



Open science communication: The first year of the UK's Independent Scientific Advisory Group for Emergencies



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ABSTRACT

The COVID-19 pandemic has shone a light on the complex relationship between science and policy. Policymakers have had to make decisions at speed in conditions of uncertainty, implementing policies that have had profound consequences for people's lives. Yet this process has sometimes been characterised by fragmentation, opacity and a disconnect between evidence and policy. In the United Kingdom, concerns about the secrecy that initially surrounded this process led to the creation of Independent SAGE, an unofficial group of scientists from different disciplines that came together to ask policy-relevant questions, review the evolving evidence, and make evidence-based recommendations. The group took a public health approach with a population perspective, worked in a holistic transdisciplinary way, and were committed to public engagement. In this paper, we review the lessons learned during its first year. These include the importance of learning from local expertise, the value of learning from other countries, the role of civil society as a critical friend to government, finding appropriate relationships between science and policy, and recognising the necessity of viewing issues through an equity lens.

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Introduction

On 12th March 2020, the British Prime Minister convened the first of what became daily televised briefings on COVID-19 [1]. Over the following weeks, ministers and advisors repeated the

mantra that they were ‘following the science’, and that it was ‘the science’ that led them to ‘taking the right steps at the right time.’

But what was ‘the science’? No one then knew. A scientific committee was advising the British Government – the Scientific Advisory Group on Emergencies (SAGE), itself informed by several subgroups, including ones on modelling, behavioural science, and emerging viruses – but the Government refused to publish any papers, minutes of meetings, or even the names of participants. ‘The science’ was, essentially, a secret [2]. When challenged, the Government’s Chief Scientific Adviser, Sir Patrick Vallance, who we now know had long favoured publication, said that SAGE minutes and membership would be made public – but only when the pandemic was over [3]. The situation was compounded when it was reported on 24th April 2020 that the Prime Minister’s chief political advisor, Dominic Cummings, had been attending the still-secret SAGE meetings [4]. This caught the attention of the former Chief Scientific Adviser to the UK Government, Sir David King, who had first-hand experience of convening scientists, advising ministers, and communicating to the public during the foot and mouth disease crisis in 2001 [5]. Working with “The Citizens”, a non-profit investigative journalism organisation, he proposed a new body, outside government, that could act as a transparent source of scientific advice. This became Independent SAGE.

Independent SAGE has been a fairly stable group of 12–14 UK expert scientists and professionals (and a behavioural sub-group of eight behavioural scientists and anthropologists) across a range of academic disciplines and speciality areas, many internationally renowned and all committed to engaging public, press and policy-makers in understanding science and its implications for policy and practice. Guests join sessions according to the topic. Independent SAGE’s first purpose was to compensate for specific weaknesses in the official mechanisms for communicating science to the public during the pandemic, weaknesses also identified much later by a joint report from two Parliamentary committees [6].

From the outset, Independent SAGE’s approach was envisaged as a two-way process involving a high degree of public engagement. Although it would cover some of the same issues examined by SAGE, it differed in that the former could only respond to questions put to it by the Government. Neither SAGE nor its subgroups could propose questions or make recommendations on their own initiative. These questions set by Government were often quite specific, and SAGE maintained a strict separation between “science” and operational considerations or policy. Yet, it was apparent that many other questions were being asked by key stakeholders and the public that were not being addressed through this mechanism. This required something different. But what?

The pandemic has created exceptional challenges, and led to policy decisions that have had profound implications for day to day lives across the world. Decisions were being made in a world awash with information, some from sources that were reliable, some that were mistaken, and some that were intentionally false. And they were being made by politicians who did not always inspire public trust. The exceptional nature of these conditions meant that there was no obvious model that could be copied. However, an extensive body of literature on the science-policy interface could be drawn on, reviewed below.

At the time of writing, the pandemic is not over, and, even when it is, there will be other crises, most notably the looming climate crisis. For this reason, we offer an account of the issues that confronted Independent SAGE during the first year of the pandemic and how we addressed them.

Methods

This paper is an account of Independent SAGE, initiated when the group was reaching its first anniversary. It responded to a per-

ceived need to learn lessons, both as a process of self-examination and in response to inquiries received from other groups seeking to emulate its activities.

It has two main elements. The first is a narrative review of debates on the complex relationship between science and policy. This began informally when Independent SAGE was created and was developed further as we refined our working model. The second is a series of issues that arose during our work. These were selected following an initial summary of minutes of meetings and recorded presentations (also used to create a detailed timeline developed simultaneously and subsequently regularly updated) that placed advice by Independent SAGE in the context of contemporaneous developments, including official evidence to the government from SAGE and other bodies [7]. This initial draft was discussed to resolve any differences in how particular events were recalled by those present, and key themes were extracted by discussion. It was then elaborated further through email and online discussions with all authors. In this process, authors continually reviewed relevant literature on science communication and policy that could inform the process of lesson learning. Finally, the insights and information assemblies were brought together in a final draft by one author and revised and agreed upon by all authors.

Results and discussion

Working methods

Members met online for 90 min every Thursday evening. We discussed the emerging evidence on different aspects of the pandemic and held internal seminars that updated the group on topics such as COVID diagnostics, population immunity, and modelling. Discussions from the Behavioural Subgroup, which met every Tuesday evening, were summarised and fed back to the Thursday evening meetings.

Initially, Independent SAGE’s work focused on preparing reports on topical issues. We agreed on the subjects and timings of these reports by consensus. These decisions reflected contemporary events, such as the beginning of school terms, government policy announcements, or increases in transmission rates. They also reflected concerns brought to our attention by key stakeholders, such as trade unions, civil society groups (including those representing patients who have had COVID), health workers, local government officials and members of Parliament. These reports were often written with those directly impacted by the issue in question. Collaborators were identified by Independent SAGE members, reflecting approaches made to us or our knowledge of those who had written or spoken on the issue in question. Examples include Universities UK and the National Union of Students on university reports; educational leaders, the National Education Union, and individual teachers and pupils on a schools’ report; city mayors contributing to the Find, Test, Trace, Isolate and Support reports, and the British Society of Occupational Health and the Trade Union Congress commenting on a safe return to the workplace report. These sought to draw together science, policy, and practice.

On 23rd June 2020, the Government stopped its daily COVID press conferences (although it has subsequently revived them for specific briefings during crises or when policies are changing significantly). This created a vacuum of reliable information, and so from Friday 26th June 2020 to the time of writing (January 2022), Independent SAGE held weekly public briefings streamed live via YouTube, with up to 20, 000 viewers [8] and Twitter, with 172 K followers to date [8]. These now provide a unique resource for understanding the history of the UK pandemic. This time was chosen to allow for analysis of the weekly releases of government data, which usually took place earlier that day. These briefings comprised an overview of the latest data on the course of the pan-

demic in the UK, collating and synthesising information from multiple sources, and accompanied by a commentary on what they may mean. These data were prepared at short notice each week following the daily release of the latest COVID data. The precise combination depends on the current context (e.g., Public Health England changing its definition of COVID deaths, changes in testing policy, emerging new variants), and the most important stories deriving from the latest infection data (e.g. rising cases, regional hotspots, school outbreaks). This was often followed by a topical presentation launching one of the reports, or addressed by guest experts speaking on issues ranging from personal experience related to COVID, development of innovative responses, policy or technical subjects. Examples include vaccine safety, international vaccine policy, vaccine hesitancy, new variants, applying behavioural science to reducing risk, Long COVID, mental health, and the pandemic's impact on women. The second half of each briefing comprised questions from journalists, members of the public and their representatives (e.g., mayors and Members of Parliament), and representatives of trade unions and civil society organisations. This is curated by The Citizens and solicited through Twitter in the days leading up to the presentation and through a press advisory release highlighting what topics Independent SAGE would be covering. The slides from each briefing were made publicly available on the Independent SAGE website [9] and the streamed events remain available on the Independent SAGE YouTube channel (<https://www.youtube.com/channel/UCqqwC56XTP8F9zeEUCottPQ>).

What goal were we pursuing?

In developing its approach, Independent SAGE had to address a series of questions about how it might operate, each drawing on distinct bodies of literature. The first was what we considered would be the desirable outcome of policies to tackle the pandemic. This is often presented as a dichotomy between controlling transmission of the virus and safeguarding the economy. Yet the historical evidence, especially from the 1918 influenza pandemic, suggested that those places that did most to suppress the disease also did best economically in the long term [10]. However, the measures that would be most effective in interrupting transmission involved restrictions on mixing. This would have many other adverse consequences for some people, especially those already disadvantaged who were less able to work from home or access education remotely [11]. Further, these groups were at greatest risk from the direct effects of COVID-19, measured in terms of illness and death. In other words, while a policy based on minimal restrictions would minimise the indirect impact on them, in terms of employment and education, it increased the risk to their health. In contrast, the most advantaged groups would be able to make choices about their behaviour, including getting others less fortunate to perform essential but risky tasks for them, thereby enjoying relative protection whichever course was adopted – exemplified by the paradox of working at home and limiting social contact whilst depending on home delivery of food and other goods. These considerations led us to reject the dichotomy of health versus the economy and to conclude that the ideal policy was one that maximally suppressed transmission with the minimum restrictions (e.g. increased ventilation in public buildings rather than closures) while taking actions that mitigated any unavoidable adverse indirect effects, for example by providing financial support to those forced to isolate.

Science and policy

A second issue is related to the nature of the relationship between science and policy [12]. Margaret Thatcher famously said,

“Advisers advise, ministers decide” [13]. This view is shared by eminent researchers, with Sir David Spiegelhalter, perhaps the most vocal advocate, as illustrated when he said, “My role is not to say what the policy should be. I’m a statistician, how do I know what policy should be when there’s so many things to be taken into account when you decide on a policy?” [14] There is, however, an extensive literature that challenges this view. Pielke, for example, has distinguished four roles for researchers. These are the ‘pure scientist’, who sees their role as presenting facts and leaving any decision to others, the ‘science arbiter’, who acts as a resource for decision-makers, answering queries, as necessary but not suggesting what those questions should be, the ‘issue advocate’, who focuses on a particular issue and advises decision-makers on what they should do, and the ‘honest broker’, who provides information on a wide range of options but leaves the decision-maker to decide based on preferences and values [15]. In this categorisation, pure scientists and science arbiters do not engage with the decision-maker on the substance of policies, whereas the other two do. However, as Pielke explains, this does not mean that the first two give advice that is value-free. Rather, the evidence they draw on is itself often generated in a way that reflects values and preferences. He illustrates this by reference to advice on a choice of restaurant. The pure scientist might advise based on the nutritional properties of the food served, yet, as Pielke notes, the evidence underpinning conventional scientific wisdom, in this case the Food Pyramid promoted by the US Government, was shown by Nestle to have been influenced by the food industry [16]. He also notes how, having incorporated these values, the pure scientist may actually be a ‘stealth issue advocate’ for a particular course of action. This was noted in a study by Millstone and van Zwanenberg of the working group advising the UK government during the BSE affair. They describe how the ostensibly independent scientists ended up acquiescing with officials to give messages that were deemed acceptable to ministers and the meat industry, contributing “to making a very serious problem considerably worse” [17].

In deciding where Independent SAGE should position itself we developed a view that the goal of policy should be to reduce the spread of infection in ways that minimised the indirect effects of the necessary restrictions, while also taking an equity perspective that sought to minimise the harms, both direct and indirect, to the least advantaged. This placed us in the role of issue advocates, rejecting a strict demarcation between science and policy (or politics). As Jasanoff has argued, “although pleas for maintaining a strict separation between science and politics continue to run like a leitmotif through the policy literature, the artificiality of this position can no longer be doubted. Studies of scientific advising leave in tatters the notion that it is possible, in practice, to restrict the advisory practice to technical issues or that the subjective values of scientists are irrelevant to decision-making” [18].

We then had to address what we considered constituted ‘evidence’. This is a long-standing fundamental question that subsumes many issues. One is whether the findings from research are universally applicable or contextually bounded. This has been addressed by, amongst others, Pawson and Tilley, who argue that a realist question asks not “what works?” but rather “what works in what context?” [19] Early on we agreed that some questions likely to be addressed by Independent SAGE would be relevant across diverse socio-political spaces, such as how a particular viral variant behaves, while others would not, for example, whether a policy requiring high levels of individual adherence that was effective in a high trust setting would work equally well in a low trust one.

Another question relates to what has been termed the hierarchy of evidence [20]. This privileges meta-analyses, systematic reviews, and randomised controlled trials (RCTs), often referred to

as the “gold standard” over others, such as cohort studies, clinical case reports, quasi-experimental or ethnographic approaches. This leads some to reject evidence that has not been evaluated in a clinical trial. This issue came to the fore during the pandemic in the debate about the effectiveness of masks in reducing transmission. Research by aerosol scientists and others indicated that the value of masks lies in preventing someone who carries the virus from transmitting it to others. There is thus evidence of the mechanism by which masks would work. However, a trial, at least at the individual level, would require a group of people to wear, or not wear, a mask, while measuring exposure in all with whom they came in contact. The practical challenges inherent in conducting a study quickly enough to have policy impact when needed were recognised to be insurmountable. Consequently, Independent SAGE took the view that evidence based on a range of study designs should be considered, with evidence being assessed on its merits, including applicability to the situation in question.

A related question arose about how much evidence was sufficient to support making a recommendation. Sarewitz has argued that “Those who advocate some line of action are likely to claim a scientific justification for their position, while those opposing the action will either invoke scientific uncertainty or competing scientific results to support their position” [21]. Throughout the pandemic this was often observed; with opponents of a particular course of action arguing that there was insufficient evidence (a view often only sustainable by selectively ignoring evidence that did exist) or, in many cases, that the problem was complex and that specific actions would be insufficient in themselves. This latter argument was deployed widely by those opposing measures to reduce transmission despite Independent SAGE and many others arguing explicitly for comprehensive packages as it was clear that any single intervention alone would be insufficient.

These challenges were not unexpected. Petticrew and colleagues have noted how manufacturers of many different harmful products have harnessed the contest of ‘uncertainty’ to delay or prevent effective action, in a paper entitled “Nothing can be done until everything is done” [22]. Indeed, a growing body of literature on the commercial or corporate determinants of health has shown how many scientific narratives, including what counts as evidence, have been influenced by vested interests [23]. Experience during the pandemic has added to this literature. Thus, Independent SAGE decided to offer advice when it deemed the evidence to be sufficient rather than necessarily conclusive, consistent with the precautionary principle.

We also considered what our role at the science-policy interface should be. We drew on a body of literature that addresses the transfer of thinking between the producers and users of evidence. [24] This often focuses on what are termed ‘knowledge brokers’ - individuals or organisations that connect the producers and users of evidence [25,26]. Most often, knowledge brokers operate at the interface between the academic research community and decision-makers in governments and international organisations. In some cases, they also work with practitioners. Yet, the role of decision-makers is not confined to those occupying formal positions in institutions. Everyone in their day-to-day activities is called upon to make decisions based on their understanding of the evidence.

Successful knowledge brokers are characterised by having well-developed networks based on trusted relationships. They are well informed about what is happening in their domain and have achieved a high level of credibility. They are not lobbyists, but neither are they simple communicators of information [27]. They answer questions that address the particular concerns of decision-makers at the time when the answers can be useful, while recognising that all knowledge is contingent, often with considerable uncertainty. Recognising these constraints is especially important

during a pandemic - regardless of whether a government minister is deciding, for example, to close schools and businesses or an individual is deciding whether to receive a vaccine. Faced with a new infectious agent, everyone is operating in a state of exceptional uncertainty. No single person, no matter how well informed, can possibly assess the sheer volume of cross-disciplinary evidence, often conflicting or context dependant, that is constantly emerging. Some of the emergent evidence may be incorrect, incomplete or inapplicable to particular contexts. It may contain inadvertent errors or even be fraudulent. The interpretation of the evidence can vary, in some cases reflecting underlying beliefs about, for example, the balance between individual and collective responsibility. There may also be powerful vested interests at play, for example those heavily invested in office facilities or transport companies, whose short-term priority to keep people, and therefore their businesses, moving, conflicts with the public health imperative to reduce transmission. In this complex and often confused situation, trust is often in short supply.

These considerations led us to consider what has been termed “post-normal science”. This concept, developed by Funtowicz and Ravetz, [28] is especially valuable where facts are uncertain, values are in dispute, stakes are high, and decisions are urgent. Carrozza has portrayed it as a reaction against “the tendency towards assigning to experts a critical role in policymaking while marginalizing laypeople” [29]. Post-normal science embraces the concept of a peer community that is extended in two ways. First, it recognises the contribution of multiple disciplines. Second, it extends the concept of peers to all those who have a stake in the issue, including the public, employers, and trade unions. This also links with concepts of citizen science [30].

These considerations fed into our discussions of public engagement. While superficially uncontroversial, the term ‘public engagement’ has attracted considerable criticism, with some scholars arguing that it is interpreted in myriad ways and so vague as to be meaningless [31]. Macq and colleagues distinguish two elements. The first is public involvement in decision making, including what to research and how [32]. The second is involvement in knowledge creation, such as lay observation of phenomena, or when people collect data on their own experiences or observations of the world around them [33]. Communication between scientists and publics can take various forms, with one typology distinguishing (i) professional communication with peers, (ii) deficit communication, in which the flow of information is from the scientists to the public to fill gaps in their knowledge, (iii) consultative communication, which involves a two-way flow, and (iv) deliberative communication, in which local and scientific knowledge are equally valued [34]. Public participation can be “invited”, for example when policymakers convene lay advisory bodies, or “uninvited”, where the initiative emerges from civil society [35].

As we will describe later, these considerations shaped the development of Independent SAGE. We sought to address questions that mattered to key stakeholders (e.g. practical advice on safe schools and universities) and the public, especially questions not being answered elsewhere. We recruited members from various relevant disciplines but, crucially, individuals respected in their fields and committed to multidisciplinary working. Recognising the need to obtain additional, more specialised expertise, we engaged with other scientists when required, inviting them to discussions on particular subjects. We engaged in deliberative communication with other stakeholders and the public, whilst always listening carefully to their concerns. This is consistent with the recommendations in the previously mentioned joint report from two Parliamentary committees, which said that “The Government and SAGE should also facilitate strong external and structured challenge to scientific advice, including from experts in countries around the world, and a wider range of disciplines” [6].

Weaknesses in policy development and the implications for independent SAGE

In this section, we describe three major weaknesses in the process of policy development and the incorporation of scientific evidence in the United Kingdom. These were the challenging policy context, the narrowness of the evidence base being drawn upon, and the reliance by policymakers on selected sources of evidence. We then examine their implications for the working of Independent SAGE.

The policy context

The United Kingdom, in theory, should have been well placed to respond to COVID-19. A Global Health Security Index, compiled in 2019, ranked it second to the United States, based on assessments of six measures of its ability to prevent, detect, and respond to outbreaks [36]. This assessment has not withstood the test posed by the pandemic [37]. There were several problems and Independent SAGE needed to understand them to ensure that its advice took account of the policy context.

First, there was a leadership vacuum. At the end of 2019, the UK Government was investing enormous effort in “getting Brexit done”. [38] This entailed a massive legislative programme and the creation of entirely new structures, often charged with implementing policies that ministers, as has since become apparent, failed to understand [39]. Stress levels amongst civil servants were at record levels [40]. Having a Prime Minister who was diverted by tangled personal issues and missed many crucial early meetings exacerbated the situation [3]. The decision making around the initial response has been described in accounts by those involved, both in books [3] and in testimony to Parliamentary committees [6]. These paint a picture of confusion but, as importantly, a marked unwillingness to seek advice from others. The joint Parliamentary committee, in particular, heavily criticises the unwillingness to subject ideas to challenge or to draw on a suitably wide range of disciplines and perspectives.

Second, while the main elements of a public health system were in place on paper, in reality the NHS was struggling. In England, a complex and confused reorganisation in 2012 had fragmented and damaged public health structures [41], with some public health functions and posts transferred to local authorities suffering substantial budget cuts between 2013 and 2020 [42]. Pandemic planning was also weak. Exercise Cygnus, a pandemic simulation conducted in 2016 (with the confidential report only released by the Department of Health in October 2020 after seven months of legal challenge) had recommended a single body - a “Pandemic Concept of Operations” - to avoid the chaos of decision-making that emerged in the pandemic response exercise [43]. The organograms were found to be confusing and overlapping. But no action was taken. Another exercise that tested the response to imported cases was not followed up [44]. When the pandemic began, there was no single body to coordinate government departments, devolved administrations in Scotland, Wales, and Northern Ireland, and local authorities, some of which, like Greater Manchester (2.8 million), had populations larger than several EU member states. There is still no co-ordinating body.

Third, the UK had suffered greatly during a decade of austerity. Reductions in spending within education and local government fell mainly on the disadvantaged [45,46] and coincided with an almost unprecedented slowing, and for some groups reversal, of what had been a long-term increase in life expectancy [47]. Health inequalities had steadily widened, and the prevalence of obesity, a risk factor for severe COVID-19, had become amongst the worst in Europe. It soon became apparent that these populations (deprived,

ethnic minority populations and those with obesity and chronic long-term conditions) were most affected by the pandemic.

Integrating different types of evidence

The UK Government was in the fortunate position of being able to draw on an exceptional range of expertise. The country's contribution to the scientific knowledge and progress relating to COVID-19 has been remarkable, including the development of the Oxford AstraZeneca vaccine [48], the RECOVERY Trial [49], the use of real world observational data such as OpenSAFELY [50], and the COG-UK virus sequencing programme [51]. When the government revealed the membership of SAGE, coinciding with the launch of Independent SAGE, it was obvious that it included experts in areas such as virology, modelling, and behavioural sciences. However, as a paper published by the Royal Society notes, “One of the constant criticisms of science advice in the UK was that it was insufficiently informed by public-health experts” [52]. Public health has several distinct characteristics. It takes a population rather than an individual perspective, it adopts a holistic multidisciplinary framework, and it takes a participative approach, involving engagement with the public, rather than a process in which enquiry takes place at a distance from those who will be affected by any findings. The inherent tension between an individual and a population approach is illustrated by the important discussion about whether children should be vaccinated. The debate has focused narrowly on the risks and benefits to the individual child (although the argument for vaccinating adolescents is clear) [53] rather than considering the broader population impact of reducing transmission within the population.

Although SAGE sought input from experts and organisations, such as the Academy of Medical Sciences, there were limited opportunities to draw on the lived experiences of those most affected. This meant that when, for example, it examined risks of transmission in care homes, modellers lacked ‘situational awareness’ and ‘input from the ground’, and were unaware that some staff members might work in several different homes, acting as a vehicle for transmission amongst them. Again, this was noted in the UK Parliamentary report on the COVID-19 response, as when it noted that “SAGE either did not have sufficient representation from social care or did not give enough weight to the impact on the social care sector” [6]. It also meant that the narrative on the potential of public health interventions known as ‘lockdowns’ (defined as “the imposition of stringent restrictions on travel, social interaction, and access to public space”) focused appropriately on the need to reduce transmission, but paid less attention to practical considerations, such as their impact on those affected and how to minimise their unintended consequences. [11] Similarly, advice on testing and tracing in England was developed in a rather one-dimensional manner, without addressing the practical implications facing a public health infrastructure weakened by long-term underinvestment [54]. Test and trace should have involved local public health teams, should have linked to NHS and public health diagnostic laboratories, and should have deployed new contact tracers under the aegis of local health protection experts who had the requisite technical expertise. The Government opted instead for an outsourced laboratory and call-centre programme to trace contacts. This approach failed consistently. The relevant scientific evidence about the benefits of adequately constituted Find, Test, Trace, Isolate and Support programmes embedded in local public health infrastructure was not presented in any of its published advice, as noted in a report by the Parliamentary Public Accounts Committee, which found that while the test and trace programme in England “claims to be a learning organisation, but since last May [2020] many important stakeholders have at times felt ignored by it”. [55]

Different sources of evidence

COVID-19 represented a clear public health emergency but with a relative absence of direct empirical evidence to draw on in the early months. The World Health Organization had laid out the core principles of a pandemic response – to find the virus through case detection and testing, to trace contacts, to isolate cases and their contacts with support, and, most importantly, to act at speed [56]. It also advised physical distancing, promotion of preventive behaviours such as handwashing and the use of masks and personal protective equipment, and the option for lockdowns when virus transmission was out of control. Yet the approach of test, trace and isolate was described by Deputy CMO Dr Jenny Harries in March as only relevant to developing countries [57]. This exemplified an apparent unwillingness to learn from the experience of others, often referred to as “English exceptionalism” (it was less of an issue in the other nations of the UK). This approach forsook learning from countries in the Asia Pacific region and elsewhere in Europe [3,58]. This has been acknowledged by one senior member of SAGE, who said that “I wish SAGE had drawn on a wider group of experts with first-hand insights from China and the surrounding region” [3]. Similarly, the joint report from Parliamentary committees said “unwillingness to consider seriously and act on the approach being taken in Taiwan, Singapore or Korea was a serious error” [6]. The problem was exacerbated by the UK’s exit from EU structures, including public health structures, and, especially, the loss of informal contacts with public health experts in other European countries.

The UK Government did not follow advice from WHO, nor did it always follow that from its own scientific advisers. Ministers had promulgated a message that it was ‘following the science’, which led to a view in some sections of the media that scientists were actually directing policy, a view that at times led to them being personally attacked. Yet some key scientific advisers, on SAGE and elsewhere, were keen to point out that they merely provided scientific advice (and indeed SAGE members were instructed not to make policy recommendations or even discuss policy options implied by evidence), and that politicians made the policy decisions [3,59]. It is clear, for instance, that SAGE advised an immediate lockdown on 16th March 2020. Instead, the national lockdown did not come into force until a week later [60]. Something similar happened in September 2020, when cases were rising and SAGE advised a ‘circuit breaker’ (a short-term lockdown), advice rejected by Ministers until six weeks later in November 2020 [3]. What emerged was a complex relationship between science and policy, in which politicians appeared to cherry-pick scientific data to support specific policies that seemed to reflect political agendas [3,59].

A related problem was that scientific differences of opinion on public health and behavioural interventions were increasingly conflated with political and ideological positions. The Government was exposed to strong libertarian views, often amplified by its own Members of Parliament and others interested in minimising any short-term economic damage consequent on countermeasures, even though the historical evidence pointed to the longer-term economic benefits of suppressing the spread of an infectious disease [10]. Scientists themselves were not above such behaviour, as exemplified by the Great Barrington Declaration [61], which used the concept of ‘herd immunity’ to propose isolation of the elderly whilst allowing others to go about their lives as usual. Developed initially by a small group of scientists, this attracted support from well-funded neoliberal interests in the United States [62]. The concept was described by the President of the UK’s Academy of Medical Sciences as “unethical and not possible” [63], a view echoed by the Director General of the World Health Organization [64], the Chief Medical Officer for England [65], and many scientists, including members of Independent SAGE [66]. Yet, as we now know, the

scientists promoting this approach were invited to meet the Prime Minister, arguably playing a key role in delaying countermeasures. One senior member of SAGE has described this view as “ideology masquerading as science” and argued that “their views and the credence given to them by Johnson were responsible for a number of unnecessary deaths” [3].

Implications for independent SAGE

From the outset we adopted a strong emphasis on interdisciplinary and policy-orientated working. As a consequence, we adopted an explicitly public health approach to the problems we addressed. We also sought to: a) incorporate diversity not only in expertise but also in ethnicity and gender, both in our membership and the focus of our work; b) to be open and transparent, c) to engage actively with those impacted by the pandemic, whether as patients, carers, or front-line workers so as to understand the challenges they faced, and d) to keep abreast of emerging scientific evidence, drawing on all relevant disciplines, while recognising the inevitable uncertainty in a rapidly changing situation. In early June 2020, we established a Behavioural Sub-Group in light of the manifest need for such expertise in guiding the pandemic response.

Independent SAGE explicitly adopted an international perspective, seeking to learn lessons from other countries, facilitated by having members who were actively involved in international collaborations on COVID-19 [67,68]. Although the Foreign, Commonwealth and Development Office and the Cabinet Office jointly established an International Comparators Joint Unit there is minimal evidence in the public domain of its activities. There was no mention of this unit in the joint report from two Parliamentary Committees which, as noted above, was extremely critical of the failure of the government to look for lessons from elsewhere [6].

Independent SAGE placed a high priority on engagement with those affected by policy, drawing on experience of co-production of solutions [69]. This engagement is essential both to the construction of effective responses to major problems but also to engender the trust and confidence necessary if people are to adhere to advice about measures such as physical distancing that are crucial to controlling the pandemic. [70] Trust derives from seeing authority as being part of and serving the interests of communities [71], and this in turn derives from authorities treating the public as respected partners rather than as problems [72]. While there is now considerable experience with the co-production of solutions during the pandemic from other countries [69], the UK Government has developed a reputation for failing to consult with those most affected by policy decisions [73]. For example, a damning report on the Government’s policies on schools in England describes how headteachers were sent complex and often contradictory instructions on a Sunday evening that were to be implemented the following day [74].

Emerging issues

In the next section we look at a series of particular issues that emerged during Independent SAGE’s first year of working, illustrating them with examples from our work. These were products of the discussion that generated this paper, summarised in Table 1.

The importance of learning from local expertise

It soon became clear that the UK Government announced policies with little regard for those who had to implement them. One of the most extreme examples was when schools opened, as instructed, for the new term in January 2021, despite head teachers and local government protesting that they were unprepared. In an

Table 1

Key issues emerging from the work of Independent SAGE.

In a pluralistic society, many different groups can provide scientific advice, not just those appointed by governments.
Scientific advice should not be provided in a vacuum. It should be developed in the context both of the circumstances to which it is being applied (including those that give rise to the issue in question) and the factors critical in implementing resultant actions;
Advice should, as far as possible, be co-produced with those who are affected by, or will be called upon to implement it;
While recognising the need to adapt advice to the local contexts in which it will be applied, it is essential to draw on evidence from elsewhere;
Scientific advice should draw on the broadest possible range of disciplines, including the social and behavioural sciences and humanities;
Scientific advisers to governments should act as critical friends, challenging assumptions and resisting constraints placed on the nature of their advice and their ability to speak truth to power;
Scientific advice should be made public in a timely fashion, and advisers should maintain both actual and perceived independence from politicians;
Scientific advice should draw heavily on principles of equity and human rights.

abrupt U-turn, schools were told to close after one day, resulting in massive disruption [75].

Safe school opening was one of the first topics we addressed. On Friday 22 May 2020, in partnership with the British Medical Journal and Mumsnet (an online community for parents), we issued an interim report for consultation on the issue of schools reopening after the closures during the first wave. Whilst recognising the detrimental impact of closures on the life of young people, the final report highlighted that waiting a further two weeks (until mid-June) for school opening might halve the infection risk for children while allowing more time to set up an effective and functional find, test, trace and isolate programme in all areas [76]. This advice, and its scientific basis, were widely appreciated by staff, parent and governing bodies, and local authorities and used by many schools to delay their opening. In August 2020, a second public engagement discussion on schools (aided by an updated school reopening paper)[77] focused on the urgent need to provide clear guidance and resource for schools to open safely in September. These recommendations were ignored by the Government (but not by teachers' unions), as were those in a further report published in November 2020 [78].

A further early example of policies implemented without regard to international evidence or local knowledge was the 'test and trace' system in England. The Government's commercially-based approach did not take advantage of existing expertise such as the experienced contact tracers attached to local public health and NHS units working on sexual health and tuberculosis. Instead, it outsourced operations to companies with little or no relevant experience. An Independent SAGE report from June 9 2020, [79], supplemented on October 30th 2020 [80], was developed with input from local public health directors and primary care teams. It highlighted three crucial ways the Government should strengthen systems to build a protective shield against further outbreaks.

First, local involvement and ownership is essential. At the core should have been a partnership led by public health, including primary care teams, local hospital laboratories, school nurses, and environmental health officers. The objective being to ensure rapid response to outbreaks and to build local engagement and trust. Second, a framework was outlined for building an integrated and sustainable approach, based on well-established systems of population infection control [81]. National and local campaigns should ensure people possess accurate knowledge about mechanisms of spread, the key symptoms and how and where to respond. The system should build on existing structures, including the UK's strong primary care network and local public health departments. Third, drawing on research showing that many people, especially in disadvantaged communities, struggled to isolate themselves, the report called for provision of adequate practical and financial support. It noted how successful countries provided for the needs of those asked to isolate, including food, finance, accommodation, practical and emotional support where needed, and appropriate security of employment.

In both cases, the official policies were expensive failures. Yet this did not have to happen. As we showed, practical solutions could have been implemented that would have at least mitigated the problems. Those on the ground, who had a detailed understanding of the challenges being encountered, could have advised the Government, but they were rarely, if ever, asked.

The value of learning from elsewhere

Independent SAGE often took a different view from the Government (although not from those advising it). Our learning was facilitated by the participation of some members of the group in international collaborations, such as the European Observatory's COVID Health Systems Response Monitor[67], the Lancet's Covid-19 Commission[82] and through professional relationships with colleagues in the Asia-Pacific region [68,83]. We were particularly interested in the experience of countries that had succeeded in suppressing transmission, such as South Korea, Taiwan, China, Vietnam, New Zealand, Australia, Norway, and Finland [68,84]. As we now know, these countries fared much better than others in reducing the cost of the pandemic in health, economic and civil liberty terms. [85] Researchers from some of these countries joined Independent SAGE public briefings to describe the lessons from their experiences. In light of this real-world experience, we rejected the dichotomy between health protection and economic growth, a common narrative amongst politicians opposing wider mitigation measures, and argued that the best way to protect the economy and livelihoods was to aggressively limit virus spread [86].

There were many other areas where the experience of other countries informed the advice we gave for the UK. These included the emergence of new variants, particularly those first identified in Brazil (Gamma), South Africa (Beta and Omicron) and India (Delta). Another example of learning from other countries was the rapid expansion of vaccine coverage in Israel, with learning gained both in how to implement a population vaccination programme[87] and the importance of not relying solely on vaccines that are less than 100% effective, especially in the face of new variants of the virus.

This international perspective was also visible when Independent SAGE along with many others recognised the importance of vaccine availability worldwide, not only on the basis of social justice, and equity, but also in recognition of the ease with which viruses can be transmitted from one continent to the next. Our report [88] made specific recommendations on waiving vaccine patents to allow additional global manufacture and called for the reinstatement of the UK Department of International Development (which was merged with the Foreign Office in the midst of the pandemic) plus a restoration of the large budget cuts that followed.

To agree or disagree with government?

Independent SAGE, SAGE, and the UK Government share the same aim: To end the pandemic and return to a fully functioning society. The areas of difference lie in how this can best be

achieved. To our knowledge there have been no occasions when we have fundamentally disagreed with advice given by SAGE. However, as noted earlier, there have been times when the Government has rejected their advice, something we have criticised.

There have been times when decisions have been finely balanced. Thus, faced with the rapid spread of the Alpha variant in early 2021, the Government decided to extend the interval between the first and second doses of vaccines to maximise the number of people with at least partial protection from a first dose. This was controversial and attracted criticism. After careful examination of the evidence, Independent SAGE concurred with the Government's strategy [89]. Independent SAGE has also generally supported the Government when it has implemented measures to reduce transmission, whilst at the same time advocating for greater support for those affected.

On the other hand, there have been many occasions when Independent SAGE has been critical of the UK Government. This was especially so when its policy seemed to lack coherence. For example, at a time when ministers were seeking to minimise transmission, they also were subsidising people going to bars and restaurants. Subsequent research showed that this increased cases [90].

Independent SAGE has also criticised the Government's perceived failure to value evidence from the behavioural and social sciences, despite having a sub-group of SAGE dedicated to this topic. In its launch statement, the Independent SAGE Behavioural Subgroup noted that "every measure to counter the spread of infection is dependant upon the understanding, engagement and adherence to guidance of the public, whether that be self-isolating, social distancing, practising self-protective behaviours such as hand cleansing, getting tested or (eventually) getting vaccinated" [91]. Many of our outputs have involved challenging instances of the misuse of behavioural science during the pandemic. Most notably, the concept of 'behavioural fatigue' has been used from before the March 2020 lockdown to suggest that the public lack the psychological resilience to observe restrictions necessary to halt the transmission of infection. As many behavioural scientists argued [92], this concept has no scientific basis [93]. Research on emergencies and disasters shows that people affected characteristically come together to support each other and this forms the basis of collective resilience [94]. In line with the COM-B model of behaviour [95], failure to observe restrictions during the pandemic had more to do with lack of clear information, of perceived effectiveness or equity of the measures, and – particularly important – lack of resources to undertake the required actions [96].

Independent SAGE stressed an approach to adherence that focused on supporting people to do what is asked of them rather than one which blames them for non-adherence and threatens them with fines and other forms of enforcement. For example, when people were criticised for congregating in urban parks and it was even suggested that parks might be closed in response [97] we argued that a better answer would be to open golf courses and playing fields and make more space available. And, in response to the finding that a minority of those asked to self-isolate do so [98], Independent SAGE and its behavioural group argued for a comprehensive programme of support and that rather than talking of 'self-isolation' we should refer instead to 'supported isolation' [99].

The necessity of viewing issues through an equity lens

From the outset, Independent SAGE has made equity a priority. Evidence of the disproportionate impact of severe outcomes from COVID-19 amongst UK ethnic minority groups was published in April 2020, [100] followed by similar data from other countries [100,101]. Ethnic minority groups are at increased risk of hospitalisation and admission to intensive care compared with white populations [100]. The most extensive study to date, OpenSAFELY,

reported a 1.7 fold increased mortality risk in black groups and a 1.6 fold increased risk for Asians/British Asians, partially explained by deprivation, comorbidity and other risk factors [102]. Factors that could explain the disproportionate impact of COVID-19 in ethnic minority communities in terms of differential exposure and increased vulnerability can be categorised into structural, biological, social and behavioural reasons. Serological studies now confirm that at least some of this excess risk is increased exposure to the virus, underpinned by wider determinants of health such as deprivation, including structural discrimination [103].

In response, we recommended a comprehensive multi-sectoral approach supported by decisive policy action to tackle the disproportionate impact of COVID-19 on ethnic minority communities. These included immediate and medium-term measures to reduce structural, economic, social and biological inequalities as well as improve communications with minority groups using culturally appropriate methods [104].

We saw that engaging with ethnic minority communities to understand and learn from their lived experiences was essential to ensure that interventions avoided further widening of inequalities. By engaging with local stakeholders and community networks to improve awareness and help change behaviour, we learned valuable lessons from the multi-ethnic city of Leicester, the first place in the UK to experience a strict lockdown [105].

Conclusion

No spheres of life have remained untouched by local, national and international responses to the pandemic. It is essential that such responses are underpinned by the best interpretations from the social and biological sciences. Provision of independent, accessible and transparent scientific advice and engagement of scientists and social scientists with the public, press, organisations and governments is a pre-requisite for broad support of these responses. Such advice needs to be generated in partnership with all key stakeholders and should draw on multidisciplinary thinking and evidence, with public health as a key academic discipline. This has been the aim of Independent SAGE.

Critical to the success of our initiative have been two specific phenomena. Firstly, the form and regularity of communications – live broadcasts, written reports, social media, mainstream media (TV, radio, press), and providing advice within the context of people's questions and concerns. This has distinguished Independent SAGE from the messaging from official scientific and government channels, which has appeared top down and is inevitably viewed through the lens of trust/mistrust of the political establishment.

Secondly, the ethos and the commitment of Independent SAGE members, manifested over two years by weekly meetings and daily WhatsApp and e-mail discussions, has generated an internal learning environment, and cross disciplinary understanding. Again, this is very different to the well-established government scientific advisory committees, based around groups of experts who speak from their own individual disciplines and perspectives.

However, these strengths also represent risks. A group of close, like minded scientists are susceptible to "group think", itself a contested concept, but nevertheless something we aimed to mitigate against through the continual engagement with academics outside Independent SAGE in our briefings and discussions. We have also been accused of "straying beyond our expertise". This is an inevitable consequence of speaking to policy implications of science, which is also why we had a strong public health voice within the group. We hope we got this balance right. Finally, we recognise the potential confusion with SAGE, and the risk of complicating, rather than simplifying scientific advice to government and the public. We have sought to address these issues in this article.

Inevitably there are things that we could have done differently as we moved along a steep learning curve. First, the UK and Scottish governments have announced inquiries into the pandemic response, processes to which Independent SAGE members intend to contribute as appropriate. We might perhaps have anticipated them by undertaking and placing on record our assessments of the official responses. Much of the material necessary to do this is in our weekly briefings and reports and the minutes of our meetings but the task of extracting and synthesising it will be substantial. Second, while our work has been received very positively by many people, some of us have experienced sustained online abuse. In retrospect, we might have developed a strategy to deal with this at the outset, recognising the different perpetrators, from the expected trolls to, in a few cases, established researchers. Third, we could have adopted a more strategic framing of our messages, for example by prefacing more of our statements with an explanation of our aim. Examples might be ‘in order to reduce the chance that more restrictions/lockdown are needed, we propose x, y, z now’ or ‘in order to keep schools open, ...’. This would have helped to avoid some misunderstandings. In particular it would have helped to pre-empt attacks by those who, for a variety of motives, sought incorrectly to portray us as somehow being in favour of restrictions for their own sake when we were trying to avoid them by other measures. Fourth, although we had hoped to offer an alternative source of advice to government, any impact that we had on the Westminster government was at best indirect although we had more success in the devolved administrations and local government. We perhaps could have been more effective in this regard (although we also recognise that ministers did not always follow the advice they received from official sources). However, this reflects, to some extent, our own difficulty in deciding how activist we should be. For example, we might have achieved more if we had sought to build alliances with opposition parties or trade unions but this risked being counterproductive and anyway there was some hesitation about doing anything that would have encouraged those who were portraying us as being political rather than scientific. Finally, it took us time to find the right balance between accessibility of messages to a lay audience and scientific content. In retrospect we might have been more explicit about the science that supported our advice, perhaps in technical annexes.

We hope that lessons have been learnt through this pandemic which will facilitate a more transparent scientific advisory structure in the future. In this respect, reverting to pre-pandemic structures would be a mistake. We also hope Independent SAGE has made a contribution to broader scientific literacy within the UK and beyond and provided a model for public engagement in pandemics and other health emergencies.

Declaration of Competing Interest

All authors or have been members of Independent SAGE. MM is Research Director at the European Observatory on Health Systems and Policies, responsible for the COVID Response Monitor. JD, SM, MP, SR and RW are members of the Scientific Pandemic Insights Group on Behaviours, which advises the UK Government. SR and LNB advise the Scottish Government.

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