. Professor, were these SAGE-related communications or were they emails between you, Professor Ferguson, and the CMO, the DCMO, and Professor Edmunds, Jenny Harries?

Who was I think, or became, another DCMO, but

the potential benefits of more draconian border restrictions in terms of the delay which might be attained. I think at that time we were saying relatively little about -- you know, certainly nothing specific about the feasibility of stopping spread within the United Kingdom.

Q. To what extent did you and your colleagues, in particular Chris Whitty, Patrick Vallance, Jonathan Van-Tam, Jenny Harries, believe that the virus, if it spread through the United Kingdom, would result in a wave, a wave of infections, and that it would be practically very difficult, if not impossible, to stop that wave proceeding through at least a significant part of the population?

A. So I think I'm on record, I think I gave an interview even in late January, or certainly early February, saying that I felt the world was at the beginning of a global pandemic. If the question is did I anticipate the use of intensive non-pharmaceutical interventions to suppress transmission at that point, no, I didn't. Did I know that they were in theory able to be used? Yes, I mean, I'd studied the use of such interventions both for SARS but, probably more relevantly, in the 1918 flu pandemic in the United States.

Q. But it was apparent, was it not, you were addressing the debate at this stage in terms of the delay which might be attained. I think at that time we were saying relatively little about -- you know, certainly nothing specific about the feasibility of stopping spread within the United Kingdom.

Q. In your statement, you say that one of the problems that was encountered at this time by yourself and your colleagues was that there appeared to be no systemic consideration of the costs of control measures or NPIs against the benefits and what the cost might be of inaction, and you've referred, of course, there to cost-benefit.

Professor Edmunds was not, of course.

A. I mean, I viewed them as an extension of discussions at SAGE.

Q. In your statement, you say that one of the problems that was encountered at this time by yourself and your colleagues was that there appeared to be no systemic consideration of the costs of control measures or NPIs against the benefits and what the cost might be of inaction, and you've referred, of course, there to cost-benefit.

Did anybody take any steps to say, in the context of SAGE or to the government by one of these emails, "We need to have a structure put in place for working out the cost-benefit of the various measures which might, God forbid, have to be considered"?

A. I don't believe -- I mean, I can't think of an instance of that happening. I mean, there was some discussion of cost-benefit, but certainly it was -- I think we did not -- none of us evaluated properly the cost of inaction, let's say.

I have to say we did not have the capability of doing so. I mean, within the Imperial College group, that -- to be able to do that thoroughly would require, you know, a dedicated group.

Q. But these emails show, Professor, don't they, that
they're not engaging in a dry epidemiological mathematical modelling debate, you are discussing matters of policy here and cost-benefit and the feasibility of particular measures?

A. Yes, of course. Yes, I mean, there's some discussion of feasibility.

Q. You referred to your views on whether or not the lockdown intervention in Wuhan was likely to be effective, and again you've said that in January 2020, in late January 2020, your view was you had concerns or doubts as to whether it would be effective.

Some of your colleagues were more confident that it would be effective. What was that caused you to change your mind about the efficacy of the Wuhan lockdown?

A. I mean, the trends in reported cases and deaths coming out of Wuhan.

Q. Was that information that was available to those other colleagues who took a more confident view of the likely outcome?

A. I mean, we shared all information internally.

Q. Were some of your colleagues quite strongly of the view that containment had been -- was being tried in Wuhan and was at least likely to work to the extent that it was worth trying or investigating further in the

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To what extent do you think that that debate about a planning tool prevented a more significant substantial debate about the reality of policy responses and what should be done on the ground to stop the spread of the virus?

A. I mean, potentially significantly. I was always uncomfortable with labelling what I felt was our central estimate as being the reasonable worst case. Because calling it the reasonable worst case, even if in theory policymakers are meant to be planning to it, makes it sound like it's an unlikely eventualty, whilst in my view it was the most likely eventualty if nothing more was done.

Q. I now want to look at, please, this issue of the infection hospitalisation rate and the infection fatality rate.

In your statement, you tell the Inquiry that the Covid response team of Imperial College London, or maybe Imperial College London, I don't know whether the response team was already in operation at this time, but in any event ICL produced two reports. They were put the MRC, the Medical Research Council, GIDA website, your website, on 17 and 22 January.

Those reports made extremely important points, did they not, about the under-ascertainment of likely cases in Wuhan? And you concluded, didn't you, that the number of real cases was likely to be a multiple of those cases which the press and the government announcements in China had indicated?

A. Yes, a minority of my colleagues, yes. Maybe I should put it into context. I mean, we rarely had discussions internally of strategy, but of course it did come up, and there were a diversity of opinions expressed by different colleagues.

Q. Another area, again in this theme of the broad conceptual issues, in January and February that was the subject of debate, and you've referred to it in your witness statement, was the way in which the government attempted to ascertain what the reasonable worst-case scenario might be.

Why did that matter?

A. I mean, because the reasonable worst-case scenario is the scenario which the government should be planning to cope with, in theory at least, in any civil contingency, any crisis.

Q. Is the reasonable worst-case scenario a planning tool, if you like?

A. Indeed.

Q. There was a considerable debate, was there not, on the subject of what the reasonable worst-case scenario should be interpreted to mean and whether or not it was likely that we would find ourselves in a position in which we were in the reasonable worst-case scenario?

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SAGE, and in the SAGE minutes and the SAGE consensus private emails to your professional colleagues outwith
But where is that warning, Professor, in your own
I think that's quite a clear ...
months, and that up to 1% of them might die. I mean,
population would get infected in the following few
80% of the -- if we did nothing, up to 80% of the UK
going to be, you know, a global pandemic and that up to
one-third of infections could be asymptomatic and that
asymptomatic cases would be around one-third less
infectious than symptomatic cases?
A. Yes. The first was a reasonable assumption based on
data. The second, that there would be less -- I mean,
less infectious, was a working assumption, we had no
direct data for it, but it was consistent with patterns
in other respiratory viruses.
Q. And later research and data throughout the course of
2020 and in fact 2021 showed that your estimates were
actually pretty accurate?
A. Yes.
Q. So from early February it must have been apparent to you
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doctors --
A. I mean, they're buried in the planning assumptions of
the SAGE documents, but those estimates were discussed
at length within SAGE meetings.
Q. In the context of planning debate, in the context of --
A. I mean, I would agree if -- if your implication is there
was perhaps too much focus on refining estimates and
reducing uncertainty, and not enough on, let's say,
operational planning -- which of course we did not have
visibility of in SAGE -- then that might be true.
Q. So you agree that there was too much focus on perhaps
the scientific or the data issues, rather than pointing
out what must have been apparent, which is a major
pandemic was inevitable?
A. I mean, I think that's maybe slightly unfair. I mean,
we had already a planning -- planning scenario which
NHS England, PHE, DHSC were meant to be producing,
you know, a policy response to, which was in my view
fairly catastrophic. I mean, the role of SAGE was to
provide scientific evidence into that process, not to
come up with policy.
Q. But you, Professor, were, as we've seen from these
emails, engaging in policy debate?
A. I was engaging in debate about the likely effectiveness
of different policy options.
Q. Having understood that the virus had a very large percentage, 35%, that was asymptomatic, and that there were, in practice -- there was very little that could be done by way of containment or control, why was it important to then work out the percentage of people who might die or would die from the infection level? Why did that matter?
A. Because with a highly transmissible respiratory virus like Covid, and we were estimating an R number of between 2.5 and 3.5, then some basic epidemic theory would tell you that if that virus spread uncontrolled in a population, then over the first, you know, six months or so you would get a very high proportion of the population infected. Not everybody, but somewhere between 60% and 80%. And therefore knowing what proportion of that very large number of people were at risk of dying from the virus was critical to evaluating the public health impact, and also, by implication, what the level of proportionate response should be for the government.

Q. And presumably you would also say, under that heading of the public health impact, what the figures were for the number of persons who might be hospitalised?
A. Yes, I mean, that took somewhat longer to develop.

Q. When did ICL first estimate the likely infection fatality rate for this virus, an estimate that turned out to be, in fact, extremely accurate?
A. I mean, the first estimate which wasn't stratified by age, though we did know about the age distribution of deaths, was 12 February. That was highly uncertain, and then we had a much more refined estimate by, I would say, the first week in March.

Q. Why was it necessary, why did in fact, we can see from the dates, four to five weeks elapse before that vital figure, how many people would die, could be bottomed out, could be certified as being, "This is our final position and this is the figure we can rely upon"?
A. There was a hesitancy for -- by SAGE to rely on any single piece of evidence, and particularly coming from a single group, and therefore there was a desire to have it confirmed by other sources, which is what the London School of Hygiene and Tropical Medicine did to a degree in terms of the analysis of the Diamond Princess data. Then there was a desire to then translate that infection fatality ratio estimate into estimates of the impact on the health service.

Q. The figure, the IFR figure, was the single most important figure in terms of working out how many people would be likely to die. Probably matched by the IHR figure, working out how many people would require to be hospitalised.

Q. Was there any basis for challenging Imperial College and its estimates on the basis of your professional provenance?
A. No, but there was challenge on the basis that we were basing it on very limited data from -- scraped from Chinese websites at the time, and a limited number of data points on what the infection prevalence was, and so -- I mean, SAGE grades, in some sense, evidence and estimates and it was, you know, viewed as being uncertain. I mean, I found that personally somewhat frustrating, but then, you know, I was partly responsible for generating the estimate, but if you look at the minute -- as you say, it took several weeks for SAGE and SPI-M to accept the estimate.

Q. You were personally frustrated?
A. Yes.

Q. You were frustrated because this was vital information which went directly to the government's ability to respond and to decide what that response might consist of?
A. Yes. And so I was pleased when it was finally accepted as a reasonable worst-case scenario. But, as you're aware, that took some weeks longer.

Q. It was only in fact at the beginning of March that your figures for infection fatality rate, a value of around about 1%, were accepted for use as an NHS planning assumption. I think it was formally accepted on 26 February. But there then had to be a meeting, which there was on 1 March, to discuss the accuracy; yes?
A. Not quite. The meeting on 1 March was less about discussing the accuracy of the IFR figure, but involved clinical colleagues with expertise in respiratory viruses and with intensive care to translate that figure into estimates of healthcare demand. So the proportion of people being hospitalised, the proportion needing intensive care unit, the estimate of how many days they would be in each of those settings.

Q. And broadly speaking, who attended that 1 March meeting which debated the likely --
A. We hosted it in my office.

Q. Who attended it?
A. It was attended by Peter Horby, I think maybe remotely, John Edmunds, Stephen Powis I think dialled in to it, some NHS planners. I mean, I've provided the full list, I don't have it immediately to hand.

Q. Around about the same time, these figures for the infection fatality rate and the infection
hospitalisation rate were put before SAGE, were they not?
A. Yes.  
Q. So they were debated in fact in the SAGE meeting of 27 February. SAGE was attended, of course, by not just the academic groups but by representatives of the government, of the NHS, Public Health England, and so on and so forth. It must have been apparent to everybody at that 1 March meeting, and at the SAGE meeting on 27 February, that given the fatality rate and given the hospitalisation rate and the number of people in our population, the number of deaths and hospitalisations would be enormous?
A. Yes. And more than that, we generated, I mean, model output on that day, spreadsheets, which were provided to NHS England, of the expected trajectory of the epidemic.
I should say those estimates of hospital demand were refined considerably over the following two weeks, because the original estimates were basically based on best clinical judgement rather than data, and it was only -- it took -- they didn't change qualitatively but they did change quantitatively in that time. Some of the greatest brains in the land, Professor Edmunds, the world experts on epidemiology, virology, pandemic response, were debating these figures. They weren't
all previous planning around lethal pandemics.
Q. So, what, those deaths would take place, the hospitalisations would occur and the system would be overwhelmed?
A. The thing that meeting did not -- all that meeting considered what an unmitigated pandemic would look like. So if the government did absolutely nothing, I mean, that was the reasonable worst-case scenario. I think a lot of the work in the following week or two was around the extent to which that could be modified and how.
Q. These were self-evidently matters of life and death. The government did not start contemplating the possibility of the top control measure, the lockdown, mandatory NPIs, until around about the 13th, we'll put it in a broad way, the 13th to the 16 March?
A. I wasn't actually aware of what the government was considering and wasn't considering at the time. I mean, in terms of what was going on within COBR, I had no visibility of COBR.
Q. But you had hitherto not been averse to emailing your thoughts on policy matters to the CMO, the GCSA, Professor Edmunds?
A. I mean, the CMO and GCSA, there was a complete Chinese wall between SAGE and COBR, so it was not as if SAGE meetings started with a readout from COBR about what the government were thinking and planning to do. We had almost no visibility of that. In terms of operational planning.
It wasn't clear, for instance, that exceeding healthcare demand, NHS capacity, was an absolute red line, really until, I would argue, 14 March. In terms of what we -- had been communicated to us as independent members of SAGE.
Q. But that elapse of time from the end of February to 14 March is a passage of time which plainly can't be got back, but it was plainly not desirable, it was not inevitable -- you describe in your statement your regret at the fact that it took five weeks to get these figures bottomed out -- and then there is another two-week gap or delay before practical measures are started to be contemplated. How can that possibly have happened?
A. I mean, I think I may put it in my recommendations for learning lessons for the future. The artificial divide between scientific advice and then operational planning and response was a hindrance. We had very little visibility of what was going on in terms of preparedness within government. I would occasionally, at the, you know, margins of SAGE meetings, hear a little, but...
nothing definitive. I think even more so was the lack
of visibility of what government red lines were, what
were the absolute constraints that policies had to
adhere to. You know, never -- I mean, red lines are one
way of putting it. Objectives would have been nice as
well.

Q. Why, as an expert professor in mathematical modelling
and epidemiology, why -- if you’ll allow me to say so --
as a plainly intelligent human being, why, as a human
being, do you need to wait for the government to tell
you what its red lines are before you raise the alarm in
the greatest way you possibly can?

A. It depends what -- I mean, what do you mean by raise
the -- I mean, I think I was clear in communicating
the magnitude of the threat, in public pronouncements
and private pronouncements. But it may be --

Q. Well --

A. You elaborate.

Q. At the 5 March meeting of SAGE, at which you were
a participant, there was a debate about whether there
were scientific grounds to move away from containment
efforts in the United Kingdom, there was a debate about
large gatherings. SAGE concluded there was no evidence
to suggest that banning large gatherings would reduce
transmission. There was a debate about what the figures

were, the IFR, the IHR, the CFR, but there doesn’t
appear to be the clearest of messages to the government
saying: our figures now show that the number of deaths
and hospitalisations are so massive that the NHS and the
healthcare system will be overrun.

A. I mean, that was about the same. It is not minuted,
you’re completely right, but that was about the time
where both John Edmunds and myself got concerned about
the slight air of unreality of some of the discussions
and did start talking in the margins of -- to members --
well, let’s say government attendees at SAGE, saying,
you know, "Do you know what this is going to be like?"
I mean ...

Q. So are you saying there was this debate but it wasn’t
minuted? In which case, my next question will be --

A. There was a --

Q. -- how -- how -- Professor, could something of such
import not be minuted?

A. I mean, I am not the person to ask.

LADY HALLETT: Can I just ask, Mr Keith put to you that one
of the matters that was debated was whether banning mass
gatherings would reduce transmission. As a layperson,
it seems to be a rather simple question: if you stop
people getting together then they’re not going to get
infected. Can you remember what the debate was?

A. Yes. So the issue is about what proportion of time --
maybe I’ll start again. So mass gatherings I think
intuitively sound like risky things, because you might
have 10,000 people together, but for a virus which
transmits through close contact, in fact if you have
only one infected person they’re no more likely to
generate large numbers of infections than they would be,
for instance -- in a pub, for instance, or a theatre.

LADY HALLETT: So they’re going to infect the people around
them?

A. Around them.

So the question there is about proportionality.

There is a tendency to target football matches, for
instance, but in fact that’s outside, generally, the
transmission risk is low.

If you look at an analysis of where people spend
their time, the venues where that sort of transmission
is much more likely to occur are hospitality venues, for
instance. I mean, this is a point I make, you have it
on record in an email exchange with Chris Whitty. So in
assessing the generic -- in some, sense a busy pub has
a hundred people in it, it is a mass gathering, indoor
mass gathering, people very close together for many
hours. It was my view that posed much more of a risk
than occasional outdoor sporting venues, because many

more people attend pubs than attend football matches.

LADY HALLETT: Thank you.

MR KEITH: I think, Professor, the government was much vexed
about the issue of mass gatherings and it repeatedly
asked SAGE for its commissioned advice, did it not?

A. Yes.

Q. So this issue was visited by, was discussed by SAGE
twice in late February and then again, as I’ve said, on
5 March. On 27 February you said this:

"I now believe it is more than 95% certain that
transmission is already established here, so from that
perspective holding the Six Nations matches will make no
difference."

Is that because --

A. So it’s in the context that the major concern was around
people, you know, travelling between different
countries. And also, to put it into context,
250,000 people fly into the UK every day, so it is
a matter of degree rather than ... there are lots of
public health measures which will have a small impact,
and the tendency is to say, well, we should do
everything, but in reality you want to target the
measures which are going to be effective.

Q. It’s like throwing, you would say, a lit match upon
a fire. If the virus is already established in
the United Kingdom, it doesn't make any difference in general terms whether or not there is a single gathering?

A. Yes.

Q. But what about, and this is I think what lay behind, perhaps, if I might suggest, my Lady's question, what about the precautionary principle? You, around about that time, made the very valid point that, on a precautionary basis, closing schools would be justified, because even if you couldn't show a direct epidemiological link to a reduction in spread and a break in the chain of transmission, it looks good, it looks right, it shows you're serious about trying to stop the transmission. Wouldn't that approach apply equally to mass gatherings? A. Not to the same degree. It's not to say there would be no impact of it, but our best estimates of the impact would be it would be much lower than, for instance, closing schools.

Q. Well, that's a relative answer, isn't it? I'm asking you in absolute terms: why wasn't the precautionary principle applied to this same issue of mass gatherings as it was to the closing of schools?

A. I would say that the question we were asked was what the likely effectiveness of the measure would be. So if you're asking about effectiveness, I mean, I've given you an answer that on its own -- as part of a suite of measures of course, these things add up, but on its own, as a single measure, it would have a very small impact on the trajectory of the pandemic.

Q. As we've seen from the emails, you weren't averse to going beyond, quite understandably, a narrow issue of what would be the epidemiological answer to questions of policy and measures and efficacy and breaking transmission. Why did you not say --

A. Well, I would say that is part of the -- there's -- talking about efficacy and talking about effectiveness and relative effectiveness is, I think, well within my area of expertise. Talking about should the government therefore do something, is something different.

Q. But you do agree, don't you, that there are plenty of examples where you do say the government should do something?

A. I mean, plenty of -- I mean, the examples I can think of most in those early days was about just ramping up testing and getting some decent surveillance into place so we knew what was going on.

Q. And control measures and cost-benefit analysis and economic considerations, all the stuff of policy?

A. I mean, yes. I mean, I would have -- compared with past emergencies I've been involved in, I saw less evidence of, let's say, behind-the-scenes government planning.

Q. So I was asking you about the SAGE meeting of 5 March. At that stage, in early March, was SAGE still advising a mitigation as opposed to a suppression strategy?

A. I mean, SAGE was still considering a mitigation rather than a suppression strategy, yes. I mean, that was the ... the government strategy laid out in the 3 March Covid plan was one effectively of mitigation.

Q. What sort of mitigation measures did you or SAGE have in mind on 5 March as being effective in support of the mitigation strategy?

A. So the first one was -- we didn't have testing, of course, but isolation of symptomatic cases and the households of symptomatic cases.

Q. So just pause there. Telling the population that if you show symptoms you self-isolate?

A. Yes.

Q. And your family?

A. And your family self-isolate.

Q. All right. So that's a --

A. I mean, that was -- and that was indeed the first policy actually announced. Other measures we considered were reducing social contacts and workplace contacts. School closure has already been mentioned. There was an extensive debate around that time about measures which were particularly targeted around shielding the elderly, because it was known that that age group was most at risk. Those were the measures being modelled.

There was also discussion within SAGE as to the particular risk associated with care homes and the need to improve infection control in that setting.

Q. But there was no recommendation made in early March about care homes, was there?

A. I mean, the risk from care home -- of care homes was discussed in -- I mean, I raised -- actually I can't remember the precise date, I think it was all the way back in February, the risk of care homes, because there was early evidence of outbreak in care homes from the United States, I think Seattle in the first instance.

Q. You did raise the issue of infection in care homes, and also the issue of nosocomial infection in hospitals, and the evidence shows, doesn't it, that a large percentage of the deaths suffered in the United Kingdom were in both those places.

A. Yeah.

Q. But at the beginning of March, although you've said you debated care homes, SAGE made no recommendations in fact for restrictions on care homes, other than the general...
self-imposed obligation to isolate you and your family members in the event of symptoms?

A. I mean, to be honest, I cannot -- I mean, I think it was -- in relation to care homes, it was more Chris Whitty and Patrick Vallance agreeing and talking -- I think Jenny Harries had a responsibility -- within a SAGE meeting and saying that improving infection control in care homes was a priority. Again, I mean, the minutes may not reflect that.

Q. You weren't confident, were you, at the beginning of March that these relatively limited measures, reflective in fact of in terms of --

A. Flattening the curve, yes.

Q. Flattening the curve, but also having their genesis to some extent in flu pandemic strategy, because you weren't talking about lockdowns here or stay at home orders or shutting of workplaces. Were you confident that they would prevent the sorts of levels of death and hospitalisation which you had indicated by the end of February would otherwise inevitably occur?

A. The best we were able to achieve in -- I mean, in modelling terms, but combining these interventions, in a mitigation sense, was a -- about a halving of deaths, mostly down to shielding, it's an open question how successful that would have been as a policy, and maybe 70%, maybe slightly more if there was spontaneous behaviour change, reduction in healthcare demand. The challenge is that we were talking about levels of healthcare demand which were more than ten-fold above what the NHS could potentially cope with and therefore a 70% reduction was not sufficient.

Q. So why did SAGE recommend and why did you throw your own personal authority behind a recommendation that was, in effect, a half measure?

A. I mean, say -- I would say SAGE was working to the -- what we understood was the government policy of wanting to do its best to mitigate the epidemic but not risk a second wave in the autumn.

Q. But the primary objective was surely to prevent death and to stop the transmission of the virus. Why were you waiting for clarity to come about the government's own strategy? Why did you need to know what its red lines were before you made a perfectly sensible recommendation, "Half measures mitigation are just not going to work we need suppression"?

A. So the challenge with suppression is what does it lead to. It delays matters at enormous -- I mean, enormous -- societal and economic cost, but what do you do next? And so the SAGE discussions, such as they were around this issue, were looking in the one-year timeframe or longer, you know, where would the UK be then, and that -- I mean, Chris Whitty in particular was concerned about what would be happening in the autumn.

Q. So is this the position: there was a fear on the part of SAGE and its constituent parts, its participants, that if you suppressed, if you pushed R0 down below 1, if you clamped down hard on the virus, it would re-emerge later like an uncoiled spring in a vicious overwhelming second wave?

A. I mean, that was the initial concern around those measures.

Q. Why was it assumed that there would be a second wave, or rather was consideration given to whether or not measures might have been able to take in the meantime in May, June, July, August, September, October, November, to make sure there wouldn't be a second wave, for example a developed test, trace, isolate and support system?

A. I don't remember that being discussed but there wasn't a lengthy discussion of suppression-type strategies in SAGE until the middle of March.

Q. You say in your statement that: "[You] did not strongly advise for a switch to a suppression strategy prior to March 13th, in part because of my belief that it isn't the role of scientific advisers to determine policy ... but also because I was very conscious of the huge economic and social costs which would be entailed by long-term and intensive use of NPIs ..."

Q. Why was it a concern of a mathematical epidemiologist, no disrespect, to determine matters of economic and social cost and to undertake this cost-benefit analysis?

A. Well, I mean, first of all, I mean, public health, there is a strong tradition within public health of looking at cost-benefit in the way we operate our health system, in the way we judge the proportionality of interventions. I mean, cost is weighed against benefit, both economic cost and other more, let's say, nebulous costs.

Q. Professor, where is the emergency call to the government at the beginning of March, two weeks before the 13th when it kicks off, where you say or SAGE says, "We have to turn to a suppression strategy because of the risk of the high levels of death and hospitalisation, but for you, the government, you'll have to work out the cost-benefit analysis, you'll have to work out whether the cost of suppression is worth it"?

A. I mean, I think Chris and Patrick were at every SAGE meeting and were very well aware of that. I wasn't clear on what was being communicated to government or
not, as some of the later emails you refer to make

clear.

Q. I said where you or SAGE, not Sir Patrick or Sir Chris,

where does SAGE say that, at the end of February and in

the first week of March?

A. I mean, as I've said before, the role of SAGE is to

answer the questions addressed to it.

MR KEITH: My Lady, is that a convenient moment?

LADY HALLETT: It is.

Sorry, it's time for another break, Professor, you

might welcome one as well.  15 minutes, please.

(3.11 pm)

(A short break)

(3.25 pm)

LADY HALLETT: Mr Keith.

MR KEITH: So, Professor, we come to the beginning of

March 2020, and the government, as you've correctly

reminded us, publishes its Coronavirus: action plan in

which the first stage is contain. And that wasn't

something that you've told us was debated with SAGE.

SAGE didn't know that the government was publishing that

plan. You must have been quite surprised to see

the promulgation of a new plan which contained as its

first stage contain, when, as you've described very ably

to us, you had very real doubts and had had very real

duties for a matter of weeks as to whether contain could

ever work.

A. Yes. It was one -- probably the only point of

disagreement I had with Chris Whitty about the extension

of the contain phase.

Q. A couple of days later, on 5 March, SAGE sat, met, and

its consensus document concludes:

"There are currently no scientific grounds to move

away from containment efforts in the United Kingdom."

What did that mean?

A. I mean, there was a debate around containment and Chris

gave his view, which was, I think, largely around

the fact that -- didn't want the UK to be the first

country to move away from that. I mean, I -- from

memory, I expressed the view which I've expressed

previously, that I didn't feel contain was succeeding.

To be honest, I don't know quite where that central

opinion, let's say, of those minutes came from.

Q. Are you saying that because there was a disagreement as

to the efficacy of containment, SAGE alighted upon that

phrase "there are no scientific grounds to move away

from it?"

A. I mean, you would have to ask the person who drafted it,

but yes, that might be ...

Q. By 9 or 10 March, you were extremely concerned, were you

not? You had had, for now a matter of four to

five weeks, the basic figures in relation to infection

fatality rate, infection hospitalisation rate. You

could see that the containment policy didn't stand

a chance, and the debate was still raging about whether

or not suppression or mitigation was the right way to

go.

A. I mean, I'm not sure that you would say the debate --

there wasn't much debate of that on SAGE itself.

I mean, the thing I was most frustrated by was there

still seemed to be a residual, I don't know -- a sense

I got that some in government hadn't really comprehended

the figures or didn't think it was going to be as bad as

it was going to be. A lack of a sense of urgency, let's

put it that way.

There was also a second challenge, which was it was

very difficult to get NHS England to actually state on

the record that the health service would be overwhelmed

and what their surge capacity was, and in fact the first

time they did that was on 13 March.

Q. That was the first occasion on which, to use your words,

they put that information on the record, and you

challenged them quite strongly at that meeting. But you...
A. had known for a considerable time before that meeting, in the NHS?

Q. Depending on the level of -- obviously it wouldn't be the NHS as normal. I didn't know anything about what their surge capacity potentially was.

A. Did you know weeks before they put it formally on the record that the number of deaths and hospital cases that you had estimated would result would likely overwhelm the NHS?

Q. Yes. Right. You emailed an official, an adviser in Downing Street called Ben Warner. I think you may have spoken to him on the phone to tell him that you were going to email him?

A. I don't honestly remember.

Q. All right. Could we have, then, that email, INQ000196055. If we go to the second page, please, we'll chronologically work backwards. We can see an email from you, director, of course, of the MRC Centre for Global Infectious Disease Analysis, and the body of the email:

"Thank you very much ..."

Talks about bed demand per day, daily deaths, the suppression?

A. Yeah.

Q. A lockdown in practice.

A. I mean, it felt uncomfortable, but at the time it felt like it needed to be said, because, yes, as I said, I was increasingly concerned about this disconnect between the numbers we were actually presenting and the reality of what that would actually look like.

Q. In the last paragraph you say: "But what would be the worst outcome -- in my opinion -- would be to go for mitigation ..." And that of course was the current plan: "... (the policy package currently being discussed) and for the health, social and political cost to be judged later to be unacceptable -- necessitating a policy pivot in the midst of what will already be a national crisis."

Q. Was the reality that the wave peaked significantly earlier?

A. No, I mean, the wave peaked because of the suppression measures adopted. But the -- okay, I understand.

The epidemic, as we learned in the next few days, was at least two weeks further progressed than the surveillance data available at the time I wrote that email suggested.

Q. Was the reason for that (a), as you've already identified, the asymptomatic nature of a significant proportion of the virus meant that in the absence of testing it's difficult to trace where it's got to, and (b) the lack of understanding, because of the lack of testing, on the number of seedings, the number of places in the United Kingdom that the virus had already got to?

A. Yes, the epidemic was effectively hundreds of times larger than we had anticipated. Well, to be fair, probably about 30 to 40 times larger.

Q. In essence, because of a lack of a sophisticated surveillance and testing system?

A. Yes, which I would say that -- I mean, both Patrick Vallance, myself, John Edmunds and Jeremy Farrar had repeatedly commented on this multiple times in SAGE.

Q. Then if we could go, please, to the prior page, the previous page, page 1, you say at the bottom of the peak. And you say this: "As long as the PM and Cabinet accept and understand this is what is likely to happen and are still ahead to proceed with current plans, then there is a rational basis to that decision which I would say the science supports."

To what extent, Professor, did you regard yourself as obliged to step out of your SAGE role and express views about government policy and the workings of the PM and the Cabinet in this way?
Q. Please.
A. So the issue of timing of policies is fundamentally different between mitigation and suppression. So for mitigation, you're wanting to implement measures around the peak of the epidemic to effectively squash the peak.

For suppression, on the other hand, you want to act as early as possible because the magnitude of the wave will come down if those measures are successful, but if an epidemic is doubling every four days, basically a week's delay corresponds to four times more cases and deaths.

Q. Because of the exponential nature of a virus. But in reality, Professor, and in the event, it just didn't matter, because measures had to be taken to stop the NHS being overwhelmed in any event?
A. Yes, I mean, what became clear on the -- the paper that was minuted.  And I think the answer was that, of course, the need to avoid the collapse of the NHS that led to mandatory measures being applied.

The SAGE meeting of 10 March was the first SAGE meeting at which, as you've described earlier, the potential risk to the care sector was debated significantly.

A. I think to the level of being minuted.

Q. To the level of being minuted. And I think the position is that there were no SPI-M-O models before 23 March that explicitly modelled care homes or the impact on the hospital sector?
A. Can I interrupt?

Q. Yes.

A. I mean, we always looked at data. SPI-M was tracking the epidemic everywhere, and we were reading the scientific literature.

Q. You've seen the suggestion in a number of places that SAGE and SPI-M failed to pay sufficient regard to the position overseas and to overseas data, what was happening in particular. Is there any basis for that --
A. No.

Q. -- suggestion? All right.

A. I think the point you make is very valid, important.

Can I interrupt?

Q. "With respect to 'wait and see'. We don't have time. That is akin to a policy pivot when it is too late."

A. Is that the same point you were making in your email to Ben Warner?

A. Maybe can I elaborate?
A. I mean, that's true, we modelled -- all the models had age-related risk in them, and we were looking at shielding options for the elderly, but no models explicitly represented the care sector.

They did represent hospitals, in some sense, but we didn't represent nosocomial -- hospital-based transmission.

Q. You say in your statement that you were so concerned by the lack of data, and it was in the main a lack of data which had led to you not being able to model the specific sectors, that you sent members of your team at the Imperial College COVID-19 Response Team to PHE's offices in Colindale. Why did you do that?

A. Well, I should elaborate. I mean, it's -- we have a close working relationship with what is now UKHSA, and the Health Protection Research Unit you mentioned at the start of this evidence session is a collaborative initiative between Imperial College, London School of Hygiene and Tropical Medicine and then Public Health England. And so we used to work together.

I just became aware that, at that time, there were -- the staff were overwhelmed at Colindale in trying to pull the data together for both the central government, for SAGE and SPI-M. I mean, I could tell that from the fact that emails were coming through at, you know, past midnight. So I offered to provide some support in terms of people who could help put in place hopefully a better system.

Q. Then, as we heard earlier from Professor Steven Riley, it's around that time that he produced the two papers that he did -- he is, of course, a member of the Imperial College team -- and the first of those papers was considered by SPI-M-O on 11 March.

I think it's fair to say, Professor, that his reports were not welcomed by you. You were, in your response to him, quite critical of what you saw to be the assumption that what he was recommending would be adopted by the government. You said there will be no appetite for the draconian -- such draconian measures.

But his approach was, putting aside the policy impact, broadly correct, was it not?

A. I mean, it was an approach which ended up being adopted in terms of suppression. I mean, the issue -- I mean, as you're aware, there are multiple iterations of --

Q. Yes.

A. -- of that. The first iteration, on 1 March, was, I mean -- and I said to him at the time we would include containment options, which are much more similar to what turned into Report 9. I felt there were certain -- so, I mean, Steven believed passionately from very early on that the country should lock down. He took a different view of that kind of interface between science and policy, and I accepted that.

So my -- I had some particular technical concerns with the final report produced which you're referring to, just in terms of the -- some of the assumptions around, I mean, looking at how mitigation might fail but not looking at, for instance, how suppression might fail.

Q. Putting aside the technical changes and the editing, in broad terms, you saw the reports as intruding impermissibly into policy areas, did you not?

A. I had concerns at the way that they were written at the time would be seen -- particularly if we put them out as an Imperial College report, and I said he was free -- I mean, absolutely, obviously, free to do what he wanted with it, but if we put them out as an Imperical College report it would be seen as almost advocating on policy solution.

Q. But you had been advocating on policy in the press, to Ben Warner, to the CMO, CSA?

A. I mean, what I had been doing is warning -- issuing warnings about was the government aware of what their policy was actually going to result in, I think.

Q. Did you debate publicly and with government officials the policy implications of the mathematical and epidemiological advice that you were providing?

A. Sorry, what do you mean by publicly?

Q. Did you talk about the policy consequences of your modelling in the press or in emails?

A. No. Not in that sense publicly.

Q. Did you communicate to Ben Warner in Downing Street --

A. Indeed.

Q. -- your concerns about the measures, whether it should be suppression, mitigation, and what should be done?

A. Well, my -- you've just covered them, emails to Ben Warner, which wasn't ... I did not view those emails as being advocating for a change of policy, more as saying: are you aware of what the current policy will cause and, you know, clearly, is the Prime Minister aware of that? It was a warning about the consequences.

Q. On 12 March -- could we have INQ000149061 -- you engaged in email communication with Professor Edmunds and Professor Farrar.

A. Yep.

Q. The email from you is at the bottom half of the page, Friday, the 13th:

"I think the message got across."

What message was that? Was that the message at the SAGE meeting on that day?
A. Yeah.

Q. "I still think part of the issue is Chris hoping it won't be as bad as we say."

You expressed that view to your colleagues, Messrs Farrar and Edmunds. Did you say to the CMO himself, "I'm concerned that you appear to have a degree of optimism bias that it won't be as bad as we all think it will be"?

A. Not in so many words. What I tried to do was reinforce the support for the estimates we were coming up with. I mean, I think Chris was naturally more, let's say, conservative at accepting -- and they were uncertain estimates.

Q. The email is obviously a conversation between yourself and Jeremy Farrar and John Edmunds. To what extent did you express these views openly in SAGE yourself on 13 March?

A. So on 13 March what I refer to in the second sentence there is the fact that I actually, I mean, my ... I explicitly asked the question of Stephen Powis in the meeting of whether the, you know, what was the NHS surge capacity, which, in some sense, was outside the remit of SAGE, it's an operational consideration, but by doing so -- and then asked him, you know, could the NHS in any way cope with the current plan, you know, that it was clearly apparent that exceeding NHS capacity was a government red line they did not want to cross, and I was therefore saying these are the policies which need to be implemented.

Q. Around this time, you were engaged in drafting Report 9?

A. Yes.

Q. Which is the report of which we've heard earlier today from Professor Steven Riley. Could we have, please, INQ000270159.

There is a summary on page 1 which, in essence, is this right, states that the result of epidemiological modelling is that, whilst there are two fundamental strategies, mitigation and suppression, the optimal mitigation policy is that policy which you've identified in the email of a relatively stringent degree of measure but falling short of a lockdown?

A. I mean, the difference between green and red in the previous table is the difference between mitigation and suppression.

Q. Does this email therefore stand as the point at which you yourself are converted to the merits of a suppression policy as opposed to a mitigation policy?

A. I think that's a very different and difficult judgement. I didn't -- I'm on record as saying that I didn't view any easy decisions here. I think it's the point at which it was clearly apparent that exceeding NHS capacity was a government red line they did not want to cross, and I was therefore saying these are the policies which need to be implemented.

Q. Around this time, you were engaged in drafting Report 9?

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Q. Which is the report of which we've heard earlier today from Professor Steven Riley. Could we have, please, INQ000270159.

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A. Not quite. So the optimal mitigation policy could achieve maybe a two-thirds reduction in peak healthcare demand and the halving of deaths, which was the "mitigation". The suppression policy then went further and that's, you know, where you can avoid exceeding healthcare limits.

Q. Page 2, you say:

"The major challenge of suppression is that this type of intensive intervention package -- or something equivalently effective at reducing transmission -- will need to be maintained until a vaccine becomes available ..."

Did you consider the possibility that a sophisticated scaled-up test, trace and isolation measure could provide a degree of succour and support before vaccines were invented?

A. I mean, that is what was being referred to, or something equivalently effective at reducing transmission, in that sentence.

Q. Well, Professor, you make the point that whatever package it is has to be "maintained until a vaccine becomes available (potentially 18 months or more)".

A. And that's true whether you're using contact tracing or you're using -- irrespective of the type of non-pharmaceutical intervention one is using. No policy plans, and he said he would get back to me and did on the exact surge capacity but basically said no, there is no way the NHS would be able to cope.

Q. On 15 March, INQ0000048089, page 2, you email Sir Chris and Sir Patrick.

A. I think it hasn't updated for me. Ah, okay.

Q. If we could go back, thank you, if you would just go back one page, please, we can see in the middle of the page, email 15 March, 2020, 3.37 am, to Sir Patrick and Sir Chris:

"... I need to sleep now."

Then, further down the page, figures, your thinking in relation to the impact upon NHS healthcare facilities and demand.

Then over the page, essentially, at the top of the page, you talk about what policy will need to be implemented in order to be able to avoid, as you saw it, and the figures supported you, the terrible consequences on the NHS of your figures of death and hospitalisation:

"The minimum policy will require: closing schools & universities, home isolation of cases, and large-scale intensive social distancing -- reducing all contacts outside the home and work by 75% ..."

Was that a mitigation policy or a suppression policy, Professor?
immunity is building up in -- or limited immunity is building up in the population if suppression is working and so the only way of exiting from that policy is when a vaccine is available to generate immunity through that route.

Q. Professor, in this document you were advocating an intensive intervention package by way of reducing contact in the workplace and at home, ensuring a degree of isolation that breaks transmission chains, and you say that package will need to be maintained until a vaccine becomes available.

A. You're not there referring to testing. Testing is not a package, is it, which is concerned with --

Q. All right. Why didn't you say, "The best way of being able to return to life, something approaching normality, after this package is -- intervention package is introduced, is to develop, at speed, a rapid test, trace and isolate system"?

A. I mean, I think -- well, we did a lot of work in terms of intensive care unit demand. Qualitatively,

Q. And March for whatever reason, more clarity on the data, of could things have acted -- moved faster in February and March for whatever reason, more clarity on the data, more clarity on NHS capacity, had we moved the 16 March interventions back a week. So returning to your point -- the merits --

A. Okay.

Q. Thank you.

A. But I said the same at the time, which is moving all interventions back a week. So returning to your point of could things have acted -- moved faster in February and March for whatever reason, more clarity on the data, more clarity on NHS capacity, had we moved the 16 March back to the 11th, the 23rd back to the 16th, that was the scenario we were looking at.

Q. My question to you was: if the goal was to prevent the following weeks on -- on that. It wasn't, at that time, our top priority. We had a limited amount of time to look at it and I did not want to be making statements which I couldn't back up.

Q. All right. Page --

A. I don't disagree with the concept of having an effective test and trace system and I'm on record at looking -- both stating that and looking at it in detail.

Q. Could we have page 16, please.

The middle of the page has the paragraph that we looked at earlier:

"In the [United Kingdom], this conclusion has only been reached in the last few days, with the refinement of estimates of likely ICU demand due to COVID-19 based on experience in Italy and the [United Kingdom] ... and with the NHS providing increasing certainty around the limits of hospital surge capacity."

Was it not the position that you had in fact for a matter of weeks known what the IFR number was likely to be, the hospitalisation number was going to be, you had informal information about NHS capacity, and obviously Professor Riley had produced his own report?

A. I mean, so I understand what you're saying, the IFR didn't change, the hospital estimates did change, they roughly doubled based on what was happening in Italy in...
the collapse of the NHS, was that lockdown necessary? From everything you've said, it must surely follow that it was, because --

**A.** I mean --

**Q.** -- you were saying you've got to do it otherwise --

**A.** So I thought you were distinguishing between what was announced on 16 March and what was announced on 23 March.

**Q.** No, the 23rd.

**A.** Okay. So I think -- you know, well, I think both were warranted, but I cannot definitively say whether what was announced on the 16th, maybe in combination with what was defined -- announced on the 18th, would have been sufficient in its own right, we just don't have the data to answer that question.

**Q.** So what you're saying is we will never know the exact nature of the number of deaths that would have been saved if a lockdown had been a week earlier; equally we'll never know whether or not the measures short of a lockdown which were put in place around the 16th, or the 13th in fact, whether they would have worked?

**A.** I'm specifically referring to the measures announced by the Prime Minister on the 16th, which was mostly an urging of people to work from home and to reduce social contact. They weren't mandatory measures but that the more -- you can have a range of different measures which will achieve suppression, but the rate -- the speed of doing so differs depending on how stringent the measures are, and if you are concerned about healthcare capacity being overwhelmed in the very short term, you need to implement considerably more stringent measures than if you act potentially earlier and can then later refine measures.

**Q.** Does your conclusion, your view, depend at all upon Professor Woolhouse's point, which you have already addressed separately, that there was a failure to take proper account of spontaneous changes in behaviour?

**A.** I mean, it's difficult. What we can do is observe. We had that one week to observe spontaneous changes in behaviour, because most -- nearly all the measures announced on 16 March were recommendations, and there was a significant reduction in mobility, in how other measures have -- we weren't, at that point, measuring contact rates but in proxy measures of contact rates. Whether it would have been sufficient though we don't have enough data to say.

**Q.** Now, very briefly, some of the high points and low points of the chronology thereafter.

In relation to the May 2020 alert system, and the政府's approach to the relaxation from they did have an appreciable effect on population contact rates and behaviour. And I know there's a certain sector of society who are exercised about the difference between mandatory and voluntary measures, and my response was we will never know in the UK context whether the measures announced on the 16th, and then later with school closure, which is mandatory on the 18th, would have been sufficient on their own. What we can say is that the mandatory lockdown was more effective at reducing contact rates, it had an even higher effectiveness.

**Q.** How clear are you in that conclusion? Plainly there are degrees of likelihood. If we had only had those measures, the ones imposed on the 16th, how clear is it?

**A.** It isn't, and we didn't have time to wait for it to be clear.

**Q.** Has there been any subsequent analysis done, any counterfactual work done afterwards which shows whether or not it was ever possible at all that those measures would have sufficed on their own or are we in the territory of, well, they might well have worked but we'll never know?

**A.** Well, I mean, the policies we actually modelled in Report 9 were considerably less stringent than the lockdown of 23 March, but the reason for that is the then Covid restrictions, have you said in your statement that the strategy failed to learn perhaps the most important lesson from March 2020, namely that acting early saves lives and costs no more economically than acting late?

**A.** Mm-hm.

**Q.** That is of particular application, is it not, to the debate about whether there should have been a circuit breaker in September/October or an earlier lockdown earlier than the date in November on which it was actually imposed?

Did you produce models and documents in September on behalf of ICL but also before SAGE making plain that at various stages various levels of quite stringent NPIs would be needed to slow or reverse the exponential growth in the virus as you saw it to be?

**A.** Yes, I did. And I'd like to place it into context, that first of all the efforts between April and September to, in some sense, reduce transmission through other means, through test and trace, through making environments Covid-safe, did have a marked effect. So we were not facing quite the same situation in September/October that we were facing in March 2020. We were facing a growth rate, a reproduction number of more like 1.4, 1.5 rather than one of nearly 3. But it -- as all the
modelling we had done all the way back in April of exit
strategies and lockdown had indicated, it just wasn't
sufficient. So in that context of exponentially growing
levels of infection, hospitalisation in
September/October, yes, we undertook a lot -- well, we
undertook, first of all, for SPI-M, along with other
groups, modelling of likely scenarios going into
the winter and the potential impacts of control
policies, anticipating, indeed, even before Alpha was
announced, the likely necessity of a third lockdown in
January 2021. And -- but I also contributed, with
Matt Keeling and with John Edmunds, to a table of
potential non-pharmaceutical interventions which could
be considered by the government if they wanted to
escalate from what the current policy was.

Q. As had been foreseen in February/March, because it is
part of a viral epidemic, there was a second wave?

A. I mean, a catastrophic second wave.

Q. Even though there had been Covid-safe measures to some
degree put in place and even though there was longer
warning of the breaking of that wave, the number of
deaths in fact exceeded those in the first wave?

A. I mean, by two-fold, yes.

Q. And do you say in your statement, therefore, that
the policy of acting incrementally and as late as
possible, in the end -- to prevent NHS capacity again
from being exceeded -- had a significant impact upon the
number of deaths?

A. Yes.

Q. The local tier system in October 2020 you criticise.
You make the point that SAGE and SPI-M-O were not
consulted about the introduction of the local tier
system, and you describe it as being flawed in its
implementation. Was it in essence a form of
epidemiological levelling up?

A. Mm.

Q. Everywhere would find itself inevitably in the highest
tier?

A. Eventually, yes. It was sort of delaying the
inevitable, and of course that has a public health,
a human consequence in terms of hospitalisations and
deaths.

Q. You state in your statement that you fully agreed with
the decision to introduce the second lockdown, that is
the lockdown in November 2020. There was an issue, was
there not, around about 31 October, when slides
developed in this ensemble process that you've
described, prepared by Imperial, Warwick, London School
of Hygiene and Tropical Medicine and Public Health
England, Cambridge, were leaked, were they slides which
were draft documents prepared some time before the leak?

A. My concern with it is they weren't any sort of
prediction, they were a commission to develop in some
sense reasonably bad scenarios for the winter, before
the tier system had even been introduced, and they had
been superseded by, you know, more recent and calibrated
projections of what the epidemic was going to be. So it
felt like deliberately pessimistic figures were being
produced, and I felt that, you know, that wasn't the --
I mean, the more recent figures were also -- I think
could have made the point equally well.

Q. The position was that, together with the other research
groups, you had prepared documents for a specific
purpose, in fact to identify a particular reasonable
worst-case scenario, a very pessimistic scenario, and
you had had done so some weeks before --

A. Well, not very pessimistic, somewhat pessimistic.

Q. Somewhat pessimistic. But in the event those slides
came to be used --

A. Almost as if they were predictions, yes.

Q. All right. And there was a considerable press and
public turmoil concerning --

A. Yes.

Q. -- the production of those documents.

Finally, in relation to SAGE, which I said I would
come back to, drawing together, and you address SAGE in
multiple places in your statement, would it be fair to
say that you have expressed a number of views about
particular aspects of the way in which SAGE operated?

A. Mm-hm.

Q. Firstly, in relation to its make-up, that is to say its
membership, do you have anything to say in relation to
whether or not it was dominated by epidemiologists,
modellers and behavioural scientists or whether it had
a sufficient number of pandemic management experts,
public health experts and experts outside your
particular field?

A. So I think it evolved over time. So in the very
earliest stages of the pandemic it was a small group.
I should say, there were typically always two members
of -- senior members of Public Health England present to
represent public health, so it wasn't that it was not
present, but in terms of independent expertise there
were a number of gaps. Many discussions around,
you know, why wasn't economics, more social science
represented. And I would have -- I mean, I think that
would have been to the good.

Q. You have, secondly, addressed this issue of the
commission basis upon which SAGE was approached. Would
you agree that a byproduct of that basis, that system by
which the government approached SAGE and said "Could you please address the following specific issues", that SAGE did not feel able to raise issues of its own accord or proactively make recommendations to the extent it might otherwise have preferred?

A. Yes. I mean, I do.

I mean, I frame that in a broader context, that I think SAGE became almost the normative source of public health advice, certainly for the early months of the pandemic, and I don't think it was ever properly constituted to act in that role.

I mean, I think -- my own view is that most countries, not all, but most countries which handled the pandemic better had empowered public health agencies informed by independent scientific advice, but that is the appropriate body which should be informing government policy on something on the magnitude of a pandemic, not a professor from Imperial.

Q. Thirdly, you've described how there was a process of reaching consensus. Is it possible that that process of reaching consensus, which reached its fruition in the documents which were produced, may have perpetuated a status quo, it may have led to inaction, because the government, when reading those documents, would have been unaware of the range of views which were actually expressed?

A. I think that was a risk, and I would certainly recommend that full -- I mean, more comprehensive minutes are produced in future, along with a -- then probably accompanied by a summary, but minutes could give -- true minutes give a much better sense of debate and discussion.

Q. You have described, Professor, how there were occasions when you did not -- and these are my words, not yours -- speak out when you might have done so, because there was a lack of understanding as to what the government's aims were, what its objectives were, what it wanted.

A. I think that was true throughout 2020, 2021, it was much clearer.

Q. There's next then the issue of "following the science".

Did you feel that the mantra of "following the science" blurred the boundaries between scientific advice and policy decision-making, and also perhaps lead to an unwanted pressure upon SAGE itself?

A. Yes, because there is no such thing as really "following the science". I mean, policy is there to achieve -- I mean, science informs policy in the sense of saying what is possible, what the likely impacts of both the virus and policies will be, but it doesn't predetermine a single best strategy, that's obviously determined by what, you know, what policy objectives you're trying to achieve.

Q. The evidence shows multiple communications between yourself and the Chief Medical Officer and the Government Chief Scientific Adviser outwith the framework of SAGE. Does that indicate that the funnel by which SAGE's views were communicated to government through the CMO and the CSA personally were not working as effectively as they might?

A. I think it more indicates the fact that it's -- in many cases it was difficult to have a free-flowing discussion of technical points within SAGE meetings, in my experience. That was partly rectified, you know, from about April onwards by Patrick Vallance having informal, small-group meetings to talk things through, but most of those email exchanges are around, I mean, you know, Chris or Patrick bouncing ideas, wanting clarification.

I think, thinking more -- I think there are better ways of having structures which allow for that in a more formal way than emails, if that was your question.

Q. If you had been satisfied that your views were properly reflected in SAGE, and communicated to the government through the CMO and the CSA --

A. Yes --

Q. -- you would not have, yourself, written directly to
Q. Thank you.  

Going back to page 1, if we may, and just to the beginning of that email, and just highlighting that first paragraph, please, this is the beginning of it: "Do let me know if you are happy for me to send to DCMS, also please note that I have included the comments from academics/modellers but not sure how happy they will be that their assumption heavy views will be shared but have caveated that their opinions are not based on data."

My first question is: did you know that this view was being shared?

A. No.

Q. No. Have you later become aware that it was shared?

A. Yes.

Q. Roughly when, can you assist?

A. I mean, I think as part of this public inquiry.

Q. Okay, thank you, that's helpful.

Do you agree that your view was assumption-heavy, as the caveat indicates?

A. Given that -- at the time, yes.

Q. Thank you. Back to page 2, please, if we may, just before the summary of the modellers, it says in red: "... please note that there is no data to support the following."

A. Yes.
Q. -- on that day, and both yourself and
Professor Sir Jonathan were there. How comfortable are
you with your individual views on a topic such as mass
gatherings being shared via email as opposed to being
shared within the consensus statement of the SAGE
minutes?
A. My preference in all of these, it would have been better
for a summary opinion from SAGE or SPI-M, probably
including SPI-B, to be written. My understanding, and
it is a long time ago, was that Jonathan Van-Tam wanted
an urgent and quick opinion rather than having the time
to go through the formal process. But I would agree
a more considered and consensus view would be
preferable, clearly.
Q. Particularly when the two things happen on the same day,
is that fair?
A. Yes, yeah.
Q. The email is on the same day as the SAGE meeting?
A. I should say it wasn't unusual, that timescale of
getting advice.

MS MORRIS: I see. That's helpful. Thank you, Professor.
Thank you, my Lady.

LADY HALLETT: Thank you, Ms Morris.

Ms Gowman.

Questions from MS GOWMAN
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paragraph 12 to be understood by the Prime Minister,
that no regulations were imposed despite that identified
risk. Can you see that?
A. Yes.
Q. To your knowledge, Professor, has there been any
statistical analysis of the likely impact on mortality
and healthcare burden in Wales of not implementing
border controls between England and Wales specifically?
A. Specifically, no. I think there has been some
consideration and analysis not by my own -- maybe even
by my own group, but certainly by other groups, of the
extent to which -- this is when Covid was endemic in
the UK, as it is today, of how the extent to which
infections get moved from area to area, so there is some
analysis of that. I'm not completely familiar with it
all.
Q. So when you said within your statement that there was no
evidence to suggest that -- there was evidence to
suggest that border controls would have little impact on
the final mortality and healthcare burden, that was not
specifically to Wales, and is it fair to say that you
can't comment on the position in respect of Wales?
A. I think that would be fair. I was thinking of
the international borders.
Q. Thank you, Professor.

The second topic relates to paragraph 141 of your
statement, and the working group meeting convened on
1 March 2020, to analyse key clinical variables for
reasonable worst case planning for the NHS, which you've
already touched upon in your evidence.

It's right, isn't it, that there were no academics
or NHS clinical leaders from Wales on that working
group?
A. Sorry, remind me of the date again? It's quite hard
to --
Q. 1 March. And if it assists, this is --
A. You're correct. To my knowledge there were no
representatives from Wales in that meeting.
Q. With this in mind, what steps, if any, were taken by
the working group, or indeed SAGE, who had commissioned
the working group, to engage academics and NHS clinical
leaders in Wales to seek to agree a co-ordinated
approach on these very important issues that were
discussed at the meeting?
A. I wouldn't be able to answer for the Chief Medical --
I mean, if anything happened it would be via the Chief
Medical Officer's office.
Q. Similarly, what steps, to your knowledge, were taken
after the meeting to promptly share the important
outcomes of that meeting with academics, NHS clinical
transmitting Covid was a topic of much activity and modelling, and you observed that the role of children in paragraph 219(a), this is a subparagraph on children and different policy options, it was more evaluating the, suggesting there as a kind of commission to look at members of SPI-B and clinicians. But undoubtedly it in, which involved the Department of Education and interventions on children which I partly participated working groups around, let's say, the broad both public were a number -- in fact there were quite a number of to their suitability? Specifically, to give an example, could SAGE have non-pharmaceutical interventions on children specifically and provided the government with advice as to their suitability? So, I mean, this is going outside my area of expertise but I believe SPI-B, the behavioural science group of -- or subgroup of SAGE, could have done that, and there were a number -- in fact there were quite a number of working groups around, let's say, the broad both public health and educational effect of non-pharmaceutical interventions on children which I partly participated in, which involved the Department of Education and members of SPI-B and clinicians. But undoubtedly it could be -- it wasn't done in the way which I was suggesting there as a kind of commission to look at different policy options, it was more evaluating the, you know, role of children in transmission. Secondly, page 69 of the same statement, paragraph 219(a), this is a subparagraph on children and modelling, and you observed that the role of children in transmitting Covid was a topic of much activity and particularly as the pandemic went on and capacity ramped up, yes, we could have done. Q. Specifically, to give an example, could SAGE have evaluated the social and psychological impacts of non-pharmaceutical interventions on children specifically and provided the government with advice as to their suitability? A. So, I mean, this is going outside my area of expertise but I believe SPI-B, the behavioural science group of -- or subgroup of SAGE, could have done that, and there were a number -- in fact there were quite a number of working groups around, let's say, the broad both public health and educational effect of non-pharmaceutical interventions on children which I partly participated in, which involved the Department of Education and members of SPI-B and clinicians. But undoubtedly it could be -- it wasn't done in the way which I was suggesting there as a kind of commission to look at different policy options, it was more evaluating the, you know, role of children in transmission. Secondly, page 69 of the same statement, paragraph 219(a), this is a subparagraph on children and modelling, and you observed that the role of children in transmitting Covid was a topic of much activity and
1 asked to do.
2 Q. Thank you.
3 Thirdly, I assume you were aware at the time that
4 there were social distancing exemptions for children in
5 Scotland but not for children in England from about
6 July 2020 onwards.
7 Q. Are you aware of any modelling that was done as to
8 the impact of such a relaxation of the rules?
9 A. Actually, I mean, when I nodded, I mean, I thought you
10 were going to say something else. I don't think I was
11 aware -- you'll have to elaborate about what the
12 relaxation was in Scotland for me to comment.
13 Q. Well, I mean, there were a number of relaxations.
14 I mean, for example, in July 2020 the need for
15 children under the age of 12 to distance physically from
16 each other was removed, not in England.
17 In September 2020, children under the age of 12 were
18 exempt from the rule of six when it was reintroduced in
19 Scotland.
20 I mean, those are just two examples, but there are
21 others.
22 A. So I am not aware of certainly SPI-M being asked to look
23 at exempting children from social distancing
24 restrictions in England. I'm not aware really of SAGE
25 discussions of that. So I think the -- Patrick Vallance
26 provided with on surveillance -- well, that's not
27 completely true. A small portion of the data we were
28 provided on surveillance had ethnicity. It was
29 incomplete in many cases, and therefore of difficult --
30 difficult to use, but most data sources did not provide
31 any information on ethnicity. Neither, therefore, was
32 ethnicity considered in the analysis we were doing at
33 the time.
34 That situation changed quite substantially over the
35 following, I would say, three to four months, such that
36 we were more able to -- it wasn't a primary focus, but
37 we were more able to look at ethnicity in detailed
38 epidemiological analysis of the impact of a pandemic on
39 different groups.
40 Q. Subsequently?
41 A. Yeah.
42 MR MENON: Thank you.
43 LADY HALLETT: Thank you very much, Mr Menon.
44 Mr Dayle.
45 Questions from MR DAYLE
46 MR DAYLE: Thank you, my Lady.
47 Professor Ferguson, I ask questions on behalf of
48 FEHMO, the Federation of Ethnic Minority Healthcare
49 Organisations. I have five short topics.
50 Firstly, in the period leading up to the pandemic
51 and in the early stages, did the data sources and
52 modelling you've referred to include ethnicity?
53 A. Do you mean prior to 2020?
54 Q. Perhaps more specifically in the period of January 2020
55 up to March/April 2020.
56 A. So none -- at that time, period none of the data we were
57 provided with on surveillance -- well, that's not
58 and Chris Whitty will be able to give you a definitive
59 view, but I don't think it was significantly considered
60 at SAGE.
61 Q. Finally, page 54, at paragraph 174 of the same
62 statement, please. In this paragraph, Professor, you
63 mention a meeting in February 2020 when school closures
64 was discussed by SAGE as a possible non-pharmaceutical
65 intervention.
66 Thinking back, I appreciate it's a long time ago,
67 but was this discussion of school closures before SAGE
68 ever considered, for example, other non-pharmaceutical
69 interventions such as closing pubs and non-essential
70 shops, requiring adults to work from home? Can you
71 help?
72 A. Yes. I mean, so case isolation and, you know, quarantine had been discussed earlier, but this was the
73 first community measure which was discussed. The reason
74 being is it was already one of the most commonly --
75 I mean, you'll be aware that countries in East Asia were
76 already responding to the pandemic and nearly all of
77 them shut schools, and so we were looking at what's
78 going on in Singapore, Hong Kong and other countries.
79 And there is a -- I appreciate the social and emotional
80 and mental health cost and educational cost of closing
81 schools, but there is a rationale to it in many cases,
82 and Chris Whitty will be able to give you a definitive
83 view, but I don't think it was significantly considered
84 at SAGE.
variation by ethnicity and/or deprivation. Presumably you're referring to economic deprivation. And you cited two possible reasons: one, complexity of modelling required to do so and, secondly, data gaps.

So my questions are: appreciating that you have indicated that this is an area of current research for you at ICCRT, can you share any insight at this time as to whether it would have been possible to carry out such modelling during the Covid pandemic?

A. I think it wouldn’t have been possible in the first few months, if it had been made -- I mean, we just didn’t have time and we didn’t have the data sources. If it had been a priority, then certainly by the end of 2020 it would have been possible if it had been a priority.

I think it isn’t a trivial undertaking because it increases, for the reasons I explain in my statement, the computational complexity of models quite dramatically. But let me put it this way, it is something we’re actively working on and in future epidemics -- I hope I don’t see another pandemic -- but I would very much hope that it is one of the factors included.

I would also say, I think, as well as differential impacts by minority ethnic group, there were also very significant differential impacts by, as you say, level 209 accumulated”.

What specific data are you referring to there?

A. So I’m talking about individual level both case data, hospitalisation data and mortality data. So that data was -- only really became available after the initial decision to lock down. I mean, you heard the discussion of the poor data streams. But once we -- by late March, early April, we were getting regular detailed lists of cases, hospitalisation -- well, hospitalisations were later; cases and deaths, my -- some colleagues within the Imperial group were working closely with clinical colleagues in northwest London on detailed health data, so we were able to then look at ethnicity as a risk factor for both exposure and hospitalisation and death.

Q. Do you --

LADY HALLETT: I think you’ve had your time, I'm afraid, Mr Dayle.

MR DAYLE: Very well.

LADY HALLETT: I’m also not clear where these questions are on the ones I approved.

MR DAYLE: My understanding is that they are just a slight rephrase of the ones --

LADY HALLETT: You have one more minute, Mr Dayle.

MR DAYLE: Very well. I am most obliged.

Do you recall any data indicating a trend towards accumulation of economic deprivation which -- we would like to be able to capture both, because both pointed to the fact that the poorest in society had the least ability to comply with measures, to work from home, were most exposed to the virus in health settings, in service jobs, and I think that should be better reflected in analysis and modelling going forward.

Q. Thank you.

Putting aside issues of modelling complexity and data gaps, are there any other factors that would have precluded ethnicity being considered in the work leading up to the early stages of the pandemic?

A. I mean, I can’t see of any reasons it wouldn’t be considered beyond those two, but those are kind of quite major hurdles.

Q. Thirdly, at paragraph 3.42 of your first statement, you state that the potential for unequal impacts was appreciated by SAGE from February 2020 onwards, and that you believe this was discussed frequently at SPI-B, that you’ve referred to. You refer specifically to care homes, low income households and low income population groups as being discussed in March 2020.

Then you go on in paragraph 3.44 to state that differences in impact between ethnic groups "began to be recognised from early April, once sufficient data"

potential disparate impacts between ethnic groups coming towards April of 2020?

A. Yes, I mean, we published some early analyses. Also it didn’t come as any surprise to me. I mean, pandemics build on the pre-existing health inequity, and there is already health inequity between ethnic -- inequity between different ethnic groups in the United Kingdom.

Q. And had a better data capture system been in place from the onset, does it follow that the disparate impact on some ethnic groups would have been identified sooner?

A. Perhaps. I can't be definitive about that, because it also partly depends on how much data has been accumulated.

Q. The penultimate topic: you state at paragraph 3.44 of your first witness statement that, despite the ICCRT publishing analysis on 29 April that identified two times higher risk of death for black patients, you believe that SAGE didn’t review or discuss the data on ethnic inequalities until late May, with the first comment not being issued until 4 June; the Ethnicity Subgroup of SAGE was not formed until September.

So two questions: can you share any insights as to why there was such delay in responsive action?

A. As I think I've referred to earlier, SAGE was being bombarded with requests for evidence from government and
it was government which largely determined the topics, certainly at that point in time, that SAGE was prioritising.

Q. And finally, in your second witness statement at paragraph 22, you explain you have been asked to comment on specific questions regarding considerations of vulnerable groups in modelling. You do not appear to have been instructed specifically to address ethnicity as a vulnerability. However, you were asked to address whether the public health response was sufficiently targeted at those who were most vulnerable. In your answer you refer to the elderly and those required to shield, but not specifically to ethnicity.

A. I mean, I think the -- the data is complex. A lot of the vulnerability of minority ethnic groups is associated with either occupational exposure or the higher prevalence of comorbid conditions, and so it counts -- those conditions, diabetes for instance, were -- meant that individuals with those conditions, regardless of ethnicity, were prioritised as vulnerable groups.

Q. So I can't give a simple answer, but just being of

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I didn’t encounter a government official, fellow scientist or clinical colleague who was not working flat out."
I think we’ve seen the proof of that in the timing of some of the emails. So thank you very much for all the work that you did during the pandemic, and your colleagues.

(The witness withdrew)

LADY HALLETT: 10 o’clock tomorrow, please.

(5.00 pm)

(The hearing adjourned until 10 am on Wednesday, 18 October 2023)
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