INSTITUTE FOR GOVERNMENT

Science advice in a crisis

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Previous governments adapted these structures in response to past crises, including the outbreak of bovine spongiform encephalopathy (BSE, or 'mad cow disease') in the 1990s, the foot and mouth disease (FMD) outbreak in 2001 and the H1N1 'swine flu' pandemic in 2009. Each of these crises, though much smaller in scale than the current one posed by the Covid-19 coronavirus, demonstrated the difficulty of using scientific advice well in an emergency.

But many of the problems identified by inquiries into those crises have returned: the blurring of policy decisions and expert advice; the need for politicians to interrogate advice, and for advisers to understand the policies they are informing; the risks of relying on uncertain modelling and of 'groupthink'; and a lack of transparency in explaining how evidence and advice are used.

The difficulties faced by decision makers during the coronavirus pandemic have been far greater than in any recent crisis. Ministers have had to make unprecedented interventions in people's lives and faced extraordinarily difficult trade-offs. They have done this while operating under huge uncertainty.

No system would have been flawless in responding to such an emergency. It is easy to criticise decisions with the benefit of hindsight, while decision makers (and those advising them) had to respond very fast. Nevertheless, our research has identified some clear problems: while there are improvements those providing scientific advice should reflect on, the biggest concerns are the way the government used this advice and the way it communicated it.

How science advice was used by decision makers

In the initial months, ministers put too much weight on SAGE – relying on it to fill the gap in government strategy and decision making that it was not its role to fill. At times the prime minister and ministers waited until the scientific evidence was overwhelming rather than using it alongside other inputs to make their own judgements. This was captured in the government's rhetoric, which wrongly suggested that science could simply be "followed" – and appears to have been a big factor behind the costly delay to the first lockdown. The reluctance to make judgements on a precautionary basis was also visible elsewhere, such as the delayed mandating of the use of face masks.

Decision making at the centre of government was too often chaotic and ministers failed to clearly communicate their priorities to science advisers. This was most acute in the initial months but a lack of clarity about objectives persisted through the release of the first lockdown to recent decisions over the second lockdown and regional tiers. At times the process of commissioning advice – COBR* asking questions for SAGE to answer – did not work well, with advisers' ability to provide useful answers hampered by poorly formulated questions (though this improved as the crisis went on).

* COBR, which stands for the Cabinet Office Briefing Rooms, is the meeting of ministers and officials that provides high-level co-ordination and decision making in national emergencies. See: www.instituteforgovernment.org.uk/explainers/cobr-cobra

The work of departments was at times fragmented, most damagingly during the lifting of the first lockdown between May and August. An example was the Treasury designing policies – such as the Eat Out to Help Out scheme – without consulting the government's leading epidemiologists. Reports have since found the scheme was associated with increases in transmission of coronavirus.

How science advice has been provided, and the role of SAGE

Scientific advisers have broadly responded well to the pressures they have faced. Sir Patrick Vallance, the government chief scientific adviser (GCSA), and Chris Whitty, the chief medical officer (CMO) for England, adapted SAGE, which they co-chair, in response to the scale of the crisis. Often its interventions have proved critical.

But the crisis also threw up some issues with the way advice is generated, several stemming from the fact that, as an ad hoc group, SAGE was not designed to take on such a prolonged role. It has now met more than 70 times; in most previous crises it has met on no more than five occasions. Typically, after the initial weeks of a crisis, the lead department and agencies take over for the ongoing response. In a public health crisis, this would be the Department of Health and Public Health England (PHE) (and the public health agencies in the devolved governments). But this did not happen. Instead, No.10 opted to retain greater control at the centre and keep SAGE running even after COBR stopped meeting.

SAGE and its secretariat have coped with a punishing workload. In late summer, some of its external members were still working pro bono and said they lacked pastoral support and clarity about their roles. As in past crises, scientists have been put under sustained, and unfamiliar, media scrutiny. Extra support has been put in place in recent months, but more should now be done to better equip SAGE for future crises.

Scientific advisers have struggled to access data essential to their modelling, including health data, in part because government departments and public agencies were unwilling to share it, and had concerns over the legality of sharing data with external organisations. This was most difficult early in the crisis but has continued. The creation of the Joint Biosecurity Centre (JBC) in May, with additional analytical resources and access to data, helped. But these problems reflect deeper issues with data access and sharing in government.*

Vallance and Whitty have managed a difficult balancing act. They have publicly made clear where their advice suggested stronger action was needed, while also maintaining a close relationship with the prime minister and other ministers. Some interviewees questioned whether they and other SAGE members been forced to "self-censor" their private advice to ministers, based on what they thought ministers' would support. This has come up in past crises and will no doubt feature in the public inquiry into the government's handling of coronavirus. But accusations that Vallance and Whitty have been "captured" are wide of the mark.

* While there have been some improvements, data sharing between organisations remains patchy. There is a lack of clear responsibility for improvement: the post of chief data officer has been vacant for four years. The Institute for Government set out how to improve the use of data in policy making in a previous report, www.instituteforgovernment.org.uk/publications/policy-making-digital-world

The GCSA and CMO should reflect, however, on the criticism that there could have been more challenge built into the scientific advice process. While they clearly thought hard about how to do this, scientists inside and outside government argued that SAGE has still been dominated by too narrow a group of medical scientists and modellers at the expense of others such as external public health experts. The same criticism was made after the swine flu crisis.

Transparency and communication of science advice

The communication of scientific advice and evidence is crucial in a public health crisis. Compliance relies on the public trusting the government's overall handling of the crisis, understanding specific measures they are supposed to follow and having confidence in the rationale for them. But here the government has fallen short.

A lack of transparency about SAGE's membership and advice in the first four months created suspicion about the government's approach that it has struggled to shake off, even after much greater publication and openness. Lack of access to evidence also undermined the implementation of specific policies: for instance, making it harder for parents and teachers to have confidence in the government's plan to reopen schools.

In May, SAGE published a backlog of minutes from its first 34 meetings and it has published minutes fairly regularly since. This is welcome and has raised the quality of public debate. But the prominence of SAGE evidence without clear discussion of the other evidence (such as economic advice) has created a perception of conflict between ministers and scientific advice: for example, over the timing of a second lockdown.

The government's communication of the risk around key activities has also often been confusing. Ministers have switched back and forth between alarm and reassurance, while failing to drive home key messages, such as the risk of gathering in indoor and poorly ventilated settings.

Trust in the government's handling of the crisis – and its authority in communicating rules – was also harmed by its response to the scandal over Dominic Cummings, the prime minister's chief adviser at the time, who broke lockdown rules by taking a trip in April from London to Barnard Castle in the north-east of England. That damage was ultimately a matter of political judgement and leadership. But scientific advisers arguably should have been more consistent in distancing themselves from the breach of rules in order to preserve the consistency of public health messaging.

The government has also frequently released details about major changes such as national lockdowns through off-the-record briefings, creating uncertainty and adding to public anxiety. At times there has been a lack of clarity about who was responsible for communicating the overall strategy.

2. How science advice has been used in decision making

The value of science advice in a crisis depends on the quality of the decision making it informs. Ministers and officials need to balance scientific advice alongside other inputs, ask the right questions and understand how to interrogate advice received. In turn, science advisers need to understand ministerial priorities to make their advice relevant and useful. This dynamic has not always been achieved in the current crisis.

Ministers' insistence that they were "following the science" was inaccurate and damaging

In the early months of the crisis, the prime minister and other cabinet members regularly said they were "following" or "led by the science". The phrase was offered so frequently in daily briefings and media interviews that it became a mantra. It may have been an attempt to give greater authority to public health measures. But the phrase was inaccurate – and in fact damaging – because it implied a role that scientific advice could and should not play.

The phrase blurred the line between the scientific advice and policy decisions. Politicians make judgements by weighing up a range of factors – the social, economic and other impacts of a proposal; operational considerations; their values and political programme; and the attitudes of their parliamentary party, the media and the public.[1] Scientific advisers cannot make policy judgements for politicians to simply "follow".

The difference between being *led* by and *informed* by the science may seem subtle, but it is important. It is also not new. Ministers should have appreciated the distinction given the UK's experience of previous crises: the BSE inquiry noted that "the attraction" for ministers of obscuring the distinction between scientific advice and policy choices was harmful.[2]

Politicians outside Westminster took a different approach. Nicola Sturgeon, first minister of Scotland, said that science advice "informs our decisions" while stressing "the uncertainties and complexities of the decisions ahead".[3] Angela Merkel, the German chancellor, said that information from scientific experts informed decisions made by the authorities.[4] Jacinda Ardern, the prime minister of New Zealand, explained her decision to lock down as a choice made by the cabinet, drawing on medical data and modelling.[5]

The UK government's decision to frame science advice the way it did undercut both the importance of ministerial judgement and the accountability of ministers for those decisions. It also undermined the protective space in which scientists advising the government could operate. It made it difficult to explain occasions UK ministers came to different decisions from those in the devolved administrations and other countries.

And it made it harder for scientific advisers, pressed at daily briefings, to clearly set out their expert view of the evidence. Their appearances alongside politicians made them appear accountable for policy choices. Many scientists, including members of the Scientific Advisory Group for Emergencies (SAGE), went as far as to say they felt they were being set up as scapegoats, with politicians "hiding behind a cloak of science".

The specific phrase "*the* science" also implied there was a single, fixed scientific view of the pandemic. But this was a crisis caused by a novel pathogen, about which scientists had, for many months, limited understanding. In many areas – the extent of asymptomatic transmission, the efficacy of face masks – scientific understanding was uncertain and changed rapidly. And, as one interviewee said, it misrepresented the nature of science: far from establishing one unchanging truth, acknowledging uncertainty is "at the heart of what it means to be scientific".

UK ministers eventually began to drop the phrase in May and June. But by then the line had already been blurred – and would remain so. As well as obscuring the role of ministers, it also created a perception of SAGE that was at odds with what the body was designed to do. This planted the seed for tensions between science and other forms of advice that have affected subsequent decisions as the crisis has progressed.

Ministers' lack of clarity about strategy delayed decisions and made it harder for scientific advisers to provide useful advice

The use of scientific advice throughout the crisis has been undermined by major problems in how the government made decisions.

One SAGE member described a "void of decision making" at the centre. In the early stages of the crisis, the prime minister missed several key COBR meetings. While COBR meetings are often chaired by other ministers, Boris Johnson's absences raised legitimate questions about whether the prime minister was sufficiently alert to the scale of the threat.[6] Less than three weeks later, he and several senior ministers and advisers fell ill with the virus. But even after a recovered Johnson took greater charge, a lack of clarity over decision making continued.

The government shifted between several different forums of decision making: first COBR, then a smaller C-19 group centred around the prime minister and key ministers, then two cabinet sub-committees dealing with strategy and operations respectively. There may have been good reasons why the models needed to change as the crisis developed, but the shifts made decision making opaque and confusing for senior officials working in government, let alone external advisers working on SAGE. There was also a divide between No.10 and the Cabinet Office, which added to the chaotic

nature of decision making at the centre. At times it was very unclear, outside the inner circle, just who would be involved, how decisions were taken and on what basis.

Delaying the decision to lock down in March laid bare these problems – and led to tragic consequences. An Institute for Government report that examined that decision found that "science was seen as a source of 'answers' to the questions with which the government was grappling, rather than an input into wider policy discussions".

Scientific advisers, including Whitty and Vallance, have argued that politicians implemented SAGE's advice on the first lockdown in reasonable time.[7,*] However, at the root of the issue is not timing per se but how government uses advice. In countries that locked down faster – and suffered proportionately fewer fatalities than the UK – politicians often made a judgement or decision on a *precautionary* basis. In the UK, ministers were unwilling to take action until scientists thought the evidence was "overwhelming".[8] Waiting for evidence to cross that bar proved costly. With the benefit of hindsight, and evidence they did not have at the time, several SAGE members have conceded that with cases in mid-March doubling every three to four days, many lives would have been saved if the UK should have locked down just a week earlier.[9,**]

There was ongoing confusion in the scientific community over the government's objectives. The basic strategy – suppression of the virus – was known. But beyond that, we were told, scientists asked to advise the government often had little idea of what politicians' objectives were and what actions they were prepared to consider taking to achieve them, or over what timeframe. This persisted after the first lockdown. On 11 May, the government published *Our Plan to Rebuild*, its strategy for exiting the lockdown,[10] but as our colleague Gemma Tetlow argued, this left glaring questions about the government's objectives and reasoning unanswered, including how it would balance different trade-offs and what informed its plans for phasing out restrictions.[11,***]

SAGE members told us that in the autumn they were still unclear about the government's thinking, despite the new Covid cabinet committees having been created in June with the aim of clarifying decision making. One interviewee described the conversation between ministers and SAGE as circular: "Ministers said: 'What should we do?' and scientists said: 'Well, what do you want to achieve?'" Some back and forth is necessary to refine questions, but scientists said ministers' objectives remained unclear throughout the crisis.

This had a lasting effect on how effectively science advice was used. One SAGE member described it as the biggest obstacle he had faced in advising the government.

* Two days after lockdown, Vallance said: "I think the government has listened to SAGE's advice very carefully and followed it." Whitty agreed that ministers followed SAGE advice "with a delay of no more than you would reasonably expect".

** Neil Ferguson, an Imperial College modeller and member of SAGE, told MPs: "Had we introduced lockdown a week earlier we'd have reduced the final death toll by at least half." Others have argued that a policy of "shielding" would have caused less harm but it is highly doubtful whether such a policy would have worked.

*** It also failed to explain the reasoning or evidence behind specific measures, such as encouraging people to travel to their workplace if it was open but keeping schools closed.

The lack of strategy meant the government struggled to commission advice effectively

There were also problems with how ministers and officials commissioned science advice. SAGE is meant to be a "crisp mechanism for filtering and answering questions", one scientist told us. But particularly in the initial months of the crisis, the questions that came to it were often poorly formulated. With limited understanding of ministers' thinking, scientists often struggled to answer them. This undermined the ability of scientific expertise to feed into political decisions.

A SAGE member, with experience of playing a leading role in past crises, explained how commissioning (the process by which policy makers request scientific advice) should work. The COBR secretariat should work with ministers and departments to refine a question – "how toxic is Novichok?" in the case of the Salisbury poisoning – on which scientists can assess evidence and agree a consensus view. An official explained that to be a good "policy customer", departments needed to give SAGE "clarity on what they're trying to achieve".

But officials and SAGE members said that the questions submitted to it during the earlier stages of the coronavirus crisis, particularly in March and April, were not always well phrased and objectives were often unclear. Ministerial discussions and policy decisions were described as a "black box", and scientists we spoke to said they had little clarity about how their advice was used.

The government failed to consult with SAGE on the potential impact of some key policies it was contemplating. Theresa Marteau, a member of SPI-B, the SAGE sub-group for behavioural advice, cited the example of the government's advice on self-isolation for those suspected of being infected.[12] She said that had they been consulted, behavioural scientists on SPI-B would have advised that the level of financial support was too low to encourage adherence, and that the use of fines could discourage people from engaging with the track and trace system. This may show the benefit of hindsight – but has proved the case.

The government was also slow to seek advice from SAGE on issues where it was evident some time in advance that difficult policy decisions would have to be made. It should have been clear from March, for example, that managing the return of students to universities in the new academic year would be a challenge. But SAGE was not commissioned to look at this until it was almost too late to inform policy. Members told us that, since they were not asked for advice on some key issues, they started to set some of their own research questions based on what they thought would be useful to policy makers.

The closures of schools, ultimately announced on 18 March, was a prime example of where it was difficult for SAGE to provide useful advice and modelling without a sense of what ministers wanted to prioritise and what options they would consider – who would be sent home, for how long and so on. Even when it came to schools reopening in June, communication between SAGE and the Department for Education (DfE) was

Integrating large volumes of evidence to formulate advice quickly in a crisis is always difficult. However, sub-committees play an important role in giving SAGE depth and analytical capacity: there is a strong case in such a broad-based crisis for using them to ensure a wide range of disciplines are contributing to advice.

SAGE discussions would have benefited from greater challenge to its thinking

A major criticism of SAGE levelled by MPs and external scientists has been that it lacked sufficient internal challenge. Vallance appointed a range of internal and external experts to the committee, with an average of around 30 experts attending most meetings from mid-March (and often a large number of observers on top of that). The Government Office for Science launched wider initiatives to incorporate a range of expertise and challenge. However, some interviewees argued the actual discussion was still largely dominated by a small core group of medical scientists and modellers, and several members felt it had too few "dissenting voices" from other disciplines, particularly external public health experts, to scrutinise its thinking.

SAGE's lack of external expertise in public health arguably impeded it in understanding and articulating to ministers how local public health systems respond to epidemics. Anthony Costello, a former director of maternal, child and adolescent health at the World Health Organization, said that while implementation was not SAGE's responsibility, it needed to better understand the implications of what it was recommending on the ground.[3]

Others have argued that SAGE did not take as broad a view of the impacts of restrictions on population health and wellbeing as it might have.[4] UK public health academics were involved in expert advisory committees in other countries, such as Ireland, while the expert committee advising US president-elect Joe Biden's transition team features prominent public health experts.[5]

PHE officials regularly attended and contributed to SAGE, but interviewees did not feel that they (or other public health experts) were prominent in the discussions, compared with the core group of epidemiologists and modellers. Several argued that it would have been valuable to also have external public health experts – in the same way government had other scientists from outside – to bring additional experience and expertise, and an ability to provide challenge.

Not everyone agreed about the need for more public health expertise, however, with some arguing SAGE should stick to "pure science". A senior academic felt appointing public health experts or social scientists to SAGE risked "moving into policy and operations". It is true that SAGE cannot (and should not attempt to) cover everything. Different strands of expertise need to be integrated at the higher level of policy formation, as we have argued in relation to economics. But particularly given SAGE's prolonged role in the response to such a wide-ranging crisis, in our view broader public health expertise would have been helpful.