1 **Thursday, 12 October 2023**
2 **(10.00 am)**
3 **LADY HALLETT:** Mr Keating.
4 **MR KEATING:** My Lady, my Lady. May I call
5 Dr Stuart Wainwright, please.
6 **DR STUART WAINWRIGHT (affirmed)**
7 **Questions from COUNSEL TO THE INQUIRY**
8 **MR KEATING:** Thank you, and do sit down. Could you give
9 your full name, please.
10 **A.** I'm Stuart Wainwright.
11 **Q.** And it's Dr Stuart Wainwright, isn't that correct?
12 **A.** That's correct.
13 **Q.** And you're somebody who has got a long history in the
14 civil service. Am I right that you are a civil servant
15 rather than a scientist?
16 **A.** That's right. I was a civil --
17 **LADY HALLETT:** You can't be both?
18 **A.** So I was a civil servant for 20 years, recruited
19 originally as a science fast streamer.
20 **MR KEATING:** Can I invite you to keep your voice up, and
21 both of us will try to keep our voice up so that the
22 stenographer can hear us. Secondly, pace. There is
23 a stenographer who is recording what we are saying, so
24 between us if we could avoid speaking over each other
25 and pacing it accordingly. I may ask you to pause from

1 time to time really just to allow everyone to digest
2 your evidence and to allow the stenographer to capture
3 your evidence. Is that okay?
4 **A.** Of course.
5 **Q.** You provided two witness statements to the Inquiry,
6 which we're very grateful for. The first witness
7 statement is dated 23 August, we see that in the top
8 right of the screen, and if we go to page 30 of that
9 document, we see that you've signed that statement.
10 That's signed 23 August and it's the statement of truth,
11 and that's correct; is that the position?
12 **A.** It is correct.
13 **Q.** In relation to the second witness statement, that's
14 dated 31 August, so the following week, and we see it's
15 23 pages and at the last page, page 23, you again sign
16 the statement of truth.
17 **A.** That's correct.
18 **Q.** Thank you.
19 Turning briefly to your professional background and
20 really an overview of your evidence today,
21 Dr Wainwright, and perhaps if we could have your first
22 statement open at page 3, at paragraph 0.2. You're here
23 really as director of GO-Science, which we'll explain in
24 a moment, but in relation to your background, your
25 doctorate, is it right that we see at paragraph 0.3 that

1 you have a PhD in microbiology?
2 **A.** That's right.
3 **Q.** And a degree in genetics from the University of
4 Sheffield?
5 **A.** That's right.
6 **Q.** And you're also a policies fellow of the University of
7 Cambridge's Centre for Science and Policy. As you say,
8 that is scientific background.
9 **A.** Yeah.
10 **Q.** Then you joined the civil service, and you were civil
11 service for a number of years, and you set those out in
12 your statement at paragraph 0.4, a number of different
13 departments.
14 **A.** That's right.
15 **Q.** But perhaps of relevance is that you were in
16 the Cabinet Office?
17 **A.** Yes. I mean, I was a civil servant for 20 years in
18 a range of different organisations, and I guess the two
19 main things that I did in my career was roles relating
20 to the use of science and to resilience.
21 **Q.** In terms of resilience, whilst in the Cabinet Office,
22 you were on the Civil Contingencies Secretariat, CCS?
23 **A.** That's right, I was there twice, originally as a more
24 junior member of staff in around 2010 to 2012, and then
25 just before joining GO-Science for four years.

1 **Q.** So that would have been 2017 to -- or 2016 to --
2 **A.** 2015 to 2019, I think.
3 **Q.** Thank you.
4 You were involved in a number of significant
5 emergencies during that time?
6 **A.** That's correct. Quite a large number. Salisbury
7 poisonings, collapse of Carillion and Monarch, so quite
8 a range of incidents, yes.
9 **Q.** 2017, a pretty intense year, with a number of terrorist
10 attacks and the Grenfell Tower fire?
11 **A.** That's correct.
12 **Q.** Then you moved into preparing for Brexit?
13 **A.** That's right. The last year and a half in
14 Cabinet Office, my role changed to understand what
15 a no-deal Brexit might mean and to try to get
16 the country as prepared as it could be.
17 **Q.** Against that background of science, academia,
18 civil service, you joined GO-Science in December 2019?
19 **A.** That's right, the middle of December 2019.
20 **Q.** Probably hoping for a little bit more of a quieter life?
21 **A.** I -- it was supposed to be a more strategic role, but
22 of course then events took off and the great majority of
23 my time was on Covid for the first 18 months.
24 **Q.** In terms of your evidence today, the purpose of you
25 attending is, as you were the director of GO-Science, we

1 want you to help to explain to the public and those who
2 are here the scientific structures which SAGE was
3 involved in. So we want you to help us with
4 the systems, number one, and then after that part two
5 will be exploring some of the comments and criticisms
6 which were made about SAGE, its structures, its
7 composition, and to give you the opportunity to comment
8 upon those and consider lessons learnt.
9 A. Yeah.
10 Q. So in relation to part one, there is a sea of acronyms
11 involving SAGE, which we should, but perhaps won't, know
12 all of them.
13 A. Yeah.
14 Q. So our collective task is trying to make that a little
15 bit more --
16 A. Sure.
17 Q. -- digestible and accessible today.
18 So let's turn to GO-Science. Director of GO-Science
19 from December 2019 until June 2023?
20 A. That's right.
21 Q. What is GO-Science?
22 A. So GO-Science is a relatively small part of government,
23 technically it's just a directorate of what's now
24 the Department for Science, Innovation and Technology,
25 then it was Business, Energy and Industrial Strategy,

1 but it's kind of semi-independent from that department.
2 To be able to understand what GO-Science is, you
3 need to understand science and government more
4 generally.
5 Science is needed in almost every area of policy and
6 operations, and every government department or almost
7 every government department has their own chief
8 scientists and teams of scientists and agencies. Some
9 of those are very large, huge capabilities, such as MoD
10 or DEFRA, and some departments have much smaller
11 capabilities, and it's their job, the chief scientists
12 in those departments, to ensure that science is provided
13 to input to policy and operations in those departments
14 and made good use of.
15 GO-Science sits at the heart of government, really
16 to do two things and support the Government
17 Chief Scientist. At the time of the pandemic that was
18 Patrick Vallance, it's now Angela McLean. And the two
19 things that we do to support the GCSA, one is to produce
20 science advice to the heart of government, that's
21 Number 10, Cabinet Office and Treasury, on whatever they
22 need it on. It was Covid in this case but it might be
23 net zero or artificial intelligence, whatever the big
24 issue is of the day. And the second big mission is to
25 support all of government in doing science better. So

1 that meant we recruited chief scientists for
2 departments, we ran the science and engineering
3 profession across government, things like that.
4 Q. We can actually go to paragraph 1.1 of your statement
5 and you touch upon the Government Chief Scientific
6 Adviser, the GCSA the acronym --
7 A. That's right.
8 Q. That sets out there what his role is, which you've just
9 told us about, really, it's to provide scientific advice
10 to the Prime Minister and members of Cabinet, advising
11 the government on aspects of science or policy and
12 ensuring and improving the quality and use of scientific
13 advice and advice in government. The GCSA [the
14 Government Chief Scientific Adviser] ... reports to
15 the Cabinet Secretary."
16 Is that correct?
17 A. That's right.
18 Q. GO-Science's role, and your role, is really to --
19 largely to enable him or her to complete that task?
20 A. That's exactly right. So our role is to support
21 the Government Chief Scientist and my role was to help
22 sure that that happened and the organisation was well
23 run.
24 Q. Yes. If we turn over a page to page 6, at
25 paragraph 1.3, you talk about the two major missions of

1 GO-Science:
2 "... firstly: science advice mechanisms that are
3 efficient, effective, speak truth to power and are
4 embedded permanently in government systems; and
5 secondly, achieving visible impact through both
6 proactive and demand led science advice that is
7 relevant, excellent and delivered fit for purpose."
8 A. That's right.
9 Q. "Speak truth to power", that's something which you've
10 included in your statement as one of the major missions.
11 What do you mean by that?
12 A. So, I mean, the role of a civil servant generally is to
13 provide objective and impartial advice, and that's
14 absolutely right. For scientists, that becomes even
15 more so. In any area of policy or operations,
16 government is going to want to have an honest, accurate,
17 objective view of the science that it's needing to
18 contend with. So that's about providing truth, and
19 uncertainty as well, to those who need to make
20 decisions.
21 Q. You say truth and uncertainty. What do you mean by --
22 is science certain? That's probably a very deep
23 question, but you mentioned the word "uncertainty".
24 A. So science and indeed other forms of evidence is rarely
25 totally certain. I mean, you know, we know the world is

1 round now, okay, but rarely in these situations is
2 science totally certain. There's things that we know,
3 there's things that we know with some level of
4 confidence, things that we might think we know with
5 little confidence, and there's things that we just don't
6 know. And, you know, part of the role of scientific
7 committees and advisers and the officials that supports
8 them is to be able to present that coherent view of what
9 the science says, but also the level of certainty that
10 we have in what we're seeing and what we don't know.
11 **Q.** Let's move on to SAGE, a phrase which everybody is no
12 doubt familiar with.
13 **A.** Yeah.
14 **Q.** What does SAGE stand for?
15 **A.** So that stands for the Science Advisory Group (to
16 government) [in] Emergencies.
17 **Q.** We see at paragraph 2.3 overleaf that you describe this
18 as:
19 "... an ad hoc independent advisory group that is
20 convened to provide scientific advice to support
21 decision-making in COBR in the event of a national
22 emergency ... activated by the Cabinet Office or as
23 a 'pre-SAGE' on a precautionary basis by the GCSA."
24 **A.** Yeah.
25 **Q.** Is that a fair summary?

1 **A.** It is.
2 **Q.** It's perhaps obvious in the name, it's advisory?
3 **A.** That's exactly right. So it's an advisory committee to
4 COBR. There's a document, which I know you have, which
5 lays out what SAGE is and how it works. That's the --
6 it's a Cabinet Office publication, and that makes clear
7 that SAGE is an advisory committee to the
8 COBR committee. But of course COBR can set up a whole
9 range of different advisory committees on all sorts of
10 things.
11 **Q.** Yes, so in terms of composition of the SAGE group, you
12 say it's not a permanent body?
13 **A.** No.
14 **Q.** It has no standing membership. How would the membership
15 be selected for a certain emergency, and by whom?
16 **A.** So just as COBR's a very flexible mechanism, so is SAGE.
17 You need the expertise in the room for the situation at
18 hand. So, for example, SAGE was activated in
19 the eruptions of the Icelandic volcanos in the
20 early 2010s, so that was a totally different set of
21 people participating in the SAGE meetings than for
22 the pandemic.
23 So how those people are selected, there's usually
24 a starter standing roster for each major risk area of
25 the sort of experts we might turn to, and those get

1 regularly reviewed, but at the start of an event, we'd
2 liaise with the Government Chief Scientist and any other
3 major relevant chief scientist, the Chief Medical
4 Officer in this case, to add to that list, and that
5 would be the starter list. But as situations evolve you
6 might need more scientific advice.
7 I would say usually round that table is
8 a combination of roughly two sorts of people: scientists
9 from within government and its technical agencies, so in
10 this case PHE, and external academics. Usually a mix of
11 those. Sometimes you have industry scientists for other
12 risks as well.
13 **Q.** Thank you. Could I invite you just to slow down
14 a little bit more?
15 **A.** My apologies.
16 **Q.** Not at all, not at all.
17 In terms of SAGE itself, in its current structure,
18 it's been mobilised nine times since 2009; is that
19 correct?
20 **A.** That's correct.
21 **Q.** And different structures before 2009 had been activated
22 for the BSE, mad cow disease, and other incidents such
23 as swine flu in 2009?
24 **A.** That's correct.
25 **Q.** Okay.

1 SAGE, as you say, doesn't advise, it doesn't make
2 decisions or set policy; is that correct?
3 **A.** That's correct.
4 **Q.** Is that an important distinction?
5 **A.** Very much so. I mean, it's -- I mean, in any situation,
6 but particularly some kind of national crisis, there's
7 very tough decisions that have to be made, and we live
8 in a democracy so it's right that our policy
9 decision-makers make those choices reflective of how
10 society feels. To do that they need to take account of
11 a wide range of evidence. Some of that is science, so
12 this is just about providing science advice. But then
13 the decisions are made by ministers.
14 **Q.** One input into central government decision-making?
15 **A.** That's right.
16 **Q.** In relation to "consensus advice", that's a term you
17 use, and that's at paragraph 2.1, you mention that:
18 "It brings together a range of experts and delivers
19 consensus advice in the form of minutes."
20 **A.** Yeah.
21 **Q.** So the vehicle for the advice, in writing, are the
22 minutes, that's quite important; correct?
23 **A.** That's right.
24 **Q.** And "consensus advice", what does that mean?
25 **A.** So in a rapidly evolving situation, you bring together

1 a range of scientists from different disciplines, and
2 they'll bring to bear what they know, what they don't
3 know, what we're relatively certain about, what we're
4 uncertain about, and the SAGE meetings allow them to
5 bring together that -- all the evidence and the science
6 that they do understand and also what they don't, and
7 the minutes have to try to capture that consensus view
8 that emerges, that the chair in the meetings will
9 usually try to sum up after each agenda item what they
10 think they've heard and what the consensus is, and if
11 people disagree with that at the time, then they can --
12 we'll talk about it more, and then he'll try to replay
13 what the consensus is.
14 The minutes are the formal representation of that
15 consensus that emerged from the meetings, so they should
16 say what the science says, certainty levels, but also
17 what we don't know as well.
18 **Q.** Is there any downside to this process of having just
19 consensus advice formulated within the minutes?
20 **A.** I don't think so. So as well as the minutes, of course,
21 the GCSA and, in this case, the CMO will also have been
22 giving advice orally to ministers on the back of that
23 advice, very much using the written advice as the
24 anchor. I mean, the written advice, it has to be done
25 at pace and speed. I mean, if I compare this to a very

1 different world, so the world of climate change, where
2 you have the international panel on climate change,
3 which also works through consensus statements, but it
4 can take months and years to produce that consensus. In
5 this situation, we don't have months and years, we have
6 hours. So they are written at speed.
7 **Q.** So consensus at speed?
8 **A.** You've got it.
9 **Q.** But is there a downside, in a sense, that contrarian
10 views are significant but minority views might be
11 excluded from what's reduced to writing?
12 **A.** Potentially. I mean, it's not so much views. The --
13 within a SAGE meeting, you'll have different
14 perspectives on the evidence, and in early stages people
15 will have different evidence and data to hand, because
16 it's so fast-moving. You might get different views on
17 how to interpret that. If that's the case, we try to
18 reflect that difference of interpretation in the minutes
19 as best we can. I mean, it's possible we may not always
20 have got that entirely right. Although we never -- very
21 rarely would we send round the minutes for active
22 comment. After they had been issued to attendees and to
23 Cabinet Office as well, occasionally some of the
24 participants might come back and say, "Actually I think
25 you need to tweak this part", and we would.

1 **Q.** You mentioned that GO-Science is at the heart of
2 government, but also is that -- in terms of the source
3 of government scientific advice, is SAGE the only source
4 of government scientific advice in an emergency?
5 **A.** No, not at all. And as I explained earlier, every
6 government department or most government departments
7 have their own chief scientist, teams of scientists.
8 Some of them have huge scientific agencies.
9 **Q.** Yes.
10 **A.** The Met Office or Environment Agency or, in this case,
11 Public Health England, and very often in emergencies,
12 SAGE isn't needed. So if I take the example of floods,
13 you've got two highly technical agencies in the mix, the
14 Environment Agency and the Met Office. Most floods
15 happen, they need an awful lot of science, but there's
16 no role for SAGE usually, unless something unusual has
17 happened. So the only time SAGE, in my recollection,
18 has been activated for a flood is twice. One was when
19 the Somerset levels refused to drain, so that was
20 unusual, and the second was when the Toddbrook Dam was
21 at risk, and again that was unusual, but mostly the
22 government can rely on its good scientific technical
23 agencies for that particular risk.
24 **Q.** So SAGE is not automatic?
25 **A.** No.

1 **Q.** It's something to be activated.
2 So let's turn to SAGE during the pandemic, a number
3 of meetings, we know. And you've set this out at
4 paragraph 2.6, that SAGE was internally mobilised on
5 3 January?
6 **A.** Yeah.
7 **Q.** And the first SAGE meeting was on 22 January 2020; is
8 that correct?
9 **A.** That's correct.
10 **Q.** We see also at paragraph 2.5, going back, that SAGE met
11 105 times from January 2020 to February 2022, and that's
12 the longest continual period for which it had been
13 convened since its inception?
14 **A.** Yes, by a very long way.
15 **Q.** In terms of the volume of work, and it's tucked away in
16 that paragraph there, over 1,200 papers were produced or
17 considered by SAGE by April 2022, so a huge amount of
18 work was done?
19 **A.** That is correct, yeah.
20 **Q.** It's fair to say this was an unprecedented time for
21 GO-Science, and the team, which you led, supporting
22 SAGE; is that correct?
23 **A.** That is correct. And we were a very small organisation
24 going into this, 60 people in total. SAGE team was
25 five people, as I recall. By the end of April we had

1 I think around 80 people just working on SAGE, 24/7.
2 I think it's -- I'd just like to say here that,
3 I mean, what really formed SAGE was two sets of people:
4 huge numbers of academics, I think almost 200 in total,
5 who gave their time for free, and then officials from
6 within GO-Science, across government, and many of the
7 government science agencies, who joined us, again to
8 give up their time. And I want to say a huge thank you
9 to both groups of people, and in particular the
10 independent scientists, who gave their time for free.
11 **Q.** In relation to what you say, that the SAGE group, in
12 terms of secretariat, there was a massive scaling up in
13 relation to that?
14 **A.** It was, we had to grow very quickly in just a month or
15 two.
16 **Q.** Drawing upon other colleagues in other departments in
17 the civil service?
18 **A.** So really four routes. We switched off most of what
19 GO-Science did elsewhere and steered most of our staff
20 towards it. There was a cross-government mechanism for
21 getting staff from elsewhere in place that we got some
22 people from, but it quickly ran out. We brought in
23 a lot of mid-career academics, including some who worked
24 with some of the SAGE participants, and then the biggest
25 cohort was we put out a call to -- there was also

1 science fast streamers, but the biggest cohort was from
2 science government agencies, so Met Office, Dstl, and
3 particularly the Environment Agency, who gave us
4 an awful lot of people. So they just came to our help
5 and I can't think them enough.
6 **Q.** In terms of the composition, we see at paragraph 2.6
7 that the GCSA, the chief scientific officer, and
8 the CMO, the Chief Medical Officer, assembled a group of
9 experts from key disciplines --
10 **A.** Yeah.
11 **Q.** -- particularly medicine, public health, epidemiology,
12 virology and behavioural science; is that correct?
13 **A.** That's correct.
14 **Q.** What role did the Chief Medical Officer have in SAGE?
15 Was he originally meant to be involved in SAGE? Was
16 that something in the original parameters, or was he
17 brought in?
18 **A.** No, he was always involved, right from the start, and
19 the working assumption is that for a health emergency
20 the CMO is the co-chair. I mean, in effect,
21 Patrick Vallance acted primarily as the chair in most of
22 the meetings. Chris would be a very sort of active --
23 Chris Whitty, sorry -- participant in support of him.
24 There were occasions when Chris Whitty would take on the
25 sort of full chairing role as well.

1 **Q.** In terms of the members, you mentioned, you've touched
2 upon that there were SAGE members, experts in
3 the field --
4 **A.** Yeah.
5 **Q.** -- both within government, other departments, and also
6 outside government, and that the latter group were doing
7 this pro bono, this was a public service for free?
8 **A.** That's exactly right. As things went on for a long
9 time, for some of them, I think it was in the autumn of
10 2020, we paid their universities to be able to backfill
11 their roles, because they didn't have time to do their
12 teaching duties, so we paid for their teaching duties to
13 be covered by others, some of them.
14 **Q.** The workload, without labouring this too much, in
15 relation to those SAGE members, they were working
16 all day, evenings, weekends; is that fair?
17 **A.** It was incredibly hard for everybody. I mean,
18 the pandemic had an absolutely huge effect on everyone,
19 and I just want to acknowledge the grief of the families
20 who are here today, and all of the awful sort of impacts
21 that happened to the people that you know. It affected
22 all of us in absolutely terrible ways, and I greatly
23 respect your bravery in bringing this all to light.
24 For our people working on this, yes, the academics
25 and the officials, it was very long hours, very long

1 days, for months on end.
2 **Q.** If I could move on to paragraph 2.13, on page 12, you
3 mention that as the pandemic response grew, an official
4 from each department was invited to attend SAGE, and
5 there was:
6 "... other departmental officials ...
7 Cabinet Office, DHSC, HM Treasury ... and No 10 attended
8 as observers to allow them to hear the discussion
9 directly, to feed in any required policy perspectives
10 and to ask questions."
11 You mention that they did not contribute
12 to scientific advice, that this is normal practice.
13 I just want to hone in on the part of that passage
14 where you say that they would feed in any required
15 policy perspectives. What do you mean by that?
16 **A.** So, this is good practice for science advisory
17 committees generally. Government operates a huge range
18 of policy advisory committees, SAGE is just one for
19 emergencies. Officials like this I think need to attend
20 for two reasons. One, in case they need to provide that
21 context as to what the policy challenges are, what are
22 the issues that they think the government is contending
23 with and struggling with, and that can help with what
24 sorts of science advice might need to be provided. But
25 if we take -- SAGE commissions itself foremost in two

1 ways, it gets commissioned in two ways. The first is
2 that it will get asked things by the policy customers,
3 Cabinet Office and, in this case, Department of Health,
4 but it also self-tasks: what it considers to be
5 the scientific challenges and questions it tasks itself.
6 But for these sorts of officials, it's good for them to
7 be there to frame what they think the policy challenges
8 are, that helps the committee, but also it's good for
9 them to hear the discussion, you know. So then when
10 they are back trying to weave together, as should happen
11 in the best of times, different forms of advice, they
12 have a better understanding of what the scientists are
13 actually saying.
14 **Q.** Thank you.
15 **LADY HALLETT:** So I think it's both reactive and proactive?
16 I think I've heard other witnesses suggest it was only
17 reactive to questions it's posed.
18 **A.** It was mainly reactive, but at the start you might ask,
19 for example, if there was, you know, a particular item
20 on -- I don't know, say, in the autumn, you know, on
21 sort of, you know, should we have another lockdown or
22 NPIs or whatever, they might be asked at the start of
23 the agenda item: Could you give us a sense,
24 Cabinet Office representative, of what's the policy
25 challenges at the moment. That would sometimes happen.

1 **MR KEATING:** I'm going to revisit this topic in part two,
2 when we discuss strategic direction and whether there
3 was sufficient strategic direction.
4 **A.** Yeah.
5 **Q.** Let's move on to structure, and in terms of structure
6 there was SAGE and there was a number of subgroups, and
7 perhaps we can bring up a brief organogram which might
8 assist in relation to that. That's INQ -- we have it
9 just there, thank you very much.
10 You mentioned in your evidence, in your statements,
11 that some pre-existing specialist groups of experts were
12 called upon, and that includes, I'm going to use
13 the acronym first, SPI-M. We see that tucked away
14 there, I hope. Is SPI-M on the list? Right in front of
15 me.
16 **A.** They are.
17 **Q.** So Scientific Pandemic Insight Group on Modelling? So
18 there was a pre-existing group in relation to that; is
19 that correct?
20 **A.** That's correct.
21 **Q.** And that was activated. What was the role, briefly, of
22 SPI-M, just to assist a member of the public to
23 understand what SPI-M did?
24 **A.** So SPI-M is a committee that stands all the time that
25 the Department of Health run, and it advises them on --

1 it provides modelling of potential diseases. When some
2 kind of disease, significant disease outbreak is coming,
3 the SPI-M-O, which I think stands for operations --
4 **Q.** Correct.
5 **A.** -- gets activated by the Department of Health and
6 provides sort of rapid modelling for the Department of
7 Health and PHE.
8 **Q.** This became a subgroup of SAGE in January 2020?
9 **A.** That's correct.
10 **Q.** Am I correct in understanding the chairs were
11 Professor Edmunds and Professor Angela McLean?
12 **A.** Yes, so originally it was just -- no, it wasn't
13 Professor Edmunds, it was Graham Medley, the chair.
14 **Q.** Yes.
15 **A.** Angela got made co-chair I think sometime in March.
16 **Q.** Next acronym, which was a pre-existing subgroup,
17 NERVTAG?
18 **A.** That's right.
19 **Q.** We see that in front of us. So NERVTAG means New and
20 Emerging Respiratory Virus Threats Advisory Group.
21 Perhaps we can see why it's called NERVTAG?
22 **A.** That's right.
23 **Q.** Again, what was the role of NERVTAG?
24 **A.** So, again, another existing group that meets anyway,
25 I think it's actually a statutory group, and run by the

1 Department of Health and PHE, now UK Health Security
2 Agency, and this provides not just modelling advice but
3 they have virologists and geneticists and various kinds
4 to advise on a wide range of emerging respiratory
5 viruses.
6 **Q.** Am I right in understanding that Professor Horby was
7 the chair?
8 **A.** That's correct.
9 **Q.** Yes. There was a number of other subgroups which were
10 set up by SAGE. You'll be pleased to know I'm not going
11 to ask you about every single one of those. I'm going
12 to touch upon some of those, please.
13 Let's, as a general point, why were other subgroups
14 set up?
15 **A.** First of all I'd say that not all of these groups here
16 were set up by SAGE, so some of them were set up
17 elsewhere, but -- and they were doing their own jobs,
18 but SAGE would draw on their expertise and what they
19 were doing.
20 So CO-CIN, at the bottom left, the PHE Serology
21 Working Group, were set up independently but we made use
22 of them anyway.
23 But subgroups, as the pandemic grew, and the needs
24 of government to understand what was happening, and as
25 more data and science emerged -- I mean, remember in

1 January we knew next to nothing, but as, gradually, more
2 data, more science emerged, you could make more sense of
3 things.
4 Q. Would it help if I went through a few examples?
5 A. Please.
6 Q. It might help. So we've got general -- you've made
7 a distinction that some were set up elsewhere but would
8 feed in?
9 A. That's right.
10 Q. And then some were set up as a result of the needs of
11 government, and let's go to three examples --
12 A. Please.
13 Q. -- which we'll hear evidence about this week and
14 next week.
15 A. Excellent.
16 Q. SPI-B, which is on that list as well, B being
17 the significant word, behaviours, the Scientific
18 Pandemic Insights Group on Behaviours?
19 A. Yeah.
20 Q. What was the role of SPI-B?
21 A. So SPI-B had been activated, I understand, in the --
22 during swine flu, and had been run by the Department of
23 Health, but we took this on here and it really is to
24 bring together a wide range of social scientists to
25 provide that social science and behavioural advice to

1 government, so an understanding of how different groups
2 might react, and hopefully to aid communication.
3 So particularly as advice got steered towards
4 non-pharmaceutical interventions as well as public
5 health, and epidemiology being important, you need to
6 understand how people are going to react as well.
7 Q. So to summarise the evidence in your statement and to
8 assist you, we don't need to turn to it, but you mention
9 in your second statement, at paragraph 1.9, that:
10 "... behavioural and social science was recognised
11 as an important component of the overall scientific
12 understanding and advice during the pandemic response."
13 And we will hear from --
14 A. Yeah.
15 Q. -- the cochairs, Professors Rubin and Yardley shortly,
16 and you said that SAGE discussions included behavioural
17 science advice throughout the period when SAGE was
18 active, and in fact Professor Rubin attended the first
19 SAGE meeting in January 2020 --
20 A. That's right.
21 Q. -- and subsequent meetings.
22 SPI-B, the subgroup, the SAGE subgroup, was set up
23 formally on 4 February 2020 to provide independent
24 expert advice?
25 A. That's right.

1 Q. In relation to behavioural advice provided to
2 government, to your knowledge, was SPI-B the only source
3 of that type of scientific advice?
4 A. No, I don't think it was. There's a lot of social
5 scientists within different departments in government,
6 PHE, Department of Health, Cabinet Office, all had
7 social scientists, and in particular Cabinet Office also
8 had the Behavioural Insights Team, who also were
9 providing advice, but those organisations would come and
10 input to SPI-B, but I imagine many of them were
11 providing advice themselves.
12 Q. The Behavioural Insights Team was led by
13 Professor David Halpern; is that correct?
14 A. That's correct.
15 Q. We'll be hearing from him later on in this module.
16 The next group is the Ethnicity Subgroup, and in
17 fact we've already heard from the chair of that group.
18 A. Yeah.
19 Q. Professor Khunti gave evidence yesterday. That was set
20 up on 22 August 2020; is that correct?
21 A. That's correct.
22 Q. Perhaps we can bring up your second statement at
23 paragraph 2.40, please, dealing with the question of
24 those from ethnic groups and the impact of Covid on
25 them.

1 So if you look at paragraph 2.40 on page 18, please,
2 you mention that:
3 "The understanding of the impact of [Covid] on
4 at risk and vulnerable groups developed through the
5 pandemic, and was considered frequently by SAGE."
6 And you add:
7 "Some groups were at increased risk of
8 infection ..."
9 You talk about:
10 "... employment-related exposure; others were at
11 increased risk of poor outcomes (hospitalisation and
12 death) or Long Covid once infected ..."
13 And you talk about the "mix" of reasons why that
14 was.
15 You also mention at 2.42 that CO-CIN -- and that was
16 one of the subgroups you mentioned that fed in to
17 SAGE -- and this is data -- that was established in
18 February 2020, and that catalogued data from
19 laboratory-confirmed cases of Covid admitted to
20 UK hospitals. And that data indicated increased
21 mortality in black ethnic groups compared to white
22 ethnic groups in April 2020.
23 Is that right?
24 A. That's correct.
25 Q. You probably are aware from the wider material that

1 there was a Public Health England report published in
2 June 2020 about the impact of Covid on BME groups?
3 **A.** Yeah.
4 **Q.** And there was an updated report in August 2020 regarding
5 the disparities in risk and outcomes in Covid-19.
6 So drawing that background together, we've got
7 the data in February 2020, we've got the PHE report in
8 June 2020, update in August 2020.
9 What do you say to the suggestion that the Ethnicity
10 Subgroup should have been set up before August 2020?
11 **A.** I don't think I'd agree with that. A consideration of
12 BME and, indeed, impacts on any underrepresented group
13 is incredibly important. And Patrick Vallance's
14 statement for Module 2 lays out very clearly sort of
15 over several pages sort of when SAGE looks at issues to
16 do with different groups, right back to early February.
17 I mean, what this shows to me is that the NHS, PHE
18 were considering these issues and trying to build them
19 into their work. It was only as we got into later in
20 the summer that there was enough information for SAGE to
21 form a subgroup to look at this. There might be value
22 in considering setting up these kinds of things earlier.
23 I guess the challenge is: would a greater focus from
24 SAGE or another group earlier have led to greater
25 interrogation of the data? Maybe so, but data was

1 light.
2 So I think that is something to reflect on, and
3 within the system across science advice, whether it's DH
4 or PHE or SAGE, maybe there should have been some
5 earlier consideration there. But SAGE wasn't really
6 asked to get involved with this until that time.
7 **Q.** So just unpacking that, there was a lot in there, so
8 SAGE wasn't asked to look at the impacts --
9 **A.** No.
10 **Q.** -- on ethnic groups before August 2020, number one, and
11 in reflecting upon it you think that perhaps there would
12 have been benefit if there was earlier focus on it?
13 **A.** So SAGE did provide advice earlier on this issue,
14 you know, and Patrick's statement lays this out and
15 there's quite clearly an example of April there.
16 I don't know the extent to which PHE and CO-CIN or
17 others were -- how much they were investigating
18 ethnicity before this, but I think there probably is
19 a lesson around: across that consideration of public
20 health and science and statistical information, was the
21 right focus brought early enough? I think is
22 a reasonable question.
23 **Q.** And the last point, just to unpack on those series of
24 answers, is data. You mentioned that maybe there wasn't
25 sufficient data, in your view, which allowed the focus

1 that you think perhaps should have been placed?
2 **A.** Data generally was a real challenge, particularly for
3 the first year, I would say, of the pandemic. I mean,
4 as, you know, has been, I think, well documented in
5 Module 1, you know, there were not the surveillance
6 systems in place going into this, so the ability to
7 gather data in the first place was highly limited early
8 on. And then the ability to share data across the NHS
9 and PHE and then with academics was also very limited,
10 and that extended to any data relating to ethnicity, and
11 everything else.
12 So data sharing, or data gathering and then sharing
13 were real challenges that hampered the ability of
14 scientists to research and understand.
15 **Q.** Just dealing with that last point about data sharing,
16 it's been commented in other publications that SAGE in
17 particular had difficulties with receiving data from
18 intergovernment departments --
19 **A.** Yeah.
20 **Q.** -- right up until May or June 2020. Was that the
21 position?
22 **A.** Yes, that's correct, and I think Ian Diamond spoke very
23 well about the challenges in that, and some of the
24 potential solutions, earlier this week.
25 **Q.** Final group, subgroup, I would like your assistance

1 upon, because we're going to hear from a member who was
2 on that group, is Environmental Modelling Group,
3 the EMG, which included in itself a subgroup, so
4 a subgroup of the subgroup, the transmission working
5 group.
6 **A.** Yes.
7 **Q.** So we've got the EMG, the Environmental Modelling Group,
8 was established in April 2020, and that was to provide
9 science advice and modes of transmission?
10 **A.** Yeah.
11 **Q.** Is that correct?
12 **A.** That's correct.
13 **Q.** And the EMG transmission subgroup was established in
14 January 2021, and you mention in your statement, we
15 don't need to turn to it, that that was to examine
16 further the evidence around transmission in real world
17 settings --
18 **A.** Yeah.
19 **Q.** -- including where transmission was happening. What
20 does that mean?
21 **A.** So as -- by that point the data and the evidence that we
22 had, we had more data around how the virus was moving in
23 real world settings like, for example, workplaces or
24 public transport or hairdressers, whatever. All these
25 things matter quite a lot, because it's where people

1 tend to meet. So by this stage quite a lot more science
2 and evidence was emerging, so a subgroup was set up to
3 make more sense of that emerging science and data and to
4 be able to help inform more advice.
5 **Q.** So January 2021 we were in the third lockdown?
6 **A.** Yeah.
7 **Q.** January 2021.
8 **A.** Yeah.
9 **Q.** Was the work of the EMG transmission subgroup there to
10 inform the relaxation of the lockdown and the pathway
11 out of lockdown 3?
12 **A.** I've struggled to recall, if I'm honest, on that.
13 I don't think we'd have framed it in that way. I think
14 it would have been more: look, there's more science and
15 data, there's obviously a range of NPIs under way in the
16 country, so let's make sense of the science and data
17 that's emerged and try to provide policymakers with
18 a clearer sense of what it says.
19 **Q.** We went through a number of the subgroups, we in fact
20 touched upon Long Covid when we were talking about the
21 impact on certain groups?
22 **A.** Yeah.
23 **Q.** But we will see there wasn't a subgroup for Long Covid.
24 Was one set up in relation to Long Covid?
25 **A.** Not to my knowledge, no. I mean, I'd presume that that

1 was set up within the Department of Health, and PHE have
2 focused on that. I hone in a little bit on the name,
3 Science Advisory Group for Emergencies, it's supposed to
4 be a short-term mechanism, but I would have expected
5 Long Covid to be covered through the Department of
6 Health and PHE.
7 **Q.** But from your perspective, as chief executive of
8 GO-Science for SAGE, which was operational for the
9 longest it's ever been --
10 **A.** Yeah.
11 **Q.** -- there wasn't a Long Covid subgroup set up during that
12 two-year period?
13 **A.** No.
14 **Q.** Was GO-Science asked to consider the risk and advise
15 the risk and impact on those who had Long Covid during
16 your time there?
17 **A.** I don't recall. We would need to go back and check
18 the records.
19 **Q.** Okay.
20 I'm going to move on now to another topic in part A,
21 which is advice. You've touched upon this already,
22 about how scientific advice was sought -- "commissioned"
23 is your word for it; correct?
24 **A.** That's correct.
25 **Q.** And that would normally come from -- it's at

1 paragraph 2.19 of your first statement -- the
2 Cabinet Office --
3 **A.** Yeah.
4 **Q.** -- via COBR?
5 **A.** That's correct.
6 **Q.** Is that correct? That was the primary commissioner.
7 And in due course that evolved, did it not, with -- it
8 perhaps came from the Covid Taskforce in the autumn
9 of 2020?
10 **A.** That's correct.
11 **Q.** In terms of how advice was provided to ministers, is it
12 right that it was two-fold. First of all, the minutes,
13 which we have already dealt with, significance?
14 **A.** That's correct.
15 **Q.** And secondly, advice from the Government Chief
16 Scientific Adviser and the Chief Medical Officer?
17 **A.** Yes. When they were presenting orally to ministers.
18 **Q.** Yes.
19 **A.** Yep.
20 **Q.** So it's that combination of oral advice combined with
21 the underlying written material which is set out in the
22 minutes?
23 **A.** That's exactly right.
24 **Q.** We talked about confidence in terms of minutes. It's
25 right, isn't it, that degrees of confidence in advice

1 such as high, medium and low were introduced and
2 included in minutes? Was it the case that there wasn't
3 at the outset that that --
4 **A.** Erm.
5 **Q.** -- degree of confidence was included but it was --
6 by SAGE 4, 4 February, it was added?
7 **A.** That's correct. I think earlier we might have tried to
8 reflect it just generally in the drafting of
9 the minutes, but we moved to that more formal grading at
10 that point.
11 **Q.** So advice would include that level of confidence --
12 **A.** Yeah.
13 **Q.** -- high, medium and low as we touched upon.
14 Publication of advice and analysis. Perhaps we
15 could turn to your statement in relation to this at
16 paragraph 2.32, page 15.
17 I can summarise that as we're waiting to bring it
18 up. In previous emergencies SAGE minutes normally were
19 not published at the time of the crisis --
20 **A.** Yeah.
21 **Q.** -- but they would follow on once the crisis or emergency
22 had concluded; is that correct?
23 **A.** That's correct.
24 **Q.** That was normal. It wasn't exclusively the position but
25 that was normally the way forward?

1 A. That's correct, yeah.
2 Q. In relation to the pandemic, you've mentioned at
3 paragraph 2.33 that a batch of SAGE papers was published
4 on 20 March on GOV.UK, and then on 30 March, so there
5 was initial papers were published on 20 and 30 March?
6 A. Yeah.
7 Q. Then in due course you mention at 2.35 that all
8 the meeting minutes were published by 29 May 2020?
9 A. That's correct.
10 Q. The topic of transparency and providing those minutes
11 has been subject to a lot of public debate --
12 A. Yeah.
13 Q. -- and there's been questions as to whether it was
14 right, two months after the first lockdown, for those
15 minutes, and the participants, to be published. So
16 a couple of questions against that backdrop.
17 A. Sure.
18 Q. First of all, who decided that the minutes and
19 participants should have been, would be published?
20 A. So that will have been Cabinet Office and Number 10 who
21 decided. The recommendation from the Government
22 Chief Scientist and ourselves was to publish.
23 Q. Was there any initial resistance from government as to
24 publishing the advice?
25 A. I'm not sure I'd regard it as resistance. It was right

1 to publish, and I think it was right to publish for two
2 reasons.
3 Firstly, this was an event that was affecting
4 everybody, and so it's right in a situation like that,
5 in my view, to be transparent about the decisions on
6 which decisions are being made.
7 The second reason, which is more to do with science,
8 is that scientists -- it's a great quality -- like to
9 challenge and engage in debate, and they can more
10 readily engage in that if you publish the SAGE minutes
11 and the associated papers.
12 I think there were three problems with publishing,
13 though, we were worried about, all of which came to
14 pass, all of which relate to: if you only publish
15 the SAGE minutes and not anything else within
16 government.
17 So the first is that we were concerned that it would
18 lead to greater abuse of the scientists who were
19 supporting us. And it did. So we had to put in place
20 a lot of mechanisms to support them. The second
21 challenge, in our mind, which I think also came to pass,
22 is that it would lead to an unbalanced understanding,
23 and debate, in Parliament and the media. They were only
24 seeing one form of advice -- they were not seeing
25 economics or operational or policy advice, they were

1 only seeing one form of advice. And I think that did
2 have a negative impact.
3 The third reason is that it reduced the amount of
4 time that policy and decision-makers had to make
5 decisions. Now, they managed that, but at times that
6 felt -- I imagine that felt challenging for them.
7 So it was the right thing to publish, and that was
8 the right thing, but there were challenges, as I've just
9 outlined, and I think all of those problems came to
10 pass, and hopefully that's some lessons that can be
11 learned for the future.
12 Q. So it was transparency but at a cost?
13 A. Yes, but it was the right thing to do, but there should
14 have been more transparency on other forms of advice.
15 Q. One of the issues is to ensure there is a safe space for
16 scientific debate and advice to take place?
17 A. Yeah. And, I mean, I'm very sorry to all of our
18 SAGE participants who received abuse. It affected a lot
19 of them, to a very large extent. And some of them
20 you'll be interviewing and I hope they're honest about
21 that. I worry that this situation may have put off
22 other academics from coming forward to help government
23 in future.
24 So GO-Science put in place a great use of
25 arrangements around comms support, wellbeing support,

1 counselling, security advice and support, which felt
2 like we should never have really have had to do them,
3 but we had to provide that. I think in future events
4 that might be something that the whole of government
5 might want to think about, how it can provide that more
6 fully for these amazing experts who are giving their
7 time for free.
8 Q. In terms of advice, one tangential point I just want
9 your assistance upon is this: we have members who are in
10 the subgroup, we have members in the SAGE group, and we
11 know that the vanguard of that is the Chief Scientific
12 Adviser and chief medical adviser giving that advice to
13 politicians. What do you say to the complaints by those
14 on the subgroup, or even on SAGE, that they never really
15 knew how their advice was considered or flowed into
16 decision-making?
17 A. I understand their concerns, and I think it -- we could
18 have been better, at times, at -- sorry, we and
19 Cabinet Office could have been better at times at
20 communicating things back to them. That did get better
21 in the autumn of 2020, once Cabinet Office had
22 a stronger analytical unit, who really helped engaging
23 the experts on that.
24 But I think those concerns from a lot of our experts
25 were heightened because the SAGE advice was very public

1 and that was clear what was going on, but nothing else
2 was. So although the SAGE advice was public, the other
3 forms of advice, the basis on which decisions were
4 taken, was not. So as an expert on a SAGE committee
5 you're left in a situation where your advice is public,
6 but then a different decision is made, not apparently in
7 line with that, and they're left understanding -
8 thinking, "Well, why?" They were not able to see that
9 because nothing else was published.
10 **MR KEATING:** Thank you.
11 **LADY HALLETT:** Can I just go back to the point about the
12 dreadful abuse of people who, as you say, gave their
13 time, and a great deal of time, free to try to serve the
14 public.
15 Is one possible answer revealing the nature of
16 the speciality of the scientific advisers without naming
17 them, or does that not meet the test of openness?
18 **A.** That could be one way to go. That could be a way to go.
19 I was surprised -- maybe they think differently
20 individually, but when we did ask the SAGE participants
21 "Are you happy to be named?" they all said yes --
22 **LADY HALLETT:** They didn't know what was going to come.
23 **A.** Yeah, maybe so. I also think you'd have different views
24 on that. I mean, people are different, you know, and
25 some people have got thicker skins than others. I mean,

1 that could be a good way to go. I think that might be
2 right.
3 **MR KEATING:** I mentioned that the Chief Scientific Adviser
4 and the Chief Medical Officer were at the vanguard of
5 advice at central government, especially that oral
6 advice, and it's right, isn't it, they attended numerous
7 key meetings?
8 **A.** Yeah.
9 **Q.** You've summarised these in your statement, and perhaps
10 I could do that here.
11 **A.** Yeah.
12 **Q.** The Cabinet, they would attend Cabinet meetings --
13 **A.** Yeah.
14 **Q.** -- on occasion, by invitation; COBR meetings; and the
15 various ministerial implementation groups, the MIGs,
16 which we'll hear about in due course --
17 **A.** Yeah.
18 **Q.** -- which was one of the structures for decision-making
19 which was implemented --
20 **A.** Yeah.
21 **Q.** -- in April/May 2020, and they were succeeded by
22 something called Covid-O and Covid-S, Covid-O for
23 operations and Covid-S, strategy, they were the new
24 structures which were brought in, and again they
25 attended those --

1 **A.** Yeah.
2 **Q.** -- and provided advice. Then there was regular updates
3 or meetings, bilateral meetings with the Prime Minister
4 on occasion, or at Prime Ministerial dashboard meetings
5 which took place on certain mornings --
6 **A.** Yeah.
7 **Q.** -- in Downing Street, and also at quad meetings, which
8 would be the meetings involving the Prime Minister,
9 Chancellor, Health Secretary and the Chancellor of
10 the Duchy of Lancaster?
11 **A.** Yeah.
12 **Q.** So in terms of that vanguard, they would attend multiple
13 key decision-making meetings and provide that advice?
14 **A.** Yeah. That's correct.
15 **Q.** In terms of other areas of work which were undertaken,
16 and a huge amount of work was undertaken, but you
17 mention sometimes that there was other entities which --
18 or organisations which SAGE would call upon, and
19 an example perhaps of this is the Academy of Medical
20 Sciences, AMS, and they were commissioned to prepare
21 a report, *"Preparing for a challenging winter 2020/21"*?
22 **A.** Yeah.
23 **Q.** And that was published in July 2020, and they did the
24 same for the next winter?
25 **A.** Yeah.

1 **Q.** What was the rationale upon commissioning the academy to
2 do that work and to publish that report?
3 **A.** So we made -- we have -- GO-Science always has a good
4 relationship with all the scientific academies, and
5 particularly the four main ones, the Academy of Medical
6 Sciences, the Royal Society, the Royal Academy of
7 Engineering and the British Academy, and they, like
8 the rest of the scientific community, were keen to help
9 with the national effort.
10 In this case, of AMS, it was felt, look, with
11 the networks they've got of the best medical scientists
12 in the UK, SAGE is still embroiled in the -- sort of
13 very much the day-to-day advice that's needed, we asked
14 AMS to look a bit longer term and work with its members
15 to produce an independent report on this. Which they
16 did, and then, you're right, in a subsequent year.
17 So this was that a great example of the wider
18 academic community working to produce a slightly longer
19 looking report than SAGE would have been able to at that
20 point.
21 **Q.** It wasn't the longest period to be horizon scanning
22 for --
23 **A.** No.
24 **Q.** -- but it was really there to try to assist, was it,
25 decision-makers in terms of considering the issues?

1 **A.** That's correct.
2 **Q.** Were these reports, to your knowledge, highlighted to
3 governments and key decision-makers?
4 **A.** Yes. So I recall that for a range of these from
5 the large academies when they came out we would
6 communicate them within government, say: look, go look
7 at this report that's been produced.
8 For some of them we may have offered teachings on
9 them and arranged for the academies to speak to
10 policymakers. I can't recall if that one happened with
11 this one or not, but generally we tried to make sure
12 that they were known, but to what extent they were
13 picked up, I can't say.
14 **Q.** You can't say whether there was traction or capacity in
15 relation to considering those reports?
16 **A.** I think others would have to answer that.
17 **Q.** A discrete subtopic is the relationship between
18 GO-Science and SAGE with the devolved administrations,
19 which you touch upon in your statements. You mention
20 this at paragraph 6.1 of your first statement, on
21 page 28, that the devolved administration
22 representatives were regular attendees of SAGE and that
23 they received all SAGE minutes and papers at the same
24 time --
25 **A.** Yeah.

1 **Q.** -- as Whitehall departments.
2 Pausing there for a moment, was there a little bit
3 of an issue that they didn't get the first few minutes
4 of SAGE?
5 **A.** A little, perhaps. So representatives from all of
6 the DAs were invited I think from 11 February, and that
7 was usually a range of participants in the DAs, so that
8 was SAGE 6. Before then there's a -- all of them will
9 have received the minutes -- might have been a slight
10 problem with Northern Ireland. So the minutes go in
11 sort of two directions, they would go to Cabinet Office
12 and then to COBR. All of the DAs were on COBR and would
13 have received them at that point. They also went across
14 the chief scientists network as well, so Scottish and
15 Welsh CSAs would have received them right from
16 the start. Northern Ireland did not have a singular CSA
17 at that point, so they would have not received them
18 through that route initially. However, from
19 February 11th they would have done. Northern Ireland do
20 now have a CSA, I should say on that.
21 **Q.** Just pausing there, and I'm very grateful. So in terms
22 of the co-ordination --
23 **A.** Yeah.
24 **Q.** -- and distribution information, two mechanisms.
25 Number one, the minutes?

1 **A.** Yeah.
2 **Q.** And number two that they were attendees at the SAGE
3 meetings?
4 **A.** Exactly. And I think that's important.
5 I take a step back. Usually in a crisis situation
6 the DAs get involved at COBR and they receive all
7 the information, and they can make sense of it and do
8 what they want. And that happened here.
9 SAGE is not a body to represent all parts of
10 the country, it's there to get the experts together who
11 need to be there to advise on particular matters. As it
12 became clear the scale of the pandemic, but also that
13 the devolved governments might be making different
14 decisions on the back of it, it was right to have
15 the chief scientists and the chief medical officers from
16 all the nations there, because they might need to, in
17 their own governments, talk about the SAGE advice in
18 depth. So it was right to involve them from that early
19 stage.
20 **Q.** And it's implicit in your answer, but each of
21 the devolved administrations had their own chief
22 scientific adviser?
23 **A.** Northern Ireland did not at that point.
24 **Q.** They had a departmental chief scientific adviser?
25 **A.** That's right.

1 **Q.** But for the other nations, they had their own
2 independent advice?
3 **A.** Exactly.
4 **Q.** And there was co-ordination, was there not, between
5 the CSAs, asterisk not Northern Ireland?
6 **A.** Well, Northern Ireland, quite quickly their health CSA
7 filled that space, you know --
8 **Q.** Yes?
9 **A.** -- from early February, and co-ordination with the CSAs
10 happened in two ways from within GO-Science, and
11 probably more ways elsewhere. So there's the
12 CSA network, which meets every Wednesday all of the
13 time. It's a great group for bringing together all
14 the chief scientists from the UK Government and the
15 devolved administrations to support each other and to
16 learn together. But in relation to Covid, as it really
17 took off as well, we established a mechanism called
18 the Science Co-ordination Group in May of 2020, which
19 wasn't to discuss science, but it brought together
20 the chairs of all the subcommittees, PHE, the CSAs from
21 the devolved administrations, key chief scientists from
22 government, to co-ordinate who was doing what and what
23 was going to what committee.
24 **Q.** Thank you.
25 **A.** Separately -- I mean others will answer this -- I know

1 the comms met regularly. To what extent PHE engaged
2 with their counterparts, I do not know.
3 Q. Okay. I'm going to pause there for a moment.
4 In 60 minutes we've dealt with the first part,
5 explaining --
6 A. Apologies.
7 Q. It's not apology at all.
8 Hopefully we've met our first challenge, to try to
9 explain how the science structures worked in terms of
10 GO-Science, SAGE, the subgroups, how advice was
11 commissioned, and then moving on to the attendance of
12 those key advisers and key decision-makers and how
13 the devolved administrations fitted in. So I'm very
14 grateful in relation to that.
15 In the remaining time I want to turn to part two,
16 which is some of the work that has been done and
17 the analysis which has been done in relation to
18 the issues which you faced over those two plus years in
19 your role during -- as chief executive.
20 Could we turn to the Institute for Government
21 report, *"Science advice in a crisis*", which is dated
22 December 2020. That's INQ000063070.
23 Whilst we're waiting for that to be brought up,
24 you're familiar with this report?
25 A. Yes, I am.

1 Q. And you've had the opportunity to refresh your memory --
2 A. That's right.
3 Q. And it's no doubt something which, whilst in your role,
4 you considered with care, one assumes?
5 A. Of course.
6 Q. If we could turn, please, to page 5 of that report, and
7 the fourth paragraph is probably worth -- by way as
8 a preface, it says:
9 "No system would have been flawless in responding to
10 such an emergency. It is easy to criticise decisions
11 with the benefit of hindsight, while decision makers
12 (and those advising them) had to respond very fast."
13 That's a feature you make -- a comment you make in
14 your statement --
15 A. That's right.
16 Q. -- that we have to consider the context of
17 decision-making:
18 "Nevertheless, our research has identified some
19 clear problems: while there are improvements those
20 providing scientific advice should reflect on, the
21 biggest concerns are the way the government used this
22 advice and the way it communicated it."
23 I'm going to ask you questions really regarding
24 the sort of GO-Science/SAGE aspect, under are a few
25 topics, if I may, just to help you.

1 The first topic is strategy, and if we have that
2 page open and pan out, please, second last -- in fact
3 the last paragraph, this is:
4 "Decision making at the centre of government was too
5 often chaotic and ministers failed to clearly
6 communicate their priorities to science advisers. This
7 was most acute in the initial months but a lack of
8 clarity about objectives persisted through the release
9 of the first lockdown to recent decisions over the
10 second lockdown and regional tiers."
11 Pausing there, so in terms of strategy, do you have
12 any comment to make in relation to that? Did you find,
13 as the chief executive, that there was issues regarding
14 the failure to clearly communicate priorities to
15 scientific advisers?
16 A. Yes, I'd agree with much of the tenor of this paragraph
17 from the Institute for Government. I think it changed
18 over time. I think initial -- I'm not quite sure where
19 to start.
20 LADY HALLETT: At the beginning.
21 A. It's a very good place to start.
22 So, I think this went through quite different
23 phrases. I mean, I think in the early couple of months
24 there was actually some good examples of trying to bring
25 together departments, the NHS, experts, to try to

1 understand what was going on, and to try to formulate
2 advice. But things were evolving so quickly that you
3 have to manage the evidential, the policy, the political
4 quite closely to be able to navigate that and adapt your
5 objectives as you go. So there were some good attempts
6 to do that, and initially there were people, I would
7 say, who were in Cabinet Office in the first few months
8 who understood how to interact with science fairly well.
9 But it was an extraordinary situation and whether
10 the formulation of national objectives was clear enough,
11 I'm not sure that it was.
12 I think then there was a phase from after there was
13 the change in governance to the MIGs when I think
14 the formulation of science commissioning from the centre
15 got quite chaotic for quite some time.
16 MR KEATING: This is about May 2020?
17 A. April/May 2020. Gradually got better through the summer
18 and then got a lot better, I think, when a much stronger
19 analysis unit was created in the C-19 secretariat in the
20 autumn, and again that was rebuilding Cabinet Office's
21 capacity to engage in science evidence and analysis and
22 statistics, and then the questions got better.
23 I -- one of the documents you sent me last night to
24 look at was parts of Neil Ferguson's statement. I agree
25 with much of the analysis in that, not quite all but

1 much of it, and within that he said that the setting of
2 objectives was often very short term, when there was
3 setting of objectives, and I agree with that. I think
4 it had to be initially. You know, in a very fast-moving
5 event sometimes you do need to just look at the here and
6 now to an extent. But that setting of longer-term
7 objectives, I agree, was absent for quite some time.
8 However, I recall, I can't remember if it was March or
9 April, that there were attempts to set a longer-term
10 strategy. I remember Mark Sedwill commissioning the now
11 permanent secretary of FCDO, Philip Barton, to lead work
12 to look at a long-term strategy. That looked good to me
13 but it seemed to disappear.
14 Q. Thank you.
15 I would like to turn to page 18 to perhaps give
16 an illustration of the issue that was being experienced,
17 so page 18 of that report, please, and the second last
18 paragraph:
19 "SAGE members told us that in the autumn they were
20 still unclear about the government's thinking, despite
21 the new Covid cabinet committees having been created in
22 June with the aim of clarifying decision making. One
23 interviewee described the conversation between ministers
24 and SAGE as circular: 'Ministers said: "What should we
25 do?" and scientists said: "Well, what do you want to

1 achieve?"' Some back and forth is necessary to refine
2 questions, but scientists said minsters' objectives
3 remained unclear throughout the crisis."
4 What do you say in relation to that? Is that
5 a valid observation?
6 A. I think it is for that point in time. I say, I think it
7 was a little better earlier, you know, prior to
8 mid-March, and it was better later. I think you need
9 much more discussion across policy officials, operators
10 of key services and experts at these times to help
11 determine what it is you were aiming for, and I'm not
12 sure there was enough people in Cabinet Office with
13 scientific skills at this point who understood how to
14 try to frame the questions.
15 Q. I'm going to move on to framing the questions in
16 a moment, but this is a wider point, really, isn't it,
17 in terms of strategic direction?
18 A. Yeah.
19 Q. Let's move on to commissioning, then, which is the next
20 point, which really flows on from your answer. If we
21 would turn back, please, to page 5, and that
22 paragraph we had looked at at the outset, the bottom
23 paragraph. It says this:
24 "At times the process of commissioning advice --
25 COBR asking questions for SAGE to answer -- did not work

1 well, with advisers' ability to provide useful answers
2 hampered by poorly formulated questions (though [your
3 point] this improved as the crisis went on)."
4 Is that correct, that there was, especially at the
5 outset, poorly formulated questions in terms of seeking
6 advice?
7 A. I think that's right. I actually think it wasn't so bad
8 very early on, although it -- I think the scale of what
9 people had to contend with meant that it was hard to
10 formulate the question.
11 So early on, as you discovered in Module 1,
12 you know, there weren't sufficient plans for things like
13 non-pharmaceutical interventions in place, and I agree
14 with the analysis of many people in Module 1 that PHE
15 did not go in with sufficient capacity into this.
16 In that context, to shift from a position where
17 I think no one ever believed sort of a lockdown could
18 happen in a society like ours to it happening, you had
19 to overcome a lot of public health and policy and
20 political beliefs and dogma. That was hard, and I think
21 needed to involve scientists, policy officials,
22 politicians engaging closely.
23 But the commissioning of advice did get quite
24 chaotic and poorly formulated from March through into
25 the summer and then got better again in the autumn.

1 Q. If we could turn to page 19 of this report, independent
2 report, and you touched upon speed as one of the issues,
3 and at page 19, the penultimate paragraph:
4 "The government was also slow to seek advice from
5 SAGE on issues where it was evident some time in advance
6 that difficult policy decisions would have to be made."
7 It gives an example about return of students to
8 universities and how SAGE was not commissioned to look
9 at this until it was almost too late.
10 "Members told us that, since they were not asked for
11 advice on some key issues, they started to set some of
12 their own research questions based on what they thought
13 would be useful to policymakers."
14 So two questions flow from that. Firstly, was that
15 right, in your view, that the government was on occasion
16 slow to seek advice from SAGE on issues?
17 A. I think it's a bit more nuanced than that. I think by
18 this point -- we talked about the lack of capacity
19 of PHE and others going into this situation, and SAGE
20 had to grow into something that it was never meant to
21 be, to fill some of the gaps that were just not there
22 going into the pandemic. We didn't have a lot of
23 standing public health capacity on the scale that we
24 needed it going into the pandemic, so a mixture of
25 academic volunteers and a small number of officials

1 filled that gap. I mean, this is the kind of example
2 when you might want a SAGE view, but you might just
3 want -- in a better situation, you might want to draw on
4 your public health experts within your public health
5 agency. So maybe they were slow to seek scientific
6 advice but whether SAGE advice was needed I think is
7 a question.
8 **Q.** Let's examine that for a moment. SAGE grew into
9 something it wasn't ever meant to be. Was it the case
10 that there was a vacuum which SAGE had to fill because
11 other departments were unable or perceived to be unable
12 to fill that?
13 **A.** I think I mostly agree with that. I suppose the feeling
14 for us through late February and into March was
15 a feeling of other parts of government either not being
16 there or not being allowed to be there, in some cases,
17 and -- but science, technical advice, public health
18 advice was needed and we had to grow our structures to
19 be able to provide that. That wasn't out of design,
20 certainly not by desire, but I think it was out of
21 necessity.
22 **Q.** You've hinted at it, but was PHE one of those
23 organisations which you would have thought would have
24 been asked to do some of the work which SAGE undertook?
25 **A.** That's correct.

1 **LADY HALLETT:** Is that a convenient moment, Mr Keating?
2 **MR KEATING:** Very convenient, thank you.
3 **LADY HALLETT:** You're all right if we take a break? You've
4 got time this morning?
5 **THE WITNESS:** Of course.
6 **LADY HALLETT:** Very well, I shall return at 11.30.
7 Thank you.
8 **(11.13 am)**
9 **(A short break)**
10 **(11.30 am)**
11 **LADY HALLETT:** Mr Keating.
12 **MR KEATING:** My Lady, thank you.
13 **LADY HALLETT:** Sorry, there was just one matter I wanted to
14 raise, Dr Wainwright. You said earlier that
15 the representatives of the devolved administrations
16 attended SAGE and COBR. Was that throughout, was it
17 that they were invited to attend but --
18 **A.** So for SAGE, from SAGE 6 in -- February 11th, they were
19 always invited to attend. Whether they did or not, the
20 minutes will show that.
21 COBR, I mean, people from Cabinet Office would have
22 to confirm that. My understanding was that they were
23 always invited but it's possible I may have that wrong.
24 **LADY HALLETT:** We'll check that. Thank you very much.
25 Sorry, Mr Keating.

1 **MR KEATING:** Not at all, my Lady.
2 Dr Wainwright, we're coming to the end, on this part
3 two of your evidence. There's three more topics I'd
4 like your assistance on before giving you an opportunity
5 at the end to reflect upon what went well, in your view,
6 and what could be learned by way of lessons.
7 So in terms of the next topic, which flows from what
8 we discussed before the break, you mentioned SAGE grew
9 into something that was not meant to be. Let's look at
10 the IFG report, please, at page 6. Page 6. It will be
11 the third paragraph.
12 In terms of issues which were thrown up, it says:
13 "... SAGE was not designed to take on such
14 a prolonged role."
15 At this stage, December 2020, it had only met
16 70 times.
17 Drawing on what you said just before the break, was
18 that a fundamental difficulty, that SAGE was scaling up
19 to do something it was never meant to do over
20 a prolonged period of time?
21 **A.** Yes, but at necessity I think we had to do it at this
22 point. But I think, you know, a lesson to learn from
23 this is to try to make sure your public health agency
24 has -- and the Department of Health, has sufficient
25 capacity and capability to perform all the roles that

1 might happen in other nations.
2 **Q.** Pausing there for a moment, because you have mentioned
3 the word "capacity" of PHE, Public Health England, at
4 that time, and SAGE had to scale up to fill this lack of
5 capacity?
6 **A.** Yeah.
7 **Q.** Why was it not the case, from your understanding, that
8 PHE did not scale up to meet this challenge?
9 **A.** So I think for a couple of reasons. I think you've got
10 an issue about capacity, capability and trust, and
11 I think GO-Science, the system it was able to put in
12 place was able to deliver on those. I think we were
13 able to deliver the capability, three sorts of
14 capability. We were able to draw on the real
15 international experts, through our academic experts, so
16 the people who really knew their stuff. Secondly, we
17 had sufficient people within GO-Science who understood
18 science and policy. That's the capability that we had.
19 But we had to grow it. Thirdly, we had people who
20 understood how to operate in a crisis. And we needed
21 that. So we had the capability, particularly that
22 academic capability.
23 Trust, I mean, others will have to comment on this,
24 but we had the trust of Number 10 and Cabinet Office,
25 I think because we provided that capability.

1 Q. From your dealings, bearing in mind you had to scale up
2 SAGE, were you aware of concerns regarding the lack of
3 capability or confidence in PHE to deal with this
4 crisis?
5 A. Yes, I think I was aware of the lack of sort of capacity
6 and capability in PHE. Even from previous roles I'd
7 seen -- they have some wonderful people in PHE but they
8 always seem very thin on what was available. The issue
9 of trust others will have to comment on that but my
10 perception in February and March is that gradually the
11 centre began to trust what GO-Science and SAGE were
12 doing, and possibly not other parts, but I don't know
13 the reasons for that.
14 Q. No.
15 The next topic is composition and challenge, and if
16 we could turn over to page 7, please, the top of page 7,
17 and again it's one of these features we have touched
18 upon already.
19 A. Yeah.
20 Q. And it's not something which is, perhaps, surprising to
21 you in terms of a -- as a criticism, but it says this:
22 "The GCSA and CMO should reflect, however, on
23 the criticism that there could have been more challenge
24 built into the scientific advice process. While they
25 clearly thought hard about how to do this, scientists

1 inside and outside government argued that SAGE has still
2 been dominated by too narrow a group of medical
3 scientists and modellers at the expense of others such
4 as external public health experts."
5 And, as I say, this was a criticism made in the past
6 about previous SAGE. And public health experts again is
7 something which is touched upon a number of times as
8 an area where there seemed to be a lack of expertise.
9 What do you say in relation to that criticism?
10 A. I think this is actually quite complicated. I don't --
11 there is a challenge here, but I don't -- I don't think
12 the solution is quite as simple as what's being
13 suggested here.
14 So, first of all, do I think SAGE had challenge
15 within it? Absolutely. I mean, the way that it worked,
16 the individual academic groups would be challenging
17 themselves and each other, they'd bring things to
18 subgroups and challenge each other there, and bring it
19 to SAGE and challenge each other more. And we drew on
20 more and more experts -- you know, almost 200 for SAGE
21 alone over time. But I think, as we've said already,
22 that as SAGE was so prominent and maybe leaned on more
23 than it should have been, it meant that some of
24 the areas where you might have had -- drawn on more
25 experts on public health, within PHE structures -- we've

1 given SAGE more of an ability to challenge those, which
2 might be a better system -- I think that is something to
3 reflect on.
4 So I think a lot of challenge happened within SAGE
5 in the system, but I think given so much focus on using
6 SAGE, I think you reduced its role to sort of challenge
7 other parts of the system where other forms of advice
8 might have been brought to bear much more.
9 Q. I would like to turn to page 33, which draws out the
10 fact that this is a complicated area, to use your
11 terminology. Perhaps starting at the top of page 33,
12 and we touched upon the subgroups earlier on this
13 morning in the first part of your evidence, it says
14 there that the subcommittees played an "important role
15 in giving SAGE depth and analytical capacity", and that:
16 "... there is a strong case in such a broad-based
17 crisis for using them to ensure a wide range of
18 disciplines are contributing to advice."
19 So a positive --
20 A. Yeah.
21 Q. -- comment there, and perhaps something to consider when
22 we're looking at diversity and composition?
23 A. Absolutely.
24 Q. If we pull out, then, into the wider page for a moment,
25 it says this, in the middle of the second paragraph,

1 that your organisation, the Government Office for
2 Science, "launched wider initiatives to incorporate
3 a range of expertise and challenge".
4 So this is something which was identified you did
5 prior to December 2020?
6 A. Yeah.
7 Q. Very briefly, what did you do to draw upon a greater
8 range of expertise and create challenge?
9 A. Yeah, so this is something that I think we improved on
10 as we went. In the early days of the pandemic, this is
11 before people were using Teams and Zoom, and so we were
12 constrained a bit by -- had to get the right experts in
13 a room or on a phone line. It seems odd to be saying
14 that now, but that was a slight constraining factor. So
15 we worked with CMO and PHE to try to get the right
16 experts there, and there were a lot of public health
17 experts there. The switch to more electronic ways of
18 working, although it was a challenge to do it initially,
19 helped us draw in many more people. I mean, you still
20 have to keep the meetings practical and only draw
21 together the experts that you need, but it allowed us to
22 go to many other parts of the country and other
23 institutions to draw on people.
24 We in GO-Science we did a process of regular reviews
25 of how we were doing, the first one was kicked off in

1 March 2020, and we did those regularly to have a process
2 of continuous learning, and that's now been built in
3 Government Office for Science into an active programme
4 called the SAGE Development Programme, to keep it live,
5 to keep us always getting better. One of the issues
6 that was drawn out in that learning early on was a need
7 to draw on academics from a greater range of
8 institutions, and also to build in more diversity in
9 terms of their backgrounds as well.
10 So that was gradually improved and was built into
11 our thinking from there. But again, I try to think
12 about sort of what the Inquiry might conclude. Do
13 I think the early stages had enough experts? I don't
14 think more experts would have made a difference, if I'm
15 honest.
16 **Q.** I'm going to move on to another topic. The final topic
17 is communication. In fact if we go to page 16 and 17 of
18 this report.
19 It's a phrase which we're all very familiar with,
20 about "following the science" and the opinion of
21 the authors that ministers and systems -- that they were
22 "following the science" was inaccurate and damaging.
23 And that may be questions for politicians and not to you
24 as a civil servant, but I want to draw out some of the
25 issues in relation to this, and whether these are

1 matters that you raised as a problem with government
2 during your time as chief executive.
3 So in relation to that phrase, it says in the second
4 paragraph or third paragraph:
5 "The phrase blurred the line between the scientific
6 advice and policy decisions."
7 Do you agree, first of all, with that proposition,
8 that the phrase blurred the line between the scientific
9 advice and decision-making?
10 **A.** I do.
11 **Q.** And the next paragraph, in the same theme:
12 "The difference between being *led* by the science and
13 being *informed* by the science may seem subtle, but it is
14 important."
15 And again that this is something which is not new
16 and had been raised before in previous inquiries.
17 **A.** I agree. In a situation like this, there's no easy
18 decisions, and it's right that -- ministers -- we live
19 in a democracy and ministers are the elected
20 representatives of our people, and in a situation like
21 this, it's right that they have to balance up different
22 factors and forms of advice, science, public health,
23 economic, operational, policy, and it's the
24 understanding of all of those that should inform their
25 decision, not one form of evidence.

1 **Q.** So I want to ask you a question in relation to this,
2 which is the impact of that phrase on your members, your
3 SAGE members, and if there's anything done to it.
4 If we turn over to address it, turn overleaf,
5 please, page 17, first paragraph, it says there that it
6 "undermined the protective space in which scientists
7 advising the government could operate".
8 Was that something, as an impact, that was raised to
9 you by members, about the difficulties the phraseology
10 by ministers was causing them?
11 **A.** Yes, I mean, as I said earlier, in this period it felt
12 SAGE was being lent on probably to a greater extent than
13 it should have been, but also as we gradually published
14 our minutes and nothing else was published, again it
15 created this impression, I think, that that's all that
16 there was. And I think that did have a negative effect
17 on the protective space in which our scientists could
18 operate.
19 **Q.** Flowing from the negative effect which you've mentioned,
20 final point on this is the next paragraph, and your
21 comment, if you can, in relation to this:
22 "Many scientists including members of the SAGE went
23 as far as to say that they felt they were being set up
24 as scapegoats, with politicians hiding behind a cloak of
25 science."

1 In relation to that, was that a concern which was
2 expressed to you, perhaps informally, by members of
3 SAGE?
4 **A.** I don't -- I don't recall.
5 **Q.** Have you raised with government the concern, when you
6 were chief executive of GO-Science, about the usage of
7 the term "following the science"?
8 **A.** Yes, I recall doing so.
9 **Q.** What was the response?
10 **A.** Our counterparts in Cabinet Office understood, and
11 gradually, I can't remember how long it took, but
12 gradually that term did stop being used.
13 **Q.** Finally, we've spent some time in the second part
14 talking about the issues which SAGE grappled with during
15 that unprecedented time, and some of the criticisms made
16 of the structure, and you've had the chance to comment
17 upon them. But it perhaps is fitting to conclude to
18 give you the opportunity to recognise what SAGE did
19 well.
20 What, in your view, were perhaps the three big areas
21 that SAGE did well during this time period?
22 **A.** I think three things. One, we delivered what we were
23 asked to deliver, despite huge pressure, and that was
24 due to the willingness of our volunteer experts and the
25 officials drawn from across government to work night and

1 day to be able to do so. So that sense of doing what
2 was needed for the nation was one thing we got right.
3 I think underpinning that, our flexibility was
4 a strength, to be able to draw on hundreds of academics
5 and to operate reflexively.
6 I think the third thing we did well is what I've
7 just mentioned: we took an active approach to learning
8 and changing as we went, from March 2020, and that
9 continues on to this day. But that sense of
10 self-evaluation how we could improve was a strength as
11 well.
12 **MR KEATING:** Thank you, Dr Wainwright, those are all the
13 questions I have.
14 My Lady, do you have any questions?
15 **LADY HALLETT:** No, I have no further questions.
16 Thank you so much, Dr Wainwright. I do hope
17 the vast majority of the people you have just mentioned
18 with whom you worked understand that the tiny minority
19 of people who think it's right to resort to personal
20 abuse, well, they're not supported, the vast majority of
21 us are really appreciative of all the work that you and
22 your colleagues did.
23 Thank you very much.
24 **THE WITNESS:** Thank you.
25 **(The witness withdrew)**

1 **MR KEATING:** Thank you, my Lady. I'm just going to pass
2 over to Mr O'Connor.
3 **(Pause)**
4 **MR O'CONNOR:** My Lady, our next witness is
5 Professor Graham Medley. Can he be sworn, please.
6 **PROFESSOR GRAHAM MEDLEY (affirmed)**
7 **Questions from COUNSEL TO THE INQUIRY**
8 **MR O'CONNOR:** Thank you, Professor, do take a seat.
9 Can you give us your full name, please?
10 **A.** Yes, Graham Francis Hassell Medley.
11 **Q.** Professor Medley, you have, at our request, prepared
12 a statement for the Inquiry. We have it up on screen.
13 It weighs in at 123 pages, and I think on the last of
14 those pages -- yes, don't worry, we don't need to call
15 it up, but you have signed the statement under the
16 statement of truth indicating that you believe the facts
17 stated in the statement to be true; is that right?
18 **A.** That's correct, yes.
19 **Q.** That signature was dated 4 September 2023; yes?
20 **A.** Yep.
21 **Q.** Thank you.
22 Professor, your witness statement gives us some
23 detail of your career to date. You are currently, and
24 you have been since 2015, professor of infectious
25 disease modelling at the London School of Hygiene and

1 Tropical Medicine?
2 **A.** Correct, yeah.
3 **Q.** That institution in London is one of the main centres of
4 epidemiological research in this country?
5 **A.** Yes.
6 **Q.** And we'll be hearing also from one of your colleagues,
7 Professor Edmunds, who is also there.
8 Before moving to, do we call it LSHTM or do we say
9 London School of --
10 **A.** The "London School", with apologies to the London School
11 of Economics.
12 **Q.** That abbreviation may end up saving us hours of time in
13 the next couple of weeks, Professor.
14 So before moving to the London School, we see that
15 you were based, first of all, at Imperial College London
16 for ten years, from 1983 onwards.
17 **A.** Yep.
18 **Q.** Then you spent some time at the University of Warwick
19 before moving to the London School?
20 **A.** Yes, correct.
21 **Q.** I think what we will discover is that, in fact, those
22 other two institutions, Imperial College and also
23 Warwick University, are two of the other leading
24 epidemiological centres in this country?
25 **A.** Yes.

1 **Q.** Also relevantly, Professor, you were co-chair of
2 the committee SPI-M -- which we've heard something about
3 from Dr Wainwright, and of course we will be hearing
4 much more from you about -- from October 2017 until,
5 first of all, the start of the pandemic, then, as we'll
6 hear, SPI-M was, as it were, replaced by SPI-M-O during
7 the pandemic --
8 **A.** Yep.
9 **Q.** -- and you chaired that committee during that time.
10 Then in February last year, when SPI-M-O stood down, you
11 returned to being co-chair of SPI-M?
12 **A.** Yes.
13 **Q.** You have, though, resigned from that position in June of
14 this year?
15 **A.** That's right, correct, yeah. And I was co-chair of
16 SPI-M-O as well.
17 **Q.** Yes.
18 **A.** So the co-chair is important.
19 **Q.** Yes, and I'm going to come back to it, but thank you,
20 thank you.
21 Just before we get into the detail, though,
22 Professor, just help us, give us an idea of just how
23 much of your time you spent on these matters during
24 the pandemic. You've already told us that you were
25 chair of SPI-M-O for that two years or so; we'll hear

1 you were also someone who attended SAGE meetings; you
2 were also, I think we'll hear, a member of the Welsh
3 Technical Advisory Group. That must have taken up a lot
4 of your time?
5 A. Yeah, so SPI-M, the pre-pandemic, is about six meetings
6 a year, although we didn't actually meet, I don't think,
7 in 2019 because of Brexit preparations, and then from
8 January 2020 my involvement ramped up so that from
9 mid-February 2020 until March 2022 I was essentially
10 full-time working with the members of the committee and
11 chairing the meetings, and working with the secretariat.
12 Q. So really very little or no time left for your research
13 or teaching commitments --
14 A. No.
15 Q. -- that you would otherwise have had?
16 A. No. The institution was extremely kind and my
17 colleagues at the London School were extremely good at
18 filling in for me, but no, I effectively gave up
19 independent research for that period.
20 Q. And I think, from having read your statement, it's fair
21 to say not just a full-time, as in Monday to Friday,
22 9 to 5, but rather more than that?
23 A. Yes, it was --
24 Q. As --
25 A. Yes, I mean, I was -- I still had commitments that I had

1 previously, so I was filling in those, but -- but
2 anyway, the demands of what I was trying to do. And
3 I took on other things. I'm involved, for example, in
4 the Academy of Medical Sciences' reports, and that was
5 partly to kind of help things be joined up and to
6 function to -- for Wales, as you've mentioned. I mean,
7 those were things that technically I suppose I didn't
8 have to do but actually I felt were important to be
9 doing.
10 Q. Professor, thank you. Let's take then, shortly, a step
11 back, I just want to ask you a few questions about SPI-M
12 before the pandemic.
13 Let's look, if we can, at page 9 of your statement,
14 paragraph 3.1, that's where you set out the dates that
15 we've already discussed, you refer there to having been
16 co-chair of SPI-M from October 2017.
17 Could I ask you what you might think is a surprising
18 question: what does the I in SPI-M stand for?
19 A. It did stand for influenza, so the committee was
20 originally I think set up in sort of 2005 and -- or 2009
21 to cope -- to deal with pandemic influenza. It has
22 since changed to infections, pandemic infections, and
23 one of the -- I noticed three -- two things when I took
24 over as chair in 2017, one was that we really shouldn't
25 be just thinking about infections and so it was

1 agreed -- sorry, influenza, and it was agreed we would
2 switch to infections more broadly, and we were in
3 the process of going through what we had in terms of
4 preparedness document and modelling capacity, so
5 in 2018, 2019, but obviously we didn't -- because of
6 the delays in 2019, we didn't get through that process.
7 And the other thing I noticed was to do with
8 devolved administrations, which we might come back to
9 it, but that was noted before the pandemic.
10 Q. I see. So just to be clear, I won't call it up, because
11 you've explained it all very well, but we were looking
12 at an organogram with Dr Wainwright's evidence and SPI-M
13 on that organogram had a yet different meaning of I, for
14 insights, but that's wrong, isn't it? It was influenza,
15 and, as you've explained, it's now infections?
16 A. Yes. Well, I'm not sure. That definition was created
17 earlier. I'm pretty sure it was pandemic influenza, but
18 I might ... I might be wrong. I only ever called it
19 SPI-M.
20 Q. Well, it's quite important, isn't it, Professor, to know
21 what the committee is called?
22 A. The committee was focused on influenza and that's why
23 I challenged it when I became chair, and the then
24 Deputy CMO, Professor Jonathan Van-Tam, agreed with me,
25 and so it was changed to infections at that point.

1 Q. Perhaps we can just call the organogram up.
2 It's INQ000303289, page 1, please.
3 So if we look there, do you see the top and bottom
4 row?
5 A. Yes.
6 Q. Do you think, then, Professor, this actually might
7 represent a misunderstanding within GO-Science as to
8 what the I stands for?
9 A. It clearly represents a misunderstanding between
10 myself --
11 Q. Well, it could just be a mistake, because the I,
12 for example, in SPI-B certainly stands for insights?
13 A. Yes.
14 Q. But with your experience of working on this committee,
15 I'm asking you whether you think that it may be that
16 other people on the committee and who support the
17 committee might actually think that the I stands for
18 something different?
19 A. My understanding is that everybody on the committee was
20 focused on influenza, and that is why I challenged it
21 when I became chair, because I said that the next
22 pandemic may well not be influenza.
23 Q. All right. Let's leave it there. Thank you, we can
24 take that down.
25 So you've explained then that when you took over in

1 2017 it was an influenza committee, if I can use that
2 shorthand, but that before the pandemic you were already
3 trying to make that shift to broaden the scope of
4 the committee so that it looked more broadly at
5 infection --
6 **A.** Yep.
7 **Q.** -- rather than simply at influenza, and I think you said
8 a moment ago that something in the nature of
9 six meetings a year would have been --
10 **A.** Yes.
11 **Q.** -- the norm?
12 **A.** Yes.
13 **Q.** Although you also said that in fact the year before
14 the pandemic it hadn't met at all?
15 **A.** I think it met once at the beginning of 2019. We -- the
16 role of that committee was really to address policy
17 questions that were raised to us, and we relied upon
18 people coming from the centre of government with
19 particular questions, and if they were not available,
20 then in most -- a lot of the rest of the work could be
21 done by email and so there was no point in us gathering
22 if policy wasn't there to ask us questions and
23 interrogate us.
24 **Q.** Does that explain what might otherwise have been
25 a bit -- it explains your remark that perhaps the reason

1 you didn't meet in 2019 was because of Brexit?
2 **A.** We were told that was why.
3 **Q.** There's no obvious connection between the risk of
4 a pandemic and Brexit, but is your explanation that
5 the officials in government were so busy concentrating
6 on Brexit they didn't have time to ask you --
7 **A.** Yes.
8 **Q.** -- about pandemics?
9 **A.** Yes.
10 **Q.** But I think you're telling us that the fact you didn't
11 meet didn't mean that, as a committee, you weren't doing
12 any work; is that fair?
13 **A.** Yes, I think so. We had -- we have -- the main output
14 from the government was the preparedness document, and
15 this is a short summary of what modelling tells us about
16 the start of epidemics, and it's designed -- was written
17 originally to fill the gap, that kind of knowledge gap
18 between the start of the epidemic and before we have
19 sufficient data within the UK to be able to make more
20 focused -- produce more focused evidence, and it's there
21 to, as I say, fill that gap, to explain to policymakers
22 what we understand generically about controlling
23 the start of epidemics. And we had just refreshed that
24 document and we were going through to refresh it, and
25 I can't -- I can't remember at the moment what else was

1 on our agenda, but I think we were being asked about
2 the -- the Department of Health had conducted
3 an analysis of pre-buying vaccines, influenza vaccines,
4 and investing that, and we were being asked to discuss
5 that work.
6 **Q.** Right. So that was the sort of background activity --
7 **A.** Yep.
8 **Q.** -- in the year or so before the pandemic?
9 **A.** Yes.
10 **Q.** Just for completeness, you mentioned the Department of
11 Health, that was the body, the department, to which
12 SPI-M reported?
13 **A.** Yes.
14 **Q.** Although, as we have seen from the organogram, it's
15 accurate in this respect, once the committee became
16 SPI-M-O, it reported to SAGE?
17 **A.** Correct. We had a secretariat associated with SPI-M,
18 and we retained that same secretariat as SPI-M-O, so the
19 people we were working with day to day didn't change,
20 but the position in the organogram changed.
21 **Q.** Let me ask you about the switch from SPI-M to SPI-M-O.
22 We can look briefly, if we may, at page 23 of your
23 statement, paragraph 3.43. You explain here, Professor,
24 that SPI-M, so the old committee, was emailed in late
25 January, 21 January, about what you describe as

1 the novel coronavirus.
2 **A.** Mm-hm.
3 **Q.** You spoke to the secretariat, and in fact there was then
4 a meeting of SPI-M on 27 January to discuss preparedness
5 and so on, and it appears to have been shortly after
6 that that the change was made from SPI-M to SPI-M-O,
7 because you then mention the first meeting of SPI-M-O on
8 3 February, so a week or so later.
9 On the paper, it's simply a change of name from one
10 committee to another. What about the membership of
11 the committee, did it remain the same as between the old
12 and the new?
13 **A.** No, it didn't. I advised -- I mean, it's not my
14 committee, it is run by the secretariat, but I gave
15 a lot of thought and we had a lot of discussion about
16 the membership, and so the -- I think all the members of
17 SPI-M became members of SPI-M-O, but we also involved
18 a much wider range of people as well. And my
19 principal -- well, I had several concerns, but at that
20 point my main concern was that we had sufficient
21 expertise to be able to answer any -- all the questions
22 that we were -- we might be asked, but I also gave
23 thought to the composition of the committee in terms of
24 the people, their relationships to each other, and
25 the relationships to me.

1 I had no thought at that point that this would go on
2 for two years, meeting every week, and I did have qualms
3 at the beginning that I had involved too many people,
4 but in fact that turned out to be very good, because in
5 the end SPI-M-O was essentially co-created by
6 the members and the secretariat, and we needed to have
7 that community to be able to carry through, as I say,
8 meeting weekly for two years.
9 **Q.** Yes. Just give us an idea, Professor, we don't need
10 exact numbers, but the move from two committees, roughly
11 how many academic members of the first committee and
12 then how many -- how much larger was SMI-M-O?
13 **A.** That's a good question. Off the top of my head I'm
14 going to say three times bigger, but I would need to
15 count them.
16 **Q.** A substantial increase.
17 **A.** Yes. And the workload meant that not every member could
18 attend every meeting, so having that, if you like,
19 redundancy in the numbers, so meant that there was
20 always a -- always a quorate in the meeting.
21 **Q.** Just before we get much further, I want to take you to
22 a part of your witness statement where you crystallise
23 what the function of this organisation was. So if we
24 can look at page 86, please, and it's the paragraph at
25 the bottom of that page, 8.27, you say:

1 "The role of SPI-M-O [so the new committee created
2 in early February 2020] is to generate scientific
3 evidence based on transmission dynamic modelling of the
4 epidemic. The key questions for SPI-M-O are what drives
5 the tram (epidemiological parameters, core groups ...)
6 and what determines disease given infection."
7 And you refer to the models as being "intended to
8 inform policy", so "guided by what policy options are
9 being considered at the time".
10 And you go on to say:
11 "The age-dependent risk of severe outcomes [that's
12 of the infection Covid] ... were well established by the
13 end of February."
14 So we'll come back, I don't want to unpack all of
15 that now, Professor, because in a sense that's what
16 we'll do for the rest of the morning, but it was
17 a modelling committee, and those key aspects of
18 the disease, what drives it and what determines the
19 disease, given infection, those were at the heart of
20 the modelling exercise?
21 **A.** Yes, I mean, the -- just to caveat that, we are not
22 clinicians, we're not medics, and we're not
23 immunologists, although all of those disciplines are
24 pulled into modelling at one point or another, so we are
25 not looking at the process of disease, but we are

1 looking, at a population level, at the consequences of
2 widespread infection.
3 **Q.** Moving on to a couple of more just practical points
4 about the committee, you mentioned that you were
5 co-chair of SPI-M-O, as you had been of SPI-M, and more
6 precisely you were the academic co-chair, and we know
7 from your statement that there was also a policy
8 co-chair. Certainly as from March of 2020 the co-chair,
9 the policy co-chair, was Angela McLean?
10 **A.** Yes, correct.
11 **Q.** Who was then the chief scientific adviser in the
12 Ministry of Defence?
13 **A.** Yes.
14 **Q.** Tell us in a few sentences what the significance of
15 there being two chairs and their different functions and
16 responsibilities.
17 **A.** So, in order to kind of make a lot of sense of the rest
18 of my evidence, I just need to kind of point out that
19 government -- what happens in government is very
20 different to what happens outside. The code of conduct,
21 the employment of civil servants, the conditions under
22 which they're employed, is very different from outside,
23 and particularly from academia, which is where I'm
24 coming from. And so crossing that fence, the things
25 that we were allowed to be -- to know and the things

1 that we were allowed to say, in some senses, but not --
2 it's more about what we could know and what we couldn't
3 know -- is not simple.
4 And so it was decided, I think as I became chair,
5 the co-chair situation was developed. So there was
6 somebody inside government, and their task is to talk to
7 people in government about the modelling, to bring the
8 appropriate questions to us, and to take the answers
9 back. And then I'm the academic co-chair and my role is
10 to try and get -- or to get the members to provide the
11 evidence in answer to the questions.
12 But because I am not a member of government, I can't
13 go into government and talk to civil servants openly,
14 you know, about what they might be thinking or what
15 they're worried about.
16 **Q.** Yes, and I think you explain in your statement that you
17 felt that Angela McLean did a very effective job of
18 fulfilling that function --
19 **A.** Yes.
20 **Q.** -- of the policy chair that you just described?
21 **A.** It was an essential -- well, essentially it was
22 an extremely important step change in the way that
23 SPI-M-O worked in March 2020.
24 **Q.** Moving on, we'll see from some of the documents we look
25 at that the routine during the pandemic was for there to

1 be three SPI-M-O meetings a week, two subcommittee
2 meetings, and then, if you like, a plenary meeting which
3 considered what had happened at the two earlier
4 subcommittee meetings; is that right?
5 **A.** That was the normal pattern, but there were many other
6 ad hoc meetings as issues arose, and of course
7 the meetings between members, you know, to discuss
8 particular technical issues.
9 **Q.** Yes, but what we may see is that the subcommittees then
10 fed into, and other discussions, the main meeting?
11 **A.** Yes.
12 **Q.** Then that main meeting produced material, which we'll
13 have a look at in due course, which then went to SAGE?
14 **A.** Correct, yeah.
15 **Q.** We've heard from Dr Wainwright that that pyramid, if you
16 like, of advice being generated by SAGE and its
17 subcommittees, at the top were Chris Whitty and
18 Patrick Vallance?
19 **A.** Yes.
20 **Q.** Did they ever attend SPI-M-O meetings?
21 **A.** They didn't in person, except very occasionally, but
22 the meetings, especially when they went online, so at
23 the end of March, there would be typically sort of
24 somewhere between 20 and 40 members of SAGE, there would
25 be sort of the order of ten members of the SPI-M-O --

1 sorry, members of SPI-M-O, and then about ten members.
2 SPI-M-O secretariat, and then a whole host of other
3 people, sort of numbering more than the other attendants
4 combined, of people from across government listening in.
5 And so I'm pretty sure that there will have been people
6 from SAGE secretariats and the CMO's office also
7 listening in to that meeting, but they came only very --
8 I can only remember twice where Patrick Vallance came to
9 SPI-M-O.
10 **Q.** And you've described, I was going to mention it, but
11 from the end of March, so the first lockdown, your
12 meetings were all done remotely?
13 **A.** Yes.
14 **Q.** And the output, again we'll come back to it, but
15 the output from these, the larger SPI-M-O meetings,
16 would it be fair to say that, first of all, there was
17 something called a consensus statement, and we'll have
18 a look at one or two of them in due course, which was
19 the work, or the outcome of the meeting which was going
20 to SAGE, and you might also send papers, academic
21 papers, that had been prepared by members of SPI-M-O and
22 discussed as well?
23 **A.** Yeah, they were technical papers rather than -- I mean,
24 they were written by academics but they hadn't been
25 through the peer review process.

1 **Q.** No, that's an important qualification. Because of
2 the speed with which these matters with being dealt
3 with, they were being turned around very quickly, but
4 they look like short academic-style papers?
5 **A.** Yes, they often were the beginning of bigger amounts of
6 work.
7 **Q.** One other practical aspect of SPI-M-O, and for this can
8 I ask that we go to page 35 of your statement, and
9 paragraph 3.84, it's the question of tasking, Professor.
10 I think you were watching Dr Wainwright's evidence,
11 is that right, and so he was of course talking about
12 SAGE, not SPI-M-O, but he explained that, yes, SAGE
13 received questions from policymakers that they were
14 asked to consider, but there was also at least a degree
15 of self-tasking going on on SAGE, so proactivity as well
16 as reactivity.
17 What you describe in this paragraph is a bit
18 different. What you seem to be suggesting is really you
19 were purely reactive. You say that although you had
20 some influence with the secretariat, the agenda was set
21 by policymakers and decision-makers and you weren't able
22 to determine the scope of the agenda.
23 So are we right to see a bit of a difference between
24 what you say about SPI-M-O and what Dr Wainwright said
25 about SAGE?

1 **A.** Well, it might just be a matter of language and degree,
2 but I felt that we were -- myself especially, but
3 members were able to raise issues, and one that was
4 raised a lot was the relationship between -- with
5 economic analysis, and so we were -- felt quite happy to
6 be able to tell the secretariat, SAGE and SPI-M-O
7 secretariat, that this ought to be considered. But in
8 the end it's not our meeting, we are independent
9 academics who are coming along to a meeting organised
10 and held by government in order to get our input into
11 the questions that they wish to address.
12 Now, if we spot a gap and say, "No, you're asking
13 the wrong question, and this is a whole area that you
14 need to look at", then they have the decision about
15 whether to take that advice or not.
16 **Q.** But you could be proactive at least in the sense of
17 expressing a concern that there was a gap?
18 **A.** Oh, yes, and do it in the strongest, most vigorous
19 possible terms. And because, of course, we're outside
20 government, we could take -- you know, take that to the
21 public, as it were. So we did have quite a lot of
22 power, soft power, if you like --
23 **Q.** Yes.
24 **A.** -- in terms of determining the agenda. But in the end
25 they weren't our meetings.

1 **Q.** Understood. I'm going come to come back to one or two
2 of those points in due course but let me just ask you
3 one or two more quite practical questions.
4 The first is: we've seen that pyramid before, it's
5 right, isn't it, that SPI-M-O itself had a number of
6 subject-based subcommittees, not just the two that met
7 before the plenary session, but various that were little
8 committees that were focusing on particular issues?
9 **A.** Mm-hm.
10 **Q.** You've listed them in your statement, I'm not going to
11 go through them. But can you help us with whether there
12 was something called a behavioural and
13 social interventions subgroup of SPI-M-O?
14 **A.** I think very early on there was, but that got moved, got
15 I think turned into a child -- a school-specific --
16 **Q.** Right.
17 **A.** I think it was called BSI at that point, but yes, as
18 you've described it, but then it changed its name.
19 So the acronyms for what we now call NPIs changed
20 a lot in that period. Whether that subgroup started,
21 I think, and I think Professor Julia Gog was the --
22 **Q.** Yes.
23 **A.** -- leading that at one point, but I don't remember it
24 meeting beyond the end of March 2020.
25 **Q.** Right, so early on.

1 On a similar theme, Professor, you've mentioned your
2 involvement in the Welsh Technical Advisory Group. I'll
3 ask you about that in a moment, but before I do, much
4 more generally, as far as SPI-M-O was concerned, did you
5 think it was important that the devolved nations
6 themselves were represented through membership on
7 SPI-M-O?
8 **A.** Yes. So the devolved administrations or devolved
9 nations question is something which worried me a lot
10 over the two years. As I said in 2017, when I took over
11 as chair, one of the questions -- the other question
12 I looked -- that concerned me was: who were we talking
13 to in the event of a pandemic? And clearly because
14 health is a devolved responsibility, it meant that
15 the different nations could make different decisions and
16 go in different directions, and there's a danger, in
17 epidemiological terms, if that happens that nations
18 start gaming against each other. In other words, the
19 best thing for Scotland to do depends on what England
20 does, and the best thing for England to do depends on
21 what Scotland does. So -- and that almost never
22 produces an optimum outcome. It's much better if you
23 have both administrations agreeing a common goal and
24 co-operating closely.
25 So I raised that then with the secretariat and

1 I don't know who they spoke to but the message came back
2 that, no, that would not be a problem, that
3 the United Kingdom in the event of a pandemic would
4 respond as one unit of administration. I didn't take it
5 any further, it's not -- my role is to raise problems
6 not solve them. But clearly as the epidemic -- well,
7 let me start at the beginning, as it were.
8 The epidemics, when it first started, as you have
9 heard and you may well ask me in the future, the data
10 flowing for analysis and modelling was really very poor,
11 and it wasn't until late in April 2020 that we actually
12 had data from across all four nations.
13 So there was clearly not a seamless navigation of
14 the four nations issue, and nations data definitions
15 changed differently during the epidemic, which caused us
16 some analytical headaches. But clearly, as policy
17 started to diverge, it became, I think, you know,
18 important that not only did we have a central group of
19 SPI-M-O, I needed to -- or it needed to be done to make
20 sure that there was modelling capacity within each of
21 the nations to help support their decisions, and so we
22 co-opted a member from the University of Swansea, who
23 essentially formed the -- Mike Gravenor, who formed the
24 kind of modelling unit for Wales, but with input from
25 other SPI-M-O members, so I think Matt Keeling worked

1 quite close, and John Edmunds worked quite closely with
2 Mike Gravenor, and Wales invited me to their TAG
3 meetings and I went to ensure that there was some
4 coherence in terms of capacity and capability and
5 understanding of the modelling.
6 Scotland had a much bigger internal capacity, so
7 I really wasn't involved that much at all with Scotland.
8 They came to our meetings in SPI-M-O, and some of
9 the submeetings that you've talked about the devolved
10 administrations brought their own analysis to those.
11 The nation I didn't really have much involvement with at
12 all is Northern Ireland. I think right at the beginning
13 or early in the epidemic it had been suggested that
14 I have a call with the Chief Medical Officer for
15 Northern Ireland, but that I don't think ever
16 transpired. So, yeah, I'm -- unfortunately, and
17 I don't -- I'm not very proud of that, it didn't happen.
18 **Q.** Your discussions didn't happen?
19 **A.** The discussions didn't happen, and I don't -- I didn't
20 have sight of what Northern Ireland were doing in terms
21 of modelling.
22 **Q.** So you've, I think, explained that both in Wales and
23 Scotland there was, as it were --
24 **A.** Yes.
25 **Q.** -- a freestanding, albeit linked, modelling capacity

1 that was being developed?
2 A. Yes.
3 Q. Is the position that you can't really help us with what,
4 if anything, similar took place in Northern Ireland?
5 A. I don't -- I don't know what took place in
6 Northern Ireland.
7 Q. Yes, thank you, Professor, that's very helpful.
8 I want to move on to a slightly different topic,
9 albeit one that's at the heart of your committee, which
10 is about modelling. And I do so with some trepidation,
11 given the complex detail on models which is to be found
12 not only in your statement but in the statements of your
13 colleagues which have been prepared for this Inquiry.
14 I want, if I may, to at least start with some very
15 basic principles, and it may be that we can build our
16 understanding with some of your colleagues who are
17 giving evidence next week.
18 I'm looking for these purposes at page 31 of your
19 report, and it starts at paragraph 3.69.
20 You describe there, Professor, a very basic
21 distinction in modelling between, on the one hand, what
22 you describe as "statistical models", which are
23 "data-driven", which have few, if any, assumptions built
24 into them, and which generate what you call a prediction
25 or, in longer terms, a quantitative forecast.

1 So that's one thing, the statistical model.
2 On the other hand, you describe something called
3 a mathematical model, which is driven to a much greater
4 degree by assumptions, what you describe as a series of
5 what ifs, and those models you say generate not
6 predictions or forecasts, by which you mean the same
7 thing, but scenarios, which is I think a term of art and
8 means something rather different.
9 So far, so good?
10 A. Yes. No, absolutely. I mean -- but virtually all the
11 models, the ones we use, are somewhere between the two.
12 Q. Exactly. So I wanted to say, although they're capable
13 of being described as alternatives, if you like, they
14 are in fact on a spectrum, they're at either end of
15 a spectrum --
16 A. But they are a mixture of data and assumption.
17 Q. The more you go towards a mathematical model, the more
18 assumptions that the model builds in?
19 A. I'm a biologist by background, so a mathematician I'm
20 sure -- I think your next witness might well argue about
21 some of the wordings and the definitions, but
22 essentially once you replace, start to replace data with
23 assumption, then you have moved towards a more
24 mechanistic description, set of assumptions about
25 the processes that determine transmission.

1 Q. As you do that, what -- the output from that model --
2 A. Yeah.
3 Q. -- becomes not a prediction but a scenario?
4 A. Yes, at the statistical end -- I mean statistical models
5 still have models in them, they still have mathematics
6 in them, but they are much more data driven, and from
7 those you can create formal statistical predictions, and
8 we did that, on SPI-M-O, early in the epidemic. But it
9 was quite short lived because it's the sort of thing
10 that can be done relatively easily, to --
11 Q. I want to move from the general to the specific, or the
12 practical. Because, as you say, when one looks at
13 the SPI-M-O papers, and we'll look at them, there are
14 various things that are being done. Some of the -- it
15 appears, anyway -- product of your meetings was what you
16 describe in your statement as "nowcasts", in other words
17 estimating the position of the disease at the time of
18 the meeting, and that I take it would be performed by
19 a statistical exercise; yes?
20 A. Yes, a more statistical --
21 Q. Yes, and then, perhaps a little bit further along
22 the range, we will see in the papers "Medium term
23 projections", which appear to be a prediction or
24 a projection of how the pandemic is likely to develop in
25 a matter of weeks, three weeks, four weeks, those are

1 the sorts of periods we see in the papers?
2 A. But that's -- yes, but that is only possible with
3 the relatively strong assumption about transmission in
4 the coming --
5 Q. Yes, so that -- but just to help us sort of place these
6 things in the --
7 A. Yes.
8 Q. -- hierarchy, that is clearly less --
9 A. You are correct and I'm highlighting the fact that
10 the big difference is a strong assumption that you have
11 to put in for something that hasn't happened yet.
12 Q. But it is still something in the nature of a prediction
13 of what, assuming that that -- with that strong
14 assumption that things are going to carry on as they
15 are, how you are able to give a projection of how you
16 think the pandemic is going to develop in the next
17 few weeks?
18 A. Yes. Although I don't want it to be thought of as
19 a statistical prediction --
20 Q. No?
21 A. -- in the same way --
22 Q. As the nowcast?
23 A. As a nowcast.
24 Q. Then something different again which we also see in
25 the papers is a reasonable worst-case scenario. That is

1 something completely different, it's not a prediction of
2 any sort, it's a very assumption-driven model which
3 doesn't try to predict the way the pandemic is likely to
4 develop at all, it is simply one course that
5 the pandemic might take --
6 A. Yes.
7 Q. -- depending on the assumptions that are used?
8 A. Yes, although we have to be a bit careful with
9 the language, because whilst it's not a formal
10 statistical prediction, and -- it's a set of scenarios
11 of things that might happen, but the circumstances under
12 which they might happen are really quite rare. On the
13 other hand, they do have elements of prediction in them,
14 so we're not drawing random graphs. You know, they
15 have --
16 Q. Yes.
17 A. -- the salient features that we think of a particular
18 disease within them. You know? And it's that nuance
19 which I think has, you know, caused lots of problems,
20 that -- on the one hand if we say, "Well, they're not
21 predictions", which they're not, then the temptation is
22 to say, "Well, they're valueless then". You know?
23 Q. One way, you make this point in your statement
24 Professor, as I understand it anyway, is that when we
25 are dealing with the nowcast and also the medium-term

1 projection, what is generated is, as it were, a single
2 projection, with all the caveats you've described built
3 in: the R number today is 1.5. Or: over the next
4 three weeks we expect or we project the pandemic will do
5 this or that.
6 So there is a single product which one is looking
7 at, albeit understanding it with the appropriate
8 caveats.
9 When one has a scenario, there is no value in
10 looking at a single scenario, the whole purpose of
11 scenarios is to develop a number of scenarios and look
12 at them all together. Is that one -- I think that may
13 be really what you're saying by saying if one just looks
14 at the reasonable worst-case scenario, it's valueless
15 because you need to look at it with all the other
16 scenarios that have been created and look at them
17 together?
18 A. Generally with scenarios you're absolutely right,
19 the more that you can look -- or looking at one has less
20 value than looking at several. The reasonable
21 worst-case scenario, though, is a slightly different
22 thing, it's more of a planning tool than it is
23 an epidemiological modelling --
24 Q. And I think you, certainly someone refers to the fact
25 that, for example, some risk registers require there to

1 be a reasonable worst-case scenario --
2 A. That is my understanding.
3 Q. -- for planning purposes.
4 A. Yes.
5 Q. And perhaps that's where some of the confusion arises.
6 Just a couple of sample documents produced by
7 SPI-M-O. I mentioned earlier, just by way of example --
8 well, first of all, let's look at the minutes of
9 a meeting, if we may, and I'm going to look at two
10 documents, they're not from the same meeting, but
11 I don't think that matters for these purposes.
12 Can we go to INQ000233688, please. This, we see
13 immediately, is a meeting on -- it's quite late, it's
14 February 21, it's on a Wednesday, I think it's one of
15 these plenary meetings we've discussed, would that be
16 right?
17 A. Mm. We call it the main meeting.
18 Q. The main meeting, I'll remember that.
19 We don't need to look at this in any detail,
20 although I will come back to it in due course for one
21 point. Just casting our eyes down, we can see the topic
22 headings: forward look, R, growth rate, incidence,
23 medium-term projections, restrictions and so on. These
24 were not considered every week, although I think
25 the R rate was something you looked at very regularly,

1 but these were the type of issues that were addressed at
2 your meetings regularly, Professor?
3 A. Yes, yes, and that agenda was, as I said, decided by
4 myself, the co-chair and the secretariat.
5 Q. If we look at the second topic, "R/Growth
6 rate/Incidence", we see there is reference there to the
7 committee having discussed the issue and a consensus
8 view having been agreed?
9 A. Yes, so the main meeting was every Wednesday morning.
10 On the Tuesday afternoon we met as a group to discuss
11 the reproduction numbers and the consensus, and
12 essentially came to an agreement at that -- that was
13 a very technical meeting. I mean, typically the SPI-M-O
14 meeting was three hours, the previous day's meeting
15 would often be two hours. Very technical discussion
16 about the reproduction numbers.
17 That was set because we got a data drop on
18 the Monday evening, so members had, you know, 24,
19 12 hours to do that analysis. And then the SAGE meeting
20 would follow -- the Wednesday, on the Thursday, then we
21 would -- I would meet with the secretariat and co-chair
22 on Thursday evening and we would discuss the issues that
23 had come up in that SAGE to go to the next, the meeting
24 the following week.
25 Q. Yes, so that was the pattern of things?

1 **A.** That was, yeah, the --
2 **Q.** Then, just lastly on this, if we look at the bottom we
3 can see what's being sent up to SAGE, the consensus
4 statement we've already discussed, and then the
5 medium-term projections and some papers --
6 **A.** Yes.
7 **Q.** -- of the type we mentioned.
8 Let's, if we may, look at a sample consensus
9 statement. As I say, I'm afraid it's not the precise
10 one that's referred to here, but I don't think that
11 matters.
12 Thank you very much.
13 So this is in fact earlier in the pandemic, it's
14 September of the year before, Professor, but we see here
15 the first paragraph:
16 "SPI-M-O's best estimate for R in the UK is between
17 1.2 and 1.5 ..."
18 That's the type of consensus that you reached week
19 by week --
20 **A.** Yes.
21 **Q.** -- about the R number?
22 **A.** So the consensus -- well, it differed on -- for what it
23 was we were talking about. For this reproduction
24 number, which we ended up doing every week -- so even
25 when SAGE didn't meet, SPI-M-O had to meet because we

1 were producing this official government statistic, and
2 was -- actually came from a statistical combination. So
3 many groups contributed estimates of the reproduction
4 numbers in the different devolved administrations and
5 the different regions of England. They were then
6 combined statistically and the technical meeting was
7 really to discuss why that was wrong, and so there may
8 well be individual reproduction numbers where it hadn't
9 worked or it was completely out of kilter with the rest
10 and we'd have long discussion about it and whether it
11 should be included or not, and so having decided what
12 was in and what was out, then these, this consensus is
13 essentially a statistical combination.
14 **Q.** Yes.
15 **A.** Other things, where you can't do a statistical
16 combination, the point of the consensus was to ensure --
17 sort of cover the variability and cover the uncertainty
18 in the views on the committee. So we didn't -- it's not
19 consensus as in agreeing a single thing, it's consensus
20 as in agreeing what the uncertainty was.
21 **Q.** Well, I wanted to ask you about consensus, Professor,
22 and let me come on to that now. Can we just look, for
23 these purposes, at your statement at paragraph 3.9 on
24 page 13. Perhaps you say there something similar to
25 what you've just told us, Professor, I'm starting three

1 lines down, you said:
2 "SAGE and its sub-groups developed a consensus in
3 the sense that what was written was agreed by all not to
4 be wrong."
5 Just pausing there, that sounds a rather, if you
6 like, reductionist way of producing a piece of advice.
7 **A.** So we weren't producing advice. I mean, perhaps I'm
8 wrong to include SAGE in this description, but SPI-M-O
9 was very much about creating evidence, not advice, and
10 the documents were written by the secretariat,
11 the SPI-M-O secretariat, and myself and the co-chair
12 then went through them, corrected them, changed them,
13 discussed them, and, as I say, the point was that
14 the documents emphasised that the -- uncertainty. So we
15 didn't come to an agreement about what the evidence was,
16 we came to an agreement about, if you like, what
17 the evidence wasn't, so that the statements that were
18 included had to be something that captured the
19 disagreement.
20 **Q.** It sounds like the R number is actually quite a good
21 example of this, because if amongst the committee there
22 is a disagreement about whether, for example,
23 the R number is in one place or another, the consensus
24 statement would, as it were, sort of find the lowest
25 common denominator, it would capture the range of views?

1 **A.** Lowest common denominator I think is wrong. It's not
2 the lowest common denominator, because at the time you
3 don't know what is correct. So you can have everybody
4 agreeing with one piece of evidence except for one
5 person. It would be wrong to dismiss the wrong
6 person -- the one person. You have to try to capture
7 everything. So the reproduction number, I think that
8 was a particularly narrow range that you just showed, of
9 between 1.1 -- was it 1.2 and 1.5? In other
10 circumstances we have much wider ranges.
11 **Q.** If on your committee you had a few people, expert, who
12 took the view that the R number was quite low, say
13 below 1 --
14 **A.** Yes.
15 **Q.** And you had other people who disagreed with them, and
16 thought that the R number was above 1 --
17 **A.** Yes.
18 **Q.** -- from what you're saying, that would translate into
19 a consensus statement that we are agreed the R number is
20 between 0.8 and 1.4?
21 **A.** So what would happen on the Tuesday afternoon is that we
22 would have a vigorous discussion about it, and because
23 we had multiple groups, then -- and because it was
24 a relatively technical issue, then the person who is
25 out, if there's one person whose estimate is very

1 different from the rest, then they would be challenged,
2 and say: well, why are you getting that? And often it
3 would be because they were looking at a different data
4 stream. You know. Or they had made a different set of
5 assumptions. And so if there was no reason to exclude
6 it, then we would include it, and say: yes, there is
7 uncertainty here, we -- the estimate would come out as
8 being, saying: well, it's likely or highly likely the
9 reproduction number is above 1, if that was, you know,
10 the majority, but we can't be 100% sure.
11 **Q.** What this process doesn't seem to generate, Professor,
12 is a statement saying something like: we had a debate
13 about it, some people thought it was 0.8, some others,
14 perhaps more, thought it was 1.2, these are the reasons
15 why each group took the view they did. Because of the
16 need to reduce what is being --
17 **A.** Yes.
18 **Q.** -- said into a consensus. And you know that that is
19 an outcome that has been criticised?
20 **A.** Well, I'm not sure what the criticism --
21 **Q.** Well, let me show you. If we can look perhaps at
22 Professor Woolhouse's statement, which is INQ000250231
23 at page 7, and if we can look at paragraphs 35 and 36.
24 You can see -- it's really perhaps 36, where he's
25 talking about consensus, he says:

1 "Another weakness is that on many issues there was
2 not complete consensus at the time and reporting what
3 was effectively the majority view might have given
4 an impression of groupthink. In my experience, minority
5 views were not always communicated to officials and
6 ministers."
7 So that's the point. If there is a minority view,
8 why not explain that there are different views on
9 the committee, explain the pros and cons of the
10 different arguments, so that those who are receiving the
11 benefit of your expertise can understand and, if
12 necessary, take up with those involved what
13 the difference of view is, rather than reducing it to
14 what Professor Woolhouse suggests is a sort of bland
15 statement which doesn't actually capture
16 the disagreement on the committee?
17 **A.** Yeah, so I completely respect what Mark Woolhouse is
18 saying, but in my view I didn't feel that at all,
19 otherwise I would have changed it. But I think
20 the question then of how -- so we'll take a step back
21 for a moment. Uncertainty is, I think, the -- one of
22 the core issues in terms of how science and policy work,
23 because as scientists, you know, we have, I think,
24 an understanding of what we mean by uncertainty, and
25 I think that doesn't always map directly on to

1 policymakers, of what they'd understand by uncertainty.
2 And of course uncertainty within decision-making is
3 absolutely critical. And within the pandemic, you know,
4 uncertainty was almost, you know, the biggest issue in
5 the decision-making.
6 How we communicate that uncertainty I think is
7 a very valid -- as scientific subgroups, is a very valid
8 question, and I think I was content with this consensus
9 approach, but of course I think the people who need to
10 be asked are those who received it: did it work for
11 them? The consensus, the -- for example, the scale we
12 had in terms of SAGE papers, there's kind of
13 a likelihood scale ranging from almost certain not to
14 happen, through unlikely, likely -- plausible, likely,
15 highly likely, to almost certain to happen. And again
16 I found that very useful as a sort of extended traffic
17 light system, but it's, you know -- the system wasn't
18 designed for my benefit, it was designed for somebody
19 else to read.
20 **Q.** Certainly not, and you do explain in your statement,
21 exactly as you've said, that you felt that this idea of
22 uncertainty within the scientific analysis may not have
23 been properly understood by ministers, and do you think
24 that it may be this consensus approach may be one of
25 the reasons why it wasn't properly understood?

1 **A.** Again, you'll have to ask the people to whom we were
2 communicating. A lot of my understanding about
3 uncertainty and consensus -- you know, and how we
4 reached -- how we defined it and used it, have come on
5 in reflection. I think during the pandemic I was
6 quite -- it appeared to me to be a very sensible way of
7 working, to capturing that uncertainty, in a statement
8 rather than in a series of bullet points.
9 **Q.** We certainly will, in due course, ask the people who
10 received that, your materials, Professor, but even then,
11 with hindsight, are you able to say that you think
12 perhaps it might have been done a better way?
13 **A.** But I think an advantage of the consensus approach that
14 we had, which I don't think you can -- should be
15 minimised, is that the way in which it enabled
16 the committee to function. I think if -- given that
17 it's a group of academics, that if we had said, "Right,
18 everybody write down your views", then we would have
19 ended up with 20 bullet points, because people would
20 have found all sorts of nuances, we would have been
21 emphasising the differences in the actual meetings. And
22 part of my concern with a group of academics who are
23 always competing with each other for grant funding and
24 publications and data, was to get a cohesion, and so
25 having a consensus approach whereby we had to agree on

1 something was actually extremely useful.
2 I -- the approach -- running a committee or trying
3 to get within those -- these timeframes, capturing all
4 the possible nuances I think would have been much more
5 difficult.
6 **Q.** Yes.
7 **A.** But of course I'm saying that's running it from my point
8 of view, not from the people who need it.
9 **Q.** It's a useful insight, Professor, and of course one of
10 the things which Professor Woolhouse mentions there and
11 which you mention, I haven't touched on so much, is the
12 delay aspect.
13 **A.** Mm.
14 **Q.** And one of the concerns about consensus that's been
15 expressed is that it takes time to create a consensus
16 and therefore it delays the evidence, but I think what
17 you're saying is that actually trying to capture a range
18 of different views may be even more time consuming,
19 because all the members of the committee would want
20 their views to be represented?
21 **A.** I think that's correct. And the other point to remember
22 is that we are independent academics and we are having
23 our meeting in front of the secretariat, who then
24 produced these documents. So -- and I as co-chair have
25 input into the SPI-M-O document, but we are doing it for

1 their purposes rather than for ours.
2 **Q.** Let me move on.
3 **LADY HALLETT:** Mr O'Connor, before you do, it looks as
4 though we're not going to finish the professor before
5 the break.
6 **MR O'CONNOR:** We're not, no.
7 **LADY HALLETT:** Can you be back this afternoon, Professor?
8 **THE WITNESS:** I can.
9 **LADY HALLETT:** In which case I think best, probably, to
10 break now?
11 **MR O'CONNOR:** Certainly.
12 **LADY HALLETT:** Very well, I'll be back at 1.50, please.
13 **(12.48 pm)**
14 **(The short adjournment)**
15 **(1.50 pm)**
16 **LADY HALLETT:** Mr O'Connor.
17 **MR O'CONNOR:** Professor Medley, I want to take you to
18 a slightly different topic from what which we were
19 discussing before lunch, and that is a more general
20 consideration of the balance of the make-up of SPI-M-O,
21 and in particular the question of whether it might have
22 included experts from wider disciplines.
23 Let me start, if I may, by asking you to look at two
24 paragraphs in Professor Woolhouse's statement, and it's
25 page 4 of his statement, please, and paragraphs 18 and

1 19. We see here that Professor Woolhouse, in the first
2 paragraph, makes the point that SPI-M-O was
3 exceptionally well qualified in epidemiology and so on,
4 and he says the group was fit for purpose with regard to
5 quantifying the direct health harms caused by Covid-19,
6 but it didn't have appropriate expertise to assess,
7 using models or any other form of analysis, the harms
8 being done to the economy, nor harms to education,
9 mental health and societal wellbeing.
10 He goes on to say that this "lack of attention", as
11 he puts it, to the wider harms was repeatedly raised by
12 him and others during SPI-M-O meetings. He understood
13 that it wasn't the committee's role but no one, DHSC
14 officials or Cabinet Office observers, was able to say
15 whose role it was.
16 Thank you.
17 Now, I think that you broadly agree with those
18 comments, first of all in the sense that clearly those
19 wider disciplines weren't on your committee, and
20 secondly you were told that it wasn't your job to
21 consider those wider harms?
22 **A.** Yes, not just broadly, I completely agree, and it was
23 raised many times and particularly in regard to
24 the strategy that the Government wished to pursue across
25 the whole epidemic, which was an area in which modelling

1 was underused, I think.
2 **Q.** Yes. Can I just take you to one passage in your
3 statement, please, and that's paragraph 34 -- sorry,
4 page 34, and we see at the end of paragraph 3.80 you
5 say:
6 "It is explicitly states in [minutes in] SAGE ...
7 [in] September 2020 ... that the economic harms of
8 interventions were being addressed outside of the SAGE
9 structures."
10 Then further down, if we can look at the next
11 paragraph, you say something rather similar to
12 Professor Woolhouse, about four or five lines up from
13 the bottom:
14 "I was assured that the quantitative exploration of
15 the impact of measures on the economy, education, mental
16 health and societal well-being was being done."
17 Professor Woolhouse said he never found out who was
18 supposed to be doing that modelling or exploration. Did
19 you ever receive an answer to that?
20 **A.** No, I didn't. We raised it -- as I say, we raised as
21 a gap, or us not doing it, and our concern about who was
22 doing it, several times. It's included in some of our
23 consensus statements. I notice that the one we produced
24 in February regarding school closures, we state in that
25 that school closures causes harms, but we are no experts

1 in that area.
2 And ... yeah.
3 Q. Let's just look at one more paragraph on this in your
4 statement, and we need to go forward, please, to
5 page 119 and paragraph 12.27. You are responding there
6 to a question about the development of epidemiology
7 economic models, so this is the broader type of
8 modelling.
9 You say they do exist, they're used to evaluate cost
10 efficiency of things like vaccines and new medicines.
11 And dropping down a couple of lines, you mention
12 the fact that the impact of the epidemic was exacerbated
13 by disparities in, for example, housing, access to
14 healthcare and occupation, and that the epidemic
15 increased those disparities. You then say this:
16 "This is a major gap in modelling and should be
17 addressed."
18 How, by whom?
19 A. So it's a major gap in infectious disease modelling, not
20 just in this epidemic but generally. We -- at
21 the moment decisions are made on the basis of averages,
22 so -- and I'm not aware that we were asked during
23 the epidemic, but indeed have never been asked to model
24 the outcomes within different groups. So if something
25 is deemed to be cost-effective on average, you know, if

1 it prevents -- let's say it prevents a thousand -- there
2 is a very simple example. Suppose you have two
3 interventions and one saves a thousand lives, the other
4 saves 500, then clearly the thousand is better, but if
5 those thousand are all from one particular group, and
6 the 500 are a much better cross-section of society, then
7 maybe the thousand isn't better. That's not a question
8 we can answer directly, that's, you know, then a policy
9 interpretation of the models, but we were never asked
10 those questions, and as a consequence we've never
11 developed the models. Now, the policy side, of course,
12 can say that: we don't ask those questions because you
13 haven't got the models.
14 So we need to address that, and I think it's
15 a subject-specific issue that we need to go to
16 the research councils to make sure for the next pandemic
17 we have those models available.
18 It's not straightforward, but it's perfectly
19 possible to do, if the data are available, and we know
20 what type of policy questions we might be asked.
21 Q. Was this gap something that was discussed on SPI-M --
22 A. Yes.
23 Q. -- before 2020?
24 A. Yes, and I had actually published about it previously.
25 I had a piece of work which was trying to address this.

1 We as modellers know of this gap, and we have been
2 trying to address it, but we hadn't solved it by
3 the time the epidemic started.
4 Q. Is it closer to being solved now?
5 A. A good question. I'm -- not that I am aware of, no, but
6 it might be.
7 Q. It sounds as though it's not being treated as
8 an urgent --
9 A. Well, I know people have written grant applications, but
10 they have to be funded. It's not something that we can
11 just do, it's something that we as a community can try
12 to address.
13 Q. Going back to the point you referred to, you certainly
14 say in your statement, and it makes sense, that it's
15 something that should be addressed between pandemics
16 rather than during one?
17 A. Absolutely. And many of the issues that I raise in my
18 statement are of that nature.
19 Q. Thank you.
20 I want to move on to another related topic. It's
21 a theme of your statement, Professor, and in fact it's
22 something that Dr Wainwright gave us some evidence about
23 at the beginning of the day, that, at least at various
24 stages during the pandemic, you, as a committee, lacked
25 sufficient understanding of government policy to be able

1 to give them as much help as you would otherwise have
2 been able to do.
3 Can you expand on that for us?
4 A. Yes. So I think there are two -- two answers to that.,
5 the first of which is really a between-epidemic problem,
6 and that is governments have -- well, what the policy
7 needs to do is to give some indication of what it
8 regards as a better outcome. And by an outcome I mean
9 over the whole epidemic. So from beginning to end.
10 So some idea in 2020 -- we didn't have vaccines and
11 there was no guarantee that they would have arrived, in
12 which case the epidemic might have lasted three, four,
13 five years, we might still be in the epidemic now
14 without the vaccines, but what would the decision-makers
15 think of as being success over that period of time.
16 Because that then provides the framework, the strategy
17 for understanding what government is trying to achieve.
18 It's not up to us to determine what that is, because
19 they're value-based judgements as to whether
20 the United Kingdom did badly or well, and personal
21 perspectives in terms of whether the country did badly
22 or well, and we have elected representatives to make
23 those very difficult decisions for us.
24 Q. Sorry, can I just add a thought, which is that it was
25 apparent that the government had some policies. I mean,

1 for example, we knew they wanted to save the NHS. Was
2 that too broad a policy objective for you to work with?
3 **A.** Yes. And that was -- only became -- that was only
4 stated early in the epidemic, but the pre-pandemic
5 strategy was to have the epidemic in one wave, which
6 has -- the only advantage it has is that it's over more
7 quickly. Yeah? So that was the strategy. There were
8 no other strategies.
9 That changed, then, as soon as the epidemic -- or
10 very quickly into the epidemic, and the strategies were
11 much more short term, and modelling has a particular
12 problem with a lack of discussion and sort of a lack of
13 understanding what the policies might be, because we
14 cannot make a policy-neutral model. So in the types of
15 model that you talked about at the beginning,
16 particularly for the scenario models but also for the
17 medium-term projections, if we don't know what
18 government might do when or why they might do it, then
19 we have to second-guess, we have to make it up. We
20 can't put nothing into the model.
21 So ideally what happens is that you have
22 a discussion with the policymakers to come -- to ensure
23 that there's shared understanding of what evidence is
24 going to be most useful for them to make their
25 decisions.

1 **Q.** What I wanted to understand, and I think you're helping
2 us in this regard, is: is it a question of detail? Is
3 it a question of temporal scope, long-term policies? Or
4 perhaps it's both.
5 **A.** I think it's a combination of both. And the best way
6 that I can describe it, I think, is the comparison in
7 the epidemic. So up until January 2021 we didn't really
8 know what -- what the government would have thought of
9 as being a good 2020, you know, or -- sorry, "good" is
10 the wrong word, less worse. Epidemics are bad things,
11 bad things happen in them. But what would
12 the government have regarded as being a less worse
13 outcome?
14 After January, from January 2021 afterwards, the
15 Cabinet Office started to send people to the SPI-M-O
16 meetings and we started to have much more of a dialogue.
17 Now, this fence between within and outside of government
18 still exists, but it's possible to talk and signal over
19 the fence, and we clearly understood, although we might
20 not have been directly told, that the government would
21 have regarded a success in the next six months by not
22 having a major surge of infection. In which case we can
23 say: well, do it slowly, take your -- you know, don't
24 rush to open up immediately, remove restrictions slowly,
25 and remove them in an ordered way so that the data

1 analysis and the modelling can inform you what
2 the impact of the previous decision was. And that was
3 the roadmap: the data, not dates process.
4 **Q.** I was about to say, that's data not dates?
5 **A.** Yes.
6 **Q.** And we can see that that was a process where there was
7 no doubt a dialogue between the government and you
8 which --
9 **A.** Yes.
10 **Q.** -- informed when the various steps --
11 **A.** And critically was that time period. So we had raised
12 very early, and it's in one of our consensus statements,
13 that we -- it's not just us as modellers but data
14 analysis needs a period of several weeks between making
15 a change, a decision, and seeing it reflected in the
16 data.
17 So there are several instances of measures being
18 introduced by the government too late, so that you
19 couldn't evaluate them properly before the next decision
20 had to be made.
21 So I think one of our -- I think one of SPI-M-O's
22 sort of contributions to that roadmap was to say: spread
23 out the decisions and tell us when you're going to make
24 it, because then when we do the modelling we can include
25 that date in the modelling as the date at which things

1 might change.
2 And I think the evidence that we produced for that
3 period was much improved in terms of its relevance to
4 the decision-making, and supported the decisions much
5 more. And it wasn't -- much of a relief to me -- it
6 wasn't then put front and centre to explain why the
7 decisions were being made.
8 The amount of work done in that period was
9 absolutely huge in terms of the members of SPI-M-O and
10 their teams. You know, not just the people coming to
11 the meetings but the teams of people behind them. But
12 it was not presented as being: this is why we have to
13 make this decision. And it was a much more ordered,
14 rational period of time in which hopefully the decisions
15 were better.
16 **Q.** Last thought on this subject, Professor, we're obviously
17 at least partly thinking about recommendations for
18 the future and how the next pandemic might be handled.
19 The period that you're referring to as being a much
20 better period was, of course, a year into the Covid
21 pandemic. How realistic is it, do you think, that were
22 there to be another pandemic, or when there is another
23 pandemic, the initial period, which will be one of
24 inevitably great uncertainty, whether it would be
25 possible for the government to provide the modellers and

1 the scientists with that type of sort of calm,
2 thought-through strategic information at the very start
3 of a pandemic as opposed to well into it?
4 A. Well, the time to do it is now. I was disappointed that
5 as soon -- you know, when we reached February 2022
6 the policymakers who we had been interacting with were
7 disbanded and -- you know, almost immediately. I would
8 very much like to have gone with them, with that group,
9 gone back to February 2020 and re-gone through that
10 process.
11 I mean, critical in that was Dame Angela McLean, the
12 policy co-chair, who I suspect had brokered that
13 interaction. Because it's a risk for government
14 officials to come and talk to people, so -- even though
15 it wasn't direct talking -- to come and meet with people
16 outside government and discuss policy options. And
17 so -- but that is absolutely critical, and I've
18 mentioned in the report we had sort of --
19 Dame Angela McLean also managed to get two people into
20 Cabinet Office, so people from SPI-M-O who worked in
21 Cabinet Office, just to keep the -- that dialogue
22 flowing. When I say dialogue, I don't necessarily --
23 I mean information rather than words. So that we are
24 able, as modellers, to understand what government wants
25 to try and achieve, so that we can support their

1 decisions to achieve that. Or, of course, we can tell
2 them: no, that's impossible.
3 Q. Yes.
4 A. Yeah.
5 Q. We heard that you had resigned the chairmanship of SPI-M
6 earlier this year?
7 A. Yep.
8 Q. Are you in fact still a member of the committee at all?
9 A. No, I'm not.
10 Q. Regardless, the type of work that you're describing, the
11 sort of between pandemic preparation work, is that
12 something that SPI-M ought to be involved with?
13 A. We ought to be, but, you know, much to my disappointment
14 it's not happening, or it wasn't when I was there. And,
15 you know, we -- actually, the first piece of work that
16 we came back to on SPI-M was that piece of work that we
17 hadn't finished before, which is this pre-purchase of
18 vaccines. So the Department of Health is asking whether
19 it should invest a large amount of money to buy vaccines
20 for influenza for the next pandemic.
21 Well, the answer to that question very much depends
22 on what government would do. Because if the government
23 was prepared to stop the epidemic with a lockdown at the
24 next time, then it changes, you know, the amount of
25 investment now that's worthy of putting in. But we

1 don't have any idea of what that is, and that policy
2 landscape is still developing. So UKHSA, Department of
3 Health, how SPI-M feeds into it is all still there, but
4 it needs to have -- or we're not quite clear what those
5 relationships are, but it needs to have input from
6 the centre of government, because if it gets bad enough
7 that you need Cabinet Office policymaking, then
8 Cabinet Office should be involved now to discuss what
9 that's going to look like.
10 Q. Thank you, Professor.
11 I want to change focus again and in fact take us
12 back to the beginning of the Covid pandemic, early 2020.
13 We've heard your evidence about SPI-M, the I standing
14 for influenza but transporting itself across to
15 infection at that time. But, as you've said,
16 a committee that, historically at any rate, had very
17 much focused on influenza planning.
18 A. Yeah.
19 Q. Let's look, if we may, at another passage from
20 Professor Woolhouse's statement.
21 It's on page 44, paragraphs 243 and 244, I think.
22 Yes, thank you.
23 So 243, yes, he says:
24 "An important question in those early stages was
25 whether a Covid-19 epidemic would be more influenza like

1 or more SARS-like. The UK response initially
2 assumed ... an influenza-like event. This was not
3 unreasonable but, in my view, it took looking to
4 recognise that Covid-19 had many similarities to SARS:
5 we knew from early January that [it] was closely related
6 to SARS. Compared with influenza, Covid-19 had a higher
7 R number and had little impact on children while being
8 highly dangerous to the elderly, frail and infirm."
9 Do you agree with that so far?
10 A. Well, I'm not sure what he means by "early stages".
11 I mean, the timeframe is -- generically I agree that
12 pre-pandemic preparedness was influenza, and I have --
13 if you look at the cover of the SPI-M modelling summary,
14 it spells out influenza as the I. So -- and SARS -- so
15 this was transmissible SARS, but I think I first used
16 "transmissible SARS" as a phrase in February, so I think
17 we realised quite quickly that this was not influenza.
18 That is important in public health considerations, but
19 in terms of the modelling was not critical, I don't
20 think.
21 Q. You've already stated in the course of your evidence
22 today, and as I think we know, that in early 2020 there
23 really was only one policy that the Government had, it's
24 the delay, contain, mitigate. You've also referred to
25 the idea of just letting the epidemic take its course.

1 And you say quite straightforwardly in your statement
2 that that turned out to be outdated.
3 Two questions --
4 A. Sorry, it would have been outdated for influenza as
5 well, because influenza still would have had the same
6 kind of health impact.
7 Q. Let's just focus on Covid, if we may. The two high
8 level questions that arise, Professor, is firstly, and
9 that's really the point raised by Professor Woolhouse,
10 whether the UK pivoted away from its pre-existing
11 influenza-based plans too slowly in early 2020, and
12 the related question is whether SPI-M-O or SAGE should
13 have done more to alert policymakers that there was
14 a problem with the influenza plan, or was it that
15 the policymakers themselves weren't tasking SPI-M-O and
16 SAGE appropriately?
17 Let's take them in stages. Do you think that
18 the pivot from the earlier contain, delay, mitigate
19 strategy towards suppression happened too late?
20 A. So that question of -- which is why I pointed out that
21 the -- that plan would have been inadequate or, sorry,
22 wouldn't have ... given the preferences that
23 the government subsequently showed, that they didn't
24 want to have the epidemic in one wave, that would have
25 been true for influenza as well. So the realisation

1 that there would be a large number of hospitalisations
2 and deaths, would mean that they were going to stop
3 the epidemic, would have to have occurred with
4 influenza. Yeah?
5 Q. I don't want to get into a debate with you about
6 a pandemic that didn't happen, Professor, but vaccines
7 might have played a part in influenza --
8 A. But the virus that was causing the epidemic wasn't
9 the issue. The issue was that in the plan these large
10 numbers of -- you know, hundreds of thousands of deaths
11 were just going to happen. It was going to be a natural
12 event that the country would get through.
13 Q. All right.
14 A. Yeah?
15 Q. Yes.
16 A. The question of suppression, of stopping the epidemic,
17 yeah, is -- was clearly made, but that wasn't because it
18 was coronavirus, presumably the government would have
19 made that same decision had it been pandemic influenza.
20 Q. So I think what you're saying is that the reason why
21 there was a delay in changing, in pivoting from one
22 strategy to the other was really the fact that
23 policymakers themselves had previously signed up to
24 the earlier policy, and it was only when they decided on
25 a change of course that a new policy was adopted?

1 A. Yes. And that policy, I'm not sure where it originates
2 from, but, you know, clearly the world and society has
3 changed a lot in the intervening period. And the
4 ability to stop it. You know, I mean, I don't think
5 ten years ago it would have been possible to have the
6 kind of lockdowns that we had.
7 Q. Can we look at another passage of your statement,
8 please, Professor, it's page 18, and I want to look at
9 paragraphs 3.27 and following. Picking it up at the end
10 of paragraph 3.27, please, you say, last sentence:
11 "My view is that the reality of the epidemic, via
12 the SAGE process, was not given sufficient weight
13 initially.
14 "3.28. There was a sense that [the] government
15 strategy was being created 'on the hoof' during February
16 and March ..."
17 Just pausing there, are you here referring to some
18 similar points to those we were just discussing? What
19 do you mean by policy being created "on the hoof",
20 Professor?
21 A. I mean the lack of a plan. It wasn't clear what
22 the plan was going to be. If they were not --
23 government were not going to follow the pre-pandemic
24 plan, and clearly at that point, I don't think -- it
25 depends when I was writing this, but I never got a sense

1 that not having a single wave was something that
2 the government was thinking about. I had a conversation
3 on 4 March which convinced me, you know, very quickly
4 that even if that was the government plan they would
5 change their mind. And so it was really, at that period
6 of time, was a sense of, from my point of view, the lack
7 of strategy, of the lack of decision-making under
8 uncertainty, the things that might happen in the future
9 and what we would do at that point.
10 Q. I suppose not lack of strategy, because I think what
11 you're telling us is there was the strategy, there was
12 the single wave strategy?
13 A. I realise the inconsistency in what I'm saying, yes.
14 Q. But were you expecting them to change course but that
15 call didn't come or --
16 A. I thought they would, and that was partly, of course,
17 from the international perspective, in the sense that we
18 had already seen, you know, the first country, China,
19 close the economy rather than face the epidemic. And
20 even from that perspective you thought, well, that might
21 well be the response.
22 Q. So, and this is what you mention at the bottom of
23 the page we're looking at, you talk about China's
24 response being to "close their economy rather than face
25 the epidemic and its consequences". You say you thought

1 it was "likely that generalised NPI would be a widely
2 used intervention in the pandemic", and that what
3 happened in Italy confirmed your view.
4 So looking at -- focusing in on Professor Medley and
5 SPI-M-O in, let's say, February 2020, it sounds almost
6 as though you were waiting for the government to ask you
7 about lockdowns or to issue you with some tasking
8 saying, "We don't think we can bear to take this wave,
9 what else can we do?" But that call didn't come. Is
10 that what you're saying?
11 A. Yeah, we were doing things, we were looking at
12 the impact, and we were particularly asked about
13 schools. You know, much to some people's frustration,
14 because -- some members' frustration, because, as
15 Professor Woolhouse has already pointed out, that
16 relatively early, in February, having realised that this
17 was more SARS than influenza, then care homes would be
18 more of a problem than schools. So -- nonetheless the
19 government was asking us about the impact of closing
20 schools, and, you know, that is the only NPI, really,
21 for which we had prior information. We were not being
22 asked about alternatives to the strategy.
23 Q. No. Were you, either on SPI-M-O or on SAGE, encouraging
24 the government to think about alternative strategies?
25 A. Regardless of the -- or under most strategies that you

1 would think of, then putting in place NPIs and, I mean,
2 restrictions such as -- or guidance such as asking
3 people with clinical disease to stay at home, so
4 individual isolation, would have to be done, and my
5 frustration at that point was that those were not being
6 put in place early enough, because we didn't know
7 whether they would work.
8 So coming back to this point about sufficient time
9 and data to enable -- see interventions working,
10 the doing nothing and then suddenly changing your mind,
11 which is to some extent what happened, was perhaps where
12 I got the -- you know, some of that confusion from, that
13 if -- regardless of what the outcome you want to achieve
14 is, putting those kind of interventions, individual
15 isolation, in place sooner would have seemed to be more
16 sensible.
17 Sorry, does that answer your question?
18 Q. I want to stay on this subject but move on to a slightly
19 different issue, which is the NHS, and which -- as we
20 know, the cause of the NHS, whether it would be
21 overwhelmed or not, became a key issue.
22 If we look at paragraph 4.9 of your statement at
23 page 43 --
24 A. Just to point out whilst that is coming up, in
25 the pre-pandemic preparedness plan, hospitalisations are

1 not mentioned.
2 Q. No. Let's just look at this paragraph, Professor. It's
3 the second sentence:
4 "Throughout February 2020 it became increasingly
5 clear ..."
6 And I take it you mean -- well, is that clear to
7 you, clear to SPI-M-O?
8 A. Yes, to SPI-M-O.
9 Q. "... that NHS capacity in the UK would be overwhelmed."
10 A. Yes.
11 Q. And you say that SAGE asked a working group be set up to
12 discuss the extent of the overwhelm.
13 Now, we may hear from those, for example, in
14 Number 10 that this prospect of the NHS being
15 overwhelmed wasn't something that at the very least they
16 adverted to until a couple of weeks later than the end
17 of February, in mid-March.
18 But are we to take it from this that -- not
19 the possibility but the certainty of NHS capacity being
20 overwhelmed was something that was clear to you and to
21 SPI-M-O during February?
22 A. So the extent of the epidemic became very clear during
23 February and so I think at that point we were, you know,
24 the -- we'd essentially established the infection
25 fatality rates, so that's the proportion of people who

1 are -- die following infection, at about 1%, big
2 variation with -- especially with age, but -- and if 80%
3 of the population becomes infected in a single wave,
4 then you can calculate the numbers of people who would
5 die.
6 The question, then, of hospitalisation is slightly
7 more complicated, because of course it depends on who
8 goes to hospital under those kind of circumstances.
9 So it needed a meeting with the NHS and with
10 clinical colleagues for them to say what symptoms would
11 justify admission into hospital, because that is
12 a variable, it's a clinical variable that if somebody
13 goes to hospital then they might not be admitted, and
14 that -- those kind of clinical questions determine
15 the extent to which the epidemic results in
16 hospitalisations, for example.
17 Q. Well, Professor, just looking at this statement, and
18 maybe you want to qualify or change it, looking at
19 the statement, what you say is it became increasingly
20 clear that capacity would be overwhelmed, and all you
21 were doing with the NHS was talking about the extent of
22 the overwhelm?
23 A. I think that's right. I mean, throughout -- I mean,
24 yes, I stand by the statement, throughout February.
25 What I mean is that, in terms of being able to make

1 a clear statement, it was absolutely clear the expected
2 deaths. Hospitalisations are slightly, you know, more
3 uncertain because it requires more clinical input.
4 **Q.** I want to have a look -- sorry, Professor.
5 **A.** I don't think it's recorded in the minutes, but just to
6 make it clear, so Dominic Cummings' iPhone X, for
7 example, attended all of the SPI-M-O meetings, even
8 those, I think, pre-pandemic. Whether it's recorded in
9 the minutes I'm not sure, but, we -- as I said, there
10 was a whole host of people phone -- people phoning in
11 from across government. So even if it might not be in
12 the paperwork, but I'd argue about that, it was known.
13 **Q.** Let's have a look at what is in the paperwork,
14 Professor, and I want to look at the minutes of two SAGE
15 meetings at the end of February.
16 So first of all for 25 February -- thank you -- we
17 see a SAGE meeting. Though this is pre-lockdown, so it
18 looks as though it was held in person, although there
19 may well have been people dialling in. We see that you
20 were there.
21 If we can go over to the next page, please, we can
22 see that the measures to limit spread are referred to.
23 And if we look at paragraph 13, it says:
24 "Any combination of measures would slow but not halt
25 an epidemic."

1 Then this:
2 "NHS needs must be considered in any decisions to
3 alter the epidemic curve."
4 Is that consistent with a view that you'd reached
5 that NHS overwhelm was at that stage inevitable?
6 **A.** I think so, yes. Remember these documents are written
7 by civil servants for civil servants --
8 **Q.** Well, just pausing there, Professor, we may hear that
9 SAGE minutes are written for policymakers.
10 **A.** Who are civil servants.
11 **Q.** Well, they are politicians, Professor.
12 **A.** Well, I always think of them as decision-makers.
13 **Q.** I'm not going to quibble with you about language,
14 Professor, but I want to press you on the rather more
15 important point, which is whether the sentence "NHS
16 needs must be considered in any decisions to alter
17 the epidemic curve", does that really mean, does that
18 sentence signal a conclusion that it is inevitable that
19 the NHS will be overwhelmed in the approaching epidemic?
20 **A.** It certainly indicates that the NHS is a major factor.
21 **Q.** Well, that's not the same thing, Professor, is it?
22 **A.** No. No. I mean, I don't remember that -- as I said,
23 I went to many meetings over the epidemic, I don't
24 remember that particular meeting.
25 **Q.** Let's have a look at the next one, Professor. It's

1 a meeting in fact only two or three days later, two days
2 later, so it's the 11th meeting of SAGE.
3 It's a different document. INQ000213175.
4 **A.** No, this is a paper I wrote.
5 **Q.** I may have the wrong ...
6 **(Pause)**
7 We may have to come back to this. Just bear with me
8 one moment.
9 **(Pause)**
10 We can take that down, that's the wrong reference.
11 Yes, could we have INQ000106129 on the screen, please.
12 There may be a problem with the document. I tell
13 you what I'm going to do, Professor, I'm going to read
14 out -- there was a SAGE meeting a couple of days
15 later -- I think there is a problem with getting the
16 document on the screen, but I will read out the entry.
17 In fact it's the same entry that you refer to in your
18 statement, but what it says is:
19 "UK academic modelling groups, Imperial Oxford,
20 London School of Hygiene and NHS planners to organise
21 a working group in the week starting ..."
22 I think we've got it on screen -- yes.
23 So if we go over to the bottom of the second page,
24 please, thank you. Yes, this was the passage I was
25 reading.

1 If we see the very bottom:
2 "UK academic modelling groups ... and NHS planners
3 to organise a working group in the week starting 2 March
4 [so the next week] to analyse key clinical variables for
5 reasonable worst-case scenario planning for the NHS, for
6 review by SPI-M and then discussion at SAGE."
7 So on the one hand, Professor, we have your
8 statement which says that during February it became
9 clear that the NHS would be overwhelmed, and then we
10 have these two sets of minutes at the end of February,
11 neither of which refer to an overwhelming of the NHS.
12 Here what is referred to is reasonable worst-case
13 planning. So, as we've already discussed, it's
14 a scenario, it's not a prediction. How can we reconcile
15 those two things, Professor?
16 **A.** So at the beginning of February it wasn't clear at all.
17 By the end of February SAGE was asking for quantitative
18 details. So that meeting happened on 1 March, I think.
19 It was asked for in SAGE, so by 1 March we had the --
20 a good understanding of what the impact would likely be
21 on the NHS. So that's, you know, that's throughout
22 February.
23 **Q.** Professor, from a lay perspective, and of course with
24 hindsight, but if you and your colleagues had already
25 realised during February that the NHS was going to be

1 overwhelmed by the pandemic that was developing, why
2 didn't you just say so?
3 A. Well, we -- I mean, we -- the secretariat that we were
4 talking to completely understood. The SAGE secretariat
5 were taking the minutes. I didn't write these
6 documents, the documents were written by somebody else
7 for somebody else, they're not written for my benefit,
8 and it's really the writers and the readers that you
9 need to question. I was -- at the end -- by the end
10 of February it was clear, I think, that the NHS would be
11 overwhelmed, and I don't think that was being kept
12 a secret.
13 Q. So the situation you're describing is a meeting, a SAGE
14 meeting, where everyone round the table is discussing
15 the fact that the NHS is going to be overwhelmed --
16 A. Yes.
17 Q. -- but the minutes record simply that there needs to be
18 some reasonable worst-case planning for the NHS?
19 A. Yes.
20 Q. I see, thank you.
21 I want to move to a related document, and that is,
22 please, INQ000129093. I hope this one is right.
23 Thank you.
24 This is -- Professor, I think you've seen this
25 document before, it's a report or a note written by

1 someone called David Halpern, who was a Number 10 civil
2 servant, a behavioural expert who will be giving
3 evidence to the Inquiry in two or three weeks' time.
4 We can see it's dated at the top September 2020, and
5 he's looking back, is he not, at the early days of
6 the pandemic? It's a sort of a -- well, it says, it's
7 a lessons learned document.
8 If we can turn over to the second page, it's
9 the section which is headed "The Early misstep" that
10 we're interested in, and it's in fact the next page
11 where we -- the particular point, but I'll just
12 introduce it, if I may.
13 You can see he says:
14 "Arguably the most fundamental misstep in the UK
15 response was the presumption that Covid would be
16 an unstoppable flu-like wave."
17 He says, the next paragraph:
18 "It is important to see that this presumption was
19 not based on ignorance, but on a century of prior
20 knowledge and assumptions."
21 Then the next paragraph, he refers to the mass
22 expertise which he has described converging on the
23 conclusion that once early containment had failed,
24 a flu-like wave was inevitable.
25 If we can go to the next page, he carries on

1 referring to this, as it were, received wisdom, which he
2 perceived in any event, and he describes it as being
3 a block to any suggestion that there might be
4 an alternative policy of suppression.
5 If we can pick it up at the bottom of this page,
6 please, so the paragraph -- he says:
7 "If I had to choose a single issue -- and moment --
8 that embodied this failure, I'd point to the unshakeable
9 conviction of the SPI-M modellers that suppression --
10 the sustained holding down of Covid prevalence -- was
11 not a viable strategy. For example, Graham Medley,
12 chair of SPI-M, was asked in SAGE in the second week of
13 March, along with the other modellers: 'how certain they
14 were that major second waves would arise in China and
15 other Asian nations?' (ie that suppression was not
16 a viable strategy). Medley answered immediately, and
17 with total conviction: 'as close as 100% as
18 possible...yes, 100%'. His colleagues echoed the
19 conclusion 'yes, 100%'. They were totally convinced
20 that as soon as the harsh lockdowns in Wuhan,
21 South Korea and elsewhere were lifted, cases would
22 immediately surge again."
23 And he observes:
24 "Nothing in science, and certainly nothing in
25 statistical modelling, is 100%. Let alone in the face

1 of the data already emerged from the Asian experience.
2 This was doctrine, not science."
3 Professor, is it right that you believed, as it
4 were, as a matter of doctrine, that suppression wasn't
5 viable in February and March 2020?
6 A. So epidemics have happened throughout history, and
7 the study of them through models is a science,
8 scientific discipline, so it's absolutely not doctrine.
9 And I think that we were correct that -- there were
10 surges. You know, the virus did come back in every
11 country in the world. It was a question of how long
12 they suppressed it for rather than whether they
13 suppressed it. And in terms of health outcomes, clearly
14 suppressing it until a vaccine was available and getting
15 the vaccine into the people was critical in determining
16 the outcome of that. But every country has had
17 a subsequent epidemic, and to some extent, you know,
18 the -- so what is said here is correct, but it's out of
19 context, because I think the -- if I remember this
20 particular discussion, it was, you know: will having
21 a lockdown solve the problem? And the answer to that
22 is: no, it will not solve the problem, because it will
23 continue to be a problem. And if you go back to what
24 you were doing previously, you -- it will re-occur.
25 Which of course it did in the United Kingdom.

1 Q. It did, but, you see, the debate we've been having for
2 the last ten minutes or so is trying to understand what
3 was happening in that time.
4 A. Yeah.
5 Q. And why it was that lockdown doesn't seem to have been
6 considered during February or even in early March.
7 A. Yeah.
8 Q. And what you were telling us was that you were, as it
9 were, waiting for the government to ask you about it,
10 but they didn't. But I wonder whether actually it's
11 possible that you and your colleagues didn't think it
12 would work and so weren't pressing for it and that was
13 at least one of the reasons why it wasn't on the agenda?
14 A. So -- well, we didn't know if it would work, but even if
15 it worked, it doesn't resolve the problem in terms of
16 the longer term. You know, because unless you continue
17 that suppression, then it will come back.
18 Q. Of course if, as you say, you had -- it was very clear
19 to you that the NHS would be overwhelmed --
20 A. Yes.
21 Q. -- then that puts a rather different perspective on
22 whether there needs to be a lockdown, doesn't it?
23 A. Potentially. I mean, you're asking me about
24 perspectives. My role and the role of the models is not
25 to provide those kind of decisions. Our job is to give

1 the evidence, or was to give the evidence.
2 Q. Yes.
3 A. Now, I completely understand what you're saying, is that
4 had it become -- had we made it clear or had
5 policymakers known what the potential for a single wave
6 epidemic was, that they would have been asking much
7 earlier. I don't think that they could not have known.
8 But I might be wrong.
9 Q. What was, as you have said, known to be certainly going
10 to happen to the NHS, wasn't a question of modelling at
11 all, by that stage, was it? It was a statistical
12 prediction. It wasn't a scenario, to use that binary
13 approach we were discussing. On your analysis, you knew
14 that was going to happen.
15 A. Yeah, and we had already seen the policy response to it
16 internationally.
17 Q. But it wasn't flagged up in the SAGE minutes?
18 A. No, but then nor was it -- we asked about, you know,
19 what -- tell us about lockdowns in terms of
20 policymakers.
21 Q. Professor, that --
22 A. There wasn't that dialogue going on, as I pointed out
23 before.
24 Q. Thank you. I'm going to move on. I've got a few more
25 slightly shorter topics to deal with, with you, and

1 the first of them is about -- is to do with nosocomial
2 infection after the first lockdown.
3 If we can start, for these purposes, with
4 paragraph 6.6 of your report, which is on page 55.
5 So here, Professor, you address the question of
6 transmission within LTCFs, which we know is long-term
7 care facilities, I think.
8 A. Yes.
9 Q. We can call them care homes, nursing homes.
10 You refer to an email that you sent to
11 Patrick Vallance in April 2020, do you not? Perhaps we
12 can call that up on screen, and I think the best number
13 to do that with is INQ000 -- well, no, well, shall we
14 try INQ000260625.
15 What we see here is an email exchange. Let's look
16 first at your email to Sir Patrick Vallance, or
17 Patrick Vallance as he was then. So we see it's dated
18 17 April of 2020, and looking at the second paragraph,
19 you talk about two conclusions being relatively robust.
20 The first is that the number of deaths in hospital is
21 less than 50% of all deaths. Secondly, that deaths at
22 home and in care homes are not plateauing.
23 Then looking at the next paragraph, second sentence:
24 "Consequently my reading of the situation is that we
25 have widespread ongoing transmission in the health and

1 social care systems. Hospital and community health and
2 social care appear to be driving transmission, and
3 potentially at an increasing rate."
4 Then you make this rather striking observation:
5 "In effect, this is the opposite of shielding --
6 vulnerable are being preferentially infected."
7 Can you expand on the observation you were making?
8 A. So this is 17 April, so lockdown has been going for
9 three weeks, and we've seen the hospitalisation rate and
10 the death rates turn over, much to everybody's relief,
11 that government could introduce measures that would stop
12 the epidemic. So this is a relative -- this is
13 a dataset looking at deaths. Now, I'm not sure that
14 the data, when they were fully unwound and looked at,
15 actually supported the conclusion, the worry that I had
16 in this email.
17 Q. Right.
18 A. But clearly we had stopped transmission -- my feeling at
19 this time was that transmission within the community had
20 been stopped, or reduced greatly, so that this
21 reproduction number was less than 1, so the prevalence
22 in the community is falling. But the deaths in
23 care homes and in the community were continuing to rise.
24 And the care population, which it turns out we knew very
25 little about, so the people receiving care -- there are

1 more people in residential and informal care than there
2 are in care facilities, and others will know more about
3 that than I do, but this rise in deaths of people at
4 home and in care homes was concerning to me because it
5 meant that we were effectively closing schools and
6 locking down on one hand, and being successful, but
7 there were epidemics in the care sector and the health
8 sector which were continuing to rise. And that's,
9 of course, exactly what you don't want to happen.
10 **Q.** It's what you don't want to happen and it's what we now
11 know at around this time was happening?
12 **A.** Yes.
13 **Q.** So here you are sounding the alarm to Patrick Vallance.
14 If we can go back to --
15 **A.** Just to come back to another point, I mean, this is part
16 of the difficulty -- you know, the situation I was in as
17 an independent -- so if somebody from within government
18 has sent me a document that he's described as not for
19 sharing, I've then shared it potentially with somebody
20 else inside government, I mean there are all sorts of
21 boundaries going on partly because of this problem that
22 I was outside but ...
23 **Q.** Well, you obviously thought it was the right thing to
24 do, to --
25 **A.** I did.

1 **Q.** -- to share your concern with --
2 **A.** I did.
3 **Q.** -- the Chief Scientific Adviser.
4 **A.** Clearly.
5 **Q.** And I want to ask you about his response, please. So if
6 we look at the very top of the page, it's a short
7 response, he says:
8 "Thank you for sharing [it]. I think that's what
9 we've been driving at in SAGE and I will reinforce again
10 with the accountable departments that this is a very,
11 very key area that they need to get on top of."
12 Do you know, can you help us any further with
13 what --
14 **A.** No, I --
15 **Q.** -- Patrick Vallance did about that?
16 **A.** Patrick Vallance was the most senior email I had, so
17 I had told the person the most -- the highest up the
18 chain, we had been talking about it at SAGE and SPI-M-O,
19 we'd discussed this possibility previously, and,
20 you know, he presumably did something about it, but
21 I didn't hear any more.
22 **Q.** Right. That was on 17 April. If we could go to another
23 document, please, it's INQ000213298.
24 This, when it comes up, we will see is a consensus
25 statement from your committee, SPI-M, SPI-M-O,

1 three days later on 20 April.
2 If we look at the second paragraph, the first
3 paragraph talks about hospital transmission, and then
4 the second paragraph says:
5 "This estimate does not include people who acquire
6 infection in hospital, leave (either because they are
7 discharged, or because they are outpatients) and are
8 then readmitted with COVID-19. This requires urgent
9 investigation."
10 So again, the nosocomial infection. Was an urgent
11 investigation undertaken?
12 **A.** So I contacted a scientist who I knew working in PHE,
13 who had -- was -- had some expertise in nosocomial
14 infections. I was also -- I think about this time
15 the SAGE nosocomial working group was set up, so there
16 was urgent investigation of it, and work has
17 subsequently been published looking at the impact of
18 this particular phenomenon.
19 **Q.** And this issue was exposed, over time at least.
20 Yes, thank you, we can take that down.
21 Finally, Professor, I want to ask you, I hope quite
22 briefly, just about a few unrelated matters. The first
23 of them is the resignation of Neil Ferguson from SAGE,
24 something we all remember, and if we can perhaps call up
25 on screen INQ000267746. If we hadn't remembered, I hope

1 this is the document which will remind us of that event.
2 We can see it's a BBC News article from 6 May 2020,
3 so only a couple of weeks, in fact, after those emails
4 we were just looking at. It refers to him quitting
5 what's described as his "government role" after
6 "'undermining' the lockdown". We see there's
7 a reference to him having quit after admitting "an error
8 of judgement".
9 If we can go over to the next page, please, we see
10 the Health Secretary, Matt Hancock, quoted as saying it
11 was extraordinary that Professor Ferguson -- but he had
12 taken the right decision to resign. Then he says, this
13 is Mr Hancock saying it was "just not possible" for
14 Professor Ferguson to continue advising the government.
15 We read on, possibly with some degree of irony, that
16 Mr Hancock said that the social distancing rules were
17 there for everyone and were deadly serious, and there is
18 a reference to Scotland Yard having made a statement as
19 well.
20 If we could go over to the next page, please,
21 page 3, the BBC correspondent refers to
22 Professor Ferguson's resignation as being "a really big
23 deal", says he is "the most influential scientist" in
24 the virus outbreak apart from Chris Whitty and
25 Patrick Vallance.

1 Then further down the page there is
2 a Sir Robert Lechler, said he didn't think that
3 Professor/'Ferguson's resignation would "have any
4 material impact" on the work of SAGE. He says that
5 although Professor Ferguson made an important
6 contribution, he is sure the group would continue to
7 provide valuable support.
8 The point I want to ask you about, Professor, is
9 that although, as we see here, Professor Ferguson on
10 this occasion resigned from SAGE, he in fact remained
11 a member of SPI-M-O, did he not?
12 **A.** He did.
13 **Q.** We can look at an email from you to Paul Allen and
14 Angela McLean, in fact I think it was the day before
15 that BBC report, but obviously very much at the same
16 time. If we can look at the bottom half, please, we can
17 see you in the second paragraph saying that you are
18 quite keen to keep him on SPI-M, he is a modelling
19 expert, you don't want to lose his expertise. You say
20 that his input into forming SPI-M consensus is greatly
21 valued but then you say his presence might damage
22 the science and SPI-M and there is a reputational risk,
23 and then you refer at the end to the fact it's a DHSC
24 decision.
25 So we know he did stay on SPI-M. We can see in this

1 email that you understood the tension perhaps between
2 the statements that were being made publicly about
3 Neil Ferguson not being an appropriate person to advise
4 government, but your desire to keep him on
5 the committee. Presumably that's what you mean by the
6 reputational risk?
7 **A.** Yes, well, and I saw SPI-M's role as mainly providing
8 evidence rather than advice. You know, this process of
9 creating evidence that then gets transformed into advice
10 to be given to decision-makers.
11 **Q.** As a matter of --
12 **A.** SPI-M-O is one step further away from decision-makers.
13 **Q.** As a matter of transparency and public confidence,
14 Professor, did you think that perhaps it was important
15 that the public should understand that, notwithstanding
16 the public statements that had been made, although he
17 was resigning from SAGE he was in fact continuing to be
18 a regular member of SPI-M-O?
19 **A.** So the reason why we were all doing this is for
20 the public good, because we wanted -- I firmly believe
21 that modelling is essential and important within
22 an epidemic, and we wanted the government to make
23 the best decisions it could, because, you know, we're
24 living through it as well.
25 I greatly value Neil Ferguson's professional

1 expertise. I think he is, you know, undoubtedly one of
2 the leading modellers internationally, and wanted
3 SPI-M-O to produce the best evidence it could, and
4 therefore was making clear to my policy co-chair and
5 the head of -- Paul Allen's the head of the SPI-M-O
6 secretariat, that that was what I felt. But on the
7 other hand, you know, it wasn't -- it's their committee,
8 not mine.
9 **Q.** Exactly. And do we therefore assume from what you say
10 that in the end the decision that he should stay on
11 SPI-M-O was not your decision, but do you know whether
12 it was --
13 **A.** He didn't come for many meetings, I can't remember how
14 many, but then he reappeared.
15 **Q.** Do you know whether it was a decision taken by
16 Mr Hancock or not?
17 **A.** I have no idea how far up that chain it went, but I was
18 very glad for two reasons. One was because the -- it's
19 not only Neil Ferguson himself, but, I mean, he has
20 a large group with a national investment in it to
21 provide that -- this kind of evidence, and I was also
22 worried about the kind of morale on the committee at the
23 time, and, you know, felt it important that his
24 expertise was recognised in order to keep the committee
25 functioning.

1 **Q.** Yes. Thank you.
2 I want to ask you about a separate matter now, and
3 in fact this involves going back to the consensus --
4 sorry, no, the agenda, the SPI-M-O agenda that I showed
5 you before lunch, so that's INQ000233688, please.
6 You'll remember looking at this earlier. One of the
7 agenda items I didn't refer you to earlier because
8 I knew we were coming back to it, it's the fifth one
9 down, paragraph 8, Long Covid.
10 Now, we noted earlier that this is a meeting quite
11 late in the pandemic, it's February 2021. Can you tell
12 us how it came to be that you were discussing Long Covid
13 on that occasion?
14 **A.** Thank you. So you alerted me to this. I looked it up
15 yesterday. I was trying to remember or trying to find
16 out whether this was members suggesting we talk about it
17 or the secretariat asking us to talk about it, and
18 I couldn't find out which, so presumably it was done in
19 a phone conversation rather than by emails. But we knew
20 from the outset that there were likely to be
21 post-infection sequelae, I think clinically they're
22 known as, the consequence of infection. Principally
23 I remember discussion about whether or not Covid
24 increased susceptibility for bacterial infections. That
25 turned out not to be true. But without formal case

1 definitions and good data we can't include it explicitly
2 in the models, which is really the conclusion of this
3 discussion. Clearly we can and we do include
4 infections, so we were always talking about infections,
5 but there is little we can do in terms of modelling to
6 enhance the data and the information that's available.
7 **Q.** Does it follow from what you've said that following this
8 discussion there wasn't any modelling of Long Covid, at
9 least at that stage?
10 **A.** Yes.
11 **Q.** Has there in fact to your knowledge ever been any SPI-M,
12 SPI-M-O modelling of Long Covid?
13 **A.** Not to my knowledge. And until we, for example, have
14 case data and good data then it wouldn't be possible.
15 **Q.** You may not be able to answer this, in which case say
16 so, but from your understanding about what is known
17 about Long Covid now, is there enough data, enough
18 understanding to model it if one wanted to?
19 **A.** Well, because, as where we started, that models are
20 a combination of data and assumptions, so if you wanted
21 to put some assumptions in you can model anything. If
22 you want to be able to provide policy-specific evidence
23 from a model then the data do not exist to be able to
24 include Long Covid in a model that actually produces
25 realistic numbers.

1 **Q.** Thank you.
2 Just one or two more short topics. The first of
3 those is to do with interactions with the media by
4 members of your committee. We will all, I'm sure,
5 recall during the pandemic hearing about the latest
6 announcement by the government or the latest decision by
7 SAGE or one of its committees, and then perhaps hearing
8 one of -- a scientist who may or may not have been on
9 that committee, but may have been, expressing their own
10 view, and the broadcasters were always very careful to
11 introduce the person as expressing his or her own view
12 rather than the view of SAGE or SPI-M or whichever
13 committee it was.
14 Do you have a view about whether -- well, perhaps
15 I'll ask the question in this way: can we have a look at
16 a document, please.
17 It's INQ000102129.
18 This is a series of WhatsApp messages, Professor.
19 So they're WhatsApp messages from Matt Hancock's phone,
20 and we can see it's June 2020. It starts with
21 Boris Johnson saying:
22 "These sage geezers now saying we should have gone
23 into lockdown earlier ... can we gently ask them why
24 they did not make their anxieties public at the time???"
25 Then Patrick Vallance, relevantly for our purposes,

1 says:
2 "I think there is too much enthusiasm for the camera
3 at the moment and will speak to them again. All the
4 minutes of SAGE are published and so dates of
5 recommendations are clear."
6 Then Matt Hancock says:
7 "It is exceptionally unhelpful having individual
8 members of SAGE making comments like this. It
9 undermines us all."
10 So we see apparently a view being expressed by
11 Patrick Vallance and Matt Hancock which is disapproving
12 of members of SAGE and other committees making media
13 statements.
14 We know that you did talk to the media during
15 the pandemic. Help us with that issue as to whether,
16 looking forward, people like you who attend these
17 committee meetings and feed into these consensus
18 statements ought or ought not to express contrasting
19 views publicly?
20 **A.** As I said, I think this is a difficult area in terms of
21 kind of the inside/outside government and independence.
22 Clearly the government values independence, and so
23 wishes to have independent people giving advice or
24 providing evidence, and of course if we're independent
25 we can say what we like.

1 Slight irony of saying, well -- in here, a paradox
2 of, you know "Well, why weren't they speaking out
3 publicly at the beginning?" as a defence or a criticism
4 for why they're speaking out publicly now.
5 So -- and it is a difficult area, because in
6 an epidemic, you know, one of the key things that
7 determines outcome is the coherence of the population,
8 and we're very well aware of that. So being on message,
9 as it were, supporting government communications, even
10 if you might think that they are personally wrong,
11 you know, is -- puts you in a difficult position. I'm
12 not -- whereas -- as other scientific groups were quite
13 happy to advocate for things that the government weren't
14 supporting.
15 So it just creates a minefield.
16 **Q.** One way of looking at it is it undermines the consensus
17 statements we were talking about earlier, because
18 of course the SAGE minutes were being published --
19 **A.** I think we didn't have it as a consensus statement. If
20 we had a series of, you know, "Five people think this
21 and three think that", then potentially you get
22 arguments in public about which of the -- which is
23 right, the three or the five.
24 And so having a consensus statement I think helps
25 because that does give people a clear guideline of what

1 we were, what our position was as a group. But we don't
2 have any -- we weren't asked to follow that in public,
3 so people quite happily go out and -- quite within their
4 rights to go out and disagree with their own consensus,
5 which might sound incoherent, but we are independent
6 academics and, you know, it's that -- that's the nature
7 of the beast.
8 I mean, in some ways it would have been much easier
9 for me and for others if they had agreed to pay my
10 salary and co-opted me into the civil service and taken
11 me into government. Then that would have made my life
12 a lot easier. But then I wouldn't have been
13 independent. So that independence question and how you
14 use it across the barrier, across into government, I do
15 think is a critical one for understanding how SAGE
16 works.
17 **Q.** It is, Professor, and it actually brings me to the very
18 last point I wanted to mention, because as you say, as
19 we've heard, certainly you and your academic colleagues
20 were independent, you weren't being paid for all of
21 the work you did on SAGE and the like committees.
22 If we could finally then look back at your
23 statement, please, and go to page 25, and look at
24 paragraphs 3.48 and 3.49, you make the point which you
25 refer to in various places in your statement, Professor,

1 that -- picking it up towards the end of 3.48, you say:
2 "[You] expected that SPI-M-O would be mostly
3 involved in supporting the technical functions of
4 government and boosting the modelling capacity and
5 creating the breadth of models required to generate
6 ensembles and provide SAGE with scientific advice.
7 "3.49. In the event, [you] were solely responsible
8 for the majority of the formal government modelling
9 during the epidemic."
10 And you describe then the vast amount of work that
11 was done.
12 Then finally -- if we can go, please, to page 101 --
13 you pick up on very much the same point. At
14 paragraph 9.9 you say:
15 "... personally [you] were not comfortable that
16 SPI-M-O, a group of volunteers, was producing
17 a government statistic ..."
18 And you're referring to the R number here, aren't
19 you?
20 "... which had been given prominence in government
21 strategy, as our role was providing evidence rather than
22 fulfilling operational functions."
23 You're making very much the same point in those two
24 paragraphs, are you not, which is that you had expected
25 to be, as it were, providing an additional later to

1 government --
2 **A.** Yes.
3 **Q.** -- work, and in fact you found yourself week in, week
4 out calculating the R number?
5 **A.** Yeah, so even when SAGE didn't have to meet, SPI-M-O had
6 to meet. And the setting up of the Joint Biosecurity
7 Centre, JBC, in June, I think, 2020, I was hoping that
8 they would take up this function but it took them over
9 a year to get their act together to do that. And,
10 you know, a lot of what we did would have been done by
11 PHE had PHE had the capacity to do it. But, you know,
12 a lot of the people we knew in PHE on SPI-M had left PHE
13 and there was a loss of capacity. And so we did, to
14 some extent, step in and fill that gap.
15 **Q.** Looking forward, on your understanding of how things
16 work now and how they might work in the future, were
17 there to be another pandemic, would the government be
18 reliant on, as it were, the volunteer academics to
19 provide that basic modelling function, or --
20 **A.** That's under discussion, and clearly UKHSA which,
21 you know, is a new body put in, but has many of the same
22 functions that PHE has, I think now, at this point in
23 time, has much more capacity. How that would fit in
24 with an equivalent SPI-M-O, I don't know. But of course
25 the danger is not now, the danger is in ten years' time,

1 that that capacity being reduced again.
2 **MR O'CONNOR:** Professor, thank you very much. I've taken
3 you through some quite lengthy points.
4 My Lady, those are all the matters I have for this
5 witness.
6 **LADY HALLETT:** Thank you very much indeed, Professor. I'm
7 very grateful to you, and of course for all the work
8 that you and your colleagues did. Thank you.
9 **THE WITNESS:** Thank you.
10 **(The witness withdrew)**
11 **LADY HALLETT:** Right. Well, as you know, Mr O'Connor, but
12 others may not, I have to finish by 4 o'clock at
13 the latest, so I shall return at 20 past, and I'm afraid
14 anything you can't elicit by way of oral evidence this
15 afternoon, I'm going to have to rely on the written
16 statement.
17 **MR O'CONNOR:** My Lady, yes.
18 **LADY HALLETT:** Thank you.
19 **(3.08 pm)**
20 **(A short break)**
21 **(3.20 pm)**
22 **LADY HALLETT:** Mr O'Connor.
23 **MR O'CONNOR:** My Lady, our last witness of the day is
24 Professor Matthew Keeling.
25

1 **PROFESSOR MATTHEW KEELING (affirmed)**
2 **Questions from COUNSEL TO THE INQUIRY**
3 **MR O'CONNOR:** Thank you, Professor. Do sit down. Could you
4 give us your full name, please.
5 **A.** Yeah, Matthew James Keeling.
6 **Q.** Professor, you have prepared a witness statement at our
7 request for the Inquiry. We see it on screen. At the
8 end of the statement -- again we don't need to go to
9 it -- you've signed the statement underneath the
10 statement of truth saying that you believe that the
11 facts it contains are true, and your signature was made
12 on 5 July of this year; is that right?
13 **A.** That's correct, yes.
14 **Q.** Thank you.
15 Professor, you are a professor of mathematics and
16 life sciences at the University of Warwick, I think?
17 **A.** Yep.
18 **Q.** And you also explain in your witness statement that you
19 are, I think, the director or possibly a director of the
20 Zeeman Institute for Systems Biology and Infectious
21 Disease Epidemiology Research at the University of
22 Warwick as well?
23 **A.** Yes.
24 **Q.** In a couple of sentences, tell us something about the
25 work of that institute?

1 **A.** Okay. I mean, it's a large institute, so it's also in
2 some ways virtual, so we don't have a specific
3 membership but we do have individuals that are sort of
4 highly connected with it and interact fully, and it
5 spans people who are interested in using quantitative
6 tools to address challenges in biology, and this is
7 everything from sort of cellular biology and genetics
8 through to a large range of different problems in
9 infectious diseases, everything from sort of childhood
10 diseases such as measles through to human papillomavirus
11 or HPV, Mpox --
12 **LADY HALLETT:** More slowly.
13 **A.** Sorry.
14 **MR KEITH:** I know. I appreciate we've got a time limit, but
15 we have to remember the stenographer.
16 **A.** Sorry. So, yeah, human papilloma virus, monkeypox and
17 then also livestock infections. So we cover a huge
18 gamut of work.
19 **MR O'CONNOR:** Mathematical modelling of that whole range you
20 just gave us of epidemiological issues?
21 **A.** Yeah.
22 **Q.** So, as we'll hear, Covid was well within the range of
23 the type of work that you were already doing?
24 **A.** Yes, I'd say that's a good ... yeah.
25 **Q.** You joined SPI-M in early 2009, so by the time of the

1 pandemic you had been a member for over ten years. Did
2 that make you one of the longer serving members or not?
3 **A.** I believe Neil Ferguson and John Edmunds were on at
4 around the same time. I believe they were both members
5 when I joined, but they'd only recently become members.
6 So I'd also sort of been there when we'd gone through
7 the 2009 swine flu outbreak, so that gave a sense of
8 perspective.
9 **Q.** Yes, and in fact you say that you were the acting or
10 an acting chair of the committee in 2009 at the time of
11 the swine flu pandemic.
12 During the Covid pandemic, you were an active member
13 of SPI-M-O, but you weren't a regular attender at SAGE.
14 I think you did attend it on a few occasions but, unlike
15 Professor Medley, you weren't there routinely?
16 **A.** That's correct.
17 **Q.** I want to ask you about a few of the matters you've
18 raised in your witness statement, Professor Keeling, and
19 the first of them is what you describe as the JUNIPER
20 consortium. So it's paragraph 10 of your witness
21 statement where you start to describe this.
22 Perhaps you can tell us in your own words: it was
23 I think a consortium that was formed during the
24 pandemic, perhaps quite early on, I think in, you say,
25 the spring of 2020; is that right?

1 **A.** Yes, yes.
2 **Q.** And it was a coming together of epidemiological
3 modelling academics from a number of different British
4 universities?
5 **A.** Yeah, there were seven different universities
6 represented.
7 **Q.** At a later stage in your witness statement you talk
8 about the fact that the sort of the field and SPI-M also
9 had a very, a significant representation first of all
10 from what we know we should call the London School, and
11 secondly from Imperial College London, and was this
12 consortium that you call JUNIPER an attempt, if you
13 like, to gather together other universities who on their
14 own had a much smaller presence, but working together
15 could work at scale in the same way as those other two
16 institutions?
17 **A.** Basically, yes, I mean, we wanted to sort of balance out
18 the skills that we'd got, and I think also by having
19 a large number of different universities we could tap
20 into pools of other expertise as well, which I think
21 helped.
22 **Q.** There was, you describe in your statement, a problem
23 with the funding for the consortium, which took several
24 months to sort out. Should we see that as just one of
25 those things in university life, or is it more

1 fundamental and a matter that this Inquiry should
2 sort of address?
3 A. I mean, I think it's more just one of those things that
4 happens. We're all used to not getting funding on
5 occasions, and things just taking longer than they
6 should do. I mean, as soon as we got the funding we
7 were able to do more, but we were pulling together
8 before that as well.
9 Q. One of the advantages of the JUNIPER consortium that you
10 describe in your statement is being able to access
11 regional data, and I take it you mean data from the
12 regions represented by the different universities; is
13 that right?
14 A. Yeah. So, I mean, we were certainly talking to local
15 health charities -- local health trusts, and I know the
16 same was true of the Manchester group, they were very
17 involved with their local health centres. So I think
18 that gave us a different perspective. Just being
19 outside London sort of quite often means that you view
20 things quite differently.
21 Q. It does, though, raise the question of whether you need
22 to be at a university in Exeter or Warwick to get hold
23 of regional data relating to those areas or whether --
24 I mean, one might expect that data of that sort is
25 available to modellers, if it needs to be, anyway?

1 A. I think the data's available, I think what you lack is
2 the perspective of actually going and being able to talk
3 to the public health people who are on the ground, who
4 will have a slightly different perspective to what is
5 just in the data. So I think you just get a richer
6 sense of what's happening.
7 Q. Now, I think I'm right in saying, Professor, that all of
8 the universities that were part of the JUNIPER
9 consortium were from England. Is that right?
10 A. Yes.
11 Q. You may have heard us asking Professor Medley about how
12 modelling works with regard to Scotland, Wales and
13 Northern Ireland. First of all, have you got anything
14 to add to what he said? But, secondly, was it in your
15 mind that the JUNIPER exercise might include the
16 devolved nations or not?
17 A. I would say we didn't actively exclude them, it wasn't
18 that we wanted this to be an England-only grouping,
19 I think it was more of a sort of circumstance of what
20 was happening. Individuals who were working in
21 comparative areas within SPI-M-O just came together and
22 it just happened to be various people from England. But
23 it's worth saying that I think a lot of us were also
24 involved with work that was going on in the devolved
25 nations, so I attended the Welsh TAG several times and

1 spoke to them at quite long length, I also did quite
2 a lot of work with the Scottish, so Public Health
3 Scotland, trying to understand when they were seeing
4 sort of anomalous rises in cases in local areas. So
5 I don't think we had this dominated English point of
6 view, I think we were all working across the devolved
7 nations.
8 Q. Yes.
9 I want to ask you one other further question about
10 the imbalance, if you like, or at least the dominance on
11 SPI-M-O of the London School and Imperial College.
12 In the questionnaire response, the initial
13 questionnaire response that you provided to
14 the Inquiry -- let's call it up, it's INQ000056476,
15 that's it, and it's page 37, please. If we could
16 highlight the fourth paragraph, "In the very early
17 stages ..." That's it, thank you.
18 "In the very early stages of the pandemic, modelling
19 activities [as you have said] were dominated by
20 Imperial College and ... LSHTM."
21 Then you say this:
22 "They had representatives on SAGE [so in the case of
23 Imperial College that's Professor Ferguson, in the case
24 of the London School that's Professor Edmunds] and
25 therefore bypassed SPI-M-O."

1 Before I ask you about that, let me remind you of
2 something that Professor Woolhouse said in his
3 statement. I'm not going to call it up, but he refers
4 to very much the same situation and talks about SAGE
5 marking -- or rather SPI-M-O marking its own homework
6 because there were essentially the same people on both
7 committees.
8 Is that a problem that you're identifying by using
9 the word "bypassing SPI-M-O" there?
10 A. No, I think I'm referring to different things here. So
11 I think in the very early days of SAGE it was very
12 easy -- and I'm not sort of laying the blame here,
13 I'm not saying this is anyone's fault -- but it was very
14 easy, if there was a modelling question, for either
15 John Edmunds or Neil Ferguson to say "Oh, we can answer
16 that", and if that comes up in SAGE that seems
17 a perfectly natural thing to do; and I think it was only
18 later, when there were more groups involved with
19 SPI-M-O, that the questions came to SPI-M-O and we
20 addressed it as a larger group. So I think that was
21 just a case of how it was.
22 In terms of marking our own homework, I'm not sure
23 that's true either. I mean, yes, there were members of
24 SPI-M-O who were on SAGE, but actually the times I went
25 to SAGE and presented work I got a grilling by people

1 who were, you know, experts in their own field and would
2 really take you to task on the assumptions. So I don't
3 think we ever did that.
4 **Q.** The point made by Professor Woolhouse, and he'll explain
5 it for himself when he comes here, but he starts from
6 the proposition that SAGE is supposed to be -- one of
7 its functions is to challenge the conclusions drawn or
8 the evidence provided by SPI-M-O, and makes the point
9 that if the same people or the same people from the same
10 area of expertise are on both committees, then the
11 challenge function that might be provided by SAGE is
12 bound to be diminished.
13 **A.** Slightly. I think we'd already gone through rounds of
14 modelling critique of the technical elements within
15 SPI-M, or SPI-M-O, and I think, you know, that happened
16 on the Tuesday meetings as well as the Wednesday
17 meetings, and I think those were technical discussions
18 that you wouldn't have wanted to have at SAGE. Whereas
19 SAGE offered a more wide-ranging challenge to some of
20 the premises and assumptions that we'd put in.
21 So I think -- I felt we'd got an awful lot of
22 challenge. I don't think it's reflected terribly well
23 in the minutes. You know, we've already had discussions
24 of what the consensus statement is, but without wanting
25 to list every single argument that was proposed and then

1 defended, I don't know how you'd do that in a systematic
2 way.
3 **Q.** Thank you. We can take that off the screen.
4 I'm going to move on, Professor, and I want to
5 address with you, and I hope develop, an area that we
6 discussed with Professor Medley, which is the question
7 of the range of experience and expertise on SPI-M-O.
8 You'll recall -- I think you were watching at least
9 some of Professor Medley's evidence -- the passage in,
10 again, Professor Woolhouse's statement where he made the
11 point that SPI-M-O by its membership was eminently well
12 qualified to address these epidemiological modelling
13 issues, but couldn't really provide an answer to issues
14 around deprivation, inequality, the economic impact of
15 the pandemic.
16 Let's look, if we may, at part of your witness
17 statement, which is paragraph 42, which starts on
18 page 11, I believe. Yes. So it's the last two lines of
19 this page and then going over to the next. You make
20 a very similar point, Professor. You refer to the
21 discussion about interaction between epidemiological and
22 economic modelling. You say it was made clear to you
23 that the role of SPI-M-O and SAGE did not extend to
24 considering the economic consequences of infection or
25 control measures -- so entirely as Professor Medley

1 said -- and you endorse that position precisely because
2 of the limits of your own and your colleagues'
3 expertise.
4 You say that you would of course have been happy to
5 collaborate with experts in these areas, and I think in
6 another part of your statement you say you actually did
7 more than that, you volunteered or you tried to --
8 **A.** Yeah.
9 **Q.** -- make that happen?
10 **A.** We certainly reached out at various times -- I mean, not
11 as part of SPI-M-O, but as independent academics -- to
12 try and work with groups who were looking at the
13 economics.
14 **Q.** And did that bear fruit? I'm going to come on and talk
15 about your paper in a moment, but in terms of reaching
16 out within the SAGE or SPI-M-O structure, did that work?
17 **A.** Well, not within SAGE and SPI-M-O, this was sort of from
18 our academic group out to other academic groups.
19 **Q.** So perhaps we are now talking about the paper and the
20 work you did?
21 **A.** Yes.
22 **Q.** You refer to that, I think -- yes, so it's in fact the
23 paragraph 43, which is on the page. You say that in
24 late 2020 you worked with a large group of academics to
25 explore the wider costs and benefits of social

1 distancing measures over two time periods, one which
2 I think was in the past at the time you did your work
3 and one which was just in the future.
4 **A.** Yes.
5 **Q.** And you say in the paper you used a willingness to pay
6 approach, considering the economic losses the country
7 would be willing to sacrifice to preserve one year of
8 healthy life, and then you go on to describe the paper;
9 is that right?
10 **A.** Yes, that is correct.
11 **Q.** Let's actually have a look at the paper itself, if we
12 may, so it's INQ000205272. This is the paper that we
13 see -- as you say, there are a series of authors, you're
14 the third that we see on there, Professor.
15 If we can go to the second page, first of all,
16 please, briefly, and let me say I'm not going to -- I'm
17 sure it's fascinating, but not only given the time, I'm
18 not going to get into the detail of the precise
19 modelling that you did relating to those two time
20 periods. I just want to look at the approach that you
21 took.
22 So at the bottom of this page we see that the paper
23 states at the last paragraph that:
24 "Much of the existing modelling literature on the
25 pandemic has focused explicitly on the impacts of

1 interventions that minimise the direct health impact of
2 the Covid-19 pandemic, such as the number of individuals
3 being admitted to hospital and/or dying ..." and so on.
4 If we can go to the next page, please, at the top
5 you refer to the fact that there are of course
6 non-health benefits and harms that can arise as a result
7 of the lockdown, and you list some sort of economic
8 impacts, giving some examples in the hospitality sector
9 and so on.
10 Then at the end of that paragraph you say:
11 "As a result, judicious use of lockdown measures may
12 ultimately hasten economic recovery. It is therefore
13 important to consider the effect of any control policy
14 on the overall economic cost of an outbreak, taking into
15 account both positive and negative health and economic
16 effects."
17 Then a few lines further down where we see there is
18 a 15, so about six or seven lines down in that passage,
19 just one sentence, you say:
20 "In this paper ..."
21 And here I think you capture what you're trying to
22 achieve:
23 "In this paper, we analyse the effectiveness of
24 different control scenarios ... taking into account the
25 positive impact on public health and the negative impact

173

1 on the economy."
2 So does that summarise what you were trying to
3 achieve?
4 A. Yes.
5 Q. We see further on down the page these terms that you
6 referred to in your witness statement that you had used,
7 you see:
8 "To establish the COVID-related health impacts, we
9 calculate the quality adjusted life year (QALY) loss for
10 each scenario."
11 You also then refer to the societal willingness to
12 pay conversion factor.
13 Can you explain, I hope in lay terms, what you mean
14 by those terms?
15 A. I will try my best.
16 So QALY, or quality adjusted life year, is the idea
17 of just counting how much health benefit you get from
18 any particular intervention, so this could be giving
19 someone a new type of drug, it could be vaccination, and
20 what you look at is how many years of good healthy life
21 have you saved, and what needs to be done in all of
22 health economics is to balance that against the cost of
23 the drugs, the cost of the vaccine, the cost of any
24 intervention. We do that by having a willingness to
25 pay. In the UK we usually set that at £20,000 to

174

1 £30,000 per QALY, so per healthy life year, and that's
2 the sort of standard metric that we have.
3 So that seems to sort of balance out all these costs
4 and benefits, and so we wanted to try and apply the same
5 logic to NPIs, so what was the economic consequence of
6 doing certain interventions compared to the benefits
7 that we got in terms of health, and we do that by
8 balancing at this willingness to pay, which is usually
9 £20,000, but we went across an entire range because it
10 wasn't clear to us whether you're willing to pay more
11 because it's a pandemic and you want to minimise the
12 loss of life, or whether you're willing to pay less
13 because it's a larger scale thing and we know that
14 there's going to be some loss of life associated with
15 it. So we looked across an entire range.
16 Q. It's important to emphasise, isn't it, Professor, that
17 this was not -- it sounds a rather cold hearted
18 calculation to do, but it is something that is done
19 routinely, as you say, both in the context of vaccines
20 and also whether to purchase new drugs, for example?
21 A. Yeah, it's the routine way. So JCVI, which I also sit
22 on, has to go through this sort of process every time we
23 put a new vaccine through the pipeline.
24 Q. We heard from Professor Medley earlier a plea, almost,
25 the point he was making that in order to -- for

175

1 modellers to assist policymakers, they need to
2 understand, policymakers need to explain what their
3 objectives are. And is what you've just explained as
4 the sort of choice of the willingness to pay figure,
5 would that be something that you, as a modeller, would
6 look to the politician or the policymaker to tell you
7 about in order to inform your modelling?
8 A. It's certainly a possible way of doing it. I mean,
9 there's multiple ways of doing this balancing. One of
10 the other things that's worth pointing out is that we
11 look at a level of NPIs, but there's lots of ways of
12 buying the same level of control. So, you know,
13 deciding which elements of society you limit becomes the
14 political decision, so it's not -- you know, it's not
15 for SPI-M-O to say whether or not you shut schools or
16 pubs; that then becomes a politician's type of decision.
17 Q. Well, that leads me to another point I was going to
18 raise with you, because we can see what you've been
19 doing in this paper is taking a step beyond the sort of
20 normal, if you like, epidemiological modelling and added
21 a new dimension for economic impact. But of course, as
22 we have heard in evidence in the last week or so, the
23 pandemic had impacts that went well beyond economic
24 impacts: we have schools closing, children not going to
25 school, we have impact on various parts of society, we

176

1 have impact on women and girls, domestic abuse; the list
2 is very long.
3 In principle, would it be possible to extend this
4 type of modelling to address those sorts of issues as
5 well?
6 A. In principle. This was very much set up as almost
7 a pilot or a, you know, proof of principle to show what
8 could be done. I think it's hard to put every single
9 category in because you need to put a monetary value on
10 them. It's probably also worth saying that, you know,
11 I'm not an economist, and so our view of what the costs
12 were of lockdowns are probably quite trivial compared
13 to, you know, what an economics person would see and say
14 "Ah, well, you know, there's long running implications
15 for various businesses". But we just did GDP as the
16 easiest single measure that we could take at the time.
17 Q. Perhaps in that regard if we can have a look back at
18 your statement, please, page 14, paragraph 51. You've
19 just indicated that perhaps the economic input into that
20 paper was a little bit rudimentary, but you make the
21 point here, picking it up three lines down:
22 "Developing the methodology to understand and
23 quantify the broader impacts of pandemics, including
24 mental health and societal wellbeing, requires a wide
25 spectrum of academic disciplines."

1 So even wider than that group who wrote that paper
2 with you. You describe it at that stage new,
3 groundbreaking interdisciplinary work that takes time
4 and is best undertaken before a pandemic.
5 Is it -- well, first of all, are you aware that
6 these types of models, this type of work, taking forward
7 that work that you did, is actually happening or not?
8 A. I don't know of anyone who's undertaking it at the
9 moment. I know several people who are applying for
10 funding. There's various new funding initiatives that
11 are around, so there's people applying for it. Whether
12 it gets funded or not is a matter that we'll see in the
13 future, but it's certainly an area that a lot of people
14 are thinking about.
15 Q. Again you've echoed a point that Professor Medley raised
16 but, it seems self-evident that if this work is to be
17 done it would be much more sensible to do it before the
18 next pandemic rather than trying to do it in a rush
19 before the next pandemic?
20 A. Definitely. I mean, we've learnt a lot during the
21 pandemic but it's much more important to keep that going
22 and to build on it.
23 Q. Thank you.
24 I want to move on, please. Could we look, staying
25 with your statement, please, at page 6, paragraph 23.

1 Picking it up three lines down, this is about the
2 "following the science", you say:
3 "In my opinion, the use of the term 'following the
4 science' led to the impression that the balance of
5 evidence was weighted towards the scientific advice that
6 was being provided. In turn, this led to negative
7 attention being received by members of the scientific
8 community."
9 Elsewhere you say that the term was confusing and
10 unhelpful. Can you expand on those various thoughts,
11 please?
12 A. Yeah. I mean, I think what the paper showed on the
13 balancing economics and health is that you can't just
14 look at a single measure, and we know that politicians
15 aren't going to do that. You can't just say "We want to
16 save lives, reduce hospitalisations, no matter what",
17 and we wouldn't expect them to. There needs to be
18 a balance between health, economics, wellbeing,
19 social care. And so I think just saying "following the
20 science" made it sound like the science was being
21 weighted more than anything else.
22 It was also the case that the science, certainly in
23 terms of SAGE minutes and documents that went to SAGE,
24 was being put into the public domain, whereas I don't --
25 I never saw any of the other evidence that we assume was

1 being considered. I mean, we never saw it so we don't
2 know. We never saw any of that.
3 So it very much felt as if, certainly in the early
4 stages, any documents that went to SAGE were what was
5 driving policy and therefore if individuals didn't like
6 policy it reflected on the modellers, it reflected on
7 the scientific advice that was going forward.
8 So I think quite often "following the science"
9 sounded like we almost had too much power, and I don't
10 think that was ever the case, and certainly not in the
11 first year.
12 It was very much that we were answering questions
13 that we thought might want to be asked, but -- you know,
14 I think Professor Medley said this -- it wasn't until
15 early 2021, when we started doing the roadmap documents,
16 that there was a really good dialogue between scientists
17 and policymakers, and I think by then we started to
18 understand what --
19 Q. Slow down. Sorry, I'm going to pause you a moment.
20 A. Sorry.
21 Q. You were saying it wasn't until early 2021 ...?
22 A. That there was sufficient dialogue and understanding
23 between policymakers and the scientists that we could
24 actually do things like the roadmap to relaxation, which
25 really was -- I think it was really the first time when

1 there was this sort of marriage between science and
2 policy that we knew what they wanted to do and we could
3 generate policy-ready answers on a timescale that was
4 important.
5 **Q.** Yes.
6 I think you expand on that theme a little, if we can
7 look at page 15 of your statement, paragraph 56. You
8 say:
9 "During the early epidemic period there was some
10 degree of misunderstanding between modellers and
11 politicians; politicians were often asking questions
12 that were way beyond the scope of any model, while for
13 modellers it was often difficult to clearly communicate
14 many of the subtleties and uncertainties to
15 policymakers."
16 It sounds as though what you're describing is just
17 missing each other?
18 **A.** Yeah. I mean, we quite often got -- I can remember we
19 had a question that came through of: what would be the
20 impact of opening garden centres? Now, this sort of --
21 you know, our models are very much a caricature of
22 what's going on in the real world. There are people who
23 try and what's called -- form what's called a digital
24 twin, which is, you know, you have individuals moving
25 round within your computer model that try and replicate

1 what's happening in the real world. Those are
2 incredibly difficult to match to any data, so we're
3 taking a much more sort of aggregate approach, averaging
4 over people of a given age group, and so we can't
5 address those sort of subtleties.
6 But in the same way I think when we communicate to
7 policymakers we often do one figure and a page of
8 caveats, and the caveats are as important as the figure,
9 but it's very easy for someone to just look at a graph
10 and read off the top curve.
11 So I think there was miscommunication in both
12 directions.
13 **Q.** Yes, and you describe what Professor Medley described as
14 the deeper engagement, if you like, between SPI-M-O and
15 people from the Cabinet Office, which led to that more
16 productive relationship --
17 **A.** Definitely.
18 **Q.** -- later in the pandemic.
19 I think one last topic, Professor, and that's data.
20 Can we have a look at paragraph 46, page 13, please.
21 You start paragraph 46 by making the important
22 observation that:
23 "Models are only as good as the data that feeds into
24 them ..."
25 It's right, I think, that at various stages during

1 the pandemic you struggled to get good enough data to
2 put into your models?
3 **A.** Yeah, I'd say that was true.
4 **Q.** And you give us various examples in this witness
5 statement. So in the balance of this paragraph, you
6 describe a problem related to being -- related to being
7 provided with the detail about the first time people
8 tested but not subsequent tests; is that right?
9 **A.** Yeah. So in -- up until, I think it was almost towards
10 the end of 2021, we were only getting information on the
11 first time someone tested positive, and if they tested
12 subsequently that wasn't information that got fed
13 through to SPI-M-O and, you know, in the first few
14 months there was good reason for that, because if people
15 tested twice within a week that's really the same
16 infection. But as we started to get later, we needed to
17 know about reinfections. As it was, reinfections
18 weren't really that much important until we hit Omicron
19 and when they became much more common, but we didn't
20 know that without the, data and I think there's lots of
21 cases of this where -- you know, modellers always want
22 more data, but there were certain questions that we were
23 handicapped from answering because of the format that
24 the data came in.
25 **Q.** Yes.

1 Looking down, in paragraph 47 you describe
2 a disconnect between case and death data and hospital
3 admission data. That may be an issue which -- I'm going
4 to show you an email in a minute which I think probably
5 touches on that.
6 But also in paragraph 48 you seem to be referring to
7 a slightly different problem where, towards the end of
8 that paragraph, you refer to differences in the ways
9 data is reported and recorded by the four nations
10 causing difficulties. What were those difficulties?
11 **A.** So each of the devolved nations has its own way of
12 recording data. So certainly for the first few months
13 we were getting different datasets through from Wales,
14 Scotland, Northern Ireland and England. Some of this is
15 just how the data's formatted; some of it is actually
16 the definitions that underpin it. So I believe at
17 certain times Wales counted people in hospital with
18 Covid in different ways to what England did, and this
19 changed during the pandemic.
20 So what we needed to be careful of is: we're trying
21 to model the underlying mechanisms and not model the
22 counting process. So if people start counting things in
23 different ways, it can make our job more complicated.
24 But, as it says there, later -- DSTL and then UKHSA
25 actually stepped in and did the routine data collection

1 and cleaning, so we were starting to get it in a unified
2 format, which made life so much easier.
3 Q. Do you think that that improvement, that sort of lesson,
4 as it were, has now been learnt or do you think that
5 perhaps, were you to go back to needing to access, let's
6 say, hospital data or four nations data on a routine
7 basis, these problems might crop up again?
8 A. I think the problems would crop up again simply
9 because -- I mean, for example we don't have
10 an integrated electronic healthcare system, so each
11 hospital trust collects its own data, and so somewhere
12 that has to be aggregated.
13 Now, if we have another pandemic, I expect for the
14 first few weeks that will just come through as the raw
15 data, and then as time moves on we will get, you know,
16 whichever group it is, probably UKHSA, actually
17 formatting that into a single unified data structure.
18 Q. I'd like just -- the last document, I think. We looked
19 at that questionnaire which you filled in, it's actually
20 over a year ago now, but perhaps we could have another
21 look at that, please. So that's INQ000056476, and it's
22 page 39. Thank you.
23 So in fact a lot of the text that is included here
24 you've adapted and used in your statement, so we can see
25 next to the number 2 that statement about models only

1 being as good as the data that feeds into them, and then
2 the paragraph or so that follows, you're describing
3 those problems with hospital data that we were just
4 discussing.
5 Then I want to pick it up about ten lines from that
6 number 36, where it says:
7 "I had hoped that many of these difficulties would
8 have been resolved for the [what I gather we call Mpox
9 these days] Monkeypox outbreak, but if anything, the
10 data access issues are worse."
11 You say "are" because I take it that you were
12 dealing with the Mpox outbreak in this time last year
13 when you drafted this questionnaire; is that right?
14 A. That's correct, yes.
15 Q. You go on to say:
16 "Admittedly SAGE and SPI-M are not directly involved
17 in [Mpox] modelling, but the academic community has
18 still been asked for its help. With [Mpox] the UK data
19 is only available to UKHSA affiliated staff with a UKHSA
20 laptop and is again siloed so that the entirety of the
21 datasets are not available to all users."
22 Professor, we had a couple of days ago a data expert
23 giving evidence to the Inquiry who expressed his own
24 concerns that some of the advances in data sort of
25 interoperability, if you like, that had been achieved

1 during the pandemic might be slipping away -- and we
2 showed him this passage in fact -- but it sound as
3 though there is reason to be concerned that things might
4 be just as bad in the next pandemic as they were in the
5 last one?
6 A. I think there's reasons to be concerned. Talking to
7 people within UKHSA, it's clear that they understand
8 this is a problem and they are working towards
9 solutions, but I don't think any of these solutions are
10 trivial. There's a large amount of ethics, GDPR, lots
11 and lots of regulations that surround being able to just
12 freely give out data. There are partial solutions, as
13 it says sort of towards the end. OpenSAFELY is
14 a fantastic example of a repository where people can
15 access health data in a very, very secure environment,
16 but I don't think that's yet caught up to the
17 computational demands that we have for modelling, which
18 are vast. I mean, I was generally sort of maxing out
19 our computer clusters at Warwick over a weekend to
20 generate the next week's projections. So that type of
21 power isn't available very often within these systems.
22 So I think there's a conflict between how we make
23 these things secure enough that data doesn't go outside
24 the system but still allow us to utilise the power of
25 university computer systems.

1 Q. Professor, we've talked a number of times, both with you
2 and Professor Medley, today about, as it were, the roof
3 needs to be fixed while the sun was shining -- I think
4 someone else used that analogy -- but preparations for
5 the next pandemic that need to be made in between
6 pandemics; and it seems to me this is -- what you're
7 saying is something in that category?
8 A. Yes, definitely. I mean, it's not a small task, though.
9 I think this is -- you know, we need the protocols in
10 place. It would need an awfully large amount of work to
11 actually try and integrate this into a reasonable
12 system, and I think we also have the problem of trying
13 to second-guess what the next pandemic and the next data
14 needs will look like. It's very hard to say, yeah.
15 Q. Presumably it's work that needs to be continually
16 refreshed because, as computers change, as datasets
17 change, as perhaps the law changes, then the way in
18 which it's going to be stored and provided to modellers
19 may change as well?
20 A. That's correct, yeah.
21 Q. But certainly something for this Inquiry to consider --
22 you may have a view on this -- as to whether it's work
23 that would be appropriate so that, when the next
24 pandemic takes place, you in your modelling teams have
25 data ready to go to assist policymakers from the start?

1 **A.** I mean, I think it's vital, but I also think it is
2 something that UKHSA is looking at at the moment. It's
3 not that everyone is sitting back and just saying,
4 "We'll do it the next time we have to", I think it is
5 being undertaken but it is going to be a slow process.
6 **MR O'CONNOR:** Yes. Thank you, Professor.
7 My Lady, those are all the questions I have time
8 for.
9 **LADY HALLETT:** Thank you very much indeed,
10 Professor Keeling.
11 You are obviously one of those people who worked
12 extraordinarily long hours to serve the public, and
13 I fear that you and your colleagues haven't received the
14 recognition that you deserve. So may I speak on behalf
15 of all those who have been following the work that you
16 and your colleagues did, and express my gratitude again.
17 I've expressed it to other of your colleagues, but may
18 I express it to you too.
19 **THE WITNESS:** Thank you very much.
20 **LADY HALLETT:** Thank you. I'm afraid doing public service
21 doesn't always get recognition.
22 **(The witness withdrew)**
23 **LADY HALLETT:** 10 o'clock tomorrow, please.
24 **(4.00 pm)**
25 **(The hearing adjourned until 10 am**

1 **on Friday, 13 October 2023)**
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25

1 **INDEX**
2 **PAGE**
3 DR STUART WAINWRIGHT (affirmed) 1
4
5 Questions from COUNSEL TO THE INQUIRY 1
6
7 PROFESSOR GRAHAM MEDLEY (affirmed) 70
8
9 Questions from COUNSEL TO THE INQUIRY 70
10
11 PROFESSOR MATTHEW KEELING (affirmed) 160
12
13 Questions from COUNSEL TO THE INQUIRY ... 160
14
15
16
17
18
19
20
21
22
23
24
25

LADY HALLETT: [26] 1/3 1/17 21/15 41/11 41/22 51/20 58/1 58/3 58/6 58/11 58/13 58/24 69/15 110/3 110/7 110/9 110/12 110/16 160/6 160/11 160/18 160/22 162/12 189/9 189/20 189/23
MR KEATING: [12] 1/4 1/8 1/20 22/1 41/10 42/3 52/16 58/2 58/12 59/1 69/12 70/1
MR KEITH: [1] 162/14
MR O'CONNOR: [11] 70/4 70/8 110/6 110/11 110/17 160/2 160/17 160/23 161/3 162/19 189/6
THE WITNESS: [5] 58/5 69/24 110/8 160/9 189/19

'

'as [1] 139/17
'Ferguson's [1] 149/3
'following [1] 179/3
'how [1] 139/13
'Ministers [1] 53/24
'on [1] 127/15
'pre [1] 9/23
'undermining' [1] 148/6
'yes [1] 139/19

0

0.2 [1] 2/22
0.3 [1] 2/25
0.4 [1] 3/12
0.8 [2] 104/20 105/13

1

1 March [2] 136/18 136/19
1,200 [1] 16/16
1.1 [2] 7/4 104/9
1.2 [3] 101/17 104/9 105/14
1.3 [1] 7/25
1.4 [1] 104/20
1.5 [3] 98/3 101/17 104/9
1.50 [1] 110/12
1.50 pm [1] 110/15
1.9 [1] 26/9
10 [7] 6/21 20/7 37/20 60/24 131/14 138/1 163/20
10 am [1] 189/25
10 o'clock [1] 189/23
10.00 am [1] 1/2
100 [3] 105/10 139/17 139/25
100%' [2] 139/18 139/19
101 [1] 158/12
105 times [1] 16/11
11 [1] 170/18
11 February [1] 46/6
11.13 am [1] 58/8
11.30 [1] 58/6
11.30 am [1] 58/10
119 [1] 113/5
11th [3] 46/19 58/18 135/2
12 [1] 20/2
12 hours [1] 100/19
12 October 2023 [1] 1/1
12.27 [1] 113/5
12.48 pm [1] 110/13
123 pages [1] 70/13
13 [3] 102/24 133/23 182/20
13 October 2023 [1] 190/1
14 [1] 177/18
15 [3] 36/16 173/18 181/7
16 [1] 65/17
17 [2] 65/17 67/5
17 April [3] 143/18 144/8 146/22
18 [5] 28/1 53/15 53/17 110/25 127/8
18 months [1] 4/23
19 [11] 29/5 52/19 56/1 56/3 111/1 111/5 123/25 124/4 124/6 147/8 173/2
1983 [1] 71/16

2

2 March [1] 136/3
2.1 [1] 12/17
2.13 [1] 20/2
2.19 [1] 35/1
2.3 [1] 9/17
2.32 [1] 36/16
2.33 [1] 37/3
2.35 [1] 37/7
2.40 [2] 27/23 28/1
2.42 [1] 28/15
2.5 [1] 16/10
2.6 [2] 16/4 18/6
20 [3] 37/5 85/24 108/19
20 April [1] 147/1
20 March [1] 37/4
20 past [1] 160/13
20 years [2] 1/18 3/17
20,000 [2] 174/25 175/9
200 [2] 17/4 62/20
2005 [1] 74/20
2009 [7] 11/18 11/21 11/23 74/20 162/25 163/7 163/10
2010 [1] 3/24
2010s [1] 10/20
2012 [1] 3/24
2015 [2] 4/2 70/24
2016 [1] 4/1
2017 [7] 4/1 4/9 72/4 74/16 74/24 77/1 90/10
2018 [1] 75/5
2019 [9] 4/2 4/18 4/19 5/19 73/7 75/5 75/6 77/15 78/1
2020 [57] 16/7 16/11 19/10 23/8 26/19 26/23 27/20 28/18 28/22 29/2 29/4 29/7 29/8 29/8 29/10 30/10 31/20 32/8 35/9 37/8 40/21 42/21 43/23 48/18 49/22 52/16 52/17 59/15 64/5 65/1 69/8 73/8 73/9 82/2 83/8 84/23 89/24 91/11 112/7 114/23 116/10 118/9 121/9 123/12 124/22 125/11 129/5 131/4 138/4 140/5 143/11 143/18 148/2 154/20 159/7 163/25 171/24
2020/21 [1] 43/21
2021 [9] 32/14 33/5 33/7 118/7 118/14 152/11 180/15 180/21 183/10
2022 [4] 16/11 16/17 73/9 121/5
2023 [4] 1/1 5/19 70/19 190/1
21 [2] 43/21 99/14
21 January [1] 79/25
22 August 2020 [1] 27/20
22 January 2020 [1] 16/7
23 [3] 2/15 79/22 178/25
23 August [2] 2/7 2/10
23 pages [1] 2/15
24 [1] 100/18
24/7 [1] 17/1
243 [2] 123/21 123/23
244 [1] 123/21
25 [1] 157/23
25 February [1] 133/16
27 January [1] 80/4
28 [1] 45/21
29 May 2020 [1] 37/8

3

3 February [1] 80/8
3 January [1] 16/5
3.08 pm [1] 160/19
3.1 [1] 74/14
3.20 pm [1] 160/21
3.27 [2] 127/9 127/10
3.28 [1] 127/14
3.43 [1] 79/23
3.48 [2] 157/24 158/1
3.49 [2] 157/24 158/7
3.69 [1] 93/19
3.80 [1] 112/4
3.84 [1] 87/9
3.9 [1] 102/23
30 [1] 2/8
30 March [2] 37/4 37/5
30,000 [1] 175/1
31 [1] 93/18
31 August [1] 2/14
33 [2] 63/9 63/11
34 [2] 112/3 112/4
35 [2] 87/8 105/23
36 [3] 105/23 105/24 186/6
37 [1] 167/15
39 [1] 185/22

4

4 February [1] 36/6
4 February 2020 [1] 26/23
4 March [1] 128/3
4 o'clock [1] 160/12
4 September 2023 [1] 70/19
4.00 pm [1] 189/24
4.9 [1] 130/22
40 [1] 85/24
42 [1] 170/17
43 [2] 130/23 171/23
44 [1] 123/21
46 [2] 182/20 182/21
47 [1] 184/1
48 [1] 184/6

5

5 July [1] 161/12
50 [1] 143/21
500 [2] 114/4 114/6
51 [1] 177/18
55 [1] 143/4
56 [1] 181/7

6

6 May 2020 [1] 148/2
6.1 [1] 45/20
6.6 [1] 143/4
60 minutes [1] 49/4
60 people [1] 16/24

7

70 times [1] 59/16

8

8.27 [1] 81/25
80 [1] 132/2
80 people [1] 17/1
86 [1] 81/24

9

9 to [1] 73/22
9.9 [1] 158/14

A

abbreviation [1] 71/12
ability [6] 31/6 31/8 31/13 55/1 63/1 127/4
able [34] 6/2 9/8 19/10 33/4 41/8 44/19 52/4 57/19 60/11 60/12 60/13 60/14 69/1 69/4 78/19 80/21 81/7 87/21 88/3 88/6 96/15 108/11 111/14 115/25 116/2 121/24 132/25 153/15 153/22 153/23 165/7 165/10 166/2 187/11
about [151] 5/6 7/9 7/25 8/18 12/12 13/3 13/4 13/12 24/11 25/13 28/9 28/13 29/2 31/15 31/23 33/20 34/22 35/24 38/5 38/13 39/20 40/5 41/11 42/16 47/17 51/8 52/16 53/20 56/7 56/18 60/10 61/25 62/6 65/12 65/20 67/9 68/6 68/14 72/2 72/4 73/5 74/11 74/25 78/8 78/15 78/22 79/1 79/21 79/25 80/10 80/15 83/4 84/2 84/7 84/14 84/15 86/1 87/11 87/24 87/25 88/14 90/3 92/9 93/10 94/20 94/24 96/3 100/16 101/21 101/23 102/10 102/21 103/9 103/15 103/16 103/22 104/22 105/13 105/25 108/2 109/14 112/12 112/21 113/6 114/24 115/22 117/15 119/4 120/17 123/13 126/5 128/2 128/23 129/7 129/12 129/19 129/22 129/24 130/8 132/1 132/21 133/12 134/13 141/9 141/23 142/18

A

about... [45] 142/19 143/1 143/19 144/25 145/2 146/5 146/15 146/18 146/20 147/3 147/14 147/22 149/8 150/2 151/22 152/2 152/16 152/17 152/23 153/4 153/16 153/17 154/5 154/14 156/17 156/22 161/24 163/17 164/8 166/11 167/9 168/1 168/4 170/21 171/15 171/19 173/18 176/7 178/14 179/1 183/7 183/17 185/25 186/5 188/2
above [2] 104/16 105/9
absent [1] 53/7
absolutely [13] 8/14 19/18 19/22 62/15 63/23 94/10 98/18 107/3 115/17 120/9 121/17 133/1 140/8
abuse [5] 38/18 39/18 41/12 69/20 177/1
academia [2] 4/17 83/23
academic [17] 44/18 56/25 60/15 60/22 62/16 81/11 83/6 84/9 86/20 87/4 135/19 136/2 157/19 171/18 171/18 177/25 186/17
academic-style [1] 87/4
academics [18] 11/10 17/4 17/23 19/24 31/9 39/22 65/7 69/4 86/24 88/9 108/17 108/22 109/22 157/6 159/18 164/3 171/11 171/24
academies [3] 44/4 45/5 45/9
academy [6] 43/19 44/1 44/5 44/6 44/7 74/4
access [5] 113/13 165/10 185/5 186/10 187/15
accessible [1] 5/17
accordingly [1] 1/25
account [3] 12/10 173/15 173/24
accountable [1] 146/10
accurate [2] 8/16 79/15
achieve [7] 54/1 116/17 121/25 122/1 130/13 173/22 174/3
achieved [1] 186/25
achieving [1] 8/5
acknowledge [1] 19/19
acquire [1] 147/5
acronym [3] 7/6 22/13 23/16
acronyms [2] 5/10 89/19
across [18] 7/3 17/6 30/3 30/19 31/8 46/13 54/9 68/25 86/4 91/12 111/24 123/14 133/11 157/14 157/14 167/6 175/9 175/15
act [1] 159/9
acted [1] 18/21
acting [2] 163/9 163/10
activated [8] 9/22 10/18 11/21 15/18 16/1 22/21 23/5 25/21
active [6] 14/21 18/22 26/18 65/3 69/7 163/12
actively [1] 166/17
activities [1] 167/19
activity [1] 79/6
actual [1] 108/21
actually [34] 7/4 14/24 21/13 23/25 51/24 55/7 62/10 73/6 74/8 76/6 76/17 91/11 102/2 103/20 106/15 109/1 109/17 114/24 122/15 141/10 144/15 153/24 157/17 166/2 168/24 171/6 172/11 178/7 180/24 184/15 184/25 185/16 185/19 188/11
acute [1] 51/7
ad [2] 9/19 85/6
ad hoc [2] 9/19 85/6
adapt [1] 52/4
adapted [1] 185/24
add [4] 11/4 28/6 116/24 166/14
added [2] 36/6 176/20
additional [1] 158/25
address [14] 67/4 77/16 88/11 114/14 114/25 115/2 115/12 143/5 162/6 165/2 170/5 170/12 177/4 182/5
addressed [5] 100/1 112/8 113/17 115/15 168/20
adjourned [1] 189/25
adjournment [1] 110/14
adjusted [2] 174/9 174/16
administration [2] 45/21 91/4
administrations [11] 45/18 47/21 48/15 48/21 49/13 58/15 75/8 90/8 90/23 92/10 102/4
admission [2] 132/11 184/3
admitted [3] 28/19 132/13 173/3
Admittedly [1] 186/16
admitting [1] 148/7
adopted [1] 126/25
advance [1] 56/5
advances [1] 186/24
advantage [2] 108/13 117/6
advantages [1] 165/9
adverted [1] 131/16
advice [99] 6/20 7/9 7/13 7/13 8/2 8/6 8/13 9/20 11/6 12/12 12/16 12/19 12/21 12/24 13/19 13/22 13/23 13/23 13/24 15/3 15/4 20/12 20/24 21/11 24/2 25/25 26/3 26/12 26/17 26/24 27/1 27/3 27/9 27/11 30/3 30/13 32/9 33/4 34/21 34/22 35/11 35/15 35/20 35/25 36/11 36/14 37/24 38/24 38/25 39/1 39/14 39/16 40/1 40/8 40/12 40/15 40/25 41/2 41/3 41/5 42/5 42/6 43/2 43/13 44/13 47/17 48/2 49/10 49/21 50/20 50/22 52/2 54/24 55/6 55/23 56/4 56/11 56/16 57/6 57/6 57/17 57/18 61/24 63/7 63/18 66/6 66/9 66/22 85/16 88/15 103/6 103/7 103/9 150/8 150/9 155/23 158/6 179/5 180/7
advise [5] 12/1 24/4 34/14 47/11 150/3
advised [1] 80/13
adviser [10] 7/6 7/14 35/16 40/12 40/12 42/3 47/22 47/24 83/11 146/3
advisers [5] 9/7 41/16 49/12 51/6 51/15
advisers' [1] 55/1
advises [1] 22/25
advising [4] 7/10 50/12 67/7 148/14
advisory [12] 9/15 9/19 10/2 10/3 10/7 10/9 20/16 20/18 23/20 34/3 73/3 90/2
advocate [1] 156/13
affected [2] 19/21 39/18
affecting [1] 38/3
affiliated [1] 186/19
affirmed [6] 1/6 70/6 161/1 191/3 191/7 191/11
afraid [3] 101/9 160/13 189/20
after [11] 5/4 13/9 14/22 37/14 52/12 80/5 118/14 143/2 148/3 148/5 148/7
afternoon [4] 100/10 104/21 110/7 160/15
afterwards [1] 118/14
again [30] 2/15 15/21 17/7 23/23 23/24 42/24 52/20 55/25 61/17 62/6 65/11 66/15 67/14 86/14 96/24 107/15 108/1 123/11 139/22 146/9 147/10 155/3 160/1 161/8 170/10 178/15 185/7 185/8 186/20 189/16
against [4] 4/17 37/16 90/18 174/22
age [3] 82/11 132/2 182/4
age-dependent [1] 82/11
agencies [7] 6/8 11/9 15/8 15/13 15/23 17/7 18/2
agency [6] 15/10 15/14 18/3 24/2 57/5 59/23
agenda [11] 13/9 21/23 79/1 87/20 87/22 88/24 100/3 141/13 152/4 152/4 152/7
aggregate [1] 182/3
aggregated [1] 185/12
ago [4] 77/8 127/5 185/20 186/22
agree [14] 29/11 51/16 52/24 53/3 53/7 55/13 57/13 66/7 66/17 108/25 111/17 111/22 124/9 124/11
agreed [7] 75/1 75/1 75/24 100/8 103/3 104/19 157/9
agreeing [4] 90/23 102/19 102/20 104/4
agreement [3] 100/12 103/15 103/16
Ah [1] 177/14
aid [1] 26/2
aim [1] 53/22
aiming [1] 54/11
alarm [1] 145/13
albeit [3] 92/25 93/9 98/7
alert [1] 125/13
alerted [1] 152/14
all [104] 5/12 6/25 10/9 11/16 11/16 13/5 15/5 19/16 19/20 19/22 19/23 22/24 24/15 24/15 27/6 32/24 35/12 37/7 37/18 38/13 38/14 39/9 39/17 41/21 44/4 45/23 46/5 46/8 46/12 47/6 47/9 47/16 48/12 48/13 48/20 49/7 52/25 58/3 59/1 59/25 62/14 65/19 66/7 66/24 67/15 69/12 69/21 71/15 72/5 75/11 76/23 77/14 80/16 80/21 82/14 82/23 86/12 86/16 91/12 92/7 92/12 94/10 97/4 98/2 98/12 98/15 99/8 103/3 106/18 108/20 109/3 109/19 111/18 114/5 122/8 123/3 126/13 132/20 133/7 133/16 136/16 142/11 143/21 145/20 147/24 150/19 154/4 155/3 155/9 157/20 160/4 160/7 164/9 165/4 166/7 166/13 167/6 172/15 174/21 175/3 178/5 186/21 189/7 189/15
all day [1] 19/16
all right [3] 58/3 76/23 126/13
Allen [1] 149/13
Allen's [1] 151/5
allow [5] 2/1 2/2 13/4 20/8 187/24
allowed [5] 30/25 57/16 64/21 83/25 84/1
almost [15] 6/5 6/6 17/4 56/9 62/20 90/21 107/4 107/13 107/15 121/7 129/5 175/24 177/6 180/9 183/9
alone [2] 62/21 139/25

A

along [3] 88/9 95/21 139/13
already [19] 27/17 34/21 35/13 61/18 62/21 72/24 74/15 77/2 101/4 124/21 128/18 129/15 136/13 136/24 140/1 142/15 162/23 169/13 169/23
also [60] 3/6 9/9 13/6 13/16 13/21 14/3 15/2 16/10 17/25 19/5 21/4 21/8 27/7 27/8 28/15 31/9 38/21 41/23 43/7 46/13 47/12 56/4 65/8 67/13 71/6 71/7 71/22 72/1 73/1 73/2 77/13 80/17 80/22 83/7 86/6 86/20 87/14 96/24 97/25 117/16 121/19 124/24 147/14 151/21 161/18 162/1 162/17 163/6 164/8 164/18 166/23 167/1 174/11 175/20 175/21 177/10 179/22 184/6 188/12 189/1
alter [2] 134/3 134/16
alternative [2] 129/24 139/4
alternatives [2] 94/13 129/22
although [19] 14/20 41/2 55/8 64/18 73/6 77/13 79/14 82/23 87/19 94/12 96/18 97/8 99/20 99/24 118/19 133/18 149/5 149/9 150/16
always [17] 14/19 18/18 44/3 58/19 58/23 61/8 65/5 81/20 81/20 106/5 106/25 108/23 134/12 153/4 154/10 183/21 189/21
am [10] 1/2 1/14 23/10 24/6 49/25 58/8 58/10 84/12 115/5 189/25
amazing [1] 40/6
amongst [1] 103/21
amount [9] 16/17 39/3 43/16 120/8 122/19 122/24 158/10 187/10 188/10
amounts [1] 87/5
AMS [3] 43/20 44/10 44/14
analogy [1] 188/4
analyse [2] 136/4 173/23
analysis [16] 36/14 49/17 52/19 52/21 52/25 55/14 79/3 88/5 91/10 92/10 100/19 107/22 111/7 119/1 119/14 142/13
analytical [3] 40/22 63/15 91/16
anchor [1] 13/24
Angela [8] 6/18 23/11 23/15 83/9 84/17 121/11 121/19 149/14
Angela McLean [4] 6/18 83/9 84/17 149/14
announcement [1] 154/6
anomalous [1] 167/4
another [21] 21/21 23/24 29/24 34/20 65/16 80/10 82/24 103/23 106/1 115/20 120/22 120/22 123/19 127/7 145/15 146/22 159/17 171/6 176/17 185/13 185/20
answer [16] 41/15 45/16 47/20 48/25 54/20 54/25 80/21 84/11 112/19 114/8 122/21 130/17 140/21 153/15 168/15 170/13
answered [1] 139/16
answering [2] 180/12 183/23
answers [5] 30/24 55/1 84/8 116/4 181/3
anxieties [1] 154/24
any [40] 8/15 11/2 12/5 13/18 20/9 20/14 29/12 31/10 37/23 51/12 69/14 78/12 80/21 91/5 93/23 97/2 99/19 111/7 123/1 123/16 133/24 134/2 134/16 139/2 139/3 146/12 146/21 149/3 153/8 153/11 157/2 173/13 174/18 174/23 179/25 180/2 180/4 181/12 182/2 187/9
anyone [1] 178/8
anyone's [1] 168/13
anything [8] 38/15 67/3 93/4 153/21 160/14 166/13 179/21 186/9
anyway [6] 23/24 24/22 74/2 95/15 97/24 165/25
apart [1] 148/24
apologies [3] 11/15 49/6 71/10
apology [1] 49/7
apparent [1] 116/25
apparently [2] 41/6 155/10
appear [2] 95/23 144/2
appeared [1] 108/6
appears [2] 80/5 95/15
applications [1] 115/9
apply [1] 175/4
applying [2] 178/9 178/11
appreciate [1] 162/14
appreciative [1] 69/21
approach [10] 69/7 107/9 107/24 108/13 108/25 109/2 142/13 172/6 172/20 182/3
approaching [1] 134/19
appropriate [5] 84/8 98/7 111/6 150/3 188/23
appropriately [1] 125/16
April [14] 16/17 16/25 28/22 30/15 32/8 42/21 52/17 53/9 91/11 143/11 143/18 144/8 146/22 147/1
April 2020 [4] 28/22 32/8 91/11 143/11
April 2022 [1] 16/17
April/May 2020 [2] 42/21 52/17
are [143] 1/14 1/23 5/2 6/9 8/2 8/3 10/23 12/13 12/21 13/14 14/6 14/10 19/20 20/21 20/21 21/8 21/10 21/12 22/16 26/6 28/25 38/6 40/6 40/9 41/21 41/24 50/19 50/21 50/24 63/18 65/25 66/19 69/12 69/21 70/23 71/23 82/4 82/8 82/21 82/23 82/24 82/25 87/23 88/8 88/9 93/16 93/22 94/11 94/14 94/16 95/6 95/13 95/14 95/25 96/9 96/14 96/15 96/15 97/7 97/12 97/25 104/19 105/2 105/14 106/8 106/10 107/10 108/11 108/22 109/22 109/22 109/25 112/25 113/5 113/21 114/5 114/6 114/19 115/18 116/4 118/10 119/17 121/23 122/8 123/5 127/17 130/25 131/18 132/1 133/2 133/22 134/6 134/9 134/10 134/11 143/22 144/6 144/25 145/2 145/13 145/20 147/6 147/7 147/7 149/17 153/19 155/4 155/5 156/10 157/5 158/24 160/4 161/11 161/15 161/19 162/3 162/5 166/3 169/10 171/19 172/13 173/5 176/3 177/12 178/5 178/9 178/11 178/14 181/21 181/22 182/1 182/8 182/23 186/10 186/11 186/16 186/21 187/8 187/9 187/12 187/18 189/7 189/11
area [14] 6/5 8/15 10/24 62/8 63/10 88/13 111/25 113/1 146/11 155/20 156/5 169/10 170/5 178/13
areas [7] 43/15 62/24 68/20 165/23 166/21 167/4 171/5
aren't [2] 158/18 179/15
Arguably [1] 138/14
argue [2] 94/20 133/12
argued [1] 62/1
argument [1] 169/25
arguments [2] 106/10 156/22
arise [3] 125/8 139/14 173/6
arises [1] 99/5
arose [1] 85/6
around [11] 3/24 17/1 30/19 32/16 32/22 39/25 87/3 145/11 163/4 170/14 178/11
arranged [1] 45/9
arrangements [1] 39/25
arrived [1] 116/11
art [1] 94/7
article [1] 148/2
artificial [1] 6/23
as [287]
As I said [1] 90/10
Asian [2] 139/15 140/1
ask [31] 1/25 20/10 21/18 24/11 41/20 50/23 67/1 74/11 74/17 77/22 78/6 79/21 87/8 89/2 90/3 91/9 102/21 108/1 108/9 114/12 129/6 141/9 146/5 147/21 149/8 152/2 154/15 154/23 163/17 167/9 168/1
asked [27] 21/2 21/22 30/6 30/8 34/14 44/13 56/10 57/24 68/23 79/1 79/4 80/22 87/14 107/10 113/22 113/23 114/9 114/20 129/12 129/22 131/11 136/19 139/12 142/18 157/2 180/13 186/18
asking [13] 54/25 76/15 88/12 110/23 122/18 129/19 130/2 136/17 141/23 142/6 152/17 166/11 181/11
aspect [3] 50/24 87/7 109/12
aspects [2] 7/11 82/17
assembled [1] 18/8
assess [1] 111/6
assist [6] 22/8 22/22 26/8 44/24 176/1 188/25
assistance [3] 31/25 40/9 59/4
associated [3] 38/11 79/17 175/14
assume [2] 151/9 179/25
assumed [1] 124/2
assumes [1] 50/4
assuming [1] 96/13
assumption [7] 18/19 94/16 94/23 96/3 96/10 96/14 97/2
assumption-driven [1] 97/2
assumptions [11] 93/23 94/4 94/18 94/24 97/7 105/5 138/20 153/20 153/21 169/2 169/20
assured [1] 112/14
asterisk [1] 48/5
at [304]
at risk [1] 28/4
attacks [1] 4/10
attempt [1] 164/12
attempts [2] 52/5 53/9
attend [10] 20/4 20/19 42/12 43/12 58/17 58/19 81/18 85/20 155/16 163/14
attendance [1] 49/11
attendants [1] 86/3
attended [8] 20/7 26/18 42/6 42/25 58/16 73/1 133/7 166/25

A

attendees [3] 14/22 45/22 47/2
attender [1] 163/13
attending [1] 4/25
attention [2] 111/10 179/7
August [8] 2/7 2/10 2/14 27/20 29/4 29/8 29/10 30/10
August 2020 [3] 29/8 29/10 30/10
authors [2] 65/21 172/13
automatic [1] 15/24
autumn [7] 19/9 21/20 35/8 40/21 52/20 53/19 55/25
available [11] 61/8 77/19 114/17 114/19 140/14 153/6 165/25 166/1 186/19 186/21 187/21
average [1] 113/25
averages [1] 113/21
averaging [1] 182/3
avoid [1] 1/24
aware [7] 28/25 61/2 61/5 113/22 115/5 156/8 178/5
away [5] 16/15 22/13 125/10 150/12 187/1
awful [4] 15/15 18/4 19/20 169/21
awfully [1] 188/10

B

back [42] 13/22 14/24 16/10 21/10 29/16 34/17 40/20 41/11 47/5 47/14 54/1 54/21 72/19 74/11 75/8 82/14 84/9 86/14 89/1 91/1 99/20 106/20 110/7 110/12 115/13 121/9 122/16 123/12 130/8 135/7 138/5 140/10 140/23 141/17 145/14 145/15 152/3 152/8 157/22 177/17 185/5 189/3
backdrop [1] 37/16
backfill [1] 19/10
background [7] 2/19 2/24 3/8 4/17 29/6 79/6 94/19
backgrounds [1] 65/9
bacterial [1] 152/24
bad [5] 55/7 118/10 118/11 123/6 187/4
badly [2] 116/20 116/21
balance [8] 66/21 110/20 164/17 174/22 175/3 179/4 179/18 183/5
balancing [3] 175/8 176/9 179/13
barrier [1] 157/14
Barton [1] 53/11
based [8] 56/12 63/16 71/15 82/3 89/6 116/19 125/11 138/19
basic [3] 93/15 93/20 159/19
Basically [1] 164/17
basis [4] 9/23 41/3 113/21 185/7
batch [1] 37/3
BBC [3] 148/2 148/21 149/15
be [222]
bear [5] 13/2 63/8 129/8 135/7 171/14
bearing [1] 61/1
beast [1] 157/7
became [15] 23/8 47/12 75/23 76/21 79/15 80/17 84/4 91/17 117/3 130/21 131/4 131/22 132/19 136/8 183/19
because [83] 14/15 19/11 32/1 32/25 40/25 41/9 47/16 57/10 60/2 60/25 73/7 75/5 75/10 76/11 76/21 78/1 80/7 81/4 82/15 84/12 87/1 88/19 90/13 95/9 95/12 97/9 98/15 100/17 101/25 103/21 104/2 104/22 104/23 105/3 105/15 106/23 108/19 109/19 114/12 116/16 116/18 117/13 119/24 121/13 122/22 123/6 125/5 126/17 128/10 129/14 129/14 130/6 132/7 132/11 133/3 140/19 140/22 141/16 145/4 145/21 147/6 147/7 150/20 150/23 151/18 152/7 153/19 156/5 156/17 156/25 157/18 168/6 171/1 175/9 175/11 175/13 176/18 177/9 183/14 183/23 185/9 186/11 188/16
become [2] 142/4 163/5
becomes [5] 8/14 95/3 132/3 176/13 176/16
been [94] 4/1 11/18 11/21 13/21 14/22 15/18 16/12 25/21 25/22 29/10 30/4 30/12 31/1 31/4 31/16 33/14 34/9 37/11 37/13 37/19 37/20 39/14 40/18 40/19 44/19 45/7 46/9 49/16 49/17 50/9 53/21 57/24 61/23 62/2 62/23 63/8 65/2 66/16 67/13 70/24 74/15 77/9 77/24 80/5 83/5 86/5 86/21 86/24 92/13 93/13 98/16 100/8 105/19 107/23 108/12 108/20 109/4 109/14 113/23 115/1 116/2 118/20 121/6 125/4 125/21 125/25 126/19 127/5 133/19 141/1 141/5 142/6 144/8 144/20 146/9 146/18 147/17 150/16 153/11 154/8 154/9 157/8 157/12 158/20 159/10 163/1 163/6 171/4 176/18 185/4 186/8 186/18 186/25 189/15
before [41] 3/25 11/21 29/10 30/10 30/18 46/8 59/4 59/8 59/17 64/11 66/16 71/8 71/14 71/19 72/21 74/12 75/9 77/2 77/13 78/18 79/8 81/21 89/4 89/7 90/3 101/14 110/3 110/4 110/19 114/23 119/19 122/17 137/25 142/23 149/14 152/5 165/8 168/1 178/4 178/17 178/19
began [1] 61/11
beginning [12] 51/20 77/15 81/3 87/5 91/7 92/12 115/23 116/9 117/15 123/12 136/16 156/3
behalf [1] 189/14
behavioural [9] 18/12 25/25 26/10 26/16 27/1 27/8 27/12 89/12 138/2
behaviours [2] 25/17 25/18
behind [2] 67/24 120/11
being [76] 25/16 26/5 38/6 53/16 57/15 57/16 62/12 66/12 66/13 67/12 67/23 68/12 72/11 79/1 79/4 82/7 82/9 83/15 85/16 87/2 87/3 93/1 94/13 95/14 101/3 105/8 105/16 111/8 112/8 112/16 112/16 115/4 115/7 116/15 118/9 118/12 119/17 120/7 120/12 120/19 124/7 127/15 127/19 128/24 129/21 130/5 131/14 131/19 132/25 137/11 139/2 143/19 144/6 145/6 148/22 150/2 150/3 155/10 156/8 156/18 157/20 160/1 165/10 165/18 166/2 173/3 179/6 179/7 179/20 179/24 180/1 183/6 183/6 186/1 187/11 189/5
beliefs [1] 55/20
believe [7] 70/16 150/20 161/10 163/3 163/4 170/18 184/16
believed [2] 55/17 140/3
below [1] 104/13
below 1 [1] 104/13
benefit [6] 30/12 50/11 106/11 107/18 137/7 174/17
benefits [4] 171/25 173/6 175/4 175/6
best [13] 14/19 21/11 44/11 90/19 90/20 101/16 110/9 118/5 143/12 150/23 151/3 174/15 178/4
better [22] 6/25 21/12 40/18 40/19 40/20 52/17 52/18 52/22 54/7 54/8 55/25 57/3 63/2 65/5 90/22 108/12 114/4 114/6 114/7 116/8 120/15 120/20
between [37] 1/24 45/17 48/4 53/23 66/5 66/8 66/12 76/9 78/3 78/18 80/11 85/7 85/24 87/23 88/4 93/21 94/11 101/16 104/9 104/20 115/15 116/5 118/17 119/7 119/14 122/11 150/1 170/21 179/18 180/16 180/23 181/1 181/10 182/14 184/2 187/22 188/5
beyond [4] 89/24 176/19 176/23 181/12
big [6] 6/23 6/24 68/20 96/10 132/1 148/22
bigger [3] 81/14 87/5 92/6
biggest [4] 17/24 18/1 50/21 107/4
bilateral [1] 43/3
binary [1] 142/12
biologist [1] 94/19
biology [3] 161/20 162/6 162/7
Biosecurity [1] 159/6
bit [14] 4/20 5/15 11/14 34/2 44/14 46/2 56/17 64/12 77/25 87/17 87/23 95/21 97/8 177/20
black [1] 28/21
blame [1] 168/12
bland [1] 106/14
block [1] 139/3
blurred [2] 66/5 66/8
BME [2] 29/2 29/12
body [4] 10/12 47/9 79/11 159/21
bono [1] 19/7
boosting [1] 158/4
Boris [1] 154/21
Boris Johnson [1] 154/21
both [17] 1/17 1/21 8/5 17/9 19/5 21/15 90/23 92/22 118/4 118/5 163/4 168/6 169/10 173/15 175/19 182/11 188/1
bottom [12] 24/20 54/22 76/3 81/25 101/2 112/13 128/22 135/23 136/1 139/5 149/16 172/22
bound [1] 169/12
boundaries [1] 145/21
bravery [1] 19/23
breadth [1] 158/5
break [7] 58/3 58/9 59/8 59/17 110/5 110/10 160/20
Brexit [6] 4/12 4/15 73/7 78/1 78/4 78/6
brief [1] 22/7
briefly [6] 2/19 22/21 64/7 79/22 147/22 172/16
bring [11] 12/25 13/2 13/5 22/7 25/24 27/22 36/17 51/24 62/17 62/18 84/7
bringing [2] 19/23 48/13
brings [2] 12/18 157/17
British [2] 44/7 164/3
British Academy [1] 44/7

B

broad [2] 63/16 117/2
broad-based [1] 63/16
broadcasters [1] 154/10
broaden [1] 77/3
broader [2] 113/7 177/23
broadly [4] 75/2 77/4 111/17 111/22
brokered [1] 121/12
brought [8] 17/22 18/17 30/21 42/24 48/19 49/23 63/8 92/10
BSE [1] 11/22
BSI [1] 89/17
build [4] 29/18 65/8 93/15 178/22
builds [1] 94/18
built [5] 61/24 65/2 65/10 93/23 98/2
bullet [2] 108/8 108/19
Business [1] 5/25
businesses [1] 177/15
busy [1] 78/5
but [326]
buy [1] 122/19
buying [2] 79/3 176/12
bypassed [1] 167/25
bypassing [1] 168/9

C

C-19 [1] 52/19
cabinet [35] 3/16 3/21 4/14 6/21 7/10 7/15 9/22 10/6 14/23 20/7 21/3 21/24 27/6 27/7 35/2 37/20 40/19 40/21 42/12 42/12 46/11 52/7 52/20 53/21 54/12 58/21 60/24 68/10 111/14 118/15 121/20 121/21 123/7 123/8 182/15
Cabinet Office [25] 3/21 4/14 6/21 9/22 14/23 20/7 21/3 21/24 27/6 27/7 35/2 37/20 40/19 46/11 54/12 58/21 60/24 68/10 111/14 118/15 121/20 121/21 123/7 123/8 182/15
Cabinet Office's [1] 52/20
calculate [2] 132/4 174/9
calculating [1] 159/4
calculation [1] 175/18
call [21] 1/4 17/25 43/18 70/14 71/8 75/10 76/1 89/19 92/14 93/24 99/17 128/15 129/9 143/9 143/12 147/24 164/10 164/12 167/14 168/3 186/8
called [14] 22/12 23/21 42/22 48/17 65/4 75/18 75/21 86/17 89/12 89/17 94/2 138/1 181/23 181/23
calm [1] 121/1
Cambridge's [1] 3/7
came [19] 18/4 35/8 38/13 38/21 39/9 45/5 86/7 86/8 91/1 92/8 100/12 102/2 103/16 122/16 152/12 166/21 168/19 181/19 183/24
camera [1] 155/2
can [113] 1/20 1/22 7/4 10/8 13/11 14/4 14/19 15/22 20/23 22/7 23/21 27/22 36/17 38/9 39/10 40/5 41/11 47/7 67/21 70/5 70/9 74/13 76/1 76/23 77/1 79/22 81/24 86/8 87/7 89/11 93/15 95/7 95/10 98/19 99/12 99/21 101/3 102/22 104/3 105/21 105/23 105/24 106/11 108/14 110/7 110/8 112/2 112/10 114/8 114/12 115/10 115/11 116/3 116/24 118/6 118/22 119/1 119/6 119/24 121/25 122/1 127/7 129/8 129/9 132/4 133/21 133/21 135/10 136/14 138/4 138/8 138/13 138/25 139/5 143/3 143/9 143/12 144/7 145/14 146/12 147/20 147/24 148/2 148/9 149/13 149/16 149/16 149/25 152/11 153/3 153/5 153/21 154/15 154/20 154/23 155/25 158/12 163/22 168/15 170/3 172/15 173/4 173/6 174/13 176/18 177/17 179/10 181/6 181/18 182/20 184/23 185/24 187/14
can't [20] 1/17 18/5 45/10 45/13 45/14 53/8 68/11 78/25 78/25 84/12 93/3 102/15 105/10 117/20 151/13 153/1 160/14 179/13 179/15 182/4
cannot [1] 117/14
capabilities [2] 6/9 6/11
capability [11] 59/25 60/10 60/13 60/14 60/18 60/21 60/22 60/25 61/3 61/6 92/4
capable [1] 94/12
capacity [24] 45/14 52/21 55/15 56/18 56/23 59/25 60/3 60/5 60/10 61/5 63/15 75/4 91/20 92/4 92/6 92/25 131/9 131/19 132/20 158/4 159/11 159/13 159/23 160/1
capture [7] 2/2 13/7 103/25 104/6 106/15 109/17 173/21
captured [1] 103/18
capturing [2] 108/7 109/3
care [15] 50/4 129/17 143/7 143/9 143/22 144/1 144/2 144/23 144/24 144/25 145/1 145/2 145/4 145/7 179/19
care homes [5] 129/17 143/9 143/22 144/23 145/4
care sector [1] 145/7
career [3] 3/19 17/23 70/23
careful [3] 97/8 154/10 184/20
caricature [1] 181/21
Carillion [1] 4/7
carries [1] 138/25
carry [2] 81/7 96/14
case [32] 6/22 11/4 11/10 13/21 14/17 15/10 20/20 21/3 36/2 44/10 57/9 60/7 63/16 96/25 98/14 98/21 99/1 110/9 116/12 118/22 136/5 136/12 137/18 152/25 153/14 153/15 167/22 167/23 168/21 179/22 180/10 184/2
cases [5] 28/19 57/16 139/21 167/4 183/21
casting [1] 99/21
catalogued [1] 28/18
category [2] 177/9 188/7
caught [1] 187/16
cause [1] 130/20
caused [3] 91/15 97/19 111/5
causes [1] 112/25
causing [3] 67/10 126/8 184/10
caveat [1] 82/21
caveats [4] 98/2 98/8 182/8 182/8
CCS [1] 3/22
cellular [1] 162/7
central [3] 12/14 42/5 91/18
centre [8] 3/7 51/4 52/14 61/11 77/18 120/6 123/6 159/7
centres [4] 71/3 71/24 165/17 181/20
century [1] 138/19
certain [13] 8/22 8/25 9/2 10/15 13/3 33/21 43/5 107/13 107/15 139/13 175/6 183/22 184/17
certainly [21] 57/20 76/12 83/8 98/24 107/20 108/9 110/11 115/13 134/20 139/24 142/9 157/19 165/14 171/10 176/8 178/13 179/22 180/3 180/10 184/12 188/21
certainty [3] 9/9 13/16 131/19
chain [2] 146/18 151/17
chair [34] 13/8 18/20 18/21 23/13 23/15 24/7 27/17 72/1 72/11 72/15 72/18 72/25 74/16 74/24 75/23 76/21 83/5 83/6 83/8 83/8 83/9 84/4 84/5 84/9 84/20 90/11 100/4 100/21 103/11 109/24 121/12 139/12 151/4 163/10
chaired [1] 72/9
chairing [2] 18/25 73/11
chairmanship [1] 122/5
chairs [3] 23/10 48/20 83/15
challenge [22] 29/23 31/2 38/9 38/21 49/8 60/8 61/15 61/23 62/11 62/14 62/18 62/19 63/1 63/4 63/6 64/3 64/8 64/18 169/7 169/11 169/19 169/22
challenged [3] 75/23 76/20 105/1
challenges [8] 20/21 21/5 21/7 21/25 31/13 31/23 39/8 162/6
challenging [3] 39/6 43/21 62/16
chance [1] 68/16
Chancellor [2] 43/9 43/9
change [17] 14/1 14/2 52/13 79/19 80/6 80/9 84/22 119/15 120/1 123/11 126/25 128/5 128/14 132/18 188/16 188/17 188/19
changed [13] 4/14 51/17 74/22 75/25 79/20 89/18 89/19 91/15 103/12 106/19 117/9 127/3 184/19
changes [2] 122/24 188/17
changing [3] 69/8 126/21 130/10
chaotic [3] 51/5 52/15 55/24
charities [1] 165/15
check [2] 34/17 58/24
chief [36] 6/7 6/11 6/17 7/1 7/5 7/14 7/21 11/2 11/3 11/3 15/7 18/7 18/8 18/14 34/7 35/15 35/16 37/22 40/11 40/12 42/3 42/4 46/14 47/15 47/15 47/21 47/24 48/14 48/21 49/19 51/13 66/2 68/6 83/11 92/14 146/3
chief scientist [4] 6/17 11/2 15/7 37/22
chief scientists [4] 6/11 7/1 46/14 48/21
child [1] 89/15
childhood [1] 162/9
children [2] 124/7 176/24
China [2] 128/18 139/14
China's [1] 128/23
choice [1] 176/4
choices [1] 12/9
choose [1] 139/7
Chris [5] 18/22 18/23 18/24 85/17 148/24
Chris Whitty [4] 18/23 18/24 85/17 148/24
CIN [3] 24/20 28/15 30/16
circular [1] 53/24
circumstance [1] 166/19
circumstances [3] 97/11 104/10 132/8

C
civil [19] 1/14 1/14 1/16 1/18 3/10 3/10 3/17 3/22 4/18 8/12 17/17 65/24 83/21 84/13 134/7 134/7 134/10 138/1 157/10
civil service [2] 4/18 17/17
clarifying [1] 53/22
clarity [1] 51/8
cleaning [1] 185/1
clear [28] 10/6 41/1 47/12 50/19 52/10 75/10 123/4 127/21 131/5 131/6 131/7 131/20 131/22 132/20 133/1 133/1 133/6 136/9 136/16 137/10 141/18 142/4 151/4 155/5 156/25 170/22 175/10 187/7
clearer [1] 33/18
clearly [24] 29/14 30/15 51/5 51/14 61/25 76/9 90/13 91/6 91/13 91/16 96/8 111/18 114/4 118/19 126/17 127/2 127/24 140/13 144/18 146/4 153/3 155/22 159/20 181/13
climate [2] 14/1 14/2
clinical [6] 130/3 132/10 132/12 132/14 133/3 136/4
clinically [1] 152/21
clinicians [1] 82/22
cloak [1] 67/24
close [4] 92/1 128/19 128/24 139/17
closely [5] 52/4 55/22 90/24 92/1 124/5
closer [1] 115/4
closing [3] 129/19 145/5 176/24
closures [2] 112/24 112/25
clusters [1] 187/19
CMO [6] 13/21 18/8 18/20 61/22 64/15 75/24
CMO's [1] 86/6
co [32] 18/20 23/15 24/20 28/15 30/16 46/22 48/4 48/9 48/18 48/22 72/1 72/11 72/15 72/18 74/16 81/5 83/5 83/6 83/8 83/8 83/9 84/5 84/9 90/24 91/22 100/4 100/21 103/11 109/24 121/12 151/4 157/10
co-chair [20] 18/20 23/15 72/1 72/11 72/15 72/18 74/16 83/5 83/6 83/8 83/8 83/9 84/5 84/9 100/4 100/21 103/11 109/24 121/12 151/4
CO-CIN [3] 24/20 28/15 30/16
co-created [1] 81/5
co-operating [1] 90/24
co-opted [2] 91/22 157/10
co-ordinate [1] 48/22
co-ordination [4] 46/22 48/4 48/9 48/18
COBR [12] 9/21 10/4 10/8 10/8 35/4 42/14 46/12 46/12 47/6 54/25 58/16 58/21
COBR committee [1] 10/8
COBR's [1] 10/16
cochairs [1] 26/15
code [1] 83/20
coherence [2] 92/4 156/7
coherent [1] 9/8
cohesion [1] 108/24
cohort [2] 17/25 18/1
cold [1] 175/17
collaborate [1] 171/5
collapse [1] 4/7
colleagues [15] 17/16 69/22 71/6 73/17 93/13 93/16 132/10 136/24 139/18 141/11 157/19 160/8 189/13 189/16 189/17
colleagues' [1] 171/2
collection [1] 184/25
collective [1] 5/14
collects [1] 185/11
College [6] 71/15 71/22 164/11 167/11 167/20 167/23
combination [8] 11/8 35/20 102/2 102/13 102/16 118/5 133/24 153/20
combined [3] 35/20 86/4 102/6
come [28] 14/24 27/9 34/25 41/22 72/19 75/8 82/14 86/14 89/1 89/1 99/20 100/23 102/22 103/15 105/7 108/4 117/22 121/14 121/15 128/15 129/9 135/7 140/10 141/17 145/15 151/13 171/14 185/14
comes [3] 146/24 168/16 169/5
comfortable [1] 158/15
coming [12] 23/2 39/22 59/2 77/18 83/24 88/9 96/4 120/10 130/8 130/24 152/8 164/2
comment [9] 5/7 14/22 50/13 51/12 60/23 61/9 63/21 67/21 68/16
commented [1] 31/16
comments [3] 5/5 111/18 155/8
commissioned [5] 21/1 34/22 43/20 49/11 56/8
commissioner [1] 35/6
commissioning [6] 44/1 52/14 53/10 54/19 54/24 55/23
commissions [1] 20/25
commitments [2] 73/13 73/25
committee [55] 10/3 10/7 10/8 21/8 22/24 41/4 48/23 72/2 72/9 73/10 74/19 75/21 75/22 76/14 76/16 76/17 76/19 77/1 77/4 77/16 78/11 79/15 79/24 80/10 80/11 80/14 80/23 81/11 82/1 82/17 83/4 93/9 100/7 102/18 103/21 104/11 106/9 106/16 108/16 109/2 109/19 111/19 115/24 122/8 123/16 146/25 150/5 151/7 151/22 151/24 154/4 154/9 154/13 155/17 163/10
committee's [1] 111/13
committees [12] 9/7 10/9 20/17 20/18 53/21 81/10 89/8 154/7 155/12 157/21 168/7 169/10
common [5] 90/23 103/25 104/1 104/2 183/19
comms [2] 39/25 49/1
communicate [6] 45/6 51/6 51/14 107/6 181/13 182/6
communicated [2] 50/22 106/5
communicating [2] 40/20 108/2
communication [2] 26/2 65/17
communications [1] 156/9
community [10] 44/8 44/18 81/7 115/11 144/1 144/19 144/22 144/23 179/8 186/17
comparative [1] 166/21
compare [1] 13/25
compared [4] 28/21 124/6 175/6 177/12
comparison [1] 118/6
competing [1] 108/23
complaints [1] 40/13
complete [2] 7/19 106/2
completely [6] 97/1 102/9 106/17 111/22 137/4 142/3
completeness [1] 79/10
complex [1] 93/11
complicated [4] 62/10 63/10 132/7 184/23
component [1] 26/11
composition [6] 5/7 10/11 18/6 61/15 63/22 80/23
computational [1] 187/17
computer [3] 181/25 187/19 187/25
computers [1] 188/16
concentrating [1] 78/5
concern [7] 68/1 68/5 80/20 88/17 108/22 112/21 146/1
concerned [5] 38/17 90/4 90/12 187/3 187/6
concerning [1] 145/4
concerns [7] 40/17 40/24 50/21 61/2 80/19 109/14 186/24
conclude [2] 65/12 68/17
concluded [1] 36/22
conclusion [5] 134/18 138/23 139/19 144/15 153/2
conclusions [2] 143/19 169/7
conditions [1] 83/21
conduct [1] 83/20
conducted [1] 79/2
confidence [8] 9/4 9/5 35/24 35/25 36/5 36/11 61/3 150/13
confirm [1] 58/22
confirmed [2] 28/19 129/3
conflict [1] 187/22
confusing [1] 179/9
confusion [2] 99/5 130/12
connected [1] 162/4
connection [1] 78/3
cons [1] 106/9
consensus [48] 12/16 12/19 12/24 13/7 13/10 13/13 13/15 13/19 14/3 14/4 14/7 86/17 100/7 100/11 101/3 101/8 101/18 101/22 102/12 102/16 102/19 102/19 102/21 103/2 103/23 104/19 105/18 105/25 106/2 107/8 107/11 107/24 108/3 108/13 108/25 109/14 109/15 112/23 119/12 146/24 149/20 152/3 155/17 156/16 156/19 156/24 157/4 169/24
consequence [3] 114/10 152/22 175/5
consequences [3] 83/1 128/25 170/24
Consequently [1] 143/24
consider [8] 5/8 34/14 50/16 63/21 87/14 111/21 173/13 188/21
consideration [4] 29/11 30/5 30/19 110/20
considerations [1] 124/18
considered [12] 16/17 28/5 40/15 50/4 82/9 85/3 88/7 99/24 134/2 134/16 141/6 180/1
considering [6] 29/18 29/22 44/25 45/15 170/24 172/6
considers [1] 21/4
consistent [1] 134/4
consortium [6] 163/20 163/23 164/12 164/23 165/9 166/9
constrained [1] 64/12
constraining [1] 64/14
consuming [1] 109/18

C

contacted [1] 147/12
contain [2] 124/24 125/18
containment [1] 138/23
contains [1] 161/11
contend [2] 8/18 55/9
contending [1] 20/22
content [1] 107/8
context [5] 20/21 50/16 55/16 140/19 175/19
Contingencies [1] 3/22
continual [1] 16/12
continually [1] 188/15
continue [4] 140/23 141/16 148/14 149/6
continues [1] 69/9
continuing [3] 144/23 145/8 150/17
continuous [1] 65/2
contrarian [1] 14/9
contrasting [1] 155/18
contribute [1] 20/11
contributed [1] 102/3
contributing [1] 63/18
contribution [1] 149/6
contributions [1] 119/22
control [4] 170/25 173/13 173/24 176/12
controlling [1] 78/22
convened [2] 9/20 16/13
convenient [2] 58/1 58/2
converging [1] 138/22
conversation [3] 53/23 128/2 152/19
conversion [1] 174/12
conviction [2] 139/9 139/17
convinced [2] 128/3 139/19
cope [1] 74/21
core [2] 82/5 106/22
coronavirus [2] 80/1 126/18
correct [67] 1/11 1/12 2/11 2/12 2/17 4/6 4/11 7/16 11/19 11/20 11/24 12/2 12/3 12/22 16/8 16/9 16/19 16/22 16/23 18/12 18/13 22/19 22/20 23/4 23/9 23/10 24/8 27/13 27/14 27/20 27/21 28/24 31/22 32/11 32/12 34/23 34/24 35/5 35/6 35/10 35/14 36/7 36/22 36/23 37/1 37/9 43/14 45/1 55/4 57/25 70/18 71/2 71/20 72/15 79/17 83/10 85/14 96/9 104/3 109/21 140/9 140/18 161/13 163/16 172/10 186/14 188/20
corrected [1] 103/12
correspondent [1] 148/21
cost [7] 39/12 113/9 113/25 173/14 174/22 174/23 174/23
cost-effective [1] 113/25
costs [3] 171/25 175/3 177/11
could [53] 1/8 1/24 2/21 4/16 11/13 20/2 21/23 25/2 36/15 40/17 40/19 41/18 41/18 42/1 42/10 49/20 50/6 55/17 56/1 59/6 61/16 61/23 67/7 67/17 69/10 74/17 76/11 77/20 81/17 84/2 88/16 88/20 90/15 135/11 142/7 144/11 146/22 148/20 150/23 151/3 157/22 161/3 164/15 164/19 167/15 174/18 174/19 177/8 177/16 178/24 180/23 181/2 185/20
couldn't [4] 84/2 119/19 152/18 170/13
councils [1] 114/16
COUNSEL [6] 1/7 70/7 161/2 191/5 191/9 191/13
counselling [1] 40/1
count [1] 81/15
counted [1] 184/17
counterparts [2] 49/2 68/10
counting [3] 174/17 184/22 184/22
country [12] 4/16 33/16 47/10 64/22 71/4 71/24 116/21 126/12 128/18 140/11 140/16 172/6
couple [12] 37/16 51/23 60/9 71/13 83/3 99/6 113/11 131/16 135/14 148/3 161/24 186/22
course [43] 2/4 4/22 10/8 13/20 35/7 37/7 42/16 50/5 58/5 72/3 85/6 85/13 86/18 87/11 88/19 89/2 97/4 99/20 107/2 107/9 108/9 109/7 109/9 114/11 120/20 122/1 124/21 124/25 126/25 128/14 128/16 132/7 136/23 140/25 141/18 145/9 155/24 156/18 159/24 160/7 171/4 173/5 176/21
cover [4] 102/17 102/17 124/13 162/17
covered [2] 19/13 34/5
Covid [44] 4/23 6/22 27/24 28/3 28/12 28/19 29/2 29/5 33/20 33/23 33/24 34/5 34/11 34/15 35/8 42/22 42/22 42/22 42/23 48/16 53/21 82/12 111/5 120/20 123/12 123/25 124/4 124/6 125/7 138/15 139/10 147/8 152/9 152/12 152/23 153/8 153/12 153/17 153/24 162/22 163/12 173/2 174/8 184/18
Covid-19 [6] 29/5 111/5 124/4 124/6 147/8 173/2
Covid-O [2] 42/22 42/22
COVID-related [1] 174/8
Covid-S [2] 42/22 42/23
cow [1] 11/22
create [3] 64/8 95/7 109/15
created [9] 52/19 53/21 67/15 75/16 81/5 82/1 98/16 127/15 127/19
creates [1] 156/15
creating [3] 103/9 150/9 158/5
crisis [10] 12/6 36/19 36/21 47/5 49/21 54/3 55/3 60/20 61/4 63/17
critical [6] 107/3 121/11 121/17 124/19 140/15 157/15
critically [1] 119/11
criticise [1] 50/10
criticised [1] 105/19
criticism [6] 61/21 61/23 62/5 62/9 105/20 156/3
criticisms [2] 5/5 68/15
critique [1] 169/14
crop [2] 185/7 185/8
cross [2] 17/20 114/6
cross-section [1] 114/6
crossing [1] 83/24
crystallise [1] 81/22
CSA [4] 46/16 46/20 48/6 48/12
CSA network [1] 48/12
CSAs [4] 46/15 48/5 48/9 48/20
Cummings' [1] 133/6
current [1] 11/17
currently [1] 70/23
curve [3] 134/3 134/17 182/10
customers [1] 21/2

D

Dam [1] 15/20
damage [1] 149/21
damaging [1] 65/22
Dame [2] 121/11 121/19
Dame Angela McLean [2] 121/11 121/19
danger [3] 90/16 159/25 159/25
dangerous [1] 124/8
DAs [4] 46/6 46/7 46/12 47/6
dashboard [1] 43/4
data [84] 14/15 24/25 25/2 28/17 28/18 28/20 29/7 29/25 29/25 30/24 30/25 31/2 31/7 31/8 31/10 31/12 31/12 31/15 31/17 32/21 32/22 33/3 33/15 33/16 78/19 91/9 91/12 91/14 93/23 94/16 94/22 95/6 100/17 105/3 108/24 114/19 118/25 119/3 119/4 119/13 119/16 130/9 140/1 144/14 153/1 153/6 153/14 153/14 153/17 153/20 153/23 165/11 165/11 165/23 165/24 166/5 182/2 182/19 182/23 183/1 183/20 183/22 183/24 184/2 184/3 184/9 184/12 184/25 185/6 185/6 185/11 185/15 185/17 186/1 186/3 186/10 186/18 186/22 186/24 187/12 187/15 187/23 188/13 188/25
data's [2] 166/1 184/15
data-driven [1] 93/23
dataset [1] 144/13
datasets [3] 184/13 186/21 188/16
date [3] 70/23 119/25 119/25
dated [6] 2/7 2/14 49/21 70/19 138/4 143/17
dates [4] 74/14 119/3 119/4 155/4
David [2] 27/13 138/1
David Halpern [1] 138/1
day [11] 6/24 19/16 44/13 44/13 69/1 69/9 79/19 79/19 115/23 149/14 160/23
day's [1] 100/14
days [10] 20/1 64/10 135/1 135/1 135/14 138/5 147/1 168/11 186/9 186/22
deadly [1] 148/17
deal [6] 4/15 41/13 61/3 74/21 142/25 148/23
dealing [4] 27/23 31/15 97/25 186/12
dealings [1] 61/1
dealt [3] 35/13 49/4 87/2
death [3] 28/12 144/10 184/2
deaths [9] 126/2 126/10 133/2 143/20 143/21 143/21 144/13 144/22 145/3
debate [7] 37/11 38/9 38/23 39/16 105/12 126/5 141/1
December [6] 4/18 4/19 5/19 49/22 59/15 64/5
December 2019 [3] 4/18 4/19 5/19
December 2020 [3] 49/22 59/15 64/5
decided [6] 37/18 37/21 84/4 100/3 102/11 126/24
deciding [1] 176/13
decision [40] 9/21 12/9 12/14 39/4 40/16 41/6 42/18 43/13 44/25 45/3 49/12 50/11 50/17 51/4 53/22 66/9 66/25 87/21 88/14 107/2 107/5 116/14 119/2 119/15 119/19 120/4

D

decision... [14] 120/13 126/19 128/7 134/12 148/12 149/24 150/10 150/12 151/10 151/11 151/15 154/6 176/14 176/16
decision-makers [10] 12/9 39/4 44/25 45/3 49/12 87/21 116/14 134/12 150/10 150/12
decision-making [11] 9/21 12/14 40/16 42/18 43/13 50/17 66/9 107/2 107/5 120/4 128/7
decisions [28] 8/20 12/2 12/7 12/13 38/5 38/6 39/5 41/3 47/14 50/10 51/9 56/6 66/6 66/18 90/15 91/21 113/21 116/23 117/25 119/23 120/4 120/7 120/14 122/1 134/2 134/16 141/25 150/23
deemed [1] 113/25
deep [1] 8/22
deeper [1] 182/14
defence [2] 83/12 156/3
defended [1] 170/1
defined [1] 108/4
definitely [3] 178/20 182/17 188/8
definition [1] 75/16
definitions [4] 91/14 94/21 153/1 184/16
DEFRA [1] 6/10
degree [7] 3/3 36/5 87/14 88/1 94/4 148/15 181/10
degrees [1] 35/25
delay [4] 109/12 124/24 125/18 126/21
delays [2] 75/6 109/16
deliver [3] 60/12 60/13 68/23
delivered [2] 8/7 68/22
delivers [1] 12/18
demand [1] 8/6
demands [2] 74/2 187/17
democracy [2] 12/8 66/19
denominator [3] 103/25 104/1 104/2
department [21] 5/24 6/1 6/6 6/7 15/6 20/4 21/3 22/25 23/5 23/6 24/1 25/22 27/6 34/1 34/5 59/24 79/2 79/10 79/11 122/18 123/2
departmental [2] 20/6 47/24
departments [14] 3/13 6/10 6/12 6/13 7/2 15/6 17/16 19/5 27/5 31/18 46/1 51/25 57/11 146/10
dependent [1] 82/11
depending [1] 97/7
depends [5] 90/19 90/20 122/21 127/25 132/7
deprivation [1] 170/14
depth [2] 47/18 63/15
Deputy [1] 75/24
Deputy CMO [1] 75/24
describe [19] 9/17 79/25 87/17 93/20 93/22 94/2 94/4 95/16 118/6 158/10 163/19 163/21 164/22 165/10 172/8 178/2 182/13 183/6 184/1
described [10] 53/23 84/20 86/10 89/18 94/13 98/2 138/22 145/18 148/5 182/13
describes [1] 139/2
describing [4] 122/10 137/13 181/16 186/2
description [2] 94/24 103/8
deserve [1] 189/14
design [1] 57/19
designed [4] 59/13 78/16 107/18 107/18
desire [2] 57/20 150/4
despite [2] 53/20 68/23
detail [7] 70/23 72/21 93/11 99/19 118/2 172/18 183/7
details [1] 136/18
determine [5] 54/11 87/22 94/25 116/18 132/14
determines [3] 82/6 82/18 156/7
determining [2] 88/24 140/15
develop [5] 95/24 96/16 97/4 98/11 170/5
developed [5] 28/4 84/5 93/1 103/2 114/11
developing [3] 123/2 137/1 177/22
development [2] 65/4 113/6
devolved [19] 45/18 45/21 47/13 47/21 48/15 48/21 49/13 58/15 75/8 90/5 90/8 90/8 90/14 92/9 102/4 166/16 166/24 167/6 184/11
DH [1] 30/3
DHSC [3] 20/7 111/13 149/23
dialling [1] 133/19
dialogue [7] 118/16 119/7 121/21 121/22 142/22 180/16 180/22
Diamond [1] 31/22
did [78] 3/19 17/19 18/14 20/11 22/23 30/13 35/7 38/19 39/1 40/20 41/20 43/23 44/16 46/16 47/23 51/12 54/25 55/15 55/23 58/19 60/8 64/4 64/7 64/24 65/1 67/16 68/12 68/18 68/21 69/6 69/22 74/19 80/11 81/2 84/17 85/20 88/21 90/4 91/18 95/8 105/15 107/10 112/18 116/20 116/21 140/10 140/25 141/1 145/25 146/2 146/15 146/20 149/11 149/12 149/25 150/14 154/24 155/14 157/21 159/10 159/13 160/8 163/1 163/14 167/1 169/3 170/23 171/6 171/14 171/16 171/20 172/2 172/19 177/15 178/7 184/18 184/25 189/16
didn't [48] 19/11 41/22 46/3 56/22 73/6 74/7 75/5 75/6 78/1 78/6 78/10 78/11 79/19 80/13 85/21 91/4 92/11 92/17 92/18 92/19 92/19 101/25 102/18 103/15 106/18 111/6 112/20 116/10 118/7 125/23 126/6 128/15 129/9 130/6 137/2 137/5 141/10 141/11 141/14 146/21 149/2 151/13 152/7 156/19 159/5 166/17 180/5 183/19
die [2] 132/1 132/5
differed [1] 101/22
difference [6] 14/18 65/14 66/12 87/23 96/10 106/13
differences [2] 108/21 184/8
different [60] 3/12 3/18 10/9 10/20 11/21 13/1 14/1 14/13 14/15 14/16 21/11 26/1 27/5 29/16 41/6 41/23 41/24 47/13 51/22 66/21 75/13 76/18 83/15 83/20 83/22 87/18 90/15 90/15 90/16 93/8 94/8 96/24 97/1 98/21 102/4 102/5 105/1 105/3 105/4 106/8 106/10 109/18 110/18 113/24 130/19 135/3 141/21 162/8 164/3 164/5 164/19 165/12 165/18 166/4 168/10 173/24 184/7 184/13 184/18 184/23
differently [3] 41/19 91/15 165/20
difficult [8] 56/6 109/5 116/23 155/20 156/5 156/11 181/13 182/2
difficulties [5] 31/17 67/9 184/10 184/10 186/7
difficulty [2] 59/18 145/16
digest [1] 2/1
digestible [1] 5/17
digital [1] 181/23
dimension [1] 176/21
diminished [1] 169/12
direct [3] 111/5 121/15 173/1
direction [3] 22/2 22/3 54/17
directions [3] 46/11 90/16 182/12
directly [5] 20/9 106/25 114/8 118/20 186/16
director [5] 2/23 4/25 5/18 161/19 161/19
directorate [1] 5/23
disagree [2] 13/11 157/4
disagreed [1] 104/15
disagreement [3] 103/19 103/22 106/16
disappear [1] 53/13
disappointed [1] 121/4
disappointment [1] 122/13
disapproving [1] 155/11
disbanded [1] 121/7
discharged [1] 147/7
discipline [1] 140/8
disciplines [7] 13/1 18/9 63/18 82/23 110/22 111/19 177/25
disconnect [1] 184/2
discover [1] 71/21
discovered [1] 55/11
discrete [1] 45/17
discuss [11] 22/2 48/19 79/4 80/4 85/7 100/10 100/22 102/7 121/16 123/8 131/12
discussed [11] 59/8 74/15 86/22 99/15 100/7 101/4 103/13 114/21 136/13 146/19 170/6
discussing [6] 110/19 127/18 137/14 142/13 152/12 186/4
discussion [16] 20/8 21/9 54/9 80/15 100/15 102/10 104/22 117/12 117/22 136/6 140/20 152/23 153/3 153/8 159/20 170/21
discussions [6] 26/16 85/10 92/18 92/19 169/17 169/23
disease [13] 11/22 23/2 23/2 70/25 82/6 82/18 82/19 82/25 95/17 97/18 113/19 130/3 161/21
diseases [3] 23/1 162/9 162/10
dismiss [1] 104/5
disparities [3] 29/5 113/13 113/15
distancing [2] 148/16 172/1
distinction [3] 12/4 25/7 93/21
distribution [1] 46/24
diverge [1] 91/17
diversity [2] 63/22 65/8
do [116] 1/8 6/16 6/19 8/11 8/21 12/10 13/6 19/11 20/15 29/9 29/16 38/7 39/13 40/2 40/13 42/10 44/2 46/19 47/7 49/2 51/11 52/6 53/5 53/25 53/25 54/4 57/24 59/19 59/19 59/21 61/25 62/9 62/14 64/7 64/18 65/12 66/7 66/10 69/1 69/14 69/16 70/8 71/8 71/8 74/2 74/8 75/7 76/3 76/6 82/16 88/18 90/3 90/19 90/20 93/10 95/1 97/13 98/4 100/19 102/15 107/20

D

do... [55] 107/23 110/3 113/9 114/19 115/11 116/2 116/7 117/18 117/18 118/23 119/24 120/21 121/4 122/22 124/9 125/17 127/19 128/9 129/9 135/13 143/1 143/11 143/13 145/3 145/24 146/12 151/9 151/11 151/15 153/3 153/5 153/23 154/3 154/14 157/14 159/9 159/11 161/3 162/3 165/6 165/7 168/17 170/1 174/24 175/7 175/18 178/17 178/18 179/15 180/24 181/2 182/7 185/3 185/4 189/4
doctorate [1] 2/25
doctrine [3] 140/2 140/4 140/8
document [17] 2/9 10/4 75/4 78/14 78/24 109/25 135/3 135/12 135/16 137/21 137/25 138/7 145/18 146/23 148/1 154/16 185/18
documented [1] 31/4
documents [13] 52/23 84/24 99/6 99/10 103/10 103/14 109/24 134/6 137/6 137/6 179/23 180/4 180/15
does [16] 9/14 12/24 32/20 41/17 74/18 77/24 90/20 90/21 130/17 134/17 134/17 147/5 153/7 156/25 165/21 174/2
doesn't [11] 12/1 12/1 97/3 105/11 106/15 106/25 141/5 141/15 141/22 187/23 189/21
dogma [1] 55/20
doing [29] 6/25 19/6 24/17 24/19 48/22 61/12 64/25 68/8 69/1 74/9 78/11 92/20 101/24 109/25 112/18 112/21 112/22 129/11 130/10 132/21 140/24 150/19 162/23 175/6 176/8 176/9 176/19 180/15 189/20
domain [1] 179/24
domestic [1] 177/1
dominance [1] 167/10
dominated [3] 62/2 167/5 167/19
Dominic [1] 133/6
Dominic Cummings' [1] 133/6
don't [73] 9/5 9/10 13/2 13/6 13/17 13/20 14/5 21/20 26/8 27/4 29/11 30/16 32/15 33/13 34/17 61/12 62/10 62/11 62/11 65/13 68/4 68/4 70/14 70/14 73/6 81/9 82/14 89/23 91/1 92/15 92/17 92/19 93/5 93/5 96/18 99/11 99/19 101/10 104/3 108/14 114/12 117/17 118/23 121/22 123/1 124/19 126/5 127/4 127/24 129/8 133/5 134/22 134/23 137/11 142/7 145/9 145/10 149/19 157/1 159/24 161/8 162/2 167/5 169/2 169/22 170/1 178/8 179/24 180/1 180/9 185/9 187/9 187/16
done [24] 13/24 16/18 46/19 49/16 49/17 67/3 77/21 86/12 91/19 95/10 95/14 108/12 111/8 112/16 120/8 125/13 130/4 152/18 158/11 159/10 174/21 175/18 177/8 178/17
doubt [3] 9/12 50/3 119/7
down [23] 1/8 11/13 72/10 76/24 99/21 103/1 108/18 112/10 113/11 135/10 139/10 145/6 147/20 149/1 152/9 161/3 173/17 173/18 174/5 177/21 179/1 180/19 184/1
Downing [1] 43/7
Downing Street [1] 43/7
downside [2] 13/18 14/9
Dr [15] 1/5 1/6 1/11 2/21 58/14 59/2 69/12 69/16 72/3 75/12 85/15 87/10 87/24 115/22 191/3
Dr Stuart Wainwright [2] 1/5 1/11
Dr Wainwright [8] 2/21 58/14 59/2 69/12 72/3 85/15 87/24 115/22
Dr Wainwright's [2] 75/12 87/10
drafted [1] 186/13
drafting [1] 36/8
drain [1] 15/19
draw [10] 24/18 57/3 60/14 64/7 64/19 64/20 64/23 65/7 65/24 69/4
drawing [4] 17/16 29/6 59/17 97/14
drawn [4] 62/24 65/6 68/25 169/7
draws [1] 63/9
dreadful [1] 41/12
drew [1] 62/19
driven [4] 93/23 94/3 95/6 97/2
drives [2] 82/4 82/18
driving [3] 144/2 146/9 180/5
drop [1] 100/17
dropping [1] 113/11
drug [1] 174/19
drugs [2] 174/23 175/20
Dstl [2] 18/2 184/24
Duchy [1] 43/10
due [9] 35/7 37/7 42/16 68/24 85/13 86/18 89/2 99/20 108/9
during [36] 4/5 16/2 25/22 26/12 34/11 34/15 49/19 66/2 68/14 68/21 72/6 72/9 72/23 84/25 91/15 108/5 111/12 113/22 115/16 115/24 127/15 131/21 131/22 136/8 136/25 141/6 154/5 155/14 158/9 163/12 163/23 178/20 181/9 182/25 184/19 187/1
duties [2] 19/12 19/12
dying [1] 173/3
dynamic [1] 82/3

E

each [18] 1/24 10/24 13/9 20/4 47/20 48/15 62/17 62/18 62/19 80/24 90/18 91/20 105/15 108/23 174/10 181/17 184/11 185/10
earlier [26] 15/5 29/22 29/24 30/5 30/12 30/13 31/24 36/7 54/7 58/14 63/12 67/11 75/17 85/3 99/7 101/13 122/6 125/18 126/24 142/7 152/6 152/7 152/10 154/23 156/17 175/24
early [41] 10/20 14/14 29/16 30/21 31/7 47/18 48/9 51/23 55/8 55/11 64/10 65/6 65/13 82/2 89/14 89/25 92/13 95/8 117/4 119/12 123/12 123/24 124/5 124/10 124/22 125/11 129/16 130/6 138/5 138/9 138/23 141/6 162/25 163/24 167/16 167/18 168/11 180/3 180/15 180/21 181/9
early 2010s [1] 10/20
easier [3] 157/8 157/12 185/2
easiest [1] 177/16
easily [1] 95/10
easy [5] 50/10 66/17 168/12 168/14 182/9
echoed [2] 139/18 178/15
economic [16] 66/23 88/5 112/7 113/7 170/14 170/22 170/24 172/6 173/7 173/12 173/14 173/15 175/5 176/21 176/23 177/19
economics [7] 38/25 71/11 171/13 174/22 177/13 179/13 179/18
economist [1] 177/11
economy [5] 111/8 112/15 128/19 128/24 174/1
Edmunds [7] 23/11 23/13 71/7 92/1 163/3 167/24 168/15
education [2] 111/8 112/15
effect [6] 18/20 19/18 67/16 67/19 144/5 173/13
effective [3] 8/3 84/17 113/25
effectively [3] 73/18 106/3 145/5
effectiveness [1] 173/23
effects [1] 173/16
efficiency [1] 113/10
efficient [1] 8/3
effort [1] 44/9
either [6] 57/15 94/14 129/23 147/6 168/14 168/23
elderly [1] 124/8
elected [2] 66/19 116/22
electronic [2] 64/17 185/10
elements [3] 97/13 169/14 176/13
elicit [1] 160/14
else [13] 31/11 38/15 41/1 41/9 67/14 78/25 107/19 129/9 137/6 137/7 145/20 179/21 188/4
elsewhere [7] 17/19 17/21 24/17 25/7 48/11 139/21 179/9
email [9] 77/21 143/10 143/15 143/16 144/16 146/16 149/13 150/1 184/4
emailed [1] 79/24
emails [2] 148/3 152/19
embedded [1] 8/4
embodied [1] 139/8
embroiled [1] 44/12
emerged [5] 13/15 24/25 25/2 33/17 140/1
emergencies [6] 4/5 9/16 15/11 20/19 34/3 36/18
emergency [6] 9/22 10/15 15/4 18/19 36/21 50/10
emerges [1] 13/8
emerging [4] 23/20 24/4 33/2 33/3
EMG [4] 32/3 32/7 32/13 33/9
eminently [1] 170/11
emphasise [1] 175/16
emphasised [1] 103/14
emphasising [1] 108/21
employed [1] 83/22
employment [2] 28/10 83/21
employment-related [1] 28/10
enable [2] 7/19 130/9
enabled [1] 108/15
encouraging [1] 129/23
end [31] 16/25 20/1 59/2 59/5 71/12 81/5 82/13 85/23 86/11 88/8 88/24 89/24 94/14 95/4 112/4 116/9 127/9 131/16 133/15 136/10 136/17 137/9 137/9 149/23 151/10 158/1 161/8 173/10 183/10 184/7 187/13
ended [2] 101/24 108/19
endorse [1] 171/1
Energy [1] 5/25

E

engage [3] 38/9 38/10 52/21
engaged [1] 49/1
engagement [1] 182/14
engaging [2] 40/22 55/22
engineering [2] 7/2 44/7
England [11] 15/11 29/1 60/3 90/19 90/20 102/5 166/9 166/18 166/22 184/14 184/18
English [1] 167/5
enhance [1] 153/6
enough [12] 18/5 29/20 30/21 52/10 54/12 65/13 123/6 130/6 153/17 153/17 183/1 187/23
ensembles [1] 158/6
ensure [6] 6/12 39/15 63/17 92/3 102/16 117/22
ensuring [1] 7/12
enthusiasm [1] 155/2
entire [2] 175/9 175/15
entirely [2] 14/20 170/25
entirety [1] 186/20
entities [1] 43/17
entry [2] 135/16 135/17
environment [4] 15/10 15/14 18/3 187/15
Environment Agency [1] 18/3
Environmental [2] 32/2 32/7
epidemic [45] 78/18 82/4 91/6 91/15 92/13 95/8 111/25 113/12 113/14 113/20 113/23 115/3 116/5 116/9 116/12 116/13 117/4 117/5 117/9 117/10 118/7 122/23 123/25 124/25 125/24 126/3 126/8 126/16 127/11 128/19 128/25 131/22 132/15 133/25 134/3 134/17 134/19 134/23 140/17 142/6 144/12 150/22 156/6 158/9 181/9
epidemics [6] 78/16 78/23 91/8 118/10 140/6 145/7
epidemiological [10] 71/4 71/24 82/5 90/17 98/23 162/20 164/2 170/12 170/21 176/20
epidemiology [5] 18/11 26/5 111/3 113/6 161/21
equivalent [1] 159/24
Erm [1] 36/4
error [1] 148/7
eruptions [1] 10/19
especially [5] 42/5 55/4 85/22 88/2 132/2
essential [2] 84/21 150/21
essentially [9] 73/9 81/5 84/21 91/23 94/22 100/12 102/13 131/24 168/6
establish [1] 174/8
established [6] 28/17 32/8 32/13 48/17 82/12 131/24
estimate [4] 101/16 104/25 105/7 147/5
estimates [1] 102/3
estimating [1] 95/17
ethics [1] 187/10
ethnic [4] 27/24 28/21 28/22 30/10
ethnicity [4] 27/16 29/9 30/18 31/10
evaluate [2] 113/9 119/19
evaluation [1] 69/10
even [16] 8/14 40/14 61/6 101/24 108/10 109/18 121/14 128/4 128/20 133/7 133/11 141/6 141/14 156/9 159/5 178/1
evening [2] 100/18 100/22
evenings [1] 19/16
event [11] 9/21 11/1 38/3 53/5 90/13 91/3 124/2 126/12 139/2 148/1 158/7
events [2] 4/22 40/3
ever [10] 34/9 55/17 57/9 75/18 85/20 92/15 112/19 153/11 169/3 180/10
every [17] 6/5 6/6 6/7 15/5 24/11 48/12 81/2 81/17 81/18 99/24 100/9 101/24 140/10 140/16 169/25 175/22 177/8
everybody [6] 9/11 19/17 38/4 76/19 104/3 108/18
everybody's [1] 144/10
everyone [5] 2/1 19/18 137/14 148/17 189/3
everything [4] 31/11 104/7 162/7 162/9
evidence [54] 2/2 2/3 2/20 4/24 8/24 12/11 13/5 14/14 14/15 22/10 25/13 26/7 27/19 32/16 32/21 33/2 52/21 59/3 63/13 66/25 75/12 78/20 82/3 83/18 84/11 87/10 93/17 103/9 103/15 103/17 104/4 109/16 115/22 117/23 120/2 123/13 124/21 138/3 142/1 142/1 150/8 150/9 151/3 151/21 153/22 155/24 158/21 160/14 169/8 170/9 176/22 179/5 179/25 186/23
evident [2] 56/5 178/16
evidential [1] 52/3
evolve [1] 11/5
evolved [1] 35/7
evolving [2] 12/25 52/2
exacerbated [1] 113/12
exact [1] 81/10
exactly [10] 7/20 10/3 19/8 35/23 47/4 48/3 94/12 107/21 145/9 151/9
examine [2] 32/15 57/8
example [27] 10/18 15/12 21/19 30/15 32/23 43/19 44/17 56/7 57/1 74/3 76/12 98/25 99/7 103/21 103/22 107/11 113/13 114/2 117/1 131/13 132/16 133/7 139/11 153/13 175/20 185/9 187/14
examples [5] 25/4 25/11 51/24 173/8 183/4
excellent [2] 8/7 25/15
except [2] 85/21 104/4
exceptionally [2] 111/3 155/7
exchange [1] 143/15
exclude [2] 105/5 166/17
excluded [1] 14/11
exclusively [1] 36/24
executive [5] 34/7 49/19 51/13 66/2 68/6
exercise [3] 82/20 95/19 166/15
Exeter [1] 165/22
exist [2] 113/9 153/23
existing [6] 22/11 22/18 23/16 23/24 125/10 172/24
exists [1] 118/18
expand [4] 116/3 144/7 179/10 181/6
expect [4] 98/4 165/24 179/17 185/13
expected [4] 34/4 133/1 158/2 158/24
expecting [1] 128/14
expense [1] 62/3
experience [4] 76/14 106/4 140/1 170/7
experienced [1] 53/16
expert [6] 26/24 41/4 104/11 138/2 149/19 186/22
expertise [17] 10/17 24/18 62/8 64/3 64/8 80/21 106/11 111/6 138/22 147/13 149/19 151/1 151/24 164/20 169/10 170/7 171/3
experts [29] 10/25 12/18 18/9 19/2 22/11 40/6 40/23 40/24 47/10 51/25 54/10 57/4 60/15 60/15 62/4 62/6 62/20 62/25 64/12 64/16 64/17 64/21 65/13 65/14 68/24 110/22 112/25 169/1 171/5
explain [15] 2/23 5/1 49/9 77/24 78/21 79/23 84/16 106/8 106/9 107/20 120/6 161/18 169/4 174/13 176/2
explained [7] 15/5 75/11 75/15 76/25 87/12 92/22 176/3
explaining [1] 49/5
explains [1] 77/25
explanation [1] 78/4
explicitly [3] 112/6 153/1 172/25
exploration [2] 112/14 112/18
explore [1] 171/25
exploring [1] 5/5
exposed [1] 147/19
exposure [1] 28/10
express [3] 155/18 189/16 189/18
expressed [5] 68/2 109/15 155/10 186/23 189/17
expressing [3] 88/17 154/9 154/11
extend [2] 170/23 177/3
extended [2] 31/10 107/16
extent [13] 30/16 39/19 45/12 49/1 53/6 67/12 130/11 131/12 131/22 132/15 132/21 140/17 159/14
external [2] 11/10 62/4
extraordinarily [1] 189/12
extraordinary [2] 52/9 148/11
extremely [4] 73/16 73/17 84/22 109/1
eyes [1] 99/21

F

face [3] 128/19 128/24 139/25
faced [1] 49/18
facilities [2] 143/7 145/2
fact [38] 26/18 27/17 33/19 51/2 63/10 65/17 71/21 77/13 78/10 80/3 81/4 94/14 96/9 98/24 101/13 113/12 115/21 122/8 123/11 126/22 135/1 135/17 137/15 138/10 148/3 149/10 149/14 149/23 150/17 152/3 153/11 159/3 163/9 164/8 171/22 173/5 185/23 187/2
factor [3] 64/14 134/20 174/12
factors [1] 66/22
facts [2] 70/16 161/11
failed [2] 51/5 138/23
failure [2] 51/14 139/8
fair [6] 9/25 16/20 19/16 73/20 78/12 86/16
fairly [1] 52/8
falling [1] 144/22
familiar [3] 9/12 49/24 65/19
families [1] 19/19
fantastic [1] 187/14
far [5] 67/23 90/4 94/9 124/9 151/17
fascinating [1] 172/17
fast [5] 1/19 14/16 18/1 50/12 53/4

F

fast-moving [2] 14/16 53/4
fatality [1] 131/25
fault [1] 168/13
FCDO [1] 53/11
fear [1] 189/13
feature [1] 50/13
features [2] 61/17 97/17
February [42] 16/11 26/23 28/18 29/7 29/16 36/6 46/6 46/19 48/9 57/14 58/18 61/10 72/10 73/9 80/8 82/2 82/13 99/14 112/24 121/5 121/9 124/16 127/15 129/5 129/16 131/4 131/17 131/21 131/23 132/24 133/15 133/16 136/8 136/10 136/16 136/17 136/22 136/25 137/10 140/5 141/6 152/11
February 11th [2] 46/19 58/18
February 2020 [6] 28/18 29/7 82/2 121/9 129/5 131/4
February 2021 [1] 152/11
February 2022 [2] 16/11 121/5
February 21 [1] 99/14
fed [3] 28/16 85/10 183/12
feed [4] 20/9 20/14 25/8 155/17
feeds [3] 123/3 182/23 186/1
feel [1] 106/18
feeling [3] 57/13 57/15 144/18
feels [1] 12/10
fellow [1] 3/6
felt [15] 39/6 39/6 40/1 44/10 67/11 67/23 74/8 84/17 88/2 88/5 107/21 151/6 151/23 169/21 180/3
fence [3] 83/24 118/17 118/19
Ferguson [10] 147/23 148/11 148/14 149/5 149/9 150/3 151/19 163/3 167/23 168/15
Ferguson's [3] 52/24 148/22 150/25
few [17] 25/4 46/3 50/24 52/7 74/11 83/14 93/23 96/17 104/11 142/24 147/22 163/14 163/17 173/17 183/13 184/12 185/14
few weeks [2] 96/17 185/14
field [3] 19/3 164/8 169/1
fifth [1] 152/8
figure [3] 176/4 182/7 182/8
fill [7] 56/21 57/10 57/12 60/4 78/17 78/21 159/14
filled [3] 48/7 57/1 185/19
filling [2] 73/18 74/1
final [3] 31/25 65/16 67/20
finally [4] 68/13 147/21 157/22 158/12
find [4] 51/12 103/24 152/15 152/18
finish [2] 110/4 160/12
finished [1] 122/17
fire [1] 4/10
firmly [1] 150/20
first [63] 2/6 2/21 4/23 16/7 21/1 22/13 24/15 26/18 31/3 31/7 35/1 35/12 37/14 37/18 38/17 45/20 46/3 49/4 49/8 51/1 51/9 52/7 62/14 63/13 64/25 66/7 67/5 71/15 72/5 80/7 81/11 86/11 86/16 89/4 91/8 99/8 101/15 111/1 111/18 116/5 122/15 124/15 128/18 133/16 143/1 143/2 143/16 143/20 147/2 147/22 154/2 163/19 164/9 166/13 172/15 178/5 180/11 180/25 183/7 183/11 183/13 184/12 185/14
firstly [4] 8/2 38/3 56/14 125/8
fit [3] 8/7 111/4 159/23
fitted [1] 49/13
fitting [1] 68/17
five [5] 16/25 112/12 116/13 156/20 156/23
five people [1] 16/25
five years [1] 116/13
fixed [1] 188/3
flagged [1] 142/17
flawless [1] 50/9
flexibility [1] 69/3
flexible [1] 10/16
flood [1] 15/18
floods [2] 15/12 15/14
flow [1] 56/14
flowed [1] 40/15
flowing [3] 67/19 91/10 121/22
flows [2] 54/20 59/7
flu [6] 11/23 25/22 138/16 138/24 163/7 163/11
flu-like [1] 138/16
focus [7] 29/23 30/12 30/21 30/25 63/5 123/11 125/7
focused [7] 34/2 75/22 76/20 78/20 78/20 123/17 172/25
focusing [2] 89/8 129/4
fold [1] 35/12
follow [5] 36/21 100/20 127/23 153/7 157/2
following [12] 2/14 65/20 65/22 68/7 100/24 127/9 132/1 153/7 179/2 179/19 180/8 189/15
follows [1] 186/2
forecast [1] 93/25
forecasts [1] 94/6
foremost [1] 20/25
form [7] 12/19 29/21 38/24 39/1 66/25 111/7 181/23
formal [6] 13/14 36/9 95/7 97/9 152/25 158/8
formally [1] 26/23
format [2] 183/23 185/2
formatted [1] 184/15
formatting [1] 185/17
formed [4] 17/3 91/23 91/23 163/23
forming [1] 149/20
forms [6] 8/24 21/11 39/14 41/3 63/7 66/22
formulate [2] 52/1 55/10
formulated [4] 13/19 55/2 55/5 55/24
formulation [2] 52/10 52/14
forth [1] 54/1
forward [8] 36/25 39/22 99/22 113/4 155/16 159/15 178/6 180/7
found [5] 93/11 107/16 108/20 112/17 159/3
four [10] 3/25 17/18 44/5 91/12 91/14 95/25 112/12 116/12 184/9 185/6
four nations [4] 91/12 91/14 184/9 185/6
four weeks [1] 95/25
four years [1] 3/25
fourth [2] 50/7 167/16
frail [1] 124/8
frame [2] 21/7 54/14
framed [1] 33/13
framework [1] 116/16
framing [1] 54/15
Francis [1] 70/10
free [5] 17/5 17/10 19/7 40/7 41/13
freely [1] 187/12
freestanding [1] 92/25
frequently [1] 28/5
Friday [2] 73/21 190/1
front [4] 22/14 23/19 109/23 120/6
fruit [1] 171/14
frustration [3] 129/13 129/14 130/5
fulfilling [2] 84/18 158/22
full [6] 1/9 18/25 70/9 73/10 73/21 161/4
full-time [1] 73/10
fully [3] 40/6 144/14 162/4
function [7] 74/6 81/23 84/18 108/16 159/8 159/19 169/11
functioning [1] 151/25
functions [5] 83/15 158/3 158/22 159/22 169/7
fundamental [3] 59/18 138/14 165/1
funded [2] 115/10 178/12
funding [6] 108/23 164/23 165/4 165/6 178/10 178/10
further [12] 32/16 69/15 81/21 91/5 95/21 112/10 146/12 149/1 150/12 167/9 173/17 174/5
future [9] 39/11 39/23 40/3 91/9 120/18 128/8 159/16 172/3 178/13

G

gaming [1] 90/18
gamut [1] 162/18
gap [12] 57/1 78/17 78/17 78/21 88/12 88/17 112/21 113/16 113/19 114/21 115/1 159/14
gaps [1] 56/21
garden [1] 181/20
gather [3] 31/7 164/13 186/8
gathering [2] 31/12 77/21
gave [12] 17/5 17/10 18/3 27/19 41/12 73/18 80/14 80/22 115/22 162/20 163/7 165/18
GCSA [7] 6/19 7/6 7/13 9/23 13/21 18/7 61/22
GDP [1] 177/15
GDPR [1] 187/10
geezers [1] 154/22
general [4] 24/13 25/6 95/11 110/19
generalised [1] 129/1
generally [10] 6/4 8/12 20/17 31/2 36/8 45/11 90/4 98/18 113/20 187/18
generate [7] 82/2 93/24 94/5 105/11 158/5 181/3 187/20
generated [2] 85/16 98/1
generically [2] 78/22 124/11
geneticists [1] 24/3
genetics [2] 3/3 162/7
gently [1] 154/23
get [35] 4/15 10/25 14/16 21/2 30/6 40/20 46/3 47/6 47/10 55/23 64/12 64/15 72/21 75/6 81/21 84/10 84/10 88/10 108/24 109/3 121/19 126/5 126/12 146/11 156/21 159/9 165/22 166/5 172/18 174/17 183/1 183/16 185/1 185/15 189/21
gets [5] 21/1 23/5 123/6 150/9 178/12
getting [8] 17/21 65/5 105/2 135/15 140/14 165/4 183/10 184/13
girls [1] 177/1
give [18] 1/8 5/7 17/8 21/23 53/15 68/18 70/9 72/22 81/9 96/15 116/1 116/7 141/25 142/1 156/25 161/4 183/4 187/12
given [13] 63/1 63/5

G

given... [11] 82/6 82/19 93/11 106/3 108/16 125/22 127/12 150/10 158/20 172/17 182/4
gives [2] 56/7 70/22
giving [11] 13/22 40/6 40/12 59/4 63/15 93/17 138/2 155/23 173/8 174/18 186/23
glad [1] 151/18
go [77] 2/8 2/23 3/25 4/18 4/25 5/18 5/18 5/21 5/22 6/2 6/15 7/4 7/18 8/1 15/1 16/21 17/6 17/19 25/11 34/8 34/14 34/17 39/24 41/11 41/18 41/18 42/1 44/3 45/6 45/18 46/10 46/11 48/10 49/10 50/24 52/5 55/15 60/11 60/17 61/11 64/22 64/24 65/17 68/6 76/7 81/1 82/10 84/13 87/8 89/11 90/16 94/17 99/12 100/23 113/4 114/15 133/21 135/23 138/25 140/23 145/14 146/22 148/9 148/20 157/3 157/4 157/23 158/12 161/8 172/8 172/15 173/4 175/22 185/5 186/15 187/23 188/25
GO-Science [28] 2/23 3/25 4/18 4/25 5/18 5/18 5/21 5/22 6/2 6/15 8/1 15/1 16/21 17/6 17/19 34/8 34/14 39/24 44/3 45/18 48/10 49/10 60/11 60/17 61/11 64/24 68/6 76/7
GO-Science's [1] 7/18
GO-Science/SAGE [1] 50/24
goal [1] 90/23
goes [3] 111/10 132/8 132/13
Gog [1] 89/21
going [77] 8/16 16/10 16/24 22/1 22/12 24/10 24/11 26/6 31/6 32/1 34/20 41/1 41/22 48/23 49/3 50/23 52/1 54/15 56/19 56/22 56/24 65/16 70/1 72/19 75/3 78/24 81/14 86/10 86/19 87/15 89/1 89/10 96/14 96/16 99/9 110/4 115/13 117/24 119/23 123/9 126/2 126/11 126/11 127/22 127/23 134/13 135/13 135/13 136/25 137/15 142/9 142/14 142/22 142/24 144/8 145/21 152/3 160/15 166/2 166/24 168/3 170/4 170/19 171/14 172/16 172/18 175/14 176/17 176/24 178/21 179/15 180/7 180/19 181/22 184/3 188/18 189/5
gone [6] 121/8 121/9 121/9 154/22 163/6 169/13
good [30] 6/14 15/22 20/16 21/6 21/8 42/1 44/3 51/21 51/24 52/5 53/12 73/17 81/4 81/13 94/9 103/20 115/5 118/9 118/9 136/20 150/20 153/1 153/14 162/24 174/20 180/16 182/23 183/1 183/14 186/1
got [39] 1/13 14/8 14/20 15/13 17/21 23/15 25/6 26/3 29/6 29/7 29/19 32/7 41/25 44/11 52/15 52/17 52/18 52/22 55/25 58/4 60/9 69/2 89/14 89/14 100/17 114/13 127/25 130/12 135/22 142/24 162/14 164/18 165/6 166/13 168/25 169/21 175/7 181/18 183/12
GOV.UK [1] 37/4
governance [1] 52/13
government [126] 5/22 6/3 6/6 6/7 6/15 6/16 6/20 6/25 7/3 7/5 7/11 7/13 7/14 7/21 8/4 8/16 9/16 11/2 11/9 12/14 15/2 15/3 15/4 15/6 15/6 15/22 17/6 17/7 17/20 18/2 19/5 19/6 20/17 20/22 24/24 25/11 26/1 27/2 27/5 35/15 37/21 37/23 38/16 39/22 40/4 42/5 45/6 48/14 48/22 49/20 50/21 51/4 51/17 56/4 56/15 57/15 62/1 64/1 65/3 66/1 67/7 68/5 68/25 77/18 78/5 78/14 83/19 83/19 84/6 84/7 84/12 84/13 86/4 88/10 88/20 102/1 111/24 115/25 116/17 116/25 117/18 118/8 118/12 118/17 118/20 119/7 119/18 120/25 121/13 121/16 121/24 122/22 122/22 123/6 124/23 125/23 126/18 127/14 127/23 128/2 128/4 129/6 129/19 129/24 133/11 141/9 144/11 145/17 145/20 148/5 148/14 150/4 150/22 154/6 155/21 155/22 156/9 156/13 157/11 157/14 158/4 158/8 158/17 158/20 159/1 159/17
government's [1] 53/20
governments [4] 45/3 47/13 47/17 116/6
grading [1] 36/9
gradually [7] 25/1 52/17 61/10 65/10 67/13 68/11 68/12
Graham [6] 23/13 70/5 70/6 70/10 139/11 191/7
Graham Medley [2] 23/13 139/11
grant [2] 108/23 115/9
graph [1] 182/9
graphs [1] 97/14
grappled [1] 68/14
grateful [4] 2/6 46/21 49/14 160/7
gratitude [1] 189/16
Gravenor [2] 91/23 92/2
great [7] 4/22 38/8 39/24 41/13 44/17 48/13 120/24
greater [7] 29/23 29/24 38/18 64/7 65/7 67/12 94/3
greatly [4] 19/22 144/20 149/20 150/25
Grenfell [1] 4/10
Grenfell Tower [1] 4/10
grew [4] 20/3 24/23 57/8 59/8
grief [1] 19/19
grilling [1] 168/25
ground [1] 166/3
groundbreaking [1] 178/3
group [52] 9/15 9/19 10/11 17/11 18/8 19/6 22/17 22/18 23/20 23/24 23/25 24/21 25/18 27/16 27/17 29/12 29/24 31/25 32/2 32/2 32/5 32/7 34/3 40/10 48/13 48/18 62/2 73/3 90/2 91/18 100/10 105/15 108/17 108/22 111/4 114/5 121/8 131/11 135/21 136/3 147/15 149/6 151/20 157/1 158/16 165/16 168/20 171/18 171/24 178/1 182/4 185/16
grouping [1] 166/18
groups [26] 17/9 22/11 24/15 26/1 27/24 28/4 28/7 28/21 28/22 29/2 29/16 30/10 33/21 42/15 62/16 82/5 102/3 103/2 104/23 113/24 135/19 136/2 156/12 168/18 171/12 171/18
groupthink [1] 106/4
grow [4] 17/14 56/20 57/18 60/19
growth [2] 99/22 100/5
guarantee [1] 116/11
guess [4] 3/18 29/23 117/19 188/13
guidance [1] 130/2
guided [1] 82/8
guideline [1] 156/25

H

had [145] 11/21 14/22 16/12 16/25 17/14 19/18 25/21 25/22 27/6 27/8 31/17 32/22 32/22 34/15 36/22 38/19 39/4 40/2 40/3 40/21 47/21 47/24 48/1 50/1 50/12 53/4 54/22 55/9 55/18 56/20 57/10 57/18 59/15 59/21 60/4 60/17 60/18 60/19 60/19 60/21 60/24 61/1 62/14 62/24 64/12 65/13 66/16 68/16 73/15 73/25 73/25 75/3 75/13 78/13 78/23 79/2 79/17 80/15 80/19 80/20 81/1 81/3 83/5 85/3 86/21 87/19 89/5 91/12 92/6 92/13 100/18 100/23 101/25 103/18 104/11 104/15 104/23 105/4 105/12 107/12 108/14 108/17 108/25 114/24 114/25 116/25 119/11 119/20 121/6 121/12 121/18 122/5 123/16 124/4 124/6 124/7 124/23 125/5 126/19 126/23 127/6 128/2 128/18 129/21 136/19 136/24 138/23 139/7 140/16 141/18 142/4 142/4 142/4 142/15 144/15 144/18 144/19 146/16 146/17 146/18 147/13 147/13 148/11 150/16 156/20 157/9 158/20 158/24 159/5 159/11 159/11 159/12 163/1 164/9 164/14 167/5 167/22 169/23 174/6 176/23 180/9 181/19 186/7 186/22 186/25
hadn't [6] 77/14 86/24 102/8 115/2 122/17 147/25
hairdressers [1] 32/24
half [2] 4/13 149/16
Halpern [2] 27/13 138/1
halt [1] 133/24
hampered [2] 31/13 55/2
Hancock [6] 148/10 148/13 148/16 151/16 155/6 155/11
Hancock's [1] 154/19
hand [9] 10/18 14/15 93/21 94/2 97/13 97/20 136/7 145/6 151/7
handicapped [1] 183/23
handled [1] 120/18
happen [22] 15/15 21/10 21/25 55/18 60/1 92/17 92/18 92/19 97/11 97/12 104/21 107/14 107/15 118/11 126/6 126/11 128/8 142/10 142/14 145/9 145/10 171/9
happened [16] 7/22 15/17 19/21 45/10 47/8 48/10 63/4 85/3 96/11 125/19 129/3 130/11 136/18 140/6 166/22 169/15
happening [10] 24/24 32/19 55/18 122/14 141/3 145/11 166/6 166/20 178/7 182/1
happens [5] 83/19 83/20 90/17 117/21 165/4
happily [1] 157/3

H

happy [4] 41/21 88/5 156/13 171/4
hard [6] 19/17 55/9 55/20 61/25 177/8 188/14
harms [8] 111/5 111/7 111/8 111/11 111/21 112/7 112/25 173/6
harsh [1] 139/20
has [41] 1/13 6/7 10/14 13/24 15/16 15/18 31/4 37/11 44/3 49/16 49/17 50/18 59/24 59/24 62/1 74/21 97/19 98/9 98/19 105/19 117/6 117/6 117/11 127/2 129/15 138/22 140/16 144/8 145/18 147/16 151/19 153/11 159/21 159/22 159/23 172/25 175/22 184/11 185/4 185/12 186/17
hasn't [1] 96/11
Hassell [1] 70/10
hasten [1] 173/12
have [258]
haven't [3] 109/11 114/13 189/13
having [21] 13/18 53/21 73/20 74/15 81/18 100/7 100/8 102/11 108/25 109/22 118/22 128/1 129/16 140/20 141/1 148/7 148/18 155/7 156/24 164/18 174/24
he [52] 18/15 18/16 18/18 53/1 70/5 87/11 87/12 105/25 111/4 111/10 111/11 111/12 112/17 123/23 124/10 138/5 138/13 138/17 138/21 138/22 138/25 139/1 139/2 139/6 139/23 143/17 146/7 146/20 148/11 148/12 148/23 149/2 149/4 149/6 149/10 149/11 149/12 149/18 149/25 150/16 150/17 151/1 151/10 151/13 151/14 151/19 166/14 168/3 169/5 169/5 170/10 175/25
he'll [2] 13/12 169/4
he's [3] 105/24 138/5 145/18
head [3] 81/13 151/5 151/5
headaches [1] 91/16
headed [1] 138/9
headings [1] 99/22
health [63] 15/11 18/11 18/19 21/3 22/25 23/5 23/7 24/1 24/1 25/23 26/5 27/6 29/1 30/20 34/1 34/6 43/9 48/6 55/19 56/23 57/4 57/4 57/17 59/23 59/24 60/3 62/4 62/6 62/25 64/16 66/22 79/2 79/11 90/14 111/5 111/9 112/16 122/18 123/3 124/18 125/6 140/13 143/25 144/1 145/7 148/10 165/15 165/15 165/17 166/3 167/2 173/1 173/6 173/15 173/25 174/8 174/17 174/22 175/7 177/24 179/13 179/18 187/15
Health Secretary [2] 43/9 148/10
healthcare [2] 113/14 185/10
healthy [3] 172/8 174/20 175/1
hear [14] 1/22 20/8 21/9 25/13 26/13 32/1 42/16 72/6 72/25 73/2 131/13 134/8 146/21 162/22
heard [12] 13/10 21/16 27/17 72/2 85/15 91/9 122/5 123/13 157/19 166/11 175/24 176/22
hearing [6] 27/15 71/6 72/3 154/5 154/7 189/25
heart [5] 6/15 6/20 15/1 82/19 93/9
hearted [1] 175/17
heightened [1] 40/25
held [2] 88/10 133/18
help [22] 5/1 5/3 7/21 18/4 20/23 25/4 25/6 33/4 39/22 44/8 50/25 54/10 72/22 74/5 89/11 91/21 93/3 96/5 116/1 146/12 155/15 186/18
helped [3] 40/22 64/19 164/21
helpful [1] 93/7
helping [1] 118/1
helps [2] 21/8 156/24
her [2] 7/19 154/11
here [31] 2/22 5/2 17/2 19/20 24/15 25/23 42/10 47/8 53/5 62/11 62/13 79/23 101/10 101/14 105/7 111/1 127/17 136/12 140/18 143/5 143/15 145/13 149/9 156/1 158/18 168/10 168/12 169/5 173/21 177/21 185/23
hiding [1] 67/24
hierarchy [1] 96/8
high [3] 36/1 36/13 125/7
higher [1] 124/6
highest [1] 146/17
highlight [1] 167/16
highlighted [1] 45/2
highlighting [1] 96/9
highly [6] 15/13 31/7 105/8 107/15 124/8 162/4
him [9] 7/19 18/23 27/15 111/12 148/4 148/7 149/18 150/4 187/2
himself [2] 151/19 169/5
hindsight [3] 50/11 108/11 136/24
hinted [1] 57/22
his [12] 7/8 110/25 139/18 146/5 148/5 149/19 149/20 149/21 151/23 154/11 168/2 186/23
historically [1] 123/16
history [2] 1/13 140/6
hit [1] 183/18
hm [3] 20/7 80/2 89/9
HM Treasury [1] 20/7
hoc [2] 9/19 85/6
hold [1] 165/22
holding [1] 139/10
home [3] 130/3 143/22 145/4
homes [6] 129/17 143/9 143/9 143/22 144/23 145/4
homework [2] 168/5 168/22
hone [2] 20/13 34/2
honest [4] 8/16 33/12 39/20 65/15
hoof [1] 127/19
hoof' [1] 127/15
hope [8] 22/14 39/20 69/16 137/22 147/21 147/25 170/5 174/13
hoped [1] 186/7
hopefully [4] 26/2 39/10 49/8 120/14
hoping [2] 4/20 159/7
Horby [1] 24/6
horizon [1] 44/21
hospital [13] 132/8 132/11 132/13 143/20 144/1 147/3 147/6 173/3 184/2 184/17 185/6 185/11 186/3
hospitalisation [3] 28/11 132/6 144/9
hospitalisations [5] 126/1 130/25 132/16 133/2 179/16
hospitality [1] 173/8
hospitals [1] 28/20
host [2] 86/2 133/10
hours [7] 14/6 19/25 71/12 100/14 100/15 100/19 189/12
housing [1] 113/13
how [57] 10/5 10/14 10/23 12/9 14/17 26/1 26/6 30/17 32/22 34/22 35/11 40/5 40/15 49/9 49/10 49/12 52/8 54/13 56/8 60/20 61/25 64/25 68/11 69/10 72/22 81/11 81/12 81/12 95/24 96/15 96/15 106/20 106/22 107/6 108/3 108/4 113/18 120/18 120/21 123/3 136/14 140/11 151/13 151/17 152/12 157/13 157/15 159/15 159/16 159/23 166/11 168/21 170/1 174/17 174/20 184/15 187/22
however [3] 46/18 53/8 61/22
HPV [1] 162/11
huge [11] 6/9 15/8 16/17 17/4 17/8 19/18 20/17 43/16 68/23 120/9 162/17
human [2] 162/10 162/16
human papillomavirus [1] 162/10
hundreds [2] 69/4 126/10
Hygiene [2] 70/25 135/20

I

I actually [1] 55/7
I advised [1] 80/13
I agree [6] 52/24 53/3 53/7 55/13 66/17 124/11
I also [5] 41/23 80/22 167/1 175/21 189/1
I always [1] 134/12
I am [3] 49/25 84/12 115/5
I appreciate [1] 162/14
I as [1] 109/24
I ask [3] 74/17 87/8 168/1
I attended [1] 166/25
I became [3] 75/23 76/21 84/4
I believe [4] 163/3 163/4 170/18 184/16
I call [1] 1/4
I can [5] 36/17 77/1 86/8 118/6 181/18
I can't [8] 18/5 45/10 53/8 68/11 78/25 78/25 84/12 151/13
I challenged [2] 75/23 76/20
I compare [1] 13/25
I completely [3] 106/17 111/22 142/3
I contacted [1] 147/12
I correct [1] 23/10
I could [2] 20/2 42/10
I couldn't [1] 152/18
I did [2] 3/19 81/2
I didn't [9] 74/7 91/4 92/11 92/19 106/18 112/20 137/5 146/21 152/7
I do [7] 49/2 66/10 69/16 90/3 93/10 145/3 157/14
I don't [47] 13/20 21/20 27/4 29/11 30/16 33/13 34/17 61/12 62/10 62/11 62/11 65/13 68/4 68/4 73/6 82/14 89/23 91/1 92/15 92/17 92/19 93/5 93/5 96/18 99/11 101/10 108/14 121/22 124/19 126/5 127/4 127/24 133/5 134/22 134/23 137/11 142/7 159/24 167/5 169/2 169/22 170/1 178/8 179/24 180/9 187/9 187/16
I effectively [1] 73/18
I expect [1] 185/13
I explained [1] 15/5
I express [1] 189/18
I fear [1] 189/13
I felt [4] 74/8 88/2 151/6 169/21
I firmly [1] 150/20
I first [1] 124/15
I found [1] 107/16
I gather [1] 186/8
I gave [1] 80/14
I got [2] 130/12 168/25
I greatly [2] 19/22 150/25

I

I guess [2] 3/18 29/23
I had [12] 73/25 80/19 81/1 81/3 114/24 114/25 128/2 139/7 144/15 146/16 146/17 186/7
I have [7] 69/13 69/15 92/14 124/12 151/17 160/4 189/7
I haven't [1] 109/11
I hone [1] 34/2
I hope [7] 22/14 39/20 137/22 147/21 147/25 170/5 174/13
I imagine [2] 27/10 39/6
I invite [1] 1/20
I joined [1] 163/5
I just [9] 19/19 20/13 40/8 41/11 74/11 83/18 112/2 116/24 172/20
I knew [2] 147/12 152/8
I know [5] 10/4 48/25 115/9 165/15 178/9
I looked [2] 90/12 152/14
I may [7] 1/25 50/25 58/23 93/14 110/23 135/5 138/12
I mean [63] 3/17 8/12 8/25 12/5 12/5 13/24 13/25 14/12 14/19 17/3 18/20 19/17 24/25 29/17 31/3 33/25 39/17 41/24 41/25 48/25 51/23 57/1 58/21 60/23 62/15 64/19 67/11 74/6 80/13 82/21 86/23 95/4 116/8 116/25 121/11 121/23 124/11 127/4 127/21 130/1 132/23 132/23 132/25 134/22 137/3 141/23 145/20 151/19 157/8 164/17 165/3 165/6 165/14 165/24 168/23 171/10 176/8 179/12 180/1 185/9 187/18 188/8 189/1
I mentioned [2] 42/3 99/7
I might [3] 75/18 75/18 142/8
I needed [1] 91/19
I never [2] 127/25 179/25
I notice [1] 112/23
I noticed [2] 74/23 75/7
I only [1] 75/18
I pointed [2] 125/20 142/22
I raise [1] 115/17
I raised [1] 90/25
I realise [1] 128/13
I really [1] 92/7
I recall [4] 16/25 45/4 53/8 68/8
I remember [3] 53/10 140/19 152/23
I right [1] 24/6
I said [6] 67/11 76/21 100/3 133/9 134/22 155/20
I saw [1] 150/7
I say [6] 54/6 78/21 81/7 103/13 112/20 121/22
I see [2] 75/10 137/20
I shall [2] 58/6 160/13
I showed [1] 152/4
I speak [1] 189/14
I stand [1] 132/24
I still [1] 73/25
I suppose [3] 57/13 74/7 128/10
I suspect [1] 121/12
I take [6] 15/12 47/5 95/18 131/6 165/11 186/11
I tell [1] 135/12
I think [205]
I thought [1] 128/16
I took [3] 74/3 74/23 90/10
I try [1] 65/11
I understand [2] 25/21 40/17
I want [26] 17/8 49/15 65/24 67/1 81/21 93/8 93/14 95/11 110/17 115/20 123/11 127/8 130/18 133/4 133/14 134/14 137/21 146/5 147/21 149/8 152/2 163/17 167/9 170/4 178/24 186/5
I wanted [4] 58/13 102/21 118/1 157/18
I was [28] 1/18 3/17 3/23 41/19 61/5 72/15 73/9 74/1 74/2 86/10 107/8 108/5 112/14 119/4 121/4 122/14 127/25 135/24 137/9 145/16 145/22 147/14 151/17 151/21 152/15 159/7 176/17 187/18
I went [4] 25/4 92/3 134/23 168/24
I will [4] 99/20 135/16 146/9 174/15
I won't [1] 75/10
I wonder [1] 141/10
I worry [1] 39/21
I would [12] 11/7 31/3 31/25 34/4 52/6 53/15 63/9 81/14 100/21 106/19 121/7 166/17
I wouldn't [1] 157/12
I wrote [1] 135/4
I'd [14] 17/2 24/15 29/11 33/25 37/25 51/16 59/3 61/6 133/12 139/8 162/24 163/6 183/3 185/18
I'll [5] 90/2 99/18 110/12 138/11 154/15
I'm [75] 1/10 22/1 22/12 24/10 24/11 33/12 34/20 37/25 39/17 46/21 49/3 49/13 50/23 51/18 52/11 54/11 54/15 65/14 65/16 70/1 72/19 74/3 75/16 75/17 76/15 81/13 83/23 84/9 86/5 89/1 89/10 92/16 92/17 93/18 94/19 94/19 96/9 99/9 101/9 102/25 103/7 105/20 109/7 113/22 115/5 122/9 124/10 127/1 128/13 133/9 134/13 135/13 135/13 142/24 144/13 154/4 156/11 160/6 160/13 160/15 166/7 168/3 168/10 168/12 168/13 168/22 170/4 171/14 172/16 172/16 172/17 177/11 180/19 184/3 189/20
I'm afraid [2] 160/13 189/20
I'm not [1] 168/13
I've [9] 21/16 33/12 39/8 69/6 121/17 142/24 145/19 160/2 189/17
Ian [1] 31/22
Ian Diamond [1] 31/22
Icelandic [1] 10/19
idea [8] 72/22 81/9 107/21 116/10 123/1 124/25 151/17 174/16
ideally [1] 117/21
identified [2] 50/18 64/4
identifying [1] 168/8
ie [1] 139/15
if [147] 1/24 2/8 2/21 7/24 13/10 13/25 14/17 15/12 20/2 20/25 21/19 25/4 28/1 30/12 33/12 38/10 38/14 45/10 50/6 50/25 51/1 53/8 54/20 56/1 58/3 61/15 63/24 65/14 65/17 67/3 67/4 67/21 74/13 76/3 77/1 77/19 77/22 79/22 81/18 81/23 85/2 85/15 88/12 88/22 90/17 90/22 93/4 93/14 93/23 94/13 97/20 98/13 99/9 100/5 101/2 101/8 103/5 103/16 103/21 104/11 104/25 105/5 105/9 105/21 105/23 106/7 106/11 108/16 108/17 110/23 112/10 113/24 113/25 114/4 114/19 117/17 122/22 123/6 123/19 124/13 125/7 127/22 128/4 130/13 130/22 132/2 132/12 133/11 133/21 133/23 135/23 136/1 136/24 138/8 138/12 138/25 139/5 139/7 140/19 140/23 141/14 141/14 141/18 143/3 145/14 145/17 146/5 146/22 147/2 147/24 147/25 148/9 148/20 149/16 153/18 153/20 153/21 155/24 156/10 156/19 157/9 157/22 158/12 164/12 165/25 167/10 167/15 168/14 168/16 169/9 170/16 172/11 172/15 173/4 176/20 177/17 178/16 180/3 180/5 181/6 182/14 183/11 183/14 184/22 185/13 186/9 186/25
IFG [1] 59/10
ifs [1] 94/5
ignorance [1] 138/19
illustration [1] 53/16
imagine [2] 27/10 39/6
imbalance [1] 167/10
immediately [5] 99/13 118/24 121/7 139/16 139/22
immunologists [1] 82/23
impact [27] 8/5 27/24 28/3 29/2 33/21 34/15 39/2 67/2 67/8 112/15 113/12 119/2 124/7 125/6 129/12 129/19 136/20 147/17 149/4 170/14 173/1 173/25 173/25 176/21 176/25 177/1 181/20
impacts [9] 19/20 29/12 30/8 172/25 173/8 174/8 176/23 176/24 177/23
impartial [1] 8/13
Imperial [7] 71/15 71/22 135/19 164/11 167/11 167/20 167/23
Imperial College [6] 71/15 71/22 164/11 167/11 167/20 167/23
implementation [1] 42/15
implemented [1] 42/19
implications [1] 177/14
implicit [1] 47/20
important [30] 12/4 12/22 26/5 26/11 29/13 47/4 63/14 66/14 72/18 74/8 75/20 84/22 87/1 90/5 91/18 123/24 124/18 134/15 138/18 149/5 150/14 150/21 151/23 173/13 175/16 178/21 181/4 182/8 182/21 183/18
impossible [1] 122/2
impression [3] 67/15 106/4 179/4
improve [1] 69/10
improved [4] 55/3 64/9 65/10 120/3
improvement [1] 185/3
improvements [1] 50/19
improving [1] 7/12
inaccurate [1] 65/22
inadequate [1] 125/21
inception [1] 16/13
incidence [2] 99/22 100/6
incidents [2] 4/8 11/22
include [9] 36/11 103/8 105/6 119/24 147/5 153/1 153/3 153/24 166/15
included [10] 8/10 26/16 32/3 36/2 36/5 102/11 103/18 110/22 112/22 185/23
includes [1] 22/12
including [4] 17/23 32/19 67/22 177/23

I

incoherent [1] 157/5
inconsistency [1] 128/13
incorporate [1] 64/2
increase [1] 81/16
increased [5] 28/7 28/11 28/20 113/15 152/24
increasing [1] 144/3
increasingly [2] 131/4 132/19
incredibly [3] 19/17 29/13 182/2
indeed [5] 8/24 29/12 113/23 160/6 189/9
independence [3] 155/21 155/22 157/13
independent [17] 6/1 9/19 17/10 26/23 44/15 48/2 56/1 73/19 88/8 109/22 145/17 155/23 155/24 157/5 157/13 157/20 171/11
independently [1] 24/21
INDEX [1] 190/2
indicated [2] 28/20 177/19
indicates [1] 134/20
indicating [1] 70/16
indication [1] 116/7
individual [5] 62/16 102/8 130/4 130/14 155/7
individually [1] 41/20
individuals [5] 162/3 166/20 173/2 180/5 181/24
Industrial [1] 5/25
industry [1] 11/11
inequality [1] 170/14
inevitable [3] 134/5 134/18 138/24
inevitably [1] 120/24
infected [3] 28/12 132/3 144/6
infection [17] 28/8 77/5 82/6 82/12 82/19 83/2 118/22 123/15 131/24 132/1 143/2 147/6 147/10 152/21 152/22 170/24 183/16
infections [11] 74/22 74/22 74/25 75/2 75/15 75/25 147/14 152/24 153/4 153/4 162/17
infectious [4] 70/24 113/19 161/20 162/9
infirm [1] 124/8
influence [1] 87/20
influential [1] 148/23
influenza [29] 74/19 74/21 75/1 75/14 75/17 75/22 76/20 76/22 77/1 77/7 79/3 122/20 123/14 123/17 123/25 124/2 124/6 124/12 124/14 124/17 125/4 125/5 125/11 125/14 125/25 126/4 126/7 126/19 129/17
influenza-based [1] 125/11
inform [6] 33/4 33/10 66/24 82/8 119/1 176/7
informal [1] 145/1
informally [1] 68/2
information [10] 29/20 30/20 46/24 47/7 121/2 121/23 129/21 153/6 183/10 183/12
informed [2] 66/13 119/10
initial [6] 37/5 37/23 51/7 51/18 120/23 167/12
initially [6] 46/18 52/6 53/4 64/18 124/1 127/13
initiatives [2] 64/2 178/10
Innovation [1] 5/24
input [10] 6/13 12/14 27/10 88/10 91/24 109/25 123/5 133/3 149/20 177/19
INQ [1] 22/8
INQ000 [1] 143/13
INQ000056476 [2] 167/14 185/21
INQ000063070 [1] 49/22
INQ000102129 [1] 154/17
INQ000106129 [1] 135/11
INQ000129093 [1] 137/22
INQ000205272 [1] 172/12
INQ000213175 [1] 135/3
INQ000213298 [1] 146/23
INQ000233688 [2] 99/12 152/5
INQ000250231 [1] 105/22
INQ000260625 [1] 143/14
INQ000267746 [1] 147/25
INQ000303289 [1] 76/2
inquiries [1] 66/16
INQUIRY [16] 1/7 2/5 65/12 70/7 70/12 93/13 138/3 161/2 161/7 165/1 167/14 186/23 188/21 191/5 191/9 191/13
inside [4] 62/1 84/6 145/20 155/21
inside/outside [1] 155/21
insight [2] 22/17 109/9
insights [5] 25/18 27/8 27/12 75/14 76/12
instances [1] 119/17
institute [5] 49/20 51/17 161/20 161/25 162/1
institution [2] 71/3 73/16
institutions [4] 64/23 65/8 71/22 164/16
integrate [1] 188/11
integrated [1] 185/10
intelligence [1] 6/23
intended [1] 82/7
intense [1] 4/9
interact [2] 52/8 162/4
interacting [1] 121/6
interaction [2] 121/13 170/21
interactions [1] 154/3
interdisciplinary [1] 178/3
interested [2] 138/10 162/5
intergovernment [1] 31/18
internal [1] 92/6
internally [1] 16/4
international [3] 14/2 60/15 128/17
internationally [2] 142/16 151/2
interoperability [1] 186/25
interpret [1] 14/17
interpretation [2] 14/18 114/9
interrogate [1] 77/23
interrogation [1] 29/25
intervening [1] 127/3
intervention [3] 129/2 174/18 174/24
interventions [9] 26/4 55/13 89/13 112/8 114/3 130/9 130/14 173/1 175/6
interviewee [1] 53/23
interviewing [1] 39/20
into [57] 4/12 12/14 16/24 29/19 29/19 31/6 40/15 55/15 55/24 56/19 56/20 56/22 56/24 57/8 57/14 59/9 61/24 63/24 65/3 65/10 72/21 82/24 84/13 85/10 88/10 89/15 93/24 104/18 105/18 109/25 117/10 117/20 120/20 121/3 121/19 123/3 126/5 132/11 140/15 149/20 150/9 154/23 155/17 157/10 157/11 157/14 164/20 172/18 173/14 173/24 177/19 179/24 182/23 183/2 185/17 186/1 188/11
introduce [3] 138/12 144/11 154/11
introduced [2] 36/1 119/18
invest [1] 122/19
investigating [1] 30/17
investigation [3] 147/9 147/11 147/16
investing [1] 79/4
investment [2] 122/25 151/20
invitation [1] 42/14
invite [2] 1/20 11/13
invited [6] 20/4 46/6 58/17 58/19 58/23 92/2
involve [2] 47/18 55/21
involved [18] 4/4 5/3 18/15 18/18 30/6 47/6 74/3 80/17 81/3 92/7 106/12 122/12 123/8 158/3 165/17 166/24 168/18 186/16
involvement [3] 73/8 90/2 92/11
involves [1] 152/3
involving [2] 5/11 43/8
iPhone [1] 133/6
iPhone X [1] 133/6
Ireland [13] 46/10 46/16 46/19 47/23 48/5 48/6 92/12 92/15 92/20 93/4 93/6 166/13 184/14
irony [2] 148/15 156/1
is [449]
isn't [11] 1/11 15/12 35/25 42/6 54/16 75/14 75/20 89/5 114/7 175/16 187/21
isolation [2] 130/4 130/15
issue [20] 6/24 30/13 46/3 53/16 60/10 61/8 91/14 100/7 104/24 107/4 114/15 126/9 126/9 129/7 130/19 130/21 139/7 147/19 155/15 184/3
issued [1] 14/22
issues [29] 20/22 29/15 29/18 39/15 44/25 49/18 51/13 56/2 56/5 56/11 56/16 59/12 65/5 65/25 68/14 85/6 85/8 88/3 89/8 100/1 100/22 106/1 106/22 115/17 162/20 170/13 170/13 177/4 186/10
it [531]
it's [187] 1/11 2/10 2/14 5/23 6/1 6/11 6/18 7/9 8/17 10/2 10/2 10/3 10/6 10/12 11/18 12/5 12/8 14/12 14/16 14/19 16/1 16/15 16/20 17/2 21/6 21/8 21/15 21/17 23/21 23/25 30/3 31/16 32/25 34/3 34/9 34/25 35/20 35/24 38/4 38/8 42/6 47/10 47/20 48/13 49/7 50/3 51/21 56/17 58/23 61/17 61/20 65/19 66/18 66/21 66/23 69/19 73/20 75/15 75/20 76/2 78/16 78/20 79/14 80/9 80/13 81/24 84/2 87/9 88/8 89/4 90/22 91/5 95/9 97/1 97/2 97/9 97/10 97/18 98/14 98/22 99/13 99/13 99/14 99/14 101/9 101/13 102/18 102/19 104/1 105/8 105/24 107/17 108/17 109/9 110/24 112/22 113/19 114/14 114/18 114/18 115/7 115/10 115/11 115/14 115/20 115/21 116/18 117/6 118/4 118/5 118/18 119/12 119/13 121/13 122/14 123/21 124/23 127/8 131/2 132/12 133/5 133/8 134/25 135/2 135/3 135/17 136/13 136/14 137/8 137/25

I

it's... [57] 138/4 138/6 138/6 138/8 138/10 140/8 140/18 141/10 143/17 145/10 145/10 146/6 146/23 148/2 149/23 151/7 151/18 152/8 152/11 154/17 154/20 157/6 162/1 162/1 163/20 165/3 166/23 167/14 167/15 169/22 170/18 171/22 172/12 172/17 175/11 175/13 175/16 175/21 176/8 176/14 176/14 177/8 177/10 178/13 178/21 182/9 182/25 185/19 185/21 187/7 188/8 188/14 188/15 188/18 188/22 189/1 189/2
Italy [1] 129/3
item [3] 13/9 21/19 21/23
items [1] 152/7
its [22] 5/6 5/6 11/9 11/17 15/22 16/13 44/14 63/6 85/16 89/18 103/2 120/3 124/25 125/10 128/25 154/7 168/5 169/7 170/11 184/11 185/11 186/18
itself [7] 11/17 20/25 21/5 32/3 89/5 123/14 172/11

J

James [1] 161/5
January [17] 16/5 16/7 16/11 23/8 25/1 26/19 32/14 33/5 33/7 73/8 79/25 79/25 80/4 118/7 118/14 118/14 124/5
January 2020 [4] 16/11 23/8 26/19 73/8
January 2021 [5] 32/14 33/5 33/7 118/7 118/14
JBC [1] 159/7
JCVI [1] 175/21
job [5] 6/11 84/17 111/20 141/25 184/23
jobs [1] 24/17
John [3] 92/1 163/3 168/15
John Edmunds [3] 92/1 163/3 168/15
Johnson [1] 154/21
joined [6] 3/10 4/18 17/7 74/5 162/25 163/5
joining [1] 3/25
Joint [1] 159/6
Jonathan [1] 75/24
Jonathan Van-Tam [1] 75/24
judgement [1] 148/8
judgements [1] 116/19
judicious [1] 173/11
Julia [1] 89/21
July [2] 43/23 161/12
June [8] 5/19 29/2 29/8 31/20 53/22 72/13 154/20 159/7
June 2020 [4] 29/2 29/8 31/20 154/20
June 2023 [1] 5/19
junior [1] 3/24
JUNIPER [5] 163/19 164/12 165/9 166/8 166/15
just [124] 2/1 3/25 5/23 7/8 9/5 10/16 11/13 12/12 13/18 17/1 17/2 17/14 18/4 19/19 20/13 20/18 22/9 22/22 23/12 24/2 30/7 30/23 31/15 36/8 39/8 40/8 41/11 46/21 50/25 53/5 56/21 57/2 58/13 59/17 69/7 69/17 70/1 72/21 72/22 72/22 73/21 74/11 74/25 75/10 76/1 76/11 78/23 79/10 81/9 81/21 82/21 83/3 83/18 84/20 88/1 89/2 89/6 96/5 98/13 99/6 99/7 99/21 101/2 102/22 102/25 103/5 104/8 111/22 112/2 113/3 113/20 115/11 116/24 119/13 120/10 121/21 124/25 125/7 126/11 127/17 127/18 130/24 131/2 132/17 133/5 134/8 135/7 137/2 138/11 145/15 147/22 148/4 148/13 154/2 156/15 162/20 164/24 165/3 165/5 165/18 166/5 166/5 166/21 166/22 168/21 172/3 172/20 173/19 174/17 176/3 177/15 177/19 179/13 179/15 179/19 181/16 182/9 184/15 185/14 185/18 186/3 187/4 187/11 189/3
justify [1] 132/11

K

Keating [4] 1/3 58/1 58/11 58/25
Keeling [7] 91/25 160/24 161/1 161/5 163/18 189/10 191/11
keen [2] 44/8 149/18
keep [10] 1/20 1/21 64/20 65/4 65/5 121/21 149/18 150/4 151/24 178/21
kept [1] 137/11
key [15] 18/9 42/7 43/13 45/3 48/21 49/12 49/12 54/10 56/11 82/4 82/17 130/21 136/4 146/11 156/6
Khunti [1] 27/19
kicked [1] 64/25
kilter [1] 102/9
kind [20] 6/1 12/6 23/2 57/1 73/16 74/5 78/17 83/17 83/18 91/24 107/12 125/6 127/6 130/14 132/8 132/14 141/25 151/21 151/22 155/21
kinds [2] 24/3 29/22
Kingdom [3] 91/3 116/20 140/25
knew [12] 25/1 40/15 60/16 117/1 124/5 142/13 144/24 147/12 152/8 152/19 159/12 181/2
know [149] 5/11 8/25 8/25 9/2 9/3 9/4 9/6 9/6 9/10 10/4 13/2 13/3 13/17 16/3 19/21 21/9 21/19 21/20 21/20 21/21 24/10 30/14 30/16 31/4 31/5 40/11 41/22 41/24 48/7 48/25 49/2 53/4 54/7 55/12 59/22 61/12 62/20 75/20 83/6 83/25 84/2 84/3 84/14 85/7 88/20 91/1 91/17 93/5 97/14 97/18 97/19 97/22 100/18 104/3 105/4 105/9 105/18 106/23 107/3 107/4 107/17 108/3 113/25 114/8 114/19 115/1 115/9 117/17 118/8 118/9 118/23 120/10 121/5 121/7 122/13 122/15 122/24 124/22 126/10 127/2 127/4 128/3 128/18 129/13 129/20 130/6 130/12 130/20 131/23 133/2 136/21 140/10 140/17 140/20 141/14 141/16 142/18 143/6 145/2 145/11 145/16 146/12 146/20 149/25 150/8 150/23 151/1 151/7 151/11 151/15 151/23 155/14 156/2 156/6 156/11 156/20 157/6 159/10 159/11 159/21 159/24 160/11 162/14 164/10 165/15 169/1 169/15 169/23 170/1 175/13 176/12 176/14 177/7 177/10 177/13 177/14 178/8 178/9 179/14 180/2 180/13 181/21 181/24 183/13 183/17 183/20 183/21 185/15 188/9
knowledge [7] 27/2 33/25 45/2 78/17 138/20 153/11 153/13
known [7] 45/12 133/12 142/5 142/7 142/9 152/22 153/16
Korea [1] 139/21

L

laboratory [1] 28/19
laboratory-confirmed [1] 28/19
labouring [1] 19/14
lack [14] 51/7 56/18 60/4 61/2 61/5 62/8 111/10 117/12 117/12 127/21 128/6 128/7 128/10 166/1
lacked [1] 115/24
Lady [11] 1/4 1/4 58/12 59/1 69/14 70/1 70/4 160/4 160/17 160/23 189/7
Lancaster [1] 43/10
landscape [1] 123/2
language [3] 88/1 97/9 134/13
laptop [1] 186/20
large [14] 4/6 6/9 39/19 45/5 122/19 126/1 126/9 151/20 162/1 162/8 164/19 171/24 187/10 188/10
largely [1] 7/19
larger [4] 81/12 86/15 168/20 175/13
last [22] 2/15 4/13 30/23 31/15 51/2 51/3 52/23 53/17 70/13 72/10 120/16 127/10 141/2 157/18 160/23 170/18 172/23 176/22 182/19 185/18 186/12 187/5
lasted [1] 116/12
lastly [1] 101/2
late [9] 56/9 57/14 79/24 91/11 99/13 119/18 125/19 152/11 171/24
later [15] 27/15 29/19 54/8 80/8 131/16 135/1 135/2 135/15 147/1 158/25 164/7 168/18 182/18 183/16 184/24
latest [3] 154/5 154/6 160/13
latter [1] 19/6
launched [1] 64/2
law [1] 188/17
lay [2] 136/23 174/13
laying [1] 168/12
lays [3] 10/5 29/14 30/14
lead [3] 38/18 38/22 53/11
leading [3] 71/23 89/23 151/2
leads [1] 176/17
leaned [1] 62/22
learn [2] 48/16 59/22
learned [3] 39/11 59/6 138/7
learning [3] 65/2 65/6 69/7
learnt [3] 5/8 178/20 185/4
least [11] 87/14 88/16 93/14 115/23 120/17 131/15 141/13 147/19 153/9 167/10 170/8
leave [2] 76/23 147/6
Lechler [1] 149/2
led [8] 8/6 16/21 27/12 29/24 66/12 179/4 179/6 182/15
left [5] 24/20 41/5 41/7 73/12 159/12
length [1] 167/1
lengthy [1] 160/3
lent [1] 67/12
less [7] 96/8 98/19 118/10 118/12 143/21 144/21 175/12
lesson [3] 30/19 59/22 185/3
lessons [4] 5/8 39/10 59/6 138/7
let [10] 79/21 89/2 91/7 102/22 105/21 110/2 110/23 139/25 168/1 172/16
let's [29] 5/18 9/11 16/2 22/5 24/13 25/11 33/16 54/19 57/8 59/9 74/10 74/13 76/23 99/8 101/8 113/3 114/1 123/19 125/7

L

let's... [10] 125/17 129/5 131/2 133/13 134/25 143/15 167/14 170/16 172/11 185/5
letting [1] 124/25
level [7] 9/3 9/9 36/11 83/1 125/8 176/11 176/12
levels [2] 13/16 15/19
liaise [1] 11/2
life [12] 4/20 157/11 161/16 164/25 172/8 174/9 174/16 174/20 175/1 175/12 175/14 185/2
lifted [1] 139/21
light [3] 19/23 30/1 107/17
like [49] 7/3 17/2 20/19 31/25 32/23 38/4 38/8 40/2 44/7 53/15 55/12 55/18 59/4 63/9 66/17 66/20 81/18 85/2 85/16 87/4 88/22 94/13 103/6 103/16 103/20 105/12 113/10 121/8 123/9 123/25 124/1 124/2 138/16 138/24 155/8 155/16 155/25 157/21 164/13 167/10 176/20 179/20 180/5 180/9 180/24 182/14 185/18 186/25 188/14
likelihood [1] 107/13
likely [10] 95/24 97/3 105/8 105/8 107/14 107/14 107/15 129/1 136/20 152/20
limit [3] 133/22 162/14 176/13
limited [2] 31/7 31/9
limits [1] 171/2
line [4] 41/7 64/13 66/5 66/8
lines [9] 103/1 112/12 113/11 170/18 173/17 173/18 177/21 179/1 186/5
linked [1] 92/25
list [7] 11/4 11/5 22/14 25/16 169/25 173/7 177/1
listed [1] 89/10
listening [2] 86/4 86/7
literature [1] 172/24
little [16] 4/20 5/14 9/5 11/14 34/2 46/2 46/5 54/7 73/12 89/7 95/21 124/7 144/25 153/5 177/20 181/6
live [3] 12/7 65/4 66/18
lived [1] 95/9
lives [2] 114/3 179/16
livestock [1] 162/17
living [1] 150/24
local [4] 165/14 165/15 165/17 167/4
lockdown [20] 21/21 33/5 33/10 33/11 37/14 51/9 51/10 55/17 86/11 122/23 133/17 140/21 141/5 141/22 143/2 144/8 148/6 154/23 173/7 173/11
lockdowns [5] 127/6 129/7 139/20 142/19 177/12
locking [1] 145/6
logic [1] 175/5
London [15] 70/25 71/3 71/9 71/10 71/10 71/14 71/15 71/19 73/17 135/20 164/10 164/11 165/19 167/11 167/24
London School [7] 71/10 71/14 71/19 73/17 164/10 167/11 167/24
long [28] 1/13 16/14 19/8 19/25 19/25 28/12 33/20 33/23 33/24 34/5 34/11 34/15 53/12 68/11 102/10 118/3 140/11 143/6 152/9 152/12 153/8 153/12 153/17 153/24 167/1 177/2 177/14 189/12
Long Covid [12] 28/12 33/20 33/23 33/24 34/5 34/15 152/9 152/12 153/8 153/12 153/17 153/24
long-term [2] 118/3 143/6
longer [8] 44/14 44/18 53/6 53/9 93/25 141/16 163/2 165/5
longer-term [1] 53/6
longest [3] 16/12 34/9 44/21
look [74] 28/1 29/21 30/8 33/14 44/10 44/14 45/6 45/6 52/24 53/5 53/12 56/8 59/9 74/13 76/3 79/22 81/24 84/24 85/13 86/18 87/4 88/14 95/13 98/11 98/15 98/16 98/19 99/8 99/9 99/19 99/22 100/5 101/2 101/8 102/22 105/21 105/23 110/23 112/10 113/3 123/9 123/19 124/13 127/7 127/8 130/22 131/2 133/4 133/13 133/14 133/23 134/25 143/15 146/6 147/2 149/13 149/16 154/15 157/22 157/23 170/16 172/11 172/20 174/20 176/6 176/11 177/17 178/24 179/14 181/7 182/9 182/20 185/21 188/14
looked [9] 53/12 54/22 77/4 90/12 99/25 144/14 152/14 175/15 185/18
looking [30] 44/19 63/22 75/11 82/25 83/1 93/18 98/6 98/10 98/19 98/20 105/3 124/3 128/23 129/4 129/11 132/17 132/18 138/5 143/18 143/23 144/13 147/17 148/4 152/6 155/16 156/16 159/15 171/12 184/1 189/2
looks [5] 29/15 95/12 98/13 110/3 133/18
lose [1] 149/19
loss [4] 159/13 174/9 175/12 175/14
losses [1] 172/6
lot [36] 15/15 17/23 18/4 27/4 30/7 32/25 33/1 37/11 38/20 39/18 40/24 52/18 55/19 56/22 63/4 64/16 73/3 77/20 80/15 80/15 83/17 88/4 88/21 89/20 90/9 108/2 127/3 157/12 159/10 159/12 166/23 167/2 169/21 178/13 178/20 185/23
lots [5] 97/19 176/11 183/20 187/10 187/11
low [3] 36/1 36/13 104/12
lowest [3] 103/24 104/1 104/2
LSHTM [2] 71/8 167/20
LTCFs [1] 143/6
lunch [2] 110/19 152/5

M

M's [1] 150/7
mad [1] 11/22
mad cow [1] 11/22
made [34] 5/6 6/14 12/7 12/13 23/15 24/21 25/6 38/6 41/6 44/3 56/6 62/5 65/14 68/15 80/6 105/4 113/21 119/20 120/7 126/17 126/19 142/4 148/18 149/5 150/2 150/16 157/11 161/11 169/4 170/10 170/22 179/20 185/2 188/5
main [10] 3/19 44/5 71/3 78/13 80/20 85/10 85/12 99/17 99/18 100/9
mainly [2] 21/18 150/7
major [9] 7/25 8/10 10/24 11/3 113/16 113/19 118/22 134/20 139/14
majority [6] 4/22 69/17 69/20 105/10 106/3 158/8
make [40] 5/14 8/19 12/1 12/9 25/2 33/3 33/16 39/4 45/11 47/7 50/13 50/13 51/12 59/23 77/3 78/19 83/17 90/15 91/19 97/23 110/20 114/16 116/22 117/14 117/19 117/24 119/23 120/13 132/25 133/6 144/4 150/22 154/24 157/24 163/2 170/19 171/9 177/20 184/23 187/22
make-up [1] 110/20
makers [11] 12/9 39/4 44/25 45/3 49/12 50/11 87/21 116/14 134/12 150/10 150/12
makes [4] 10/6 111/2 115/14 169/8
making [22] 9/21 12/14 40/16 42/18 43/13 47/13 50/17 51/4 53/22 66/9 107/2 107/5 119/14 120/4 128/7 144/7 151/4 155/8 155/12 158/23 175/25 182/21
manage [1] 52/3
managed [2] 39/5 121/19
Manchester [1] 165/16
many [22] 17/6 27/10 55/14 64/19 64/22 67/22 81/3 81/11 81/12 85/5 102/3 106/1 111/23 115/17 124/4 134/23 151/13 151/14 159/21 174/20 181/14 186/7
map [1] 106/25
March [26] 23/15 37/4 37/4 37/5 53/8 54/8 55/24 57/14 61/10 65/1 69/8 73/9 83/8 84/23 85/23 86/11 89/24 127/16 128/3 131/17 136/3 136/18 136/19 139/13 140/5 141/6
March 2020 [5] 65/1 69/8 84/23 89/24 140/5
March 2022 [1] 73/9
Mark [2] 53/10 106/17
Mark Sedwill [1] 53/10
Mark Woolhouse [1] 106/17
marking [3] 168/5 168/5 168/22
marriage [1] 181/1
mass [1] 138/21
massive [1] 17/12
match [1] 182/2
material [4] 28/25 35/21 85/12 149/4
materials [1] 108/10
mathematical [3] 94/3 94/17 162/19
mathematician [1] 94/19
mathematics [2] 95/5 161/15
Matt [5] 91/25 148/10 154/19 155/6 155/11
Matt Hancock [3] 148/10 155/6 155/11
Matt Hancock's [1] 154/19
Matt Keeling [1] 91/25
matter [11] 32/25 58/13 88/1 95/25 140/4 150/11 150/13 152/2 165/1 178/12 179/16
matters [9] 47/11 66/1 72/23 87/2 99/11 101/11 147/22 160/4 163/17
Matthew [4] 160/24 161/1 161/5 191/11
maxing [1] 187/18
may [56] 1/4 1/25 14/19 31/20 37/8 39/21 42/21 45/8 48/18 50/25 52/16 52/17 58/23 65/23 66/13 71/12 76/15 76/22 79/22 85/9 91/9

M

may... [35] 93/14 93/15 98/12 99/9 101/8 102/7 107/22 107/24 107/24 109/18 110/23 123/19 125/7 131/13 133/19 134/8 135/5 135/7 135/12 138/12 148/2 153/15 154/8 154/8 154/9 160/12 166/11 170/16 172/12 173/11 184/3 188/19 188/22 189/14 189/17
May 2020 [1] 52/16
maybe [9] 29/25 30/4 30/24 41/19 41/23 57/5 62/22 114/7 132/18
McLean [7] 6/18 23/11 83/9 84/17 121/11 121/19 149/14
me [34] 22/15 29/17 52/23 53/12 73/18 75/24 79/21 80/25 89/2 90/9 90/12 91/7 91/9 92/2 102/22 105/21 108/6 110/2 110/23 120/5 128/3 135/7 141/23 145/4 145/18 152/14 157/9 157/10 157/11 157/17 168/1 172/16 176/17 188/6
mean [87] 3/17 4/15 8/11 8/12 8/21 8/25 12/5 12/5 12/24 13/24 13/25 14/12 14/19 17/3 18/20 19/17 20/15 24/25 29/17 31/3 32/20 33/25 39/17 41/24 41/25 48/25 51/23 57/1 58/21 60/23 62/15 64/19 67/11 73/25 74/6 78/11 80/13 82/21 86/23 94/6 94/10 95/4 100/13 103/7 106/24 116/8 116/25 121/11 121/23 124/11 126/2 127/4 127/19 127/21 130/1 131/6 132/23 132/23 132/25 134/17 134/22 137/3 141/23 145/15 145/20 150/5 151/19 157/8 162/1 164/17 165/3 165/6 165/11 165/14 165/24 168/23 171/10 174/13 176/8 178/20 179/12 180/1 181/18 185/9 187/18 188/8 189/1
meaning [1] 75/13
means [4] 23/19 94/8 124/10 165/19
meant [12] 7/1 18/15 55/9 56/20 57/9 59/9 59/19 62/23 81/17 81/19 90/14 145/5
measles [1] 162/10
measure [2] 177/16 179/14
measures [8] 112/15 119/17 133/22 133/24 144/11 170/25 172/1 173/11
mechanism [4] 10/16 17/20 34/4 48/17
mechanisms [4] 8/2 38/20 46/24 184/21
mechanistic [1] 94/24
media [4] 38/23 154/3 155/12 155/14
medical [13] 11/3 18/8 18/14 35/16 40/12 42/4 43/19 44/5 44/11 47/15 62/2 74/4 92/14
medicine [2] 18/11 71/1
medicines [1] 113/10
medics [1] 82/22
medium [7] 36/1 36/13 95/22 97/25 99/23 101/5 117/17
medium-term [4] 97/25 99/23 101/5 117/17
Medley [19] 23/13 70/5 70/6 70/10 70/11 110/17 129/4 139/11 139/16 163/15 166/11 170/6 170/25 175/24 178/15 180/14 182/13 188/2 191/7
Medley's [1] 170/9
meet [12] 33/1 41/17 60/8 73/6 78/1 78/11 100/21 101/25 101/25 121/15 159/5 159/6
meeting [42] 14/13 16/7 26/19 37/8 80/4 80/7 81/2 81/8 81/18 81/20 85/2 85/10 85/12 86/7 86/19 88/8 88/9 89/24 95/18 99/9 99/10 99/13 99/17 99/18 100/9 100/13 100/14 100/14 100/19 100/23 102/6 109/23 132/9 133/17 134/24 135/1 135/2 135/14 136/18 137/13 137/14 152/10
meetings [48] 10/21 13/4 13/8 13/15 16/3 18/22 26/21 42/7 42/12 42/14 43/3 43/3 43/4 43/7 43/8 43/13 47/3 64/20 73/1 73/5 73/11 77/9 85/1 85/2 85/4 85/6 85/7 85/20 85/22 86/12 86/15 88/25 92/3 92/8 95/15 99/15 100/2 108/21 111/12 118/16 120/11 133/7 133/15 134/23 151/13 155/17 169/16 169/17
meets [2] 23/24 48/12
member [12] 3/24 22/22 32/1 73/2 81/17 84/12 91/22 122/8 149/11 150/18 163/1 163/12
members [40] 7/10 19/1 19/2 19/15 40/9 40/10 44/14 53/19 56/10 67/2 67/3 67/9 67/22 68/2 73/10 80/16 80/17 81/6 81/11 84/10 85/7 85/24 85/25 86/1 86/1 86/21 88/3 91/25 100/18 109/19 120/9 152/16 154/4 155/8 155/12 163/2 163/4 163/5 168/23 179/7
members' [1] 129/14
membership [7] 10/14 10/14 80/10 80/16 90/6 162/3 170/11
memory [1] 50/1
mental [3] 111/9 112/15 177/24
mention [16] 12/17 20/3 20/11 26/8 28/2 28/15 32/14 37/7 43/17 45/19 80/7 86/10 109/11 113/11 128/22 157/18
mentioned [21] 8/23 15/1 19/1 22/10 28/16 30/24 37/2 42/3 59/8 60/2 67/19 69/7 69/17 74/6 79/10 83/4 90/1 99/7 101/7 121/18 131/1
mentions [1] 109/10
message [2] 91/1 156/8
messages [2] 154/18 154/19
met [11] 15/10 15/14 16/10 18/2 49/1 49/8 59/15 77/14 77/15 89/6 100/10
Met Office [2] 15/14 18/2
methodology [1] 177/22
metric [1] 175/2
microbiology [1] 3/1
mid [4] 17/23 54/8 73/9 131/17
mid-career [1] 17/23
mid-February [1] 73/9
mid-March [2] 54/8 131/17
middle [2] 4/19 63/25
might [76] 4/15 6/22 9/4 10/25 11/6 14/10 14/16 14/24 20/24 21/18 21/22 22/7 25/6 26/2 29/21 36/7 40/4 40/5 42/1 46/9 47/13 47/16 57/2 57/2 57/3 60/1 62/24 63/2 63/8 65/12 74/17 75/8 75/18 75/18 76/6 76/17 77/24 80/22 84/14 86/20 88/1 94/20 97/5 97/11 97/12 106/3 108/12 110/21 114/20 115/6 116/12 116/13 117/13 117/18 117/18 118/19 120/1 120/18 126/7 128/8 128/20 132/13 133/11 139/3 142/8 149/21 156/10 157/5 159/16 165/24 166/15 169/11 180/13 185/7 187/1 187/3
MIGs [2] 42/15 52/13
Mike [2] 91/23 92/2
Mike Gravenor [2] 91/23 92/2
mind [5] 38/21 61/1 128/5 130/10 166/15
mine [1] 151/8
minefield [1] 156/15
minimise [2] 173/1 175/11
minimised [1] 108/15
Minister [3] 7/10 43/3 43/8
ministerial [2] 42/15 43/4
ministers [12] 12/13 13/22 35/11 35/17 51/5 53/23 65/21 66/18 66/19 67/10 106/6 107/23
Ministry [1] 83/12
minority [4] 14/10 69/18 106/4 106/7
minsters' [1] 54/2
minute [1] 184/4
minutes [43] 12/19 12/22 13/7 13/14 13/19 13/20 14/18 14/21 35/12 35/22 35/24 36/2 36/9 36/18 37/8 37/10 37/15 37/18 38/10 38/15 45/23 46/3 46/9 46/10 46/25 49/4 58/20 67/14 99/8 112/6 133/5 133/9 133/14 134/9 136/10 137/5 137/17 141/2 142/17 155/4 156/18 169/23 179/23
miscommunication [1] 182/11
missing [1] 181/17
mission [1] 6/24
missions [2] 7/25 8/10
misstep [2] 138/9 138/14
mistake [1] 76/11
misunderstanding [3] 76/7 76/9 181/10
mitigate [2] 124/24 125/18
mix [3] 11/10 15/13 28/13
mixture [2] 56/24 94/16
Mm [4] 80/2 89/9 99/17 109/13
Mm-hm [2] 80/2 89/9
mobilised [2] 11/18 16/4
MoD [1] 6/9
model [18] 94/1 94/3 94/17 94/18 95/1 97/2 113/23 117/14 117/15 117/20 153/18 153/21 153/23 153/24 181/12 181/25 184/21 184/21
modeller [1] 176/5
modellers [15] 62/3 115/1 119/13 120/25 121/24 139/9 139/13 151/2 165/25 176/1 180/6 181/10 181/13 183/21 188/18
modelling [62] 22/17 23/1 23/6 24/2 32/2 32/7 70/25 75/4 78/15 82/3 82/17 82/20 82/24 84/7 91/10 91/20 91/24 92/5 92/21 92/25 93/10 93/21 98/23 111/25 112/18 113/8 113/16 113/19 117/11 119/1 119/24 119/25 124/13 124/19 135/19 136/2 139/25 142/10 149/18 150/21 153/5 153/8

M

modelling... [20] 153/12 158/4 158/8 159/19 162/19 164/3 166/12 167/18 168/14 169/14 170/12 170/22 172/19 172/24 176/7 176/20 177/4 186/17 187/17 188/24
models [24] 82/7 93/11 93/22 94/5 94/11 95/4 95/5 111/7 113/7 114/9 114/11 114/13 114/17 117/16 140/7 141/24 153/2 153/19 158/5 178/6 181/21 182/23 183/2 185/25
modes [1] 32/9
module [5] 27/15 29/14 31/5 55/11 55/14
Module 1 [3] 31/5 55/11 55/14
Module 2 [1] 29/14
moment [21] 2/24 21/25 46/2 49/3 54/16 57/8 58/1 60/2 63/24 77/8 78/25 90/3 106/21 113/21 135/8 139/7 155/3 171/15 178/9 180/19 189/2
Monarch [1] 4/7
Monday [2] 73/21 100/18
monetary [1] 177/9
money [1] 122/19
monkeypox [2] 162/16 186/9
month [1] 17/14
months [12] 4/23 14/4 14/5 20/1 37/14 51/7 51/23 52/7 118/21 164/24 183/14 184/12
morale [1] 151/22
more [102] 3/23 4/20 4/21 5/15 6/3 8/15 11/6 11/14 13/12 24/25 25/1 25/2 25/2 32/22 33/1 33/3 33/4 33/14 33/14 36/9 38/7 38/9 39/14 40/5 48/11 54/9 56/17 59/3 61/23 62/19 62/20 62/20 62/22 62/24 63/1 63/8 64/17 64/19 65/8 65/14 72/4 73/22 75/2 77/4 78/19 78/20 83/3 83/5 84/2 86/3 89/3 90/4 94/17 94/17 94/23 95/6 95/20 98/19 98/22 105/14 109/4 109/18 110/19 113/3 117/6 117/11 118/16 120/5 120/13 123/25 124/1 125/13 129/17 129/18 130/15 132/7 133/2 133/3 134/14 142/24 145/1 145/2 146/21 154/2 159/23 162/12 164/25 165/3 165/7 166/19 168/18 169/19 171/7 175/10 178/17 178/21 179/21 182/3 182/15 183/19 183/22 184/23
morning [4] 58/4 63/13 82/16 100/9
mornings [1] 43/5
mortality [1] 28/21
most [14] 15/6 15/14 17/18 17/19 18/21 51/7 77/20 88/18 117/24 129/25 138/14 146/16 146/17 148/23
mostly [3] 15/21 57/13 158/2
move [17] 9/11 20/2 22/5 34/20 54/15 54/19 65/16 81/10 93/8 95/11 110/2 115/20 130/18 137/21 142/24 170/4 178/24
moved [4] 4/12 36/9 89/14 94/23
moves [1] 185/15
moving [10] 14/16 32/22 49/11 53/4 71/8 71/14 71/19 83/3 84/24 181/24
Mpox [5] 162/11 186/8 186/12 186/17 186/18
Mr [12] 1/3 58/1 58/11 58/25 70/2 110/3 110/16 148/13 148/16 151/16 160/11 160/22
Mr Hancock [3] 148/13 148/16 151/16
Mr Keating [4] 1/3 58/1 58/11 58/25
Mr O'Connor [5] 70/2 110/3 110/16 160/11 160/22
much [76] 6/10 12/5 13/23 14/12 19/14 22/9 30/17 44/13 51/16 52/18 52/25 53/1 54/9 58/24 63/5 63/8 69/16 69/23 72/4 72/23 80/18 81/12 81/21 90/3 90/22 92/6 92/7 92/11 94/3 95/6 101/12 103/9 104/10 109/4 109/11 114/6 116/1 117/11 118/16 120/3 120/4 120/5 120/13 120/19 121/8 122/13 122/21 123/17 129/13 142/6 144/10 149/15 155/2 157/8 158/13 158/23 159/23 160/2 160/6 164/14 168/4 172/24 174/17 177/6 178/17 178/21 180/3 180/9 180/12 181/21 182/3 183/18 183/19 185/2 189/9 189/19
multiple [3] 43/12 104/23 176/9
must [3] 73/3 134/2 134/16
my [55] 1/4 1/4 3/19 4/14 4/23 7/21 11/15 15/17 33/25 38/5 58/12 58/22 59/1 61/9 69/14 70/1 70/4 73/8 73/16 76/19 80/13 80/18 80/20 81/13 83/18 84/9 91/5 99/2 106/4 106/18 107/18 108/2 108/22 109/7 115/17 122/13 124/3 127/11 128/6 130/4 137/7 141/24 143/24 144/18 151/4 153/13 157/9 157/11 160/4 160/17 160/23 174/15 179/3 189/7 189/16
my Lady [11] 1/4 1/4 58/12 59/1 69/14 70/1 70/4 160/4 160/17 160/23 189/7
myself [4] 76/10 88/2 100/4 103/11

N

name [7] 1/9 10/2 34/2 70/9 80/9 89/18 161/4
named [1] 41/21
naming [1] 41/16
narrow [2] 62/2 104/8
nation [2] 69/2 92/11
national [5] 9/21 12/6 44/9 52/10 151/20
nations [18] 47/16 48/1 60/1 90/5 90/9 90/15 90/17 91/12 91/14 91/14 91/21 139/15 166/16 166/25 167/7 184/9 184/11 185/6
natural [2] 126/11 168/17
nature [5] 41/15 77/8 96/12 115/18 157/6
navigate [1] 52/4
navigation [1] 91/13
necessarily [1] 121/22
necessary [2] 54/1 106/12
necessity [2] 57/21 59/21
need [45] 6/3 6/22 8/19 10/17 11/6 12/10 14/25 15/15 20/19 20/20 20/24 26/5 26/8 32/15 34/17 47/11 47/16 53/5 54/8 64/21 65/6 70/14 81/9 81/14 83/18 88/14 98/15 99/19 105/16 107/9 109/8 113/4 114/14 114/15 123/7 137/9 146/11 161/8 165/21 176/1 176/2 177/9 188/5 188/9 188/10
needed [15] 6/5 15/12 44/13 55/21 56/24 57/6 57/18 60/20 69/2 81/6 91/19 91/19 132/9 183/16 184/20
needing [2] 8/17 185/5
needs [16] 24/23 25/10 116/7 119/14 123/4 123/5 134/2 134/16 137/17 141/22 165/25 174/21 179/17 188/3 188/14 188/15
negative [6] 39/2 67/16 67/19 173/15 173/25 179/6
Neil [7] 52/24 147/23 150/3 150/25 151/19 163/3 168/15
Neil Ferguson [5] 147/23 150/3 151/19 163/3 168/15
Neil Ferguson's [2] 52/24 150/25
neither [1] 136/11
NERVTAG [4] 23/17 23/19 23/21 23/23
net [1] 6/23
network [2] 46/14 48/12
networks [1] 44/11
neutral [1] 117/14
never [14] 14/20 40/2 40/14 56/20 59/19 90/21 112/17 113/23 114/9 114/10 127/25 179/25 180/1 180/2
Nevertheless [1] 50/18
new [15] 23/19 42/23 53/21 66/15 80/12 82/1 113/10 126/25 159/21 174/19 175/20 175/23 176/21 178/2 178/10
News [1] 148/2
next [47] 23/16 25/1 25/14 27/16 43/24 54/19 59/7 61/15 66/11 67/20 70/4 71/13 76/21 93/17 94/20 96/16 98/3 100/23 112/10 114/16 118/21 119/19 120/18 122/20 122/24 133/21 134/25 136/4 138/10 138/17 138/21 138/25 143/23 148/9 148/20 170/19 173/4 178/18 178/19 185/25 187/4 187/20 188/5 188/13 188/13 188/23 189/4
next week [3] 25/14 93/17 136/4
next week's [1] 187/20
NHS [28] 29/17 31/8 51/25 117/1 130/19 130/20 131/9 131/14 131/19 132/9 132/21 134/2 134/5 134/15 134/19 134/20 135/20 136/2 136/5 136/9 136/11 136/21 136/25 137/10 137/15 137/18 141/19 142/10
night [2] 52/23 68/25
nine [1] 11/18
no [60] 4/15 9/11 10/13 10/14 15/5 15/16 15/25 18/18 20/7 23/12 27/4 30/9 33/25 34/13 44/23 50/3 50/9 55/17 61/14 66/17 69/15 69/15 73/12 73/14 73/16 73/18 77/21 78/3 80/13 81/1 87/1 88/12 91/2 94/10 96/20 98/9 105/5 110/6 111/13 112/20 112/25 115/5 116/11 117/8 119/7 122/2 122/9 129/23 131/2 134/22 134/22 135/4 140/22 142/18 143/13 146/14 151/17 152/4 168/10 179/16
No 10 [1] 20/7
no one [2] 55/17 111/13
non [3] 26/4 55/13 173/6
non-health [1] 173/6
non-pharmaceutical [2] 26/4 55/13

N

nonetheless [1] 129/18
nor [2] 111/8 142/18
norm [1] 77/11
normal [4] 20/12 36/24 85/5 176/20
normally [3] 34/25 36/18 36/25
Northern [13] 46/10 46/16 46/19 47/23 48/5 48/6 92/12 92/15 92/20 93/4 93/6 166/13 184/14
Northern Ireland [13] 46/10 46/16 46/19 47/23 48/5 48/6 92/12 92/15 92/20 93/4 93/6 166/13 184/14
nosocomial [4] 143/1 147/10 147/13 147/15
not [210]
note [1] 137/25
noted [2] 75/9 152/10
nothing [8] 25/1 41/1 41/9 67/14 117/20 130/10 139/24 139/24
notice [1] 112/23
noticed [2] 74/23 75/7
notwithstanding [1] 150/15
novel [1] 80/1
now [43] 5/23 6/18 9/1 24/1 34/20 39/5 46/20 53/6 53/10 64/14 65/2 75/15 82/15 88/12 89/19 102/22 110/10 111/17 114/11 115/4 116/13 118/17 121/4 122/25 123/8 131/13 142/3 144/13 145/10 152/2 152/10 153/17 154/22 156/4 159/16 159/22 159/25 166/7 171/19 181/20 185/4 185/13 185/20
nowcast [3] 96/22 96/23 97/25
nowcasts [1] 95/16
NPI [2] 129/1 129/20
NPIs [6] 21/22 33/15 89/19 130/1 175/5 176/11
nuance [1] 97/18
nuanced [1] 56/17
nuances [2] 108/20 109/4
number [45] 3/11 3/12 4/4 4/6 4/9 5/4 6/21 16/2 22/6 24/9 30/10 33/19 37/20 46/25 47/2 56/25 60/24 62/7 89/5 98/3 98/11 101/21 101/24 103/20 103/23 104/7 104/12 104/16 104/19 105/9 124/7 126/1 131/14 138/1 143/12 143/20 144/21 158/18 159/4 164/3 164/19 173/2 185/25 186/6 188/1
Number 10 [4] 6/21 37/20 60/24 131/14
number 2 [1] 185/25
number 36 [1] 186/6
number one [3] 5/4 30/10 46/25
numbering [1] 86/3
numbers [10] 17/4 81/10 81/19 100/11 100/16 102/4 102/8 126/10 132/4 153/25
numerous [1] 42/6
nursing [1] 143/9

O

o'clock [2] 160/12 189/23
O'Connor [5] 70/2 110/3 110/16 160/11 160/22
O's [2] 101/16 119/21
objective [3] 8/13 8/17 117/2
objectives [8] 51/8 52/5 52/10 53/2 53/3 53/7 54/2 176/3
observation [4] 54/5 144/4 144/7 182/22
observers [2] 20/8 111/14
observes [1] 139/23
obvious [2] 10/2 78/3
obviously [6] 33/15 75/5 120/16 145/23 149/15 189/11
occasion [5] 42/14 43/4 56/15 149/10 152/13
occasionally [2] 14/23 85/21
occasions [3] 18/24 163/14 165/5
occupation [1] 113/14
occur [1] 140/24
occurred [1] 126/3
October [4] 1/1 72/4 74/16 190/1
October 2017 [2] 72/4 74/16
odd [1] 64/13
off [8] 4/22 17/18 39/21 48/17 64/25 81/13 170/3 182/10
offered [2] 45/8 169/19
office [35] 3/16 3/21 4/14 6/21 9/22 10/6 14/23 15/10 15/14 18/2 20/7 21/3 21/24 27/6 27/7 35/2 37/20 40/19 40/21 46/11 52/7 54/12 58/21 60/24 64/1 65/3 68/10 86/6 111/14 118/15 121/20 121/21 123/7 123/8 182/15
Office's [1] 52/20
officer [7] 11/4 18/7 18/8 18/14 35/16 42/4 92/14
officers [1] 47/15
official [2] 20/3 102/1
officials [14] 9/7 17/5 19/25 20/6 20/19 21/6 54/9 55/21 56/25 68/25 78/5 106/5 111/14 121/14
often [13] 15/11 51/5 53/2 87/5 100/15 105/2 165/19 180/8 181/11 181/13 181/18 182/7 187/21
Oh [2] 88/18 168/15
okay [6] 2/3 9/1 11/25 34/19 49/3 162/1
old [2] 79/24 80/11
Omicron [1] 183/18
on [308]
once [7] 28/12 36/21 40/21 77/15 79/15 94/22 138/23
one [122] 5/4 5/10 6/19 8/10 12/14 15/18 20/18 20/20 24/11 28/16 30/10 33/24 38/24 39/1 39/15 40/8 41/15 41/18 42/18 45/10 45/11 46/25 50/4 52/23 53/22 55/17 56/2 57/22 58/13 61/17 64/25 65/5 66/25 68/22 69/2 71/3 71/6 74/23 74/24 80/9 82/24 86/18 87/7 88/3 89/1 89/3 89/23 90/11 91/4 93/9 93/21 94/1 95/12 97/4 97/20 97/23 98/6 98/9 98/12 98/13 98/19 99/14 99/20 101/10 103/23 104/4 104/4 104/6 104/25 106/21 107/24 109/9 109/14 111/13 112/2 112/23 113/3 114/3 114/5 115/16 117/5 119/12 119/21 119/21 120/23 124/23 125/24 126/21 134/25 135/8 136/7 137/22 141/13 145/6 150/12 151/1 151/18 152/6 152/8 153/18 154/2 154/7 154/8 156/6 156/16 157/15 163/2 164/24 165/3 165/9 165/24 167/9 169/6 172/1 172/3 172/7 173/19 176/9 182/7 182/19 187/5 189/11
one year [1] 172/7
ones [2] 44/5 94/11
ongoing [1] 143/25
online [1] 85/22
only [33] 15/3 15/17 21/16 27/2 29/19 38/14 38/23 39/1 59/15 64/20 75/18 86/7 86/8 91/18 93/12 96/2 117/3 117/3 117/6 124/23 126/24 129/20 135/1 148/3 151/19 163/5 166/18 168/17 172/17 182/23 183/10 185/25 186/19
onwards [1] 71/16
open [3] 2/22 51/2 118/24
opening [1] 181/20
openly [1] 84/13
openness [1] 41/17
OpenSAFELY [1] 187/13
operate [4] 60/20 67/7 67/18 69/5
operates [1] 20/17
operating [1] 90/24
operational [4] 34/8 38/25 66/23 158/22
operations [5] 6/6 6/13 8/15 23/3 42/23
operators [1] 54/9
opinion [2] 65/20 179/3
opportunity [4] 5/7 50/1 59/4 68/18
opposed [1] 121/3
opposite [1] 144/5
opted [2] 91/22 157/10
optimum [1] 90/22
options [2] 82/8 121/16
or [158] 4/1 6/6 6/10 6/23 7/11 7/19 8/15 9/22 12/2 15/6 15/10 15/10 16/16 17/14 18/16 21/21 21/22 28/12 29/24 30/4 30/4 30/16 31/12 31/20 32/23 32/24 36/21 38/25 38/25 40/14 40/15 41/17 43/3 43/4 43/18 45/11 45/14 53/8 57/11 57/16 58/19 61/3 64/13 66/4 71/8 72/25 73/12 73/13 74/20 79/8 80/8 82/24 84/10 84/14 86/18 86/19 88/15 89/1 89/3 90/8 91/19 92/13 93/25 94/6 95/11 95/23 98/4 98/5 98/19 102/9 102/11 103/23 105/4 105/8 109/2 111/7 111/14 112/12 112/18 112/21 116/20 116/22 117/9 117/18 118/3 118/9 120/22 122/1 122/14 123/4 124/1 125/12 125/14 125/21 128/15 129/7 129/23 129/25 130/2 130/21 132/18 135/1 137/25 138/3 141/2 141/6 142/1 142/4 143/16 144/20 147/7 151/16 152/15 152/17 152/23 154/2 154/6 154/7 154/8 154/11 154/12 154/12 155/18 155/23 156/3 156/23 159/19 161/19 162/11 163/2 163/9 164/25 165/22 165/23 166/16 167/10 168/5 168/15 169/7 169/9 169/15 170/24 171/7 171/16 173/3 173/18 174/16 175/12 176/6 176/15 176/15 176/22 177/7 178/7 178/12 185/4 185/6 186/2
Or: [1] 98/3
Or: over [1] 98/3
oral [3] 35/20 42/5 160/14
orally [2] 13/22 35/17
order [6] 83/17 85/25 88/10 151/24 175/25 176/7
ordered [2] 118/25 120/13
ordinate [1] 48/22
ordination [4] 46/22 48/4 48/9 48/18
organisation [4] 7/22 16/23 64/1 81/23
organisations [4] 3/18 27/9 43/18 57/23
organise [2] 135/20 136/3
organised [1] 88/9
organogram [6] 22/7

O

organogram... [5] 75/12 75/13 76/1 79/14 79/20
original [1] 18/16
originally [6] 1/19 3/23 18/15 23/12 74/20 78/17
originates [1] 127/1
other [73] 1/24 8/24 11/2 11/11 11/22 17/16 17/16 19/5 20/6 21/16 24/9 24/13 31/16 39/14 39/22 41/2 43/15 43/17 48/1 48/15 57/11 57/15 60/1 61/12 62/17 62/18 62/19 63/7 63/7 64/22 64/22 71/22 71/23 74/3 75/7 76/16 80/24 85/5 85/10 86/2 86/3 87/7 90/11 90/18 90/18 91/25 94/2 95/16 97/13 98/15 102/15 104/9 104/15 108/23 109/21 111/7 114/3 117/8 126/22 139/13 139/15 151/7 155/12 156/12 164/13 164/15 164/20 167/9 171/18 176/10 179/25 181/17 189/17
others [15] 19/13 28/10 30/17 41/25 45/16 48/25 56/19 60/23 61/9 62/3 105/13 111/12 145/2 157/9 160/12
otherwise [4] 73/15 77/24 106/19 116/1
ought [5] 88/7 122/12 122/13 155/18 155/18
our [47] 1/21 5/14 7/20 12/8 17/19 18/4 19/24 38/21 39/17 40/24 49/8 50/18 57/18 60/15 65/11 66/20 67/14 67/17 68/10 68/24 69/3 70/4 70/11 79/1 88/8 88/10 88/25 92/8 93/15 99/21 109/23 112/21 112/22 119/12 119/21 141/25 154/25 157/1 158/21 160/23 161/6 168/22 171/18 177/11 181/21 184/23 187/19
ours [2] 55/18 110/1
ourselves [1] 37/22
out [54] 3/11 7/8 10/5 16/3 17/22 17/25 29/14 30/14 33/11 35/21 45/5 51/2 57/19 57/20 63/9 63/24 65/6 65/24 74/14 81/4 83/18 102/9 102/12 104/25 105/7 112/17 119/23 124/14 125/2 125/20 129/15 130/24 135/14 135/16 140/18 142/22 144/24 152/16 152/18 152/25 156/2 156/4 157/3 157/4 159/4 164/17 164/24 171/10 171/16 171/18 175/3 176/10 187/12 187/18
outbreak [6] 23/2 148/24 163/7 173/14 186/9 186/12
outcome [9] 86/19 90/22 105/19 116/8 116/8 118/13 130/13 140/16 156/7
outcomes [5] 28/11 29/5 82/11 113/24 140/13
outdated [2] 125/2 125/4
outlined [1] 39/9
outpatients [1] 147/7
output [4] 78/13 86/14 86/15 95/1
outset [4] 36/3 54/22 55/5 152/20
outside [12] 19/6 62/1 83/20 83/22 88/19 112/8 118/17 121/16 145/22 155/21 165/19 187/23
over [36] 1/24 7/24 16/16 29/15 49/18 51/9 51/18 59/19 61/16 62/21 67/4 70/2 74/24 76/25 90/10 90/10 98/3 116/9 116/15 117/6 118/18 133/21 134/23 135/23 138/8 144/10 147/19 148/9 148/20 159/8 163/1 170/19 172/1 182/4 185/20 187/19
overall [2] 26/11 173/14
overcome [1] 55/19
overleaf [2] 9/17 67/4
overview [1] 2/20
overwhelm [3] 131/12 132/22 134/5
overwhelmed [11] 130/21 131/9 131/15 131/20 132/20 134/19 136/9 137/1 137/11 137/15 141/19
overwhelming [1] 136/11
own [20] 6/7 15/7 24/17 47/17 47/21 48/1 56/12 92/10 154/9 154/11 157/4 163/22 164/14 168/5 168/22 169/1 171/2 184/11 185/11 186/23
Oxford [1] 135/19

P

pace [2] 1/22 13/25
pacing [1] 1/25
page [71] 2/8 2/15 2/15 2/22 7/24 7/24 20/2 28/1 36/16 45/21 50/6 51/2 53/15 53/17 54/21 56/1 56/3 59/10 59/10 61/16 61/16 63/9 63/11 63/24 65/17 67/5 74/13 76/2 79/22 81/24 81/25 87/8 93/18 102/24 105/23 110/25 112/4 113/5 123/21 127/8 128/23 130/23 133/21 135/23 138/8 138/10 138/25 139/5 143/4 146/6 148/9 148/20 148/21 149/1 157/23 158/12 167/15 170/18 170/19 171/23 172/15 172/22 173/4 174/5 177/18 178/25 181/7 182/7 182/20 185/22 191/2
page 1 [1] 76/2
page 101 [1] 158/12
page 11 [1] 170/18
page 119 [1] 113/5
page 12 [1] 20/2
page 13 [2] 102/24 182/20
page 14 [1] 177/18
page 15 [2] 36/16 181/7
page 16 [1] 65/17
page 17 [1] 67/5
page 18 [4] 28/1 53/15 53/17 127/8
page 19 [2] 56/1 56/3
page 23 [2] 2/15 79/22
page 25 [1] 157/23
page 28 [1] 45/21
page 3 [2] 2/22 148/21
page 30 [1] 2/8
page 31 [1] 93/18
page 33 [2] 63/9 63/11
page 34 [1] 112/4
page 35 [1] 87/8
page 37 [1] 167/15
page 39 [1] 185/22
page 4 [1] 110/25
page 43 [1] 130/23
page 44 [1] 123/21
page 5 [2] 50/6 54/21
page 55 [1] 143/4
page 6 [4] 7/24 59/10 59/10 178/25
page 7 [3] 61/16 61/16 105/23
page 86 [1] 81/24
page 9 [1] 74/13
page for [1] 63/24
page to [1] 7/24
pages [4] 2/15 29/15 70/13 70/14
paid [3] 19/10 19/12 157/20
pan [1] 51/2
pandemic [88] 6/17 10/22 16/2 19/18 20/3 22/17 24/23 25/18 26/12 28/5 31/3 37/2 47/12 56/22 56/24 64/10 72/5 72/7 72/24 73/5 74/12 74/21 74/22 75/9 75/17 76/22 77/2 77/14 78/4 79/8 84/25 90/13 91/3 95/24 96/16 97/3 97/5 98/4 101/13 107/3 108/5 114/16 115/24 117/4 120/18 120/21 120/22 120/23 121/3 122/11 122/20 123/12 124/12 126/6 126/19 127/23 129/2 130/25 133/8 137/1 138/6 152/11 154/5 155/15 159/17 163/1 163/11 163/12 163/24 167/18 170/15 172/25 173/2 175/11 176/23 178/4 178/18 178/19 178/21 182/18 183/1 184/19 185/13 187/1 187/4 188/5 188/13 188/24
pandemics [4] 78/8 115/15 177/23 188/6
panel [1] 14/2
paper [15] 80/9 135/4 171/15 171/19 172/5 172/8 172/11 172/12 172/22 173/20 173/23 176/19 177/20 178/1 179/12
papers [15] 16/16 37/3 37/5 38/11 45/23 86/20 86/21 86/23 87/4 95/13 95/22 96/1 96/25 101/5 107/12
paperwork [2] 133/12 133/13
papilloma [1] 162/16
papilloma virus [1] 162/16
papillomavirus [1] 162/10
paradox [1] 156/1
paragraph [79] 2/22 2/25 3/12 7/4 7/25 9/17 12/17 16/4 16/10 16/16 18/6 20/2 26/9 27/23 28/1 35/1 36/16 37/3 45/20 50/7 51/3 51/16 53/18 54/22 54/23 56/3 59/11 63/25 66/4 66/4 66/11 67/5 67/20 74/14 79/23 81/24 87/9 87/17 93/19 101/15 102/23 111/2 112/3 112/4 112/11 113/3 113/5 127/10 130/22 131/2 133/23 138/17 138/21 139/6 143/4 143/18 143/23 147/2 147/3 147/4 149/17 152/9 158/14 163/20 167/16 170/17 171/23 172/23 173/10 177/18 178/25 181/7 182/20 182/21 183/5 184/1 184/6 184/8 186/2
paragraph 0.2 [1] 2/22
paragraph 0.3 [1] 2/25
paragraph 0.4 [1] 3/12
paragraph 1.1 [1] 7/4
paragraph 1.3 [1] 7/25
paragraph 1.9 [1] 26/9
paragraph 10 [1] 163/20
paragraph 12.27 [1] 113/5
paragraph 13 [1] 133/23
paragraph 2.1 [1] 12/17
paragraph 2.13 [1] 20/2
paragraph 2.19 [1] 35/1
paragraph 2.3 [1] 9/17
paragraph 2.32 [1] 36/16
paragraph 2.33 [1] 37/3
paragraph 2.40 [2] 27/23 28/1
paragraph 2.5 [1] 16/10
paragraph 2.6 [2] 16/4 18/6
paragraph 23 [1]

P

paragraph 23... [1] 178/25
paragraph 3.1 [1] 74/14
paragraph 3.27 [1] 127/10
paragraph 3.43 [1] 79/23
paragraph 3.69 [1] 93/19
paragraph 3.80 [1] 112/4
paragraph 3.84 [1] 87/9
paragraph 34 [1] 112/3
paragraph 4.9 [1] 130/22
paragraph 42 [1] 170/17
paragraph 43 [1] 171/23
paragraph 46 [2] 182/20 182/21
paragraph 47 [1] 184/1
paragraph 48 [1] 184/6
paragraph 51 [1] 177/18
paragraph 56 [1] 181/7
paragraph 6.1 [1] 45/20
paragraph 6.6 [1] 143/4
paragraph 8 [1] 152/9
paragraph 9.9 [1] 158/14
paragraph is [2] 50/7 87/17
paragraph on [1] 113/3
paragraph or [1] 66/4
paragraph saying [1] 149/17
paragraph there [1] 16/16
paragraph we [1] 54/22
paragraphs [7] 105/23 110/24 110/25 123/21 127/9 157/24 158/24
paragraphs 18 [1] 110/25
paragraphs 243 [1] 123/21
paragraphs 3.27 [1] 127/9
paragraphs 3.48 [1] 157/24
paragraphs 35 [1] 105/23
paragraphs in [1] 110/24
parameters [2] 18/16 82/5
Parliament [1] 38/23
part [21] 5/4 5/10 5/22 9/6 14/25 20/13 22/1 34/20 49/4 49/15 59/2 63/13 68/13 81/22 108/22 126/7 145/15 166/8 170/16 171/6 171/11
part A [1] 34/20
part two [1] 5/4
partial [1] 187/12
participant [1] 18/23
participants [7] 14/24 17/24 37/15 37/19 39/18 41/20 46/7
participating [1] 10/21
particular [18] 15/23 17/9 21/19 27/7 31/17 47/11 77/19 85/8 89/8 97/17 110/21 114/5 117/11 134/24 138/11 140/20 147/18 174/18
particularly [12] 12/6 18/3 18/11 26/3 31/2 44/5 60/21 83/23 104/8 111/23 117/16 129/12
partly [4] 74/5 120/17 128/16 145/21
parts [7] 47/9 52/24 57/15 61/12 63/7 64/22 176/25
pass [4] 38/14 38/21 39/10 70/1
passage [8] 20/13 112/2 123/19 127/7 135/24 170/9 173/18 187/2
past [3] 62/5 160/13 172/2
pathway [1] 33/10
Patrick [14] 6/18 18/21 29/13 85/18 86/8 143/11 143/16 143/17 145/13 146/15 146/16 148/25 154/25 155/11
Patrick Vallance [12] 6/18 18/21 85/18 86/8 143/11 143/17 145/13 146/15 146/16 148/25 154/25 155/11
Patrick Vallance's [1] 29/13
Patrick's [1] 30/14
pattern [2] 85/5 100/25
Paul [2] 149/13 151/5
Paul Allen [1] 149/13
Paul Allen's [1] 151/5
pause [6] 1/25 49/3 70/3 135/6 135/9 180/19
pausing [7] 46/2 46/21 51/11 60/2 103/5 127/17 134/8
pay [8] 157/9 172/5 174/12 174/25 175/8 175/10 175/12 176/4
peer [1] 86/25
penultimate [1] 56/3
people [97] 10/21 10/23 11/8 13/11 14/14 16/24 16/25 17/1 17/3 17/9 17/22 18/4 19/21 19/24 26/6 32/25 41/12 41/24 41/25 52/6 54/12 55/9 55/14 58/21 60/16 60/17 60/19 61/7 64/11 64/19 64/23 66/20 69/17 69/19 76/16 77/18 79/19 80/18 80/24 81/3 84/7 86/3 86/4 86/5 104/11 104/15 105/13 107/9 108/1 108/9 108/19 109/8 115/9 118/15 120/10 120/11 121/14 121/15 121/19 121/20 130/3 131/25 132/4 133/10 133/10 133/19 140/15 144/25 145/1 145/3 147/5 155/16 155/23 156/20 156/25 157/3 159/12 162/5 166/3 166/22 168/6 168/25 169/9 169/9 178/9 178/11 178/13 181/22 182/4 182/15 183/7 183/14 184/17 184/22 187/7 187/14 189/11
people's [1] 129/13
per [2] 175/1 175/1
perceived [2] 57/11 139/2
perception [1] 61/10
perfectly [2] 114/18 168/17
perform [1] 59/25
performed [1] 95/18
perhaps [47] 2/21 3/15 5/11 10/2 22/7 23/21 27/22 30/11 31/1 35/8 36/14 42/9 43/19 46/5 53/15 61/20 63/11 63/21 68/2 68/17 68/20 76/1 77/25 95/21 99/5 102/24 103/7 105/14 105/21 105/24 108/12 118/4 130/11 143/11 147/24 150/1 150/14 154/7 154/14 163/22 163/24 171/19 177/17 177/19 185/5 185/20 188/17
period [21] 16/12 26/17 34/12 44/21 59/20 67/11 68/21 73/19 89/20 116/15 119/11 119/14 120/3 120/8 120/14 120/19 120/20 120/23 127/3 128/5 181/9
periods [3] 96/1 172/1 172/20
permanent [2] 10/12 53/11
permanent secretary [1] 53/11
permanently [1] 8/4
persisted [1] 51/8
person [11] 85/21 104/5 104/6 104/6 104/24 104/25 133/18 146/17 150/3 154/11 177/13
personal [2] 69/19 116/20
personally [2] 156/10 158/15
perspective [9] 34/7 128/17 128/20 136/23 141/21 163/8 165/18 166/2 166/4
perspectives [5] 14/14 20/9 20/15 116/21 141/24
pharmaceutical [2] 26/4 55/13
phase [1] 52/12
PhD [1] 3/1
PHE [30] 11/10 23/7 24/1 24/20 27/6 29/7 29/17 30/4 30/16 31/9 34/1 34/6 48/20 49/1 55/14 56/19 57/22 60/3 60/8 61/3 61/6 61/7 62/25 64/15 147/12 159/11 159/11 159/12 159/12 159/22
phenomenon [1] 147/18
Philip [1] 53/11
Philip Barton [1] 53/11
phone [4] 64/13 133/10 152/19 154/19
phoning [1] 133/10
phrase [7] 9/11 65/19 66/3 66/5 66/8 67/2 124/16
phraseology [1] 67/9
phrases [1] 51/23
pick [3] 139/5 158/13 186/5
picked [1] 45/13
picking [4] 127/9 158/1 177/21 179/1
piece [5] 103/6 104/4 114/25 122/15 122/16
pilot [1] 177/7
pipeline [1] 175/23
pivot [1] 125/18
pivoted [1] 125/10
pivoting [1] 126/21
place [19] 17/21 31/6 31/7 38/19 39/16 39/24 43/5 51/21 55/13 60/12 93/4 93/5 96/5 103/23 130/1 130/6 130/15 188/10 188/24
placed [1] 31/1
places [1] 157/25
plan [8] 125/14 125/21 126/9 127/21 127/22 127/24 128/4 130/25
planners [2] 135/20 136/2
planning [6] 98/22 99/3 123/17 136/5 136/13 137/18
plans [2] 55/12 125/11
plateauing [1] 143/22
plausible [1] 107/14
played [2] 63/14 126/7
plea [1] 175/24
please [50] 1/5 1/9 24/12 25/5 25/12 27/23 28/1 50/6 51/2 53/17 54/21 59/10 61/16 67/5 70/5 70/9 76/2 81/24 99/12 110/12 110/25 112/3 113/4 127/8 127/10 133/21 135/11 135/24 137/22 139/6 146/5 146/23 148/9 148/20 149/16 152/5 154/16 157/23 158/12 161/4 167/15 172/16 173/4 177/18 178/24 178/25 179/11 182/20 185/21 189/23
pleased [1] 24/10
plenary [3] 85/2 89/7 99/15
plus [1] 49/18
pm [5] 110/13 110/15

P

pm... [3] 160/19 160/21 189/24
point [63] 24/13 30/23 31/15 32/21 36/10 40/8 41/11 44/20 46/13 46/17 47/23 54/6 54/13 54/16 54/20 55/3 56/18 59/22 67/20 75/25 77/21 80/20 81/1 82/24 83/18 89/17 89/23 97/23 99/21 102/16 103/13 106/7 109/7 109/21 111/2 115/13 125/9 127/24 128/6 128/9 130/5 130/8 130/24 131/23 134/15 138/11 139/8 145/15 149/8 157/18 157/24 158/13 158/23 159/22 167/5 169/4 169/8 170/11 170/20 175/25 176/17 177/21 178/15
pointed [3] 125/20 129/15 142/22
pointing [1] 176/10
points [6] 83/3 89/2 108/8 108/19 127/18 160/3
poisonings [1] 4/7
policies [4] 3/6 116/25 117/13 118/3
policy [57] 3/7 6/5 6/13 7/11 8/15 12/2 12/8 20/9 20/15 20/18 20/21 21/2 21/7 21/24 38/25 39/4 52/3 54/9 55/19 55/21 56/6 60/18 66/6 66/23 77/16 77/22 82/8 82/8 83/7 83/9 84/20 91/16 106/22 114/8 114/11 114/20 115/25 116/6 117/2 117/14 121/12 121/16 123/1 124/23 126/24 126/25 127/1 127/19 139/4 142/15 151/4 153/22 173/13 180/5 180/6 181/2 181/3
policy-ready [1] 181/3
policy-specific [1] 153/22
policymaker [1] 176/6
policymakers [22] 33/17 45/10 56/13 78/21 87/13 87/21 107/1 117/22 121/6 125/13 125/15 126/23 134/9 142/5 142/20 176/1 176/2 180/17 180/23 181/15 182/7 188/25
policymaking [1] 123/7
political [3] 52/3 55/20 176/14
politician [1] 176/6
politician's [1] 176/16
politicians [8] 40/13 55/22 65/23 67/24 134/11 179/14 181/11 181/11
pools [1] 164/20
poor [2] 28/11 91/10
poorly [3] 55/2 55/5 55/24
population [4] 83/1 132/3 144/24 156/7
posed [1] 21/17
position [11] 2/11 31/21 36/24 55/16 72/13 79/20 93/3 95/17 156/11 157/1 171/1
positive [4] 63/19 173/15 173/25 183/11
possibility [2] 131/19 146/19
possible [15] 14/19 41/15 58/23 88/19 96/2 109/4 114/19 118/18 120/25 127/5 141/11 148/13 153/14 176/8 177/3
possible...yes [1] 139/18
possibly [3] 61/12 148/15 161/19
post [1] 152/21
post-infection [1] 152/21
potential [3] 23/1 31/24 142/5
potentially [5] 14/12 141/23 144/3 145/19 156/21
power [7] 8/3 8/9 88/22 88/22 180/9 187/21 187/24
practical [5] 64/20 83/3 87/7 89/3 95/12
practice [2] 20/12 20/16
pre [13] 22/11 22/18 23/16 73/5 79/3 117/4 122/17 124/12 125/10 127/23 130/25 133/8 133/17
pre-buying [1] 79/3
pre-existing [3] 22/11 22/18 125/10
pre-lockdown [1] 133/17
pre-pandemic [5] 73/5 117/4 124/12 127/23 133/8
pre-purchase [1] 122/17
precautionary [1] 9/23
precise [2] 101/9 172/18
precisely [2] 83/6 171/1
predict [1] 97/3
prediction [10] 93/24 95/3 95/23 96/12 96/19 97/1 97/10 97/13 136/14 142/12
predictions [3] 94/6 95/7 97/21
preface [1] 50/8
preferences [1] 125/22
preferentially [1] 144/6
premises [1] 169/20
preparation [1] 122/11
preparations [2] 73/7 188/4
prepare [1] 43/20
prepared [6] 4/16 70/11 86/21 93/13 122/23 161/6
preparedness [5] 75/4 78/14 80/4 124/12 130/25
preparing [2] 4/12 43/21
presence [2] 149/21 164/14
present [1] 9/8
presented [2] 120/12 168/25
presenting [1] 35/17
preserve [1] 172/7
press [1] 134/14
pressing [1] 141/12
pressure [1] 68/23
presumably [5] 126/18 146/20 150/5 152/18 188/15
presume [1] 33/25
presumption [2] 138/15 138/18
pretty [3] 4/9 75/17 86/5
prevalence [2] 139/10 144/21
prevents [2] 114/1 114/1
previous [6] 36/18 61/6 62/6 66/16 100/14 119/2
previously [5] 74/1 114/24 126/23 140/24 146/19
primarily [1] 18/21
primary [1] 35/6
Prime [4] 7/10 43/3 43/4 43/8
Prime Minister [1] 43/3
Prime Ministerial [1] 43/4
principal [1] 80/19
Principally [1] 152/22
principle [3] 177/3 177/6 177/7
principles [1] 93/15
prior [4] 54/7 64/5 129/21 138/19
priorities [2] 51/6 51/14
pro [1] 19/7
pro bono [1] 19/7
proactive [3] 8/6 21/15 88/16
proactivity [1] 87/15
probably [12] 4/20 8/22 28/25 30/18 48/11 50/7 67/12 110/9 177/10 177/12 184/4 185/16
problem [20] 46/10 66/1 91/2 116/5 117/12 125/14 129/18 135/12 135/15 140/21 140/22 140/23 141/15 145/21 164/22 168/8 183/6 184/7 187/8 188/12
problems [9] 38/12 39/9 50/19 91/5 97/19 162/8 185/7 185/8 186/3
process [18] 13/18 54/24 61/24 64/24 65/1 75/3 75/6 82/25 86/25 105/11 119/3 119/6 121/10 127/12 150/8 175/22 184/22 189/5
processes [1] 94/25
produce [6] 6/19 14/4 44/15 44/18 78/20 151/3
produced [7] 16/16 45/7 85/12 99/6 109/24 112/23 120/2
produces [2] 90/22 153/24
producing [4] 102/1 103/6 103/7 158/16
product [2] 95/15 98/6
productive [1] 182/16
profession [1] 7/3
professional [2] 2/19 150/25
professor [123] 23/11 23/11 23/13 24/6 26/18 27/13 27/19 70/5 70/6 70/8 70/11 70/22 70/24 71/7 71/13 72/1 72/22 74/10 75/20 75/24 76/6 79/23 81/9 82/15 87/9 89/21 90/1 93/7 93/20 97/24 100/2 101/14 102/21 102/25 105/11 105/22 106/14 108/10 109/9 109/10 110/4 110/7 110/17 110/24 111/1 112/12 112/17 115/21 120/16 123/10 123/20 125/8 125/9 126/6 127/8 127/20 129/4 129/15 131/2 132/17 133/4 133/14 134/8 134/11 134/14 134/21 134/25 135/13 136/7 136/15 136/23 137/24 140/3 142/21 143/5 147/21 148/11 148/14 148/22 149/3 149/5 149/8 149/9 150/14 154/18 157/17 157/25 160/2 160/6 160/24 160/25 161/3 161/6 161/15 161/15 163/15 163/18 166/7 166/11 167/23 167/24 168/2 169/4 170/4 170/6 170/9 170/10 170/20 170/25 172/14 175/16 175/24 178/15 180/14 182/13 182/19 186/22 188/1 188/2 189/6 189/10 191/7 191/11
Professor Angela McLean [1] 23/11
Professor David Halpern [1] 27/13
Professor Edmunds [4] 23/11 23/13 71/7 167/24
Professor Ferguson [5] 148/11 148/14 149/5 149/9 167/23
Professor Ferguson's [1] 148/22
Professor Graham Medley [1] 70/5
Professor Horby [1] 24/6
Professor Julia Gog [1] 89/21

P
Professor Keeling [2] 163/18 189/10
Professor Khunti [1] 27/19
Professor Matthew Keeling [1] 160/24
Professor Medley [12] 70/11 110/17 129/4 163/15 166/11 170/6 170/25 175/24 178/15 180/14 182/13 188/2
Professor Medley's [1] 170/9
Professor Rubin [1] 26/18
Professor Woolhouse [9] 106/14 109/10 111/1 112/12 112/17 125/9 129/15 168/2 169/4
Professor Woolhouse's [4] 105/22 110/24 123/20 170/10
Professor/'Ferguson's [1] 149/3
Professors [1] 26/15
Professors Rubin [1] 26/15
programme [2] 65/3 65/4
project [1] 98/4
projection [4] 95/24 96/15 98/1 98/2
projections [5] 95/23 99/23 101/5 117/17 187/20
prolonged [2] 59/14 59/20
prominence [1] 158/20
prominent [1] 62/22
proof [1] 177/7
properly [3] 107/23 107/25 119/19
proportion [1] 131/25
proposed [1] 169/25
proposition [2] 66/7 169/6
pros [1] 106/9
prospect [1] 131/14
protective [2] 67/6 67/17
protocols [1] 188/9
proud [1] 92/17
provide [23] 7/9 8/13 9/20 20/20 25/25 26/23 30/13 32/8 33/17 40/3 40/5 43/13 55/1 57/19 84/10 120/25 141/25 149/7 151/21 153/22 158/6 159/19 170/13
provided [13] 2/5 6/12 20/24 27/1 35/11 43/2 60/25 167/13 169/8 169/11 179/6 183/7 188/18
provides [4] 23/1 23/6 24/2 116/16
providing [10] 8/18 12/12 27/9 27/11 37/10 50/20 150/7 155/24 158/21 158/25
public [41] 5/1 15/11 18/11 19/7 22/22 26/4 29/1 30/19 32/24 37/11 40/25 41/2 41/5 41/14 55/19 56/23 57/4 57/4 57/17 59/23 60/3 62/4 62/6 62/25 64/16 66/22 88/21 124/18 150/13 150/15 150/16 150/20 154/24 156/22 157/2 166/3 167/2 173/25 179/24 189/12 189/20
publication [2] 10/6 36/14
publications [2] 31/16 108/24
publicly [4] 150/2 155/19 156/3 156/4
publish [7] 37/22 38/1 38/1 38/10 38/14 39/7 44/2
published [15] 29/1 36/19 37/3 37/5 37/8 37/15 37/19 41/9 43/23 67/13 67/14 114/24 147/17 155/4 156/18
publishing [2] 37/24 38/12
pubs [1] 176/16
pull [1] 63/24
pulled [1] 82/24
pulling [1] 165/7
purchase [2] 122/17 175/20
purely [1] 87/19
purpose [4] 4/24 8/7 98/10 111/4
purposes [7] 93/18 99/3 99/11 102/23 110/1 143/3 154/25
pursue [1] 111/24
put [17] 17/25 38/19 39/21 39/24 60/11 96/11 117/20 120/6 130/6 153/21 159/21 169/20 175/23 177/8 177/9 179/24 183/2
puts [3] 111/11 141/21 156/11
putting [3] 122/25 130/1 130/14
pyramid [2] 85/15 89/4

Q
QALY [3] 174/9 174/16 175/1
quad [1] 43/7
qualification [1] 87/1
qualified [2] 111/3 170/12
qualify [1] 132/18
quality [4] 7/12 38/8 174/9 174/16
qualms [1] 81/2
quantify [1] 177/23
quantifying [1] 111/5
quantitative [4] 93/25 112/14 136/17 162/5
question [38] 8/23 27/23 30/22 55/10 57/7 67/1 74/18 81/13 87/9 88/13 90/9 90/11 106/20 107/8 110/21 113/6 114/7 115/5 118/2 118/3 122/21 123/24 125/12 125/20 126/16 130/17 132/6 137/9 140/11 142/10 143/5 154/15 157/13 165/21 167/9 168/14 170/6 181/19
questionnaire [4] 167/12 167/13 185/19 186/13
questions [48] 1/7 20/10 21/5 21/17 37/13 37/16 50/23 52/22 54/2 54/14 54/15 54/25 55/2 55/5 56/12 56/14 65/23 69/13 69/14 69/15 70/7 74/11 77/17 77/19 77/22 80/21 82/4 84/8 84/11 87/13 88/11 89/3 90/11 114/10 114/12 114/20 125/3 125/8 132/14 161/2 168/19 180/12 181/11 183/22 189/7 191/5 191/9 191/13
quibble [1] 134/13
quickly [9] 17/14 17/22 48/6 52/2 87/3 117/7 117/10 124/17 128/3
quieter [1] 4/20
quit [1] 148/7
quite [47] 4/6 4/7 12/22 30/15 32/25 33/1 48/6 51/18 51/22 52/4 52/15 52/15 52/25 53/7 55/23 62/10 62/12 75/20 88/5 88/21 89/3 92/1 92/1 95/9 97/12 99/13 103/20 104/12 108/6 123/4 124/17 125/1 147/21 149/18 152/10 156/12 157/3 157/3 160/3 163/24 165/19 165/20 167/1 167/1 177/12 180/8 181/18
quitting [1] 148/4
quorate [1] 81/20
quoted [1] 148/10

R
R number [9] 98/3 101/21 103/20 104/12 104/16 104/19 124/7 158/18 159/4
R/Growth [1] 100/5
raise [6] 58/14 88/3 91/5 115/17 165/21 176/18
raised [15] 66/1 66/16 67/8 68/5 77/17 88/4 90/25 111/11 111/23 112/20 112/20 119/11 125/9 163/18 178/15
ramped [1] 73/8
ran [2] 7/2 17/22
random [1] 97/14
range [27] 3/18 4/8 10/9 12/11 12/18 13/1 20/17 24/4 25/24 33/15 45/4 46/7 63/17 64/3 64/8 65/7 80/18 95/22 103/25 104/8 109/17 162/8 162/19 162/22 170/7 175/9 175/15
ranges [1] 104/10
ranging [2] 107/13 169/19
rapid [1] 23/6
rapidly [1] 12/25
rare [1] 97/12
rarely [3] 8/24 9/1 14/21
rate [6] 99/22 99/25 100/6 123/16 144/3 144/9
rate/Incidence [1] 100/6
rates [2] 131/25 144/10
rather [25] 1/15 73/22 77/7 86/23 94/8 103/5 106/13 108/8 110/1 112/11 115/16 121/23 128/19 128/24 134/14 140/12 141/21 144/4 150/8 152/19 154/12 158/21 168/5 175/17 178/18
rational [1] 120/14
rationale [1] 44/1
raw [1] 185/14
re [2] 121/9 140/24
re-gone [1] 121/9
re-occur [1] 140/24
reached [5] 101/18 108/4 121/5 134/4 171/10
reaching [1] 171/15
react [2] 26/2 26/6
reactive [4] 21/15 21/17 21/18 87/19
reactivity [1] 87/16
read [6] 73/20 107/19 135/13 135/16 148/15 182/10
readers [1] 137/8
readily [1] 38/10
reading [2] 135/25 143/24
readmitted [1] 147/8
ready [2] 181/3 188/25
real [7] 31/2 31/13 32/16 32/23 60/14 181/22 182/1
realisation [1] 125/25
realise [1] 128/13
realised [3] 124/17 129/16 136/25
realistic [2] 120/21 153/25
reality [1] 127/11
really [50] 2/1 2/20 2/23 6/15 7/9 7/18 17/3 17/18 25/23 30/5 40/2 40/14 40/22 44/24 48/16 50/23 54/16 54/20 60/16 69/21 73/12 74/24 77/16 87/18 91/10 92/7 92/11 93/3 97/12 98/13 102/7 105/24 116/5 118/7 124/23 125/9 126/22 128/5 129/20 134/17 137/8 148/22 153/2 169/2 170/13 180/16 180/25 180/25 183/15 183/18
reappeared [1] 151/14
reason [8] 38/7 39/3 77/25 105/5 126/20 150/19 183/14 187/3
reasonable [9] 30/22 96/25 98/14 98/20 99/1 136/5 136/12 137/18 188/11
reasons [10] 20/20

R

reasons... [9] 28/13 38/2 60/9 61/13 105/14 107/25 141/13 151/18 187/6
rebuilding [1] 52/20
recall [10] 16/25 33/12 34/17 45/4 45/10 53/8 68/4 68/8 154/5 170/8
receive [2] 47/6 112/19
received [12] 39/18 45/23 46/9 46/13 46/15 46/17 87/13 107/10 108/10 139/1 179/7 189/13
receiving [3] 31/17 106/10 144/25
recent [1] 51/9
recently [1] 163/5
recognise [2] 68/18 124/4
recognised [2] 26/10 151/24
recognition [2] 189/14 189/21
recollection [1] 15/17
recommendation [1] 37/21
recommendations [2] 120/17 155/5
reconcile [1] 136/14
record [1] 137/17
recorded [3] 133/5 133/8 184/9
recording [2] 1/23 184/12
records [1] 34/18
recovery [1] 173/12
recruited [2] 1/18 7/1
reduce [2] 105/16 179/16
reduced [5] 14/11 39/3 63/6 144/20 160/1
reducing [1] 106/13
reductionist [1] 103/6
redundancy [1] 81/19
refer [13] 74/15 82/7 135/17 136/11 143/10 149/23 152/7 157/25 170/20 171/22 173/5 174/11 184/8
reference [4] 100/6 135/10 148/7 148/18
referred [6] 101/10 115/13 124/24 133/22 136/12 174/6
referring [6] 120/19 127/17 139/1 158/18 168/10 184/6
refers [5] 98/24 138/21 148/4 148/21 168/3
refine [1] 54/1
reflect [7] 14/18 30/2 36/8 50/20 59/5 61/22 63/3
reflected [4] 119/15 169/22 180/6 180/6
reflecting [1] 30/11
reflection [1] 108/5
reflective [1] 12/9
reflexively [1] 69/5
refresh [2] 50/1 78/24
refreshed [2] 78/23 188/16
refused [1] 15/19
regard [6] 37/25 111/4 111/23 118/2 166/12 177/17
regarded [2] 118/12 118/21
regarding [5] 29/4 50/23 51/13 61/2 112/24
regardless [3] 122/10 129/25 130/13
regards [1] 116/8
regional [3] 51/10 165/11 165/23
regions [2] 102/5 165/12
registers [1] 98/25
regular [5] 43/2 45/22 64/24 150/18 163/13
regularly [5] 11/1 49/1 65/1 99/25 100/2
regulations [1] 187/11
reinfections [2] 183/17 183/17
reinforce [1] 146/9
relate [1] 38/14
related [8] 28/10 115/20 124/5 125/12 137/21 174/8 183/6 183/6
relating [4] 3/19 31/10 165/23 172/19
relation [25] 2/13 2/24 5/10 12/16 17/11 17/13 19/15 22/8 22/18 27/1 33/24 36/15 37/2 45/15 48/16 49/14 49/17 51/12 54/4 62/9 65/25 66/3 67/1 67/21 68/1
relationship [4] 44/4 45/17 88/4 182/16
relationships [3] 80/24 80/25 123/5
relative [1] 144/12
relatively [7] 5/22 13/3 95/10 96/3 104/24 129/16 143/19
relaxation [2] 33/10 180/24
release [1] 51/8
relevance [2] 3/15 120/3
relevant [2] 8/7 11/3
relevantly [2] 72/1 154/25
reliant [1] 159/18
relied [1] 77/17
relief [2] 120/5 144/10
rely [2] 15/22 160/15
remain [1] 80/11
remained [2] 54/3 149/10
remaining [1] 49/15
remark [1] 77/25
remember [20] 24/25 53/8 53/10 68/11 78/25 86/8 89/23 99/18 109/21 134/6 134/22 134/24 140/19 147/24 151/13 152/6 152/15 152/23 162/15 181/18
remembered [1] 147/25
remind [2] 148/1 168/1
remotely [1] 86/12
remove [2] 118/24 118/25
repeatedly [1] 111/11
replace [2] 94/22 94/22
replaced [1] 72/6
replay [1] 13/12
replicate [1] 181/25
report [21] 29/1 29/4 29/7 43/21 44/2 44/15 44/19 45/7 49/21 49/24 50/6 53/17 56/1 56/2 59/10 65/18 93/19 121/18 137/25 143/4 149/15
reported [3] 79/12 79/16 184/9
reporting [1] 106/2
reports [4] 7/14 45/2 45/15 74/4
repository [1] 187/14
represent [2] 47/9 76/7
representation [2] 13/14 164/9
representative [1] 21/24
representatives [6] 45/22 46/5 58/15 66/20 116/22 167/22
represented [4] 90/6 109/20 164/6 165/12
represents [1] 76/9
reproduction [8] 100/11 100/16 101/23 102/3 102/8 104/7 105/9 144/21
reputational [2] 149/22 150/6
request [2] 70/11 161/7
require [1] 98/25
required [3] 20/9 20/14 158/5
requires [3] 133/3 147/8 177/24
research [8] 31/14 50/18 56/12 71/4 73/12 73/19 114/16 161/21
residential [1] 145/1
resign [1] 148/12
resignation [3] 147/23 148/22 149/3
resigned [3] 72/13 122/5 149/10
resigning [1] 150/17
resilience [2] 3/20 3/21
resistance [2] 37/23 37/25
resolve [1] 141/15
resolved [1] 186/8
resort [1] 69/19
respect [3] 19/23 79/15 106/17
respiratory [2] 23/20 24/4
respond [2] 50/12 91/4
responding [2] 50/9 113/5
response [12] 20/3 26/12 68/9 124/1 128/21 128/24 138/15 142/15 146/5 146/7 167/12 167/13
responsibilities [1] 83/16
responsibility [1] 90/14
responsible [1] 158/7
rest [6] 44/8 77/20 82/16 83/17 102/9 105/1
restrictions [3] 99/23 118/24 130/2
result [3] 25/10 173/6 173/11
results [1] 132/15
retained [1] 79/18
return [3] 56/7 58/6 160/13
returned [1] 72/11
revealing [1] 41/15
review [2] 86/25 136/6
reviewed [1] 11/1
reviews [1] 64/24
revisit [1] 22/1
richer [1] 166/5
right [95] 1/14 1/16 2/8 2/25 3/2 3/5 3/14 3/23 4/13 4/19 5/20 7/7 7/17 7/20 8/8 8/14 10/3 12/8 12/15 12/23 14/20 18/18 19/8 22/14 23/18 23/22 24/6 25/9 26/20 26/25 28/23 29/16 30/21 31/20 35/12 35/23 35/25 37/14 37/25 38/1 38/4 39/7 39/8 39/13 42/2 42/6 44/16 46/15 47/14 47/18 47/25 50/2 50/15 55/7 56/15 58/3 64/12 64/15 66/18 66/21 69/2 69/19 70/17 72/15 76/23 79/6 85/4 87/11 87/23 89/5 89/16 89/25 92/12 98/18 99/16 108/17 126/13 132/23 137/22 140/3 144/17 145/23 146/22 148/12 156/23 160/11 161/12 163/25 165/13 166/7 166/9 172/9 182/25 183/8 186/13
rights [1] 157/4
rise [3] 144/23 145/3 145/8
rises [1] 167/4
risk [15] 10/24 15/21 15/23 28/4 28/7 28/11 29/5 34/14 34/15 78/3 82/11 98/25 121/13 149/22 150/6
risks [1] 11/12
roadmap [4] 119/3 119/22 180/15 180/24
Robert [1] 149/2
robust [1] 143/19
role [32] 4/14 4/21 7/8 7/18 7/18 7/20 7/21 8/12 9/6 15/16 18/14 18/25 22/21 23/23 25/20 49/19 50/3 59/14 63/6 63/14 77/16 82/1 84/9 91/5 111/13 111/15 141/24 141/24 148/5 150/7 158/21 170/23
roles [4] 3/19 19/11

R

roles... [2] 59/25 61/6
roof [1] 188/2
room [2] 10/17 64/13
roster [1] 10/24
roughly [2] 11/8 81/10
round [5] 9/1 11/7 14/21 137/14 181/25
rounds [1] 169/13
route [1] 46/18
routes [1] 17/18
routine [4] 84/25 175/21 184/25 185/6
routinely [2] 163/15 175/19
row [1] 76/4
Royal [2] 44/6 44/6
Royal Society [1] 44/6
Rubin [2] 26/15 26/18
rudimentary [1] 177/20
rules [1] 148/16
run [5] 7/23 22/25 23/25 25/22 80/14
running [3] 109/2 109/7 177/14
rush [2] 118/24 178/18

S

sacrifice [1] 172/7
safe [1] 39/15
sage [196]
SAGE 6 [1] 46/8
SAGE participants [1] 39/18
SAGE' [1] 9/23
said [35] 26/16 41/21 53/1 53/24 53/25 54/2 58/14 59/17 62/21 67/11 76/21 77/7 77/13 87/24 90/10 100/3 103/1 105/18 107/21 108/17 112/17 123/15 133/9 134/22 140/18 142/9 148/16 149/2 153/7 155/20 166/14 167/19 168/2 171/1 180/14
salary [1] 157/10
salient [1] 97/17
Salisbury [1] 4/6
same [28] 43/24 45/23 66/11 79/18 80/11 94/6 96/21 99/10 125/5 126/19 134/21 135/17 149/15 158/13 158/23 159/21 163/4 164/15 165/16 168/4 168/6 169/9 169/9 169/9 175/4 176/12 182/6 183/15
sample [2] 99/6 101/8
SARS [7] 124/1 124/4 124/6 124/14 124/15 124/16 129/17
SARS-like [1] 124/1
save [2] 117/1 179/16
saved [1] 174/21
saves [2] 114/3 114/4
saving [1] 71/12
saw [4] 150/7 179/25 180/1 180/2
say [110] 3/7 8/21 10/12 11/7 12/1 13/16 14/24 16/20 17/2 17/8 17/11 20/14 21/20 24/15 29/9 31/3 40/13 41/12 45/6 45/13 45/14 46/20 52/7 54/4 54/6 62/5 62/9 67/23 71/8 73/21 78/21 81/7 81/14 81/25 82/10 84/1 86/16 87/19 87/24 88/12 94/5 94/12 95/12 97/20 97/22 101/9 102/24 103/13 104/12 105/2 105/6 108/11 111/10 111/14 112/5 112/11 112/20 113/9 113/15 114/1 114/12 115/14 118/23 119/4 119/22 121/22 125/1 127/10 128/25 129/5 131/11 132/10 132/19 137/2 141/18 149/19 149/21 151/9 153/15 155/25 157/18 158/1 158/14 162/24 163/9 163/24 166/17 167/21 168/15 170/22 171/4 171/6 171/23 172/5 172/13 172/16 173/10 173/19 175/19 176/15 177/13 179/2 179/9 179/15 181/8 183/3 185/6 186/11 186/15 188/14
saying [31] 1/23 21/13 64/13 98/13 98/13 104/18 105/8 105/12 106/18 109/7 109/17 126/20 128/13 129/8 129/10 142/3 148/10 148/13 149/17 154/21 154/22 156/1 161/10 166/7 166/23 168/13 177/10 179/19 180/21 188/7 189/3
says [31] 9/9 13/16 33/18 50/8 54/23 59/12 61/21 63/13 63/25 66/3 67/5 105/25 111/4 123/23 133/23 135/18 136/8 138/6 138/13 138/17 139/6 146/7 147/4 148/12 148/23 149/4 155/1 155/6 184/24 186/6 187/13
scale [10] 47/12 55/8 56/23 60/4 60/8 61/1 107/11 107/13 164/15 175/13
scaling [2] 17/12 59/18
scanning [1] 44/21
scapegoats [1] 67/24
scenario [12] 95/3 96/25 98/9 98/10 98/14 98/21 99/1 117/16 136/5 136/14 142/12 174/10
scenarios [7] 94/7 97/10 98/11 98/11 98/16 98/18 173/24
school [15] 70/25 71/9 71/10 71/10 71/14 71/19 73/17 89/15 112/24 112/25 135/20 164/10 167/11 167/24 176/25
schools [6] 129/13 129/18 129/20 145/5 176/15 176/24
science [104] 1/19 2/23 3/7 3/20 3/25 4/17 4/18 4/25 5/18 5/18 5/21 5/22 5/24 6/2 6/3 6/5 6/12 6/15 6/20 6/25 7/2 7/11 8/1 8/2 8/6 8/17 8/22 8/24 9/2 9/9 9/15 12/11 12/12 13/5 13/16 15/1 15/15 16/21 17/6 17/7 17/19 18/1 18/2 18/12 20/16 20/24 24/25 25/2 25/25 26/10 26/17 30/3 30/20 32/9 33/1 33/3 33/14 33/16 34/3 34/8 34/14 38/7 39/24 44/3 45/18 48/10 48/18 48/19 49/9 49/10 49/21 50/24 51/6 52/8 52/14 52/21 57/17 60/11 60/17 60/18 61/11 64/2 64/24 65/3 65/20 65/22 66/12 66/13 66/22 67/25 68/6 68/7 76/7 106/22 139/24 140/2 140/7 149/22 179/2 179/20 179/20 179/22 180/8 181/1
science' [1] 179/4
Science's [1] 7/18
sciences [3] 43/20 44/6 161/16
Sciences' [1] 74/4
scientific [48] 3/8 5/2 7/5 7/9 7/12 7/14 9/6 9/20 11/6 15/3 15/4 15/8 15/22 18/7 20/12 21/5 22/17 25/17 26/11 27/3 34/22 35/16 39/16 40/11 41/16 42/3 44/4 44/8 47/22 47/24 50/20 51/15 54/13 57/5 61/24 66/5 66/8 82/2 83/11 107/7 107/22 140/8 146/3 156/12 158/6 179/5 179/7 180/7
scientist [10] 1/15 6/17 7/21 11/2 11/3 15/7 37/22 147/12 148/23 154/8
scientists [34] 6/8 6/8 6/11 7/1 8/14 11/8 11/11 13/1 15/7 17/10 21/12 25/24 27/5 27/7 31/14 38/8 38/18 44/11 46/14 47/15 48/14 48/21 53/25 54/2 55/21 61/25 62/3 67/6 67/17 67/22 106/23 121/1 180/16 180/23
scope [4] 77/3 87/22 118/3 181/12
Scotland [9] 90/19 90/21 92/6 92/7 92/23 148/18 166/12 167/3 184/14
Scotland Yard [1] 148/18
Scottish [2] 46/14 167/2
screen [9] 2/8 70/12 135/11 135/16 135/22 143/12 147/25 161/7 170/3
sea [1] 5/10
seamless [1] 91/13
seat [1] 70/8
second [27] 2/13 6/24 15/20 26/9 27/22 38/7 38/20 51/2 51/10 53/17 63/25 66/3 68/13 100/5 117/19 131/3 135/23 138/8 139/12 139/14 143/18 143/23 147/2 147/4 149/17 172/15 188/13
second-guess [2] 117/19 188/13
secondly [8] 1/22 8/5 35/15 60/16 111/20 143/21 164/11 166/14
secret [1] 137/12
secretariat [23] 3/22 17/12 52/19 73/11 79/17 79/18 80/3 80/14 81/6 86/2 87/20 88/6 88/7 90/25 100/4 100/21 103/10 103/11 109/23 137/3 137/4 151/6 152/17
secretariats [1] 86/6
secretary [4] 7/15 43/9 53/11 148/10
section [2] 114/6 138/9
sector [3] 145/7 145/8 173/8
secure [2] 187/15 187/23
security [2] 24/1 40/1
Sedwill [1] 53/10
see [63] 2/7 2/9 2/14 2/25 9/17 16/10 18/6 22/13 23/19 23/21 33/23 41/8 71/14 75/10 76/3 84/24 85/9 87/23 95/22 96/1 96/24 99/12 99/21 100/6 101/3 101/14 105/24 111/1 112/4 119/6 130/9 133/17 133/19 133/22 136/1 137/20 138/4 138/13 138/18 141/1 143/15 143/17 146/24 148/2 148/6 148/9 149/9 149/17 149/25 154/20 155/10 161/7 164/24 172/13 172/14 172/22 173/17 174/5 174/7 176/18 177/13 178/12 185/24
see the [1] 76/3
seeing [6] 9/10 38/24 38/24 39/1 119/15 167/3
seek [3] 56/4 56/16 57/5
seeking [1] 55/5
seem [6] 61/8 66/13 87/18 105/11 141/5 184/6
seemed [3] 53/13 62/8 130/15
seems [5] 64/13 168/16 175/3 178/16 188/6
seen [7] 61/7 79/14 89/4 128/18 137/24 142/15 144/9
selected [2] 10/15 10/23
self [4] 21/4 69/10 87/15 178/16

S

self-evaluation [1] 69/10
self-evident [1] 178/16
self-tasking [1] 87/15
self-tasks [1] 21/4
semi [1] 6/1
semi-independent [1] 6/1
send [3] 14/21 86/20 118/15
senior [1] 146/16
sense [21] 14/9 21/23 25/2 33/3 33/16 33/18 47/7 69/1 69/9 82/15 83/17 88/16 103/3 111/18 115/14 127/14 127/25 128/6 128/17 163/7 166/6
senses [1] 84/1
sensible [3] 108/6 130/16 178/17
sent [4] 52/23 101/3 143/10 145/18
sentence [6] 127/10 131/3 134/15 134/18 143/23 173/19
sentences [2] 83/14 161/24
separate [1] 152/2
Separately [1] 48/25
September [4] 70/19 101/14 112/7 138/4
September 2020 [2] 112/7 138/4
sequelae [1] 152/21
series [6] 30/23 94/4 108/8 154/18 156/20 172/13
serious [1] 148/17
Serology [1] 24/20
servant [6] 1/14 1/18 3/17 8/12 65/24 138/2
servants [5] 83/21 84/13 134/7 134/7 134/10
serve [2] 41/13 189/12
service [8] 1/14 3/10 3/11 4/18 17/17 19/7 157/10 189/20
services [1] 54/10
serving [1] 163/2
session [1] 89/7
set [34] 3/11 10/8 10/20 12/2 16/3 24/10 24/14 24/16 24/16 24/21 25/7 25/10 26/22 27/19 29/10 33/2 33/24 34/1 34/11 35/21 53/9 56/11 67/23 74/14 74/20 87/20 94/24 97/10 100/17 105/4 131/11 147/15 174/25 177/6
sets [3] 7/8 17/3 136/10
setting [5] 29/22 53/1 53/3 53/6 159/6
settings [2] 32/17 32/23
seven [2] 164/5 173/18
several [9] 29/15 80/19 98/20 112/22 119/14 119/17 164/23 166/25 178/9
severe [1] 82/11
shall [3] 58/6 143/13 160/13
share [2] 31/8 146/1
shared [2] 117/23 145/19
sharing [5] 31/12 31/12 31/15 145/19 146/8
Sheffield [1] 3/4
shielding [1] 144/5
shift [2] 55/16 77/3
shining [1] 188/3
short [11] 34/4 53/2 58/9 78/15 87/4 95/9 110/14 117/11 146/6 154/2 160/20
shorter [1] 142/25
shorthand [1] 77/2
shortly [3] 26/15 74/10 80/5
should [31] 5/11 13/15 21/10 21/21 29/10 30/4 31/1 37/19 39/13 40/2 46/20 50/20 53/24 61/22 62/23 66/24 67/13 102/11 108/14 113/16 115/15 122/19 123/8 125/12 150/15 151/10 154/22 164/10 164/24 165/1 165/6
shouldn't [1] 74/24
show [4] 58/20 105/21 177/7 184/4
showed [5] 104/8 125/23 152/4 179/12 187/2
shows [1] 29/17
shut [1] 176/15
side [1] 114/11
sight [1] 92/20
sign [1] 2/15
signal [2] 118/18 134/18
signature [2] 70/19 161/11
signed [5] 2/9 2/10 70/15 126/23 161/9
significance [2] 35/13 83/14
significant [5] 4/4 14/10 23/2 25/17 164/9
siloed [1] 186/20
similar [6] 90/1 93/4 102/24 112/11 127/18 170/20
similarities [1] 124/4
simple [3] 62/12 84/3 114/2
simply [5] 77/7 80/9 97/4 137/17 185/8
since [5] 11/18 16/13 56/10 70/24 74/22
single [15] 24/11 98/1 98/6 98/10 102/19 128/1 128/12 132/3 139/7 142/5 169/25 177/8 177/16 179/14 185/17
singular [1] 46/16
Sir [2] 143/16 149/2
Sir Patrick Vallance [1] 143/16
sit [3] 1/8 161/3 175/21
sits [1] 6/15
sitting [1] 189/3
situation [18] 10/17 12/5 12/25 14/5 38/4 39/21 41/5 47/5 52/9 56/19 57/3 66/17 66/20 84/5 137/13 143/24 145/16 168/4
situations [2] 9/1 11/5
six [4] 73/5 77/9 118/21 173/18
six meetings [1] 77/9
six months [1] 118/21
skills [2] 54/13 164/18
skins [1] 41/25
slight [3] 46/9 64/14 156/1
slightly [11] 44/18 93/8 98/21 110/18 130/18 132/6 133/2 142/25 166/4 169/13 184/7
slipping [1] 187/1
slow [7] 11/13 56/4 56/16 57/5 133/24 180/19 189/5
slowly [4] 118/23 118/24 125/11 162/12
small [4] 5/22 16/23 56/25 188/8
smaller [2] 6/10 164/14
SMI [1] 81/12
SMI-M-O [1] 81/12
so [403]
social [11] 25/24 25/25 26/10 27/4 27/7 89/13 144/1 144/2 148/16 171/25 179/19
social care [2] 144/2 179/19
social interventions [1] 89/13
societal [4] 111/9 112/16 174/11 177/24
society [7] 12/10 44/6 55/18 114/6 127/2 176/13 176/25
soft [1] 88/22
solely [1] 158/7
solution [1] 62/12
solutions [4] 31/24 187/9 187/9 187/12
solve [3] 91/6 140/21 140/22
solved [2] 115/2 115/4
some [91] 5/5 6/8 6/10 9/3 12/6 12/11 14/23 15/8 17/21 17/23 17/24 19/9 19/13 22/11 23/1 24/12 24/16 25/7 25/10 28/7 30/4 31/23 39/10 39/19 41/25 45/8 49/16 50/18 51/24 52/5 52/15 53/7 54/1 56/5 56/11 56/11 56/21 57/16 57/24 61/7 62/23 65/24 68/13 68/15 70/22 71/18 84/1 84/24 87/20 91/16 92/3 92/8 93/10 93/14 93/16 94/21 95/14 98/25 99/5 101/5 105/13 105/13 112/22 115/22 116/7 116/10 116/25 127/17 129/7 129/13 129/14 130/11 130/12 137/18 140/17 147/13 148/15 153/21 157/8 159/14 160/3 162/2 169/19 170/9 173/7 173/8 175/14 181/9 184/14 184/15 186/24
somebody [8] 1/13 84/6 107/18 132/12 137/6 137/7 145/17 145/19
someone [7] 73/1 98/24 138/1 174/19 182/9 183/11 188/4
Somerset [1] 15/19
something [57] 8/9 15/16 16/1 18/16 30/2 40/4 42/22 50/3 56/20 57/9 59/9 59/19 61/20 62/7 63/2 63/21 64/4 64/9 66/15 67/8 72/2 76/18 77/8 86/17 89/12 90/9 94/2 94/8 96/11 96/12 96/24 97/1 99/25 102/24 103/18 105/12 109/1 112/11 113/24 114/21 115/10 115/11 115/15 115/22 122/12 128/1 131/15 131/20 146/20 147/24 161/24 168/2 175/18 176/5 188/7 188/21 189/2
sometime [1] 23/15
sometimes [4] 11/11 21/25 43/17 53/5
somewhere [3] 85/24 94/11 185/11
soon [4] 117/9 121/5 139/20 165/6
sooner [1] 130/15
sorry [19] 18/23 39/17 40/18 58/13 58/25 75/1 86/1 112/3 116/24 118/9 125/4 125/21 130/17 133/4 152/4 162/13 162/16 180/19 180/20
sort [61] 10/25 18/22 18/25 19/20 21/21 23/6 29/14 29/15 44/12 46/11 50/24 55/17 61/5 63/6 65/12 74/20 79/6 85/23 85/25 86/3 95/9 96/5 97/2 102/17 103/24 106/14 107/16 117/12 119/22 121/1 121/18 122/11 138/6 162/3 162/7 162/9 163/6 164/8 164/17 164/24 165/2 165/19 165/24 166/19 167/4 168/12 171/17 173/7 175/2 175/3 175/22 176/4 176/19 181/1 181/20 182/3 182/5 185/3 186/24 187/13 187/18
sort of [44] 18/22 18/25 19/20 21/21 23/6 29/14 29/15 44/12 46/11 61/5 63/6 74/20 79/6 85/23 85/25 86/3 95/9 96/5 102/17 103/24 119/22 121/1 121/18 122/11 163/6 164/8 164/17 165/2 167/4 168/12 173/7 175/2 175/3 175/22 176/4 176/19 181/1 181/20 182/3

S

sort of... [5] 182/5 185/3 186/24 187/13 187/18
sorts [9] 10/9 11/8 20/24 21/6 60/13 96/1 108/20 145/20 177/4
sought [1] 34/22
sound [3] 157/5 179/20 187/2
sounded [1] 180/9
sounding [1] 145/13
sounds [6] 103/5 103/20 115/7 129/5 175/17 181/16
source [3] 15/2 15/3 27/2
South [1] 139/21
South Korea [1] 139/21
space [4] 39/15 48/7 67/6 67/17
spans [1] 162/5
speak [5] 8/3 8/9 45/9 155/3 189/14
speaking [3] 1/24 156/2 156/4
specialist [1] 22/11
speciality [1] 41/16
specific [5] 89/15 95/11 114/15 153/22 162/2
spectrum [3] 94/14 94/15 177/25
speed [5] 13/25 14/6 14/7 56/2 87/2
spells [1] 124/14
spent [3] 68/13 71/18 72/23
SPI [145] 22/13 22/14 22/22 22/23 22/24 23/3 25/16 25/20 25/21 26/22 27/2 27/10 72/2 72/6 72/6 72/10 72/11 72/16 72/25 73/5 74/11 74/16 74/18 75/12 75/19 76/12 79/12 79/16 79/17 79/18 79/21 79/21 79/24 80/4 80/6 80/6 80/7 80/17 80/17 81/5 82/1 82/4 83/5 83/5 84/23 85/1 85/20 85/25 86/1 86/2 86/9 86/15 86/21 87/7 87/12 87/24 88/6 89/5 89/13 90/4 90/7 91/19 91/25 92/8 95/8 95/13 99/7 100/13 101/16 101/25 103/8 103/11 109/25 110/20 111/2 111/12 114/21 118/15 119/21 120/9 121/20 122/5 122/12 122/16 123/3 123/13 124/13 125/12 125/15 129/5 129/23 131/7 131/8 131/21 133/7 136/6 139/9 139/12 146/18 146/25 146/25 149/11 149/18 149/20 149/22 149/25 150/7 150/12 150/18 151/3 151/5 151/11 152/4 153/11 153/12 154/12 158/2 158/16 159/5 159/12 159/24 162/25 163/13 164/8 166/21 167/11 167/25 168/5 168/9 168/19 168/24 169/8 169/15 169/15 170/7 170/11 170/23 171/11 171/16 171/17 176/15 182/14 183/13 186/16
SPI-B [7] 25/16 25/20 25/21 26/22 27/2 27/10 76/12
SPI-M [44] 22/13 22/14 22/22 22/23 22/24 72/2 72/6 72/11 73/5 74/11 74/16 74/18 75/12 75/19 79/12 79/17 79/21 79/24 80/4 80/6 80/17 83/5 114/21 122/5 122/12 122/16 123/3 123/13 124/13 136/6 139/9 139/12 146/25 149/18 149/20 149/22 149/25 153/11 154/12 159/12 162/25 164/8 169/15 186/16
SPI-M's [1] 150/7
SPI-M-O [89] 23/3 72/6 72/10 72/16 72/25 79/16 79/18 79/21 80/6 80/7 80/17 81/5 82/1 82/4 83/5 84/23 85/1 85/20 85/25 86/1 86/2 86/9 86/15 86/21 87/7 87/12 87/24 88/6 89/5 89/13 90/4 90/7 91/19 91/25 92/8 95/8 99/7 100/13 101/25 103/8 109/25 110/20 111/2 111/12 118/15 120/9 121/20 125/12 125/15 129/5 129/23 131/7 131/8 131/21 133/7 146/18 146/25 149/11 150/12 150/18 151/3 151/5 151/11 152/4 153/12 158/2 158/16 159/5 159/24 163/13 166/21 167/11 167/25 168/5 168/9 168/19 168/19 168/24 169/8 169/15 170/7 170/11 170/23 171/11 171/16 171/17 176/15 182/14 183/13
SPI-M-O's [2] 101/16 119/21
spoke [4] 31/22 80/3 91/1 167/1
spot [1] 88/12
spread [2] 119/22 133/22
spring [1] 163/25
staff [4] 3/24 17/19 17/21 186/19
stage [8] 33/1 47/19 59/15 134/5 142/11 153/9 164/7 178/2
stages [10] 14/14 65/13 115/24 123/24 124/10 125/17 167/17 167/18 180/4 182/25
stand [4] 9/14 74/18 74/19 132/24
standard [1] 175/2
standing [4] 10/14 10/24 56/23 123/13
stands [6] 9/15 22/24 23/3 76/8 76/12 76/17
start [22] 11/1 18/18 21/18 21/22 46/16 51/19 51/21 72/5 78/16 78/18 78/23 90/18 91/7 93/14 94/22 110/23 121/2 143/3 163/21 182/21 184/22 188/25
started [11] 56/11 89/20 91/8 91/17 115/3 118/15 118/16 153/19 180/15 180/17 183/16
starter [2] 10/24 11/5
starting [5] 63/11 102/25 135/21 136/3 185/1
starts [4] 93/19 154/20 169/5 170/17
state [1] 112/24
stated [3] 70/17 117/4 124/21
statement [94] 2/7 2/9 2/10 2/13 2/16 2/22 3/12 7/4 8/10 26/7 26/9 27/22 29/14 30/14 32/14 35/1 36/15 42/9 45/20 50/14 52/24 70/12 70/15 70/16 70/17 70/22 73/20 74/13 79/23 81/22 83/7 84/16 86/17 87/8 89/10 93/12 95/16 97/23 101/4 101/9 102/23 103/24 104/19 105/12 105/22 106/15 107/20 108/7 110/24 110/25 112/3 113/4 115/14 115/18 115/21 123/20 125/1 127/7 130/22 132/17 132/19 132/24 133/1 135/18 136/8 146/25 148/18 156/19 156/24 157/23 157/25 160/16 161/6 161/8 161/9 161/10 161/18 163/18 163/21 164/7 164/22 165/10 168/3 169/24 170/10 170/17 171/6 174/6 177/18 178/25 181/7 183/5 185/24 185/25
statements [13] 2/5 14/3 22/10 45/19 93/12 103/17 112/23 119/12 150/2 150/16 155/13 155/18 156/17
states [2] 112/6 172/23
statistic [2] 102/1 158/17
statistical [15] 30/20 93/22 94/1 95/4 95/4 95/7 95/19 95/20 96/19 97/10 102/2 102/13 102/15 139/25 142/11
statistically [1] 102/6
statistics [1] 52/22
statutory [1] 23/25
stay [4] 130/3 130/18 149/25 151/10
staying [1] 178/24
steered [2] 17/19 26/3
stenographer [4] 1/22 1/23 2/2 162/15
step [7] 47/5 74/10 84/22 106/20 150/12 159/14 176/19
stepped [1] 184/25
steps [1] 119/10
still [16] 44/12 53/20 62/1 64/19 73/25 95/5 95/5 96/12 116/13 118/18 122/8 123/2 123/3 125/5 186/18 187/24
stood [1] 72/10
stop [5] 68/12 122/23 126/2 127/4 144/11
stopped [2] 144/18 144/20
stopping [1] 126/16
stored [1] 188/18
straightforward [1] 114/18
straightforwardly [1] 125/1
strategic [5] 4/21 22/2 22/3 54/17 121/2
strategies [4] 117/8 117/10 129/24 129/25
strategy [21] 5/25 42/23 51/1 51/11 53/10 53/12 111/24 116/16 117/5 117/7 125/19 126/22 127/15 128/7 128/10 128/11 128/12 129/22 139/11 139/16 158/21
stream [1] 105/4
streamer [1] 1/19
streamers [1] 18/1
Street [1] 43/7
strength [2] 69/4 69/10
striking [1] 144/4
strong [4] 63/16 96/3 96/10 96/13
stronger [2] 40/22 52/18
strongest [1] 88/18
structure [6] 11/17 22/5 22/5 68/16 171/16 185/17
structures [9] 5/2 5/6 11/21 42/18 42/24 49/9 57/18 62/25 112/9
struggled [2] 33/12 183/1
struggling [1] 20/23
Stuart [5] 1/5 1/6 1/10 1/11 191/3
Stuart Wainwright [1] 1/10
students [1] 56/7
study [1] 140/7
stuff [1] 60/16
style [1] 87/4
sub [1] 103/2
sub-groups [1] 103/2
subcommittee [2] 85/1 85/4
subcommittees [5] 48/20 63/14 85/9 85/17 89/6
subgroup [20] 23/8 23/16 26/22 26/22 27/16 29/10 29/21 31/25 32/3 32/4 32/4 32/13 33/2 33/9 33/23 34/11 40/10 40/14 89/13 89/20
subgroups [10] 22/6 24/9 24/13 24/23 28/16 33/19 49/10 62/18 63/12 107/7
subject [5] 37/11 89/6 114/15 120/16

S

subject... [1] 130/18
subject-based [1] 89/6
submeetings [1] 92/9
subsequent [4] 26/21 44/16 140/17 183/8
subsequently [3] 125/23 147/17 183/12
substantial [1] 81/16
subtle [1] 66/13
subtleties [2] 181/14 182/5
subtopic [1] 45/17
succeeded [1] 42/21
success [2] 116/15 118/21
successful [1] 145/6
such [11] 6/9 11/22 36/1 50/10 59/13 62/3 63/16 130/2 130/2 162/10 173/2
suddenly [1] 130/10
sufficient [12] 22/3 30/25 55/12 55/15 59/24 60/17 78/19 80/20 115/25 127/12 130/8 180/22
suggest [1] 21/16
suggested [2] 62/13 92/13
suggesting [2] 87/18 152/16
suggestion [2] 29/9 139/3
suggests [1] 106/14
sum [1] 13/9
summarise [3] 26/7 36/17 174/2
summarised [1] 42/9
summary [3] 9/25 78/15 124/13
summer [3] 29/20 52/17 55/25
sun [1] 188/3
support [15] 6/16 6/19 6/25 7/20 9/20 18/23 38/20 39/25 39/25 40/1 48/15 76/16 91/21 121/25 149/7
supported [3] 69/20 120/4 144/15
supporting [5] 16/21 38/19 156/9 156/14 158/3
supports [1] 9/7
suppose [4] 57/13 74/7 114/2 128/10
supposed [4] 4/21 34/3 112/18 169/6
suppressed [2] 140/12 140/13
suppressing [1] 140/14
suppression [7] 125/19 126/16 139/4 139/9 139/15 140/4 141/17
sure [25] 5/16 7/22 37/17 37/25 45/11 51/18 52/11 54/12 59/23 75/16 75/17 86/5 91/20 94/20 105/10 105/20 114/16 124/10 127/1 133/9 144/13 149/6 154/4 168/22 172/17
surge [2] 118/22 139/22
surges [1] 140/10
surprised [1] 41/19
surprising [2] 61/20 74/17
surround [1] 187/11
surveillance [1] 31/5
susceptibility [1] 152/24
suspect [1] 121/12
sustained [1] 139/10
Swansea [1] 91/22
swine [4] 11/23 25/22 163/7 163/11
swine flu [4] 11/23 25/22 163/7 163/11
switch [3] 64/17 75/2 79/21
switched [1] 17/18
sworn [1] 70/5
symptoms [1] 132/10
system [11] 30/3 50/9 60/11 63/2 63/5 63/7 107/17 107/17 185/10 187/24 188/12
systematic [1] 170/1
systems [8] 5/4 8/4 31/6 65/21 144/1 161/20 187/21 187/25

T

table [2] 11/7 137/14
TAG [2] 92/2 166/25
take [39] 12/10 14/4 15/12 18/24 20/25 39/16 47/5 58/3 59/13 70/8 74/10 76/24 81/21 84/8 88/15 88/20 88/20 91/4 95/18 97/5 106/12 106/20 110/17 112/2 118/23 123/11 124/25 125/17 129/8 131/6 131/18 135/10 147/20 159/8 165/11 169/2 170/3 177/16 186/11
taken [6] 41/4 73/3 148/12 151/15 157/10 160/2
takes [3] 109/15 178/3 188/24
taking [7] 137/5 165/5 173/14 173/24 176/19 178/6 182/3
talk [17] 7/25 13/12 28/9 28/13 47/17 84/6 84/13 118/18 121/14 128/23 143/19 152/16 152/17 155/14 164/7 166/2 171/14
talked [5] 35/24 56/18 92/9 117/15 188/1
talking [15] 33/20 68/14 87/11 90/12 101/23 105/25 121/15 132/21 137/4 146/18 153/4 156/17 165/14 171/19 187/6
talks [2] 147/3 168/4
Tam [1] 75/24
tangential [1] 40/8
tap [1] 164/19
task [5] 5/14 7/19 84/6 169/2 188/8
Taskforce [1] 35/8
tasking [4] 87/9 87/15 125/15 129/7
tasks [2] 21/4 21/5
teaching [3] 19/12 19/12 73/13
teachings [1] 45/8
team [4] 16/21 16/24 27/8 27/12
teams [6] 6/8 15/7 64/11 120/10 120/11 188/24
technical [15] 11/9 15/13 15/22 57/17 73/3 85/8 86/23 90/2 100/13 100/15 102/6 104/24 158/3 169/14 169/17
technically [2] 5/23 74/7
Technology [1] 5/24
tell [10] 83/14 88/6 119/23 122/1 135/12 142/19 152/11 161/24 163/22 176/6
telling [3] 78/10 128/11 141/8
tells [1] 78/15
temporal [1] 118/3
temptation [1] 97/21
ten [8] 71/16 85/25 86/1 127/5 141/2 159/25 163/1 186/5
ten lines [1] 186/5
ten minutes [1] 141/2
ten years [3] 71/16 127/5 163/1
ten years' [1] 159/25
tend [1] 33/1
tenor [1] 51/16
tension [1] 150/1
term [21] 12/16 34/4 44/14 53/2 53/6 53/9 53/12 68/7 68/12 94/7 95/22 97/25 99/23 101/5 117/11 117/17 118/3 141/16 143/6 179/3 179/9
terminology [1] 63/11
terms [52] 3/21 4/24 10/11 11/17 15/2 16/15 17/12 18/6 19/1 22/5 35/11 35/24 40/8 43/12 43/15 44/25 46/21 49/9 51/11 54/17 55/5 59/7 59/12 61/21 65/9 75/3 80/23 88/19 88/24 90/17 92/4 92/20 93/25 106/22 107/12 116/21 120/3 120/9 124/19 132/25 140/13 141/15 142/19 153/5 155/20 168/22 171/15 174/5 174/13 174/14 175/7 179/23
terrible [1] 19/22
terribly [1] 169/22
terrorist [1] 4/9
test [1] 41/17
tested [4] 183/8 183/11 183/11 183/15
tests [1] 183/8
text [1] 185/23
than [37] 1/15 10/21 41/25 44/19 56/17 62/23 67/12 73/22 77/7 86/3 86/23 98/20 98/22 106/13 108/8 110/1 115/16 121/23 128/19 128/24 129/17 129/18 131/16 140/12 143/21 144/21 145/1 145/3 150/8 152/19 154/12 158/21 165/5 171/7 178/1 178/18 179/21
thank [56] 1/8 2/18 4/3 11/13 17/8 21/14 22/9 41/10 48/24 53/14 58/2 58/7 58/12 58/24 69/12 69/16 69/23 69/24 70/1 70/8 70/21 72/19 72/20 74/10 76/23 93/7 101/12 111/16 115/19 123/10 123/22 133/16 135/24 137/20 137/23 142/24 146/8 147/20 152/1 152/14 154/1 160/2 160/6 160/8 160/9 160/18 161/3 161/14 167/17 170/3 178/23 185/22 189/6 189/9 189/19 189/20
thank you [44] 1/8 2/18 4/3 11/13 17/8 21/14 41/10 48/24 53/14 58/2 58/7 58/12 69/12 69/16 69/24 70/1 70/8 70/21 74/10 76/23 93/7 111/16 115/19 123/10 123/22 133/16 135/24 137/20 137/23 142/24 147/20 152/1 152/14 154/1 160/8 160/9 161/3 161/14 167/17 170/3 178/23 185/22 189/6 189/20
that [1122]
that's [136] 1/12 1/16 2/10 2/11 2/13 2/17 3/2 3/5 3/14 3/23 4/6 4/11 4/13 4/19 5/20 6/20 7/7 7/17 7/20 8/8 8/9 8/13 8/18 8/22 10/3 10/5 11/20 11/24 12/3 12/15 12/16 12/17 12/22 12/23 14/17 16/9 16/11 18/13 19/8 22/8 22/20 23/9 23/18 23/22 24/8 25/9 26/20 26/25 27/14 27/21 28/24 31/22 32/12 33/17 34/24 35/5 35/10 35/14 35/23 36/7 36/23 37/1 37/9 39/10 43/14 44/13 45/1 45/7 47/4 47/25 49/22 50/2 50/13 50/15 55/7 57/25 60/18 65/2 67/15 70/18 72/15 74/14 75/14 75/22 81/13 82/11 82/15 87/1 93/7 93/9 94/1 96/2 99/5 101/10 101/18 106/7 109/7 109/14 109/21 112/3 114/7 114/8 119/4 122/2 122/25 123/9 125/9 131/25 132/23 134/21 135/10 136/21 136/21 145/8 146/8 150/5 152/5 153/6 157/6 159/20 161/13 162/24 163/16 167/15 167/17 167/23 167/24 168/23 175/1 176/10 182/19 183/15 185/21

T

that's... [3] 186/14 187/16 188/20
that: [1] 114/12
that: we [1] 114/12
their [50] 6/7 6/11 15/7 17/5 17/8 17/10 19/10 19/11 19/11 19/12 24/17 24/18 29/19 40/6 40/15 40/17 41/12 47/17 47/21 48/1 48/6 49/2 51/6 56/12 60/16 65/9 66/24 80/24 83/15 84/6 91/21 92/2 92/10 109/20 110/1 117/24 120/10 121/25 128/5 128/24 151/7 154/9 154/24 157/3 157/4 159/9 164/13 165/17 169/1 176/2
them [80] 5/12 9/8 13/4 15/8 18/5 19/9 19/13 20/8 21/6 21/9 22/25 24/16 24/22 27/10 27/25 29/18 38/20 39/6 39/19 39/19 40/2 40/20 41/17 45/6 45/8 45/9 46/8 46/13 46/15 46/17 47/18 50/12 63/17 67/10 68/17 81/15 86/18 89/10 89/11 91/6 93/24 95/5 95/6 95/13 97/13 97/18 98/12 98/16 103/12 103/12 103/12 103/13 104/15 107/11 116/1 117/24 118/11 118/25 119/19 120/11 121/8 122/2 125/17 128/14 132/10 134/12 140/7 143/1 143/9 147/23 154/23 155/3 159/8 163/19 166/17 167/1 177/10 179/17 182/24 186/1
theme [4] 66/11 90/1 115/21 181/6
themselves [5] 27/11 62/17 90/6 125/15 126/23
then [137] 3/10 3/24 4/12 4/22 5/4 5/25 12/12 13/11 13/12 17/5 17/24 21/9 25/10 31/8 31/9 31/12 37/4 37/7 41/6 43/2 44/16 46/8 46/12 49/11 52/12 52/18 52/22 54/19 55/25 63/24 71/18 72/5 72/10 73/7 74/10 75/23 76/6 76/25 77/20 80/3 80/7 81/12 83/11 84/9 85/2 85/9 85/12 85/13 86/1 86/2 88/14 89/18 90/25 94/23 95/21 96/24 97/21 97/22 100/19 100/20 101/2 101/4 102/5 102/12 103/12 104/23 104/24 105/1 105/6 106/20 108/10 108/18 109/23 112/10 113/15 114/4 114/6 114/8 116/16 117/9 117/18 119/24 120/6 122/24 123/7 129/17 130/1 130/10 132/4 132/6 132/13 134/1 136/6 136/9 138/21 141/17 141/21 142/18 143/17 143/23 144/4 145/19 147/3 147/8 148/12 149/1 149/21 149/23 150/9 151/14 153/14 153/23 154/7 154/25 155/6 156/21 157/11 157/12 157/22 158/10 158/12 162/17 167/21 169/10 169/25 170/19 172/8 173/10 173/17 174/11 176/16 180/17 184/24 185/15 186/1 186/5 188/17
there [208]
there's [33] 9/2 9/3 9/5 10/4 10/23 12/6 15/15 27/4 30/15 33/14 33/15 37/13 46/8 48/11 59/3 66/17 67/3 78/3 90/16 104/25 107/12 117/23 148/6 175/14 176/9 176/11 177/14 178/10 178/11 183/20 187/6 187/10 187/22
therefore [6] 109/16 151/4 151/9 167/25 173/12 180/5
these [46] 9/1 21/6 24/15 29/18 29/22 32/24 40/6 42/9 45/2 45/4 54/10 61/17 65/25 72/23 86/15 87/2 93/18 96/5 99/11 99/15 99/23 100/1 102/12 102/23 105/14 109/3 109/24 126/9 134/6 136/10 137/5 143/3 154/22 155/16 155/17 170/12 171/5 174/5 175/3 178/6 185/7 186/7 186/9 187/9 187/21 187/23
they [158] 6/21 12/10 13/2 13/2 13/6 13/6 13/9 13/11 13/15 14/6 14/22 15/15 18/4 19/11 19/15 20/11 20/14 20/20 20/22 21/7 21/10 21/11 21/22 22/16 24/3 24/17 24/18 30/17 35/17 36/21 38/9 38/23 38/24 38/25 39/5 40/14 41/8 41/19 41/21 41/22 42/6 42/12 42/21 42/23 42/24 43/12 43/20 43/23 44/7 44/15 45/5 45/12 45/12 45/23 46/3 46/11 46/13 46/17 46/19 47/2 47/6 47/7 47/8 47/16 47/24 48/1 53/19 56/10 56/11 56/12 57/5 58/17 58/18 58/19 58/22 61/7 61/7 61/24 65/21 66/21 67/23 67/23 77/19 78/6 84/14 85/20 85/21 85/22 86/7 86/23 86/24 86/24 87/3 87/4 87/5 87/13 88/11 88/14 88/25 91/1 92/8 94/13 94/16 95/5 95/6 96/14 97/12 97/13 97/14 102/5 105/1 105/3 105/4 105/15 113/9 115/10 116/11 117/1 117/18 125/23 126/2 126/24 127/22 128/4 128/16 130/7 131/15 132/13 134/11 139/13 139/19 140/12 140/12 141/10 142/6 142/7 144/14 146/11 147/6 147/7 154/24 156/2 156/10 157/9 159/8 159/16 163/4 165/5 165/16 167/3 167/22 176/1 181/2 183/11 183/19 187/4 187/7 187/8
they'd [3] 62/17 107/1 163/5
they'll [1] 13/2
they're [17] 39/20 41/7 69/20 83/22 84/15 94/12 94/14 97/20 97/21 97/22 99/10 113/9 116/19 137/7 152/21 154/19 156/4
they've [2] 13/10 44/11
thicker [1] 41/25
thin [1] 61/8
thing [17] 39/7 39/8 39/13 69/2 69/6 75/7 90/19 90/20 94/1 94/7 95/9 98/22 102/19 134/21 145/23 168/17 175/13
things [52] 3/19 6/16 6/19 7/3 9/2 9/3 9/4 9/5 10/10 19/8 21/2 25/3 29/22 32/25 40/20 52/2 55/12 62/17 68/22 74/3 74/5 74/7 74/23 83/24 83/25 95/14 96/6 96/14 97/11 100/25 102/15 109/10 113/10 118/10 118/11 119/25 128/8 129/11 136/15 156/6 156/13 159/15 164/25 165/3 165/5 165/20 168/10 176/10 180/24 184/22 187/3 187/23
think [274]
thinking [8] 41/8 53/20 65/11 74/25 84/14 120/17 128/2 178/14
third [6] 33/5 39/3 59/11 66/4 69/6 172/14
Thirdly [1] 60/19
this [261]
those [91] 3/11 5/1 5/8 6/9 6/12 6/13 8/19 10/23 10/25 11/11 12/9 19/15 24/11 24/12 27/9 27/24 30/23 34/15 37/10 37/14 39/9 40/13 40/24 42/25 45/15 49/12 49/18 50/12 50/19 57/22 60/12 63/1 65/1 66/24 69/12 70/14 71/21 74/1 74/7 82/17 82/19 82/23 89/2 92/10 94/5 95/7 95/25 106/10 106/12 107/10 109/3 111/17 111/18 111/21 113/15 114/5 114/10 114/12 114/17 116/23 123/4 123/24 127/18 130/5 130/14 131/13 132/8 132/14 133/8 136/15 141/25 148/3 154/3 158/23 160/4 164/15 164/25 165/3 165/23 169/17 172/19 174/14 177/4 179/10 182/1 182/5 184/10 186/3 189/7 189/11 189/15
though [15] 38/13 55/2 72/13 72/21 98/21 110/4 115/7 121/14 129/6 133/17 133/18 165/21 181/16 187/3 188/8
thought [19] 56/12 57/23 61/25 80/15 80/23 81/1 96/18 104/16 105/13 105/14 116/24 118/8 120/16 121/2 128/16 128/20 128/25 145/23 180/13
thought-through [1] 121/2
thoughts [1] 179/10
thousand [5] 114/1 114/3 114/4 114/5 114/7
thousands [1] 126/10
Threats [1] 23/20
three [22] 25/11 38/12 59/3 60/13 68/20 68/22 74/23 81/14 85/1 95/25 98/4 100/14 102/25 116/12 135/1 138/3 144/9 147/1 156/21 156/23 177/21 179/1
three days [2] 135/1 147/1
three hours [1] 100/14
three weeks [3] 95/25 98/4 144/9
three weeks' [1] 138/3
through [38] 8/5 14/3 25/4 28/4 33/19 34/5 46/18 51/8 51/22 52/17 55/24 57/14 60/15 75/3 75/6 78/24 81/7 86/25 89/11 90/6 103/12 107/14 121/2 121/9 126/12 140/7 150/24 160/3 162/8 162/10 163/6 169/13 175/22 175/23 181/19 183/13 184/13 185/14
throughout [8] 26/17 54/3 58/16 131/4 132/23 132/24 136/21 140/6
thrown [1] 59/12
Thursday [3] 1/1 100/20 100/22
tiers [1] 51/10
time [90] 2/1 2/1 4/5 4/23 6/17 13/11 15/17 16/20 17/5 17/8 17/10 19/9 19/11 22/24 30/6 34/16 36/19 39/4 40/7 41/13 41/13 45/24 48/13 49/15 51/18 52/15 53/7 54/6 56/5 58/4 59/20 60/4 62/21

T

time... [57] 66/2 68/13 68/15 68/21 71/12 71/18 72/9 72/23 73/4 73/10 73/12 73/21 78/6 82/9 95/17 104/2 106/2 109/15 109/18 115/3 116/15 119/11 120/14 121/4 122/24 123/15 128/6 130/8 138/3 141/3 144/19 145/11 147/14 147/19 149/16 151/23 154/24 159/23 159/25 162/14 162/25 163/4 163/10 172/1 172/2 172/17 172/19 175/22 177/16 178/3 180/25 183/7 183/11 185/15 186/12 189/4 189/7
timeframe [1] 124/11
timeframes [1] 109/3
times [18] 11/18 16/11 21/11 39/5 40/18 40/19 54/10 54/24 59/16 62/7 81/14 111/23 112/22 166/25 168/24 171/10 184/17 188/1
timescale [1] 181/3
tiny [1] 69/18
today [7] 2/20 4/24 5/17 19/20 98/3 124/22 188/2
Toddbrook [1] 15/20
together [20] 12/18 12/25 13/5 21/10 25/24 29/6 47/10 48/13 48/16 48/19 51/25 64/21 98/12 98/17 159/9 164/2 164/13 164/14 165/7 166/21
told [9] 7/9 53/19 56/10 72/24 78/2 102/25 111/20 118/20 146/17
tomorrow [1] 189/23
too [12] 19/14 51/4 56/9 62/2 81/3 117/2 119/18 125/11 125/19 155/2 180/9 189/18
took [18] 4/22 25/23 43/5 48/17 68/11 69/7 74/3 74/23 76/25 90/10 93/4 93/5 104/12 105/15 124/3 159/8 164/23 172/21
tool [1] 98/22
tools [1] 162/6
top [11] 2/7 61/16 63/11 76/3 81/13 85/17 138/4 146/6 146/11 173/4 182/10
topic [14] 22/1 34/20 37/10 51/1 59/7 61/15 65/16 65/16 93/8 99/21 100/5 110/18 115/20 182/19
topics [4] 50/25 59/3 142/25 154/2
total [3] 16/24 17/4 139/17
totally [4] 8/25 9/2 10/20 139/19
touch [3] 7/5 24/12 45/19
touched [9] 19/1 33/20 34/21 36/13 56/2 61/17 62/7 63/12 109/11
touches [1] 184/5
tough [1] 12/7
towards [11] 17/20 26/3 94/17 94/23 125/19 158/1 179/5 183/9 184/7 187/8 187/13
Tower [1] 4/10
traction [1] 45/14
traffic [1] 107/16
tram [1] 82/5
transformed [1] 150/9
translate [1] 104/18
transmissible [2] 124/15 124/16
transmission [15] 32/4 32/9 32/13 32/16 32/19 33/9 82/3 94/25 96/3 143/6 143/25 144/2 144/18 144/19 147/3
transparency [4] 37/10 39/12 39/14 150/13
transparent [1] 38/5
transpired [1] 92/16
transport [1] 32/24
transporting [1] 123/14
Treasury [2] 6/21 20/7
treated [1] 115/7
trepidation [1] 93/10
tried [3] 36/7 45/11 171/7
trivial [2] 177/12 187/10
Tropical [1] 71/1
true [7] 70/17 125/25 152/25 161/11 165/16 168/23 183/3
trust [6] 60/10 60/23 60/24 61/9 61/11 185/11
trusts [1] 165/15
truth [8] 2/10 2/16 8/3 8/9 8/18 8/21 70/16 161/10
try [28] 1/21 4/15 13/7 13/9 13/12 14/17 33/17 41/13 44/24 49/8 51/25 52/1 54/14 59/23 64/15 65/11 84/10 97/3 104/6 115/11 121/25 143/14 171/12 174/15 175/4 181/23 181/25 188/11
trying [20] 5/14 21/10 29/18 51/24 74/2 77/3 109/2 109/17 114/25 115/2 116/17 141/2 152/15 152/15 167/3 173/21 174/2 178/18 184/20 188/12
tucked [2] 16/15 22/13
Tuesday [3] 100/10 104/21 169/16
turn [20] 5/18 7/24 10/25 16/2 26/8 32/15 36/15 49/15 49/20 50/6 53/15 54/21 56/1 61/16 63/9 67/4 67/4 138/8 144/10 179/6
turned [5] 81/4 87/3 89/15 125/2 152/25
Turning [1] 2/19
turns [1] 144/24
tweak [1] 14/25
twice [4] 3/23 15/18 86/8 183/15
twin [1] 181/24
two [65] 2/5 3/18 5/4 6/16 6/18 7/25 11/8 15/13 17/3 17/15 20/20 20/25 21/1 22/1 34/12 35/12 37/14 38/1 46/11 46/24 47/2 48/10 49/15 49/18 56/14 59/3 71/22 71/23 72/25 74/23 81/2 81/8 81/10 83/15 85/1 85/3 86/18 89/1 89/3 89/6 90/10 94/11 99/9 100/15 110/23 114/2 116/4 116/4 121/19 125/3 125/7 133/14 135/1 135/1 136/10 136/15 138/3 143/19 151/18 154/2 158/23 164/15 170/18 172/1 172/19
two days [1] 135/1
two months [1] 37/14
two sets [1] 136/10
two years [4] 72/25 81/2 81/8 90/10
two-fold [1] 35/12
two-year [1] 34/12
type [14] 27/3 100/1 101/7 101/18 113/7 114/20 121/1 122/10 162/23 174/19 176/16 177/4 178/6 187/20
types [2] 117/14 178/6
typically [2] 85/23 100/13

U

UK [14] 24/1 28/20 44/12 48/14 78/19 101/16 124/1 125/10 131/9 135/19 136/2 138/14 174/25 186/18
UK hospitals [1] 28/20
UKHSA [8] 123/2 159/20 184/24 185/16 186/19 186/19 187/7 189/2
ultimately [1] 173/12
unable [2] 57/11 57/11
unbalanced [1] 38/22
uncertain [2] 13/4 133/3
uncertainties [1] 181/14
uncertainty [18] 8/19 8/21 8/23 102/17 102/20 103/14 105/7 106/21 106/24 107/1 107/2 107/4 107/6 107/22 108/3 108/7 120/24 128/8
unclear [2] 53/20 54/3
under [9] 33/15 50/24 70/15 83/21 97/11 128/7 129/25 132/8 159/20
under way [1] 33/15
underlying [2] 35/21 184/21
undermined [1] 67/6
undermines [2] 155/9 156/16
underneath [1] 161/9
underpin [1] 184/16
underpinning [1] 69/3
underrepresented [1] 29/12
understand [26] 4/14 6/2 6/3 13/6 22/23 24/24 25/21 26/6 31/14 40/17 52/1 69/18 78/22 97/24 106/11 107/1 118/1 121/24 141/2 142/3 150/15 167/3 176/2 177/22 180/18 187/7
understanding [28] 21/12 23/10 24/6 26/1 26/12 28/3 38/22 41/7 58/22 60/7 66/24 76/19 92/5 93/16 98/7 99/2 106/24 108/2 115/25 116/17 117/13 117/23 136/20 153/16 153/18 157/15 159/15 180/22
understood [12] 52/8 54/13 60/17 60/20 68/10 89/1 107/23 107/25 111/12 118/19 137/4 150/1
undertaken [5] 43/15 43/16 147/11 178/4 189/5
undertaking [1] 178/8
undertook [1] 57/24
underused [1] 112/1
undoubtedly [1] 151/1
unfortunately [1] 92/16
unhelpful [2] 155/7 179/10
unified [2] 185/1 185/17
unit [4] 40/22 52/19 91/4 91/24
United [3] 91/3 116/20 140/25
United Kingdom [1] 140/25
universities [8] 19/10 56/8 164/4 164/5 164/13 164/19 165/12 166/8
university [10] 3/3 3/6 71/18 71/23 91/22 161/16 161/21 164/25 165/22 187/25
unless [2] 15/16 141/16
unlike [1] 163/14
unlikely [1] 107/14
unpack [2] 30/23 82/14
unpacking [1] 30/7
unprecedented [2] 16/20 68/15
unreasonable [1] 124/3
unrelated [1] 147/22
unshakeable [1] 139/8
unstoppable [1] 138/16
until [16] 5/19 30/6 31/20 56/9 72/4 73/9

U

until... [10] 91/11 118/7 131/16 140/14 153/13 180/14 180/21 183/9 183/18 189/25
unusual [3] 15/16 15/20 15/21
unwound [1] 144/14
up [83] 1/20 1/21 10/8 13/9 17/8 17/12 22/7 24/10 24/14 24/16 24/16 24/21 25/7 25/10 26/22 27/20 27/22 29/10 29/22 31/20 33/2 33/24 34/1 34/11 36/18 45/13 49/23 59/12 59/18 60/4 60/8 61/1 66/21 67/23 70/12 70/15 71/12 73/3 73/8 73/18 74/5 74/20 75/10 76/1 100/23 101/3 101/24 106/12 108/19 110/20 112/12 116/18 117/19 118/7 118/24 126/23 127/9 130/24 131/11 139/5 142/17 143/12 146/17 146/24 147/15 147/24 151/17 152/14 158/1 158/13 159/6 159/8 167/14 168/3 168/16 177/6 177/21 179/1 183/9 185/7 185/8 186/5 187/16
update [1] 29/8
updated [1] 29/4
updates [1] 43/2
upon [23] 5/8 7/5 17/16 19/2 22/12 24/12 30/11 32/1 33/20 34/21 36/13 40/9 43/18 44/1 45/19 56/2 59/5 61/18 62/7 63/12 64/7 68/17 77/17
urgent [4] 115/8 147/8 147/10 147/16
us [67] 1/21 1/22 1/24 5/3 7/9 17/7 18/3 19/22 21/23 23/19 38/19 53/19 56/10 57/14 64/19 64/21 65/5 69/21 70/9 70/22 71/12 72/22 72/22 72/24 77/17 77/21 77/22 77/23 78/10 78/15 81/9 83/14 84/8 89/11 91/15 93/3 96/5 102/25 112/21 115/22 116/3 116/18 116/23 118/2 119/13 119/23 123/11 128/11 129/19 141/8 142/19 146/12 148/1 152/12 152/17 155/9 155/15 161/4 161/24 162/20 163/22 165/18 166/11 166/23 175/10 183/4 187/24
usage [1] 68/6
use [14] 3/20 6/14 7/12 12/17 22/12 24/21 39/24 63/10 77/1 94/11 142/12 157/14 173/11 179/3
used [12] 50/21 68/12 97/7 108/4 113/9 124/15 129/2 165/4 172/5 174/6 185/24 188/4
useful [6] 55/1 56/13 107/16 109/1 109/9 117/24
users [1] 186/21
using [7] 13/23 63/5 63/17 64/11 111/7 162/5 168/8
usually [9] 10/23 11/7 11/10 13/9 15/16 46/7 47/5 174/25 175/8
utilise [1] 187/24

V

vaccination [1] 174/19
vaccine [4] 140/14 140/15 174/23 175/23
vaccines [9] 79/3 79/3 113/10 116/10 116/14 122/18 122/19 126/6 175/19
vacuum [1] 57/10
valid [3] 54/5 107/7 107/7
Vallance [13] 6/18 18/21 85/18 86/8 143/11 143/16 143/17 145/13 146/15 146/16 148/25 154/25 155/11
Vallance's [1] 29/13
valuable [1] 149/7
value [6] 29/21 98/9 98/20 116/19 150/25 177/9
value-based [1] 116/19
valued [1] 149/21
valueless [2] 97/22 98/14
values [1] 155/22
Van [1] 75/24
vanguard [3] 40/11 42/4 43/12
variability [1] 102/17
variable [2] 132/12 132/12
variables [1] 136/4
variation [1] 132/2
various [15] 24/3 42/15 89/7 95/14 115/23 119/10 157/25 166/22 171/10 176/25 177/15 178/10 179/10 182/25 183/4
vast [4] 69/17 69/20 158/10 187/18
vehicle [1] 12/21
very [113] 2/6 6/9 8/22 10/16 12/5 12/7 13/23 13/25 14/20 15/11 16/14 16/23 17/14 18/22 19/25 19/25 22/9 29/14 31/9 31/22 39/17 39/19 40/25 44/13 46/21 49/13 50/12 51/21 53/2 53/4 55/8 58/2 58/6 58/24 61/8 64/7 65/19 69/23 73/12 75/11 81/4 83/19 83/22 84/17 85/21 86/7 87/3 89/14 91/10 92/17 93/7 93/14 93/20 97/2 99/25 100/13 100/15 101/12 103/9 104/25 107/7 107/7 107/16 108/6 110/12 114/2 116/23 117/10 119/12 121/2 121/8 122/21 123/16 128/3 131/15 131/22 136/1 141/18 144/24 146/6 146/10 146/11 149/15 151/18 154/10 156/8 157/17 158/13 158/23 160/2 160/6 160/7 164/9 165/16 167/16 167/18 168/4 168/11 168/11 168/13 170/20 177/2 177/6 180/3 180/12 181/21 182/9 187/15 187/15 187/21 188/14 189/9 189/19
via [2] 35/4 127/11
viable [3] 139/11 139/16 140/5
view [31] 8/17 9/8 13/7 30/25 38/5 56/15 57/2 59/5 68/20 100/8 104/12 105/15 106/3 106/7 106/13 106/18 109/8 124/3 127/11 128/6 129/3 134/4 154/10 154/11 154/12 154/14 155/10 165/19 167/6 177/11 188/22
views [13] 14/10 14/10 14/12 14/16 41/23 102/18 103/25 106/5 106/8 108/18 109/18 109/20 155/19
vigorous [2] 88/18 104/22
virologists [1] 24/3
virology [1] 18/12
virtual [1] 162/2
virtually [1] 94/10
virus [6] 23/20 32/22 126/8 140/10 148/24 162/16
viruses [1] 24/5
visible [1] 8/5
vital [1] 189/1
voice [2] 1/20 1/21
volcanos [1] 10/19
volume [1] 16/15
volunteer [2] 68/24 159/18
volunteered [1] 171/7
volunteers [2] 56/25 158/16
vulnerable [2] 28/4 144/6

W

Wainwright [14] 1/5 1/6 1/10 1/11 2/21 58/14 59/2 69/12 69/16 72/3 85/15 87/24 115/22 191/3
Wainwright's [2] 75/12 87/10
waiting [4] 36/17 49/23 129/6 141/9
Wales [7] 74/6 91/24 92/2 92/22 166/12 184/13 184/17
want [55] 5/1 5/3 8/16 17/8 19/19 20/13 40/5 40/8 47/8 49/15 53/25 57/2 57/3 57/3 65/24 67/1 74/11 81/21 82/14 93/8 93/14 95/11 96/18 109/19 110/17 115/20 123/11 125/24 126/5 127/8 130/13 130/18 132/18 133/4 133/14 134/14 137/21 145/9 145/10 146/5 147/21 149/8 149/19 152/2 153/22 163/17 167/9 170/4 172/20 175/11 178/24 179/15 180/13 183/21 186/5
wanted [16] 58/13 94/12 102/21 117/1 118/1 150/20 150/22 151/2 153/18 153/20 157/18 164/17 166/18 169/18 175/4 181/2
wanting [1] 169/24
wants [1] 121/24
Warwick [6] 71/18 71/23 161/16 161/22 165/22 187/19
Warwick University [1] 71/23
was [559]
was the [1] 30/20
wasn't [43] 23/12 30/5 30/8 30/24 33/23 34/11 36/2 36/24 44/21 48/19 55/7 57/9 57/19 77/22 91/11 92/7 103/17 107/17 107/25 111/13 111/20 120/5 120/6 121/15 122/14 126/8 126/17 127/21 131/15 136/16 140/4 141/13 142/10 142/12 142/17 142/22 151/7 153/8 166/17 175/10 180/14 180/21 183/12
watching [2] 87/10 170/8
wave [9] 117/5 125/24 128/1 128/12 129/8 132/3 138/16 138/24 142/5
waves [1] 139/14
way [34] 16/14 33/13 33/15 36/25 41/18 41/18 42/1 50/7 50/21 50/22 59/6 62/15 84/22 96/21 97/3 97/23 99/7 103/6 108/6 108/12 108/15 118/5 118/25 154/15 156/16 160/14 164/15 170/2 175/21 176/8 181/12 182/6 184/11 188/17
ways [13] 19/22 21/1 21/1 48/10 48/11 64/17 157/8 162/2 176/9 176/11 184/8 184/18 184/23
we [566]
we don't [1] 81/9
we'd [10] 11/1 33/13 102/10 131/24 146/19 163/6 164/18 169/13 169/20 169/21
we'll [21] 2/23 13/12 25/13 27/15 42/16 58/24 71/6 72/5 72/25 73/2 82/14 82/16 84/24 85/12 86/14 86/17 95/13 106/20 162/22 178/12 189/4
we're [26] 2/6 9/10 13/3 13/3 32/1 36/17 49/23 59/2 63/22 65/19 82/22 82/22

W

we're... [14] 88/19 97/14 110/4 110/6 120/16 123/4 128/23 138/10 150/23 155/24 156/8 165/4 182/2 184/20
we've [28] 25/6 27/17 29/6 29/7 32/7 49/4 49/8 62/21 62/25 68/13 72/2 74/15 85/15 89/4 99/15 101/4 114/10 123/13 135/22 136/13 141/1 144/9 146/9 157/19 162/14 169/23 178/20 188/1
weakness [1] 106/1
weave [1] 21/10
Wednesday [5] 48/12 99/14 100/9 100/20 169/16
week [21] 2/14 25/13 25/14 31/24 80/8 81/2 85/1 93/17 99/24 100/24 101/18 101/19 101/24 135/21 136/3 136/4 139/12 159/3 159/3 176/22 183/15
week's [1] 187/20
weekend [1] 187/19
weekends [1] 19/16
weekly [1] 81/8
weeks [11] 71/13 95/25 95/25 95/25 96/17 98/4 119/14 131/16 144/9 148/3 185/14
weeks' [1] 138/3
weighs [1] 70/13
weight [1] 127/12
weighted [2] 179/5 179/21
well [105] 7/22 8/19 11/12 13/17 13/20 14/23 18/25 25/16 26/4 26/6 31/4 31/23 41/8 46/14 48/6 48/17 52/8 53/25 55/1 58/6 59/5 65/9 68/19 68/21 69/6 69/11 69/20 72/16 75/11 75/16 75/20 76/11 76/22 80/18 80/19 82/12 84/21 86/22 87/15 88/1 91/6 91/9 94/20 97/20 97/22 99/8 101/22 102/8 102/21 105/2 105/8 105/20 105/21 110/12 111/3 112/16 115/9 116/6 116/20 116/22 118/23 121/3 121/4 122/21 124/10 125/5 125/25 128/20 128/21 131/6 132/17 133/19 134/8 134/11 134/12 134/21 137/3 138/6 141/14 143/13 143/13 145/23 148/19 150/7 150/24 153/19 154/14 156/1 156/2 156/8 160/11 161/22 162/22 164/20 165/8 169/16 169/22 170/11 171/17 176/17 176/23 177/5 177/14 178/5 188/19
well-being [1] 112/16
wellbeing [4] 39/25 111/9 177/24 179/18
Welsh [4] 46/15 73/2 90/2 166/25
went [21] 19/8 25/4 33/19 46/13 51/22 55/3 59/5 64/10 67/22 69/8 85/13 85/22 92/3 103/12 134/23 151/17 168/24 175/9 176/23 179/23 180/4
were [266]
weren't [15] 55/12 78/11 87/21 88/25 103/7 111/19 125/15 141/12 156/2 156/13 157/2 157/20 163/13 163/15 183/18
what [243]
what ifs [1] 94/5
what's [11] 5/23 14/11 21/24 62/12 101/3 148/5 166/6 181/22 181/23 181/23 182/1
whatever [4] 6/21 6/23 21/22 32/24
WhatsApp [2] 154/18 154/19
when [54] 15/18 15/20 18/24 21/9 22/2 23/1 26/17 29/15 33/20 35/17 41/20 45/5 52/13 52/18 53/2 57/2 63/21 68/5 72/10 74/23 75/23 76/21 76/25 85/22 90/10 91/8 95/12 97/24 98/9 101/25 117/18 119/10 119/23 119/24 120/22 121/5 121/22 122/14 126/24 127/25 144/14 146/24 159/5 163/5 163/6 167/3 168/18 169/5 180/15 180/25 182/6 183/19 186/13 188/23
where [32] 14/1 20/14 32/19 32/25 41/5 51/18 55/16 56/5 62/8 62/24 63/7 74/14 81/22 83/23 86/8 99/5 102/8 102/15 105/24 119/6 127/1 130/11 137/14 138/11 153/19 163/21 170/10 173/17 183/21 184/7 186/6 187/14
whereas [3] 156/12 169/18 179/24
whereby [1] 108/25
whether [43] 22/2 30/3 37/13 45/14 52/9 57/6 58/19 65/25 76/15 88/15 89/11 89/20 102/10 103/22 110/21 116/19 116/21 120/24 122/18 123/25 125/10 125/12 130/7 130/20 133/8 134/15 140/12 141/10 141/22 151/11 151/15 152/16 152/23 154/14 155/15 165/21 165/23 175/10 175/12 175/20 176/15 178/11 188/22
which [172] 2/6 2/23 5/2 5/6 5/11 7/8 8/9 9/11 10/4 10/4 14/3 16/12 16/21 22/7 23/3 23/16 24/9 25/13 25/16 30/16 30/25 32/3 34/8 34/21 35/13 35/21 38/6 38/7 38/13 38/14 38/21 40/1 41/3 42/16 42/18 42/19 42/24 43/5 43/7 43/15 43/17 43/18 44/15 45/19 48/12 48/18 49/16 49/17 49/18 49/21 50/3 54/19 54/20 57/10 57/23 57/24 59/7 59/12 61/20 62/7 63/1 63/9 64/4 65/19 66/15 67/2 67/6 67/17 67/19 68/1 68/14 72/2 75/8 79/11 83/22 83/23 85/2 85/12 85/13 86/18 86/19 87/2 90/9 91/15 93/9 93/11 93/13 93/22 93/23 93/24 94/3 94/6 94/7 95/23 96/24 97/2 97/12 97/19 97/21 98/6 101/24 105/22 106/15 108/14 108/15 109/10 109/11 110/9 110/18 111/25 111/25 114/25 116/5 116/12 116/24 117/5 118/22 119/8 119/25 120/14 120/23 122/17 125/20 128/3 129/21 130/11 130/19 130/19 132/15 134/15 136/8 136/11 138/9 138/22 139/1 140/25 143/4 143/6 144/24 145/8 148/1 152/18 153/2 153/15 155/11 156/22 156/22 157/5 157/24 158/20 158/24 159/20 164/20 164/23 170/6 170/17 170/17 171/23 172/1 172/3 175/8 175/21 176/13 180/24 181/24 182/15 184/3 184/4 185/2 185/19 187/17 188/18
whichever [2] 154/12 185/16
while [6] 50/11 50/19 61/24 124/7 181/12 188/3
whilst [5] 3/21 49/23 50/3 97/9 130/24
white [1] 28/21
Whitehall [1] 46/1
Whitty [4] 18/23 18/24 85/17 148/24
who [80] 1/13 1/23 5/1 8/19 17/5 17/7 17/10 17/23 18/3 19/20 27/8 32/1 34/15 37/18 37/20 38/18 39/18 40/6 40/9 40/22 41/12 47/10 48/22 52/7 52/8 54/13 60/16 60/17 60/19 69/19 71/7 73/1 76/16 83/11 88/9 90/12 91/1 91/22 91/23 93/16 104/11 104/15 104/24 106/10 107/9 107/10 108/9 108/22 109/8 109/23 112/17 112/21 121/6 121/12 121/20 131/25 132/4 132/7 134/10 138/1 138/2 147/5 147/12 147/13 154/8 155/16 162/5 164/13 166/3 166/3 166/20 168/24 169/1 171/12 178/1 178/9 181/22 186/23 189/11 189/15
who's [1] 178/8
whole [9] 10/8 40/4 86/2 88/13 98/10 111/25 116/9 133/10 162/19
whom [4] 10/15 69/18 108/1 113/18
whose [2] 104/25 111/15
why [25] 23/21 24/13 28/13 41/8 60/7 75/22 76/20 78/2 102/7 105/2 105/15 106/8 107/25 117/18 120/6 120/12 125/20 126/20 137/1 141/5 141/13 150/19 154/23 156/2 156/4
wide [6] 12/11 24/4 25/24 63/17 169/19 177/24
wide-ranging [1] 169/19
widely [1] 129/1
wider [13] 28/25 44/17 54/16 63/24 64/2 80/18 104/10 110/22 111/11 111/19 111/21 171/25 178/1
widespread [2] 83/2 143/25
will [42] 1/21 5/5 13/8 13/21 14/15 21/2 26/13 33/23 37/20 46/8 48/25 58/20 59/10 60/23 61/9 71/21 72/3 86/5 95/22 98/4 99/20 108/9 120/23 134/19 135/16 138/2 140/20 140/22 140/22 140/24 141/17 145/2 146/9 146/24 148/1 154/4 155/3 166/4 174/15 185/14 185/15 188/14
willing [3] 172/7 175/10 175/12
willingness [6] 68/24 172/5 174/11 174/24 175/8 176/4
winter [2] 43/21 43/24
wisdom [1] 139/1
wish [1] 88/11
wished [1] 111/24
wishes [1] 155/23
withdrew [3] 69/25 160/10 189/22
within [41] 11/9 13/19 14/13 17/6 19/5 27/5 30/3 34/1 38/15 45/6 48/10 53/1 57/4 60/17 62/15 62/25 63/4 76/7 78/19 91/20 97/18 107/2 107/3 107/22 109/3 113/24 118/17 143/6 144/19 145/17 150/21 157/3 162/22 166/21 169/14 171/16 171/17 181/25 183/15 187/7 187/21
without [6] 19/14 41/16 116/14 152/25 169/24 183/20
witness [20] 2/5 2/6 2/13 69/25 70/4 70/22

W

witness... [14] 81/22 94/20 160/5 160/10 160/23 161/6 161/18 163/18 163/20 164/7 170/16 174/6 183/4 189/22
witnesses [1] 21/16
women [1] 177/1
won't [2] 5/11 75/10
wonder [1] 141/10
wonderful [1] 61/7
Woolhouse [10] 106/14 106/17 109/10 111/1 112/12 112/17 125/9 129/15 168/2 169/4
Woolhouse's [4] 105/22 110/24 123/20 170/10
word [5] 8/23 25/17 34/23 60/3 168/9
word, [1] 118/10
word, less [1] 118/10
wordings [1] 94/21
words [4] 90/18 95/16 121/23 163/22
work [58] 16/15 16/18 29/19 33/9 43/15 43/16 44/2 44/14 49/16 53/11 54/25 57/24 68/25 69/21 77/20 78/12 79/5 86/19 87/6 106/22 107/10 114/25 117/2 120/8 122/10 122/11 122/15 122/16 130/7 141/12 141/14 147/16 149/4 157/21 158/10 159/3 159/16 159/16 160/7 161/25 162/18 162/23 164/15 166/24 167/2 168/25 171/12 171/16 171/20 172/2 178/3 178/6 178/7 178/16 188/10 188/15 188/22 189/15
worked [13] 17/23 49/9 62/15 64/15 69/18 84/23 91/25 92/1 102/9 121/20 141/15 171/24 189/11
working [23] 17/1 18/19 19/15 19/24 24/21 32/4 44/18 64/18 73/10 73/11 76/14 79/19 108/7 130/9 131/11 135/21 136/3 147/12 147/15 164/14 166/20 167/6 187/8
workload [2] 19/14 81/17
workplaces [1] 32/23
works [4] 10/5 14/3 157/16 166/12
world [9] 8/25 14/1 14/1 32/16 32/23 127/2 140/11 181/22 182/1
worried [4] 38/13 84/15 90/9 151/22
worry [3] 39/21 70/14 144/15
worse [3] 118/10 118/12 186/10
worst [7] 96/25 98/14 98/21 99/1 136/5 136/12 137/18
worst-case [7] 96/25 98/14 98/21 99/1 136/5 136/12 137/18
worth [4] 50/7 166/23 176/10 177/10
worthy [1] 122/25
would [153] 4/1 10/14 11/5 11/7 14/21 14/25 18/22 18/24 20/14 21/25 24/18 25/4 25/7 27/9 29/23 30/11 31/3 31/25 33/14 34/4 34/17 34/25 36/11 36/21 37/19 38/17 38/22 42/12 43/8 43/12 43/18 44/19 45/5 45/16 46/11 46/12 46/15 46/17 46/19 50/9 52/6 53/15 54/21 56/6 56/13 57/23 57/23 58/21 62/16 63/9 65/14 73/15 75/1 77/9 81/1 81/14 85/23 85/24 86/16 91/2 91/3 95/18 99/15 100/15 100/20 100/21 100/21 100/22 103/24 103/25 104/5 104/18 104/21 104/22 105/1 105/3 105/6 105/7 106/19 108/18 108/19 108/20 109/4 109/19 116/1 116/11 116/14 118/8 118/11 118/20 120/24 121/7 122/22 123/25 125/4 125/5 125/21 125/24 126/1 126/2 126/3 126/12 126/18 127/5 128/4 128/9 128/16 129/1 129/17 130/1 130/4 130/7 130/15 130/20 131/9 132/4 132/10 132/20 133/24 136/9 136/20 137/10 138/15 139/14 139/21 141/12 141/14 141/19 142/6 144/11 149/3 149/6 157/8 157/11 158/2 159/8 159/10 159/17 159/23 166/17 169/1 171/4 172/7 176/5 176/5 177/3 177/13 178/17 181/19 185/8 186/7 188/10 188/23
wouldn't [5] 125/22 153/14 157/12 169/18 179/17
write [2] 108/18 137/5
writers [1] 137/8
writing [3] 12/21 14/11 127/25
written [15] 13/23 13/24 14/6 35/21 78/16 86/24 103/3 103/10 115/9 134/6 134/9 137/6 137/7 137/25 160/15
wrong [15] 58/23 75/14 75/18 88/13 102/7 103/4 103/8 104/1 104/5 104/5 118/10 135/5 135/10 142/8 156/10
wrote [2] 135/4 178/1
Wuhan [1] 139/20

Y

Yard [1] 148/18
Yardley [1] 26/15
yeah [85] 3/9 5/9 5/13 9/13 9/24 12/20 16/6 16/19 18/10 19/4 22/4 25/19 26/14 27/18 29/3 31/19 32/10 32/18 33/6 33/8 33/22 34/10 35/3 36/12 36/20 37/1 37/6 37/12 39/17 41/23 42/8 42/11 42/13 42/17 42/20 43/1 43/6 43/11 43/14 43/22 43/25 45/25 46/23 47/1 54/18 60/6 61/19 63/20 64/6 64/9 71/2 72/15 73/5 85/14 86/23 92/16 95/2 101/1 106/17 113/2 117/7 122/4 123/18 126/4 126/14 126/17 129/11 141/4 141/7 142/15 159/5 161/5 162/16 162/21 162/24 164/5 165/14 171/8 175/21 179/12 181/18 183/3 183/9 188/14 188/20
year [23] 4/9 4/13 31/3 34/12 44/16 72/10 72/14 73/6 77/9 77/13 79/8 101/14 120/20 122/6 159/9 161/12 172/7 174/9 174/16 175/1 180/11 185/20 186/12
years [16] 1/18 3/11 3/17 3/25 14/4 14/5 49/18 71/16 72/25 81/2 81/8 90/10 116/13 127/5 163/1 174/20
years' [1] 159/25
Yep [8] 35/19 70/20 71/17 72/8 77/6 79/7 122/7 161/17
yes [147] 3/17 4/8 7/24 10/11 15/9 16/14 19/24 23/12 23/14 24/9 31/22 32/6 35/17 35/18 39/13 41/21 45/4 48/8 49/25 51/16 59/21 61/5 67/11 68/8 70/10 70/14 70/18 70/19 71/5 71/20 71/25 72/12 72/17 72/19 73/23 73/25 75/16 76/5 76/13 77/10 77/12 78/7 78/9 78/13 79/9 79/13 81/9 81/17 82/21 83/10 83/13 84/16 84/19 85/9 85/11 85/19 86/13 87/5 87/12 88/18 88/23 89/17 89/22 90/8 92/24 93/2 93/7 94/10 95/4 95/19 95/20 95/21 96/2 96/5 96/7 96/18 97/6 97/8 97/16 99/4 100/3 100/3 100/9 100/25 101/6 101/20 102/14 104/14 104/17 105/6 105/17 109/6 111/22 112/2 114/22 114/24 116/4 117/3 119/5 119/9 122/3 123/22 123/23 126/15 127/1 128/13 131/8 131/10 132/24 134/6 135/11 135/22 135/24 137/16 137/19 141/20 142/2 143/8 145/12 147/20 150/7 152/1 153/10 159/2 160/17 161/13 161/23 162/24 163/9 164/1 164/1 164/17 166/10 167/8 168/23 170/18 171/21 171/22 172/4 172/10 174/4 181/5 182/13 183/25 186/14 188/8 189/6
yesterday [2] 27/19 152/15
yet [3] 75/13 96/11 187/16
you [691]
you know [81] 8/25 9/6 21/9 21/19 21/20 21/21 30/14 31/4 31/5 41/24 48/7 53/4 54/7 55/12 59/22 62/20 84/14 85/7 88/20 91/17 97/14 97/19 100/18 105/4 105/9 106/23 107/3 107/4 107/17 113/25 114/8 118/9 118/23 120/10 121/5 121/7 122/13 122/15 122/24 126/10 127/2 127/4 128/3 128/18 129/13 129/20 130/12 131/23 133/2 136/21 140/10 140/17 140/20 142/18 146/20 150/8 150/23 151/1 151/7 151/23 156/6 156/11 157/6 159/10 159/11 159/21 169/1 169/15 169/23 176/12 176/14 177/10 177/13 177/14 180/13 181/21 181/24 183/13 183/21 185/15 188/9
you'd [3] 41/23 134/4 170/1
you'll [6] 14/13 24/10 39/20 108/1 152/6 170/8
you're [33] 1/13 2/22 3/6 41/5 44/16 49/24 58/3 78/10 88/12 98/13 98/18 104/18 109/17 118/1 119/23 120/19 122/10 126/20 128/11 129/10 137/13 141/23 142/3 158/18 158/23 168/8 172/13 173/21 175/10 175/12 181/16 186/2 188/6
you've [43] 2/9 7/8 8/9 14/8 15/13 16/3 19/1 25/6 34/21 37/2 42/9 50/1 57/22 58/3 60/9 67/19 68/16 72/24 74/6 75/11 75/15 76/25 86/10 89/10 89/18 90/1 92/9 92/22 98/2 102/25 107/21 123/15 124/21 124/24 137/24 153/7 161/9 163/17 176/3 176/18 177/18 178/15 185/24
your [160] 1/9 1/20 2/2 2/3 2/19 2/20 2/21 2/24 2/24 3/12 4/24 7/4 7/18 8/10 19/23 22/10 22/10 26/7 26/9

Y

your... [141] 27/2 27/22 30/25 31/25 32/14 34/7 34/16 34/23 35/1 36/15 40/9 41/5 42/9 45/2 45/19 45/20 47/20 49/19 50/1 50/3 50/14 52/4 54/20 55/2 56/15 57/4 57/4 59/3 59/4 59/5 59/23 60/7 61/1 63/10 63/13 64/1 66/2 67/2 67/2 67/20 68/20 69/22 70/9 70/22 70/23 71/6 72/23 73/4 73/12 73/20 74/13 76/14 77/25 78/4 79/22 81/22 83/7 84/16 86/11 87/8 89/10 90/1 92/18 93/9 93/12 93/12 93/16 93/18 94/20 95/15 95/16 97/23 100/2 102/23 104/11 106/11 107/20 108/10 108/18 111/19 111/20 112/2 113/3 115/14 115/21 118/23 123/13 124/21 125/1 127/7 129/3 130/10 130/17 130/22 135/17 136/7 136/24 141/11 142/13 143/4 143/16 146/1 146/25 150/4 151/11 153/11 153/16 154/4 157/19 157/22 157/25 159/15 160/8 161/4 161/11 161/18 163/18 163/20 163/22 164/7 164/22 165/10 166/14 170/16 171/2 171/2 171/6 171/15 172/2 174/6 176/7 177/18 178/25 181/7 181/25 183/2 185/24 188/24 189/13 189/16 189/17
yourself [1] 159/3

Z

Zeeman [1] 161/20
Zeeman Institute [1] 161/20
zero [1] 6/23
Zoom [1] 64/11