REVIEW ARTICLE

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From evidence to advice in France, Germany, and the UK: transparency, accountability, and participation in pandemic science advice

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Abstract

Politicians often claim to be "following science" but their claims are, reasonably, disputed. To claim to be following the science can mean that scientific evidence affects or legitimates decisions. The evidence that politicians are following science often comes from formal systems of advice that translate science into advice. We study the systems that informed policy in France, Germany, and the UK during the COVID-19 pandemic. We found that while in all three countries politicians had incentive to prefer private advice tailored to their needs, more transparent and independent advice appeared to contribute more to good policymaking and implementation, including by enhancing government's current and future accountability for their decisions.

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Key messages

- Scientists advise health authorities to inform and legitimate government decisions, but governments can seek advice from many opaque and informal sources.
- While scientific advice was especially important during the COVID-19 pandemic, the advice systems varied greatly in their autonomy and transparency.
- Autonomous and transparent advice systems can aid democratic accountability.

Keywords Scientific advice · COVID-19 · United Kingdom · France · Germany

Introduction

Elected politicians often claim to be following science, for all that scientists may disagree about that. Scientific advice systems are set up by governments to provide advice relevant to policy and to legitimate policy decisions as scientifically informed. These formal systems to intended to advise the government on the state of scientific knowledge and the likely effects of policies are where political claims intersect with scientific credibility and developing knowledge. Scientific advice systems are particularly important, and publicly visible, when scientific information is rapidly developing and urgently needed. COVID-19 tested both the ability of advice systems to turn enormous amounts of new evidence into useful advice and their ability to legitimate policy by ensuring the public believed that policies were indeed informed by solid science. Governments design advice systems for their own reasons of legitimacy and information and according to established cultures of knowledge [1].

In this article, we explored how do scientific advice systems vary with political systems and affect government decisions and examined governance approaches to the provision of scientific advice during the COVID-19 pandemic. Using publicly available information, we bridged two large and rapidly growing topics. One is the development and use of science, focusing on lessons learned during the pandemic [2–5]. The other is governance or how societies make and implement decisions [6], a topic which political scientists have studied extensively [7]. We used the TAPIC framework for health governance [6] that synthesizes a great deal of literature on governance to identify key areas of concern. This framework examines governance in terms of five components of each institution or policy area: Transparency (decisions and their grounds are made public), Accountability (it is clear to whom each actor must explain itself and who can sanction misdeeds), Participation (of affected interests in decisions), Integrity such as institutional anti-corruption measures, and Capacity to analyze and monitor policy. TAPIC is not designed, according to its developers, to be normative (by implying, for example, that more accountability or participation would always desirable). Rather, it is a tool to classify issues and draw attention to problematic issues in a particular context.

Methods

We compare advice systems in three high-income, democratic, European jurisdictions in order to understand their structure and relationship to policy: the United Kingdom (England), France, and Germany. We adopted a case study method, namely the comparative process-tracing approach from political science, which uses detailed retellings of events to identify the operation of institutions and other causes [8]. We explored processes by tracing identifying key issues in formulation and provision of scientific advice as a way to understand the underlying institutional decisions that explain developments. This approach is useful for interpreting contested and complex historical data such as COVID-19 advice discussions. It is not a review of published literature, but rather an effort to understand the behavior of actors by reconstruction of their actions. This approach was developed in political science to address the problem of understanding how institutions work when comparisons are imperfect, counterfactuals are important, and there is a great deal of noise generated by the political process.

Defining the scope of formal advice systems takes some care because politicians have multiple sources of advice. The advising structures that inform policy decisions break down into three categories: the advisors themselves and the organizational structures they inhabit, the civil servants that support them, and each government's specialist public health agencies. For advisors, we included anyone with a formal role in giving the government science advice. Advisors included anyone who is a paid or unpaid consultant and are distinct from stakeholder groups who may offer advice through consultation mechanisms but do not have a formal role—their advice is not specifically requested by the government. For civil servants, we examined the general role of civil servants in decision-making, with a focus on Chief Professional Officers, or Chief Medical Officers, and their equivalents. In terms of specialist public health agencies, we were interested in the extent to which they informed policy decisions or themselves made policy decisions, the scope of the data and outside advice they relied upon, and whether their status or prominence changed during the pandemic. We applied comparative methods to highlight lessons rather than compete with well-resourced government, legislative, and civil society inquires or professional journalists, upon whose work we draw.

Results

Three areas of governance emerged from our cases as of compelling importance and high variability between our cases: participation, transparency, and accountability. Participation in a scientific advice system means being asked to serve in an advisory capacity. Transparency in a scientific advice system can affect the legitimacy of advice and decisions claimed to be made based on that advice by convincing commentators, other governments, other politicians, and the public.

Accountability influences questions asked of scientific advice systems and other answers given. Who are scientific advice systems accountable to, and for what? For example, are they accountable to the executive alone, or are they accountable by law for fulfilling broader or different mandates?

The *transparency*, *autonomy*, and *accountability* of scientific advice systems are important because they touch on two of the most important issues in the governance of science advice: the extent to which the content and basis of advice is known; and the extent to which the advice reflects the interests of particular political actors. These shape the nature of the advice, and its potential role in both influencing decisions and in enhancing the broader accountability of the government itself, to the electorate, for the decisions it made.

Participation, defined by committee memberships and input, is also an important part of the TAPIC framework, and has been a big part of the discussion of policy and science in different countries. In our three cases at least the question of participation was about which scientists, and kinds of science, would be incorporated into formal advice. In each case, governments were able to choose, formally and informally, who advised them. Participation was contentious in each case because it showed what governments wanted to hear and therefore was an indicator of government preferences, which might be one reason some governments resisted transparency about it.

Integrity and *capacity* appeared less important in our three cases. All three have large and well-resourced science and higher education sectors, relatively high-capacity governments, and inherited relatively high institutional integrity (e.g., anti-corruption measures, a formal civil service structure). Accusations of a lack of integrity were primarily directed at elected officials and their retinues, not the scientific advice systems that answered their questions.

In the three sections below, we present our results by country, the political context of the advice system followed by a discussion of how transparency, accountability, and autonomu worked and changed during the pandemic.

Advice in the UK

Advising structures in the UK became increasingly transparent over the course of the pandemic, while remaining highly accountable to the central government that set their membership, terms of reference, and questions. They are strongly shaped by the preferences of the government of the day, which sets the terms for advisory committees, their level of transparency, decides when coordinating policy bodies meet, selects who gives advice, and ultimately makes policy decisions [9]. As is typical of the UK government, the advising structure is not balanced by strong countervailing judicial or legislative power [10]. Parliamentary scrutiny of government decision-making is weak and, even if high quality, reactive compared even to many other parliamentary democracies.

We focused on the UK government's decisions, which include most health policy in England. Overall, the UK's approach to advice during the pandemic reflected these prior features of the UK's political system. As Cairney noted, the

UK government was responsive to scientists, but only 'our scientists' [11]. At the UK level, the Civil Contingencies Committee (COBRA, or COBR) is a longstanding internal government coordination body designed to operate only in times of crisis. COBRA is advised by the Scientific Advisory Group on Emergencies (SAGE), responsible for providing COBRA with "coherent, coordinated advice and to interpret complex or uncertain scientific evidence in non-technical language." SAGE is housed within the Government Office for Science (GO-Science), and civil servants from GO-Science constitute SAGE's secretariat. SAGE aggregates specialist advice (say on modeling or behavior) from multiple advisory sub-groups [12]. SAGE meets before COBRA in order to inform its decision-making and is represented at COBRA meetings by the Government's Chief Scientific Adviser (GCSA). The GCSA appoints members of SAGE, drawing experts from existing lists maintained by GO-Science [13]

At the start of the pandemic, the key public health agency was Public Health England (PHE), created in 2013 after the passage of the Health and Social Care Act in 2012. PHE's mission was to "protect and improve the nation's health and wellbeing, and reduce health inequalities." PHE sought to ensure that "there is a single authoritative voice speaking for public health, just as the Centers for Disease Control and Prevention offer that authoritative voice for the United States" [14]. This agency was accountable to the Department for Health and Social Care, created through the merger of more than 100 different organizations, including the Health Protection Agency [15]. PHEs was scrapped in 2021. PHE's abolition was leaked to the media in August 2020 with no prior warning for its staff. In April 2021, PHE was replaced by the UK Health Security Agency and its "health improvement" functions were transferred back to the Department of Health and Social Care. The government, somewhat implausibly, said it was trying to create a public health agency similar to Germany's Robert Koch Institute [16].

COBRA, a cabinet formation for crisis management, was on paper the key decision-making body and the point at which scientific advice fed into broader decision-making. According to an analysis conducted by the Institute for Government, COBRA met 20 times to discuss the pandemic in 2020, including a meeting in January before any cases had been confirmed in the UK. Although the committee met 15 times between January and May, it did not meet at all between May and September of 2020, the first wave of the pandemic. The Prime Minister did not attend the first five COVID-related COBRA meetings in January and February of [17].

SAGE, a committee structure with varying membership designed to provide formal scientific advice to the government, meets in response to demand from the executive for scientific evidence. It first met on 22 January 2020 to discuss COVID in a preliminary meeting chaired by Chief Medical Officer Chris Whitty, an independent lawyer [18], and Sir Patrick Vallance, the government chief scientific adviser (GCSA) [15]. Regular meetings began on 28 January, with meetings held approximately twice a week at first. In later stages of the pandemic, apparently due to a 'lack of demand' for scientific evidence on the part of government ministers, SAGE held no meetings for months at a time.

Initially, membership of SAGE was not disclosed. In a letter to Parliament, Patrick Vallance stated that this decision was based on advice from the Centre for

Protection of National Infrastructure in order to ensure the safety of SAGE members and protect them from "lobbying and other forms of unwanted influence," a standard procedure for COBRA meetings [19]. This policy was in line with some prior emergencies involving matters of national security, but critics countered that the nature of a pandemic required a greater degree of public transparency than a national security event such as a terrorist attack [17]. Ultimately, lists of SAGE attendees as well as minutes were published, with some names redacted.

One of the earliest significant challenges for SAGE was tackling the issue of lockdown. Critics of the government's handling of the pandemic in early 2020 have pointed to the committee's early dismissal of arguments in favor of lockdown. SAGE meetings on this subject were apparently contentious. Dominic Cummings has testified that in January and February 2020, political leaders did not see COVID-19 as a significant threat and were still in favor of a herd immunity strategy through the month of March. Although the government had access to modeling projections as early as 13 March 2020, they still did not move to supporting lockdown. The Prime Minister showed similar resistance to the idea of lockdown in September 2020, mostly driven by the fear of a failing UK economy. This position led to internal disagreements in the UK government about the pacing of the lockdown. According to Cummings' account, political leaders also disregarded the opinion of Chief Medical Officer for England, Chris Whitty [20]. Both GCSA Patrick Vallance and Neil Ferguson, an epidemiologist at Imperial College London, whose modeling strongly influenced early policy, have publicly stated that the decision to lock down in spring 2020 came too late and cost lives.

If COBRA, SAGE, and other formal (but very government-dominated) advisory bodies were not processing as much advice as might be expected, who was? Special advisers and consultants played an important role in providing advice on the pandemic. As of March 2021, the government had 113 special advisers, 43 of whom reported to the Prime Minister, at a cost of GBP11.9 million in the 2020–2021 fiscal year [21]. Public records show special advisers mostly meeting with the press during the pandemic [20]. Public media reports stated that Special Advisors Dominic Cummings and Ben Wilkins attended SAGE. In parliamentary testimony, Cummings stated that he sent Wilkins, together with the Prime Minister's personal secretary, to attend COBRA. He did not remember attending meetings himself, but did have multiple one-on-one meetings with Patrick Vallance and Chris Whitty [20]. The cost of consulting contracts across government more than doubled in 2020–21, with COVID-19 consulting driving this increase. The highest value shares of pandemic-related contracts went to private consulting companies, like Deloitte, PA Consulting, BCG, PwC, and McKinsey, spending millions with GBP 420, 46, 34, 29, and 28 million, respectively [20].

Broadly, the UK's advice system has long been designed to provide answers to the government from the "great and the good" [1, 22], with a premium on choosing experts who can claim legitimacy while answering questions set by the government within political parameters. Debates about undue political influence in the UK often focus not on the academic or research organizations, but on less formal alternatives to civil service advice. SAGE was a comparatively public and formal manifestation of this system, drawing in independent experts to advise government on its terms,

and it became more transparent as the pandemic put the government under pressure to justify its claims to be following science. Special advisors, civil servants, and consultants' roles and advice all remained private. Over the course of the pandemic, greater transparency showed not just the extent to which SAGE was accountable to COBRA and the executive, but also the extent to which the government preferred to seek advice from less formal groups that were even more accountable to the government, such as private sector consultants and special advisors.

Advice in France

Advising structures in France are shaped by the dominance of the medical profession within the sphere of public health, a highly institutionalized set of health security structures and risk assessment influenced by the United States Centers for Disease Control and Prevention (US CDC), and dominated by ad hoc entities, accountable to the central government. In March 2020, the French government mobilized an extensive network of public health institutions, including Santé Publique France (SPF) and its sixteen regional offices, the High Council of Public Health (HCSP), the High Health Authority (HAS), and the National Health Conference (NHC). Established in 2004, the HCPS is a consultative body whose primary task is to advise national and regional health agencies on how to deal with emerging health threats. The HAS was created in 2004 to help the government set up reimbursement rates for drugs and medical devices, as well as to assess health products before they reach the market, issue clinical guidelines regarding vaccines, and measure the quality of care in hospitals. SPF was founded in 2016 following the merger of several health security agencies. Tasked with alerting and assisting the government in the face of health risks, SPF is more oriented toward public action and crisis management than HCSP.

These agencies played an important advising role, as they were frequently asked by the government to issue recommendations regarding several aspects of the containment and mitigation strategy. They were, however, limited to giving expert advice on practical issues (such as patient safety in health care settings) rather than strategic issues. The HCSP issued more than 150 recommendations during the first six months of the pandemic, on subjects ranging from pharmaceutical interventions (tests, diagnostics, therapeutics) to non-pharmaceutical interventions (lockdowns, use of facemasks in public transport) [23]. HCSP also issued recommendations of its own accord through self-referrals pertaining to the link between smoking and COVID-19 infection, or to the impact of lockdowns on children. The HCSP's advising capacity was however limited as the council primarily relied on volunteer experts working concurrently on their own research or governmental projects [23]. According to a study conducted by HCSP members, 73% of the council's recommendations were de facto used by policymakers during the pandemic [24].

The HAS issued dozens of recommendations on testing strategies, and continuously assessed COVID-19 drugs and vaccines efficiency, including "rapid response memos" intended for health care professionals and patients. SPF's initial reaction to the pandemic was fraught with technical difficulties. From January to April 2020, France's premier public health agency failed to provide timely

accounts of infection and deaths, hindered by aging technology and a dysfunctional reporting system. The agency's data were deemed "shallow" by the Prime Minister himself [25].

Pre-existing public health agencies were at times supplanted by ad hoc sources of advice. During the first wave, the French government established two generalist ad hoc bodies, responsible for advising public authorities on both pharmaceutical and non-pharmaceutical interventions, including the Scientific Council, established on 12 March 2020, and Committee for Analysis, Research and Expertise (CARE), created on 14 March 2020. The Scientific Council was set up to provide advice on issues related to COVID-19 testing and treatment. Its mandate was then enlarged to encompass all aspects of the pandemic [26]. Led by renowned immunologist Jean-François Delfraissy, this advisory body featured twelve experts, most of them trained as physicians—although some of them had significant prior public health experience fighting against Ebola. Members of SPF, HAS, HCSP attended the scientific council's meeting as "permanent observers" without participating in the debates and drafting the recommendations [27]. Some of the committee's recommendations were not followed by the executive branch in relation to politically sensitive questions. For instance, President Macron refused to enact a third lockdown in January 2021, explicitly going against the advice of the scientific committees he had set up almost a year before to help him devise the French response to COVID-19.

The French government also set up two ad hoc advisory bodies to inform the vaccine strategy, including the Conseil d'Orientation de la Stratégie Vaccinales (COSV), created on 3 December 2020 and dissolved on 31 July 2022. Alongside HAS, COSV informed the government's main decisions regarding COVID-19 vaccines, including the administration of vaccine boosters, the implementation of measures targeting vulnerable populations. COSV published more than 75 recommendations between December 2020 and July 2022, including notes released through self-referrals.

Although France was not the only country whose leading authorities decided to rely on newly established expert advisory groups, the government's decision to create two ad hoc bodies specifically dedicated to vaccines and to rely extensively on a military task force set it apart from most of its European counterparts [28]. Generalist ad hoc advisory bodies were established in many EU countries, including Belgium, Estonia, Ireland, Italy, and Spain. But only a small number of governments, such as Portugal and France, set up new vaccine task forces. Additionally, during the second half of 2020, the government turned the national Defense Council, which is similar to the UK's COBRA, into its main source of scientific advice. Originally designed to support governmental decisions in the wake of a terrorist attack, a military threat, or an environmental disaster, the council served as France's main decision-making entity, where most strategic decisions pertaining to the successive lockdowns and curfews were taken [25]. Although the scientific councils' recommendations were made public on a regular basis, the content of the defense council's proceedings was kept confidential, prompting widespread criticism. The government also turned to the private sector, including consulting firms McKinsey & Co. and Accenture, to develop their mask communication strategy following a nationwide shortage in March 2020 and their national vaccine strategy in late 2020.

Over the last two decades, France's numerous public health agencies have been confined to health risk assessment rather than risk management and thus constrained to giving expert advice rather than making and implementing policy [29]. Potentially slow advice from SPF and HCSP resulted in the President's opting for *ad-hoc* and presumably nimbler structures centered around himself and his office [26]. The creation of ad hoc consultative bodies might also have helped bridge the gap between experts and the executive branch, while also handpicking members of its own choice and centralizing the source of advice and making it clear that the advisors are accountable to the executive [26].

Advice in Germany

Advising structures in Germany revolve around a small number of high-profile institutes whose relationships to government are defined by law. They are more accountable to legislatures in performing certain activities, functionally autonomous, and more transparent than their UK and French equivalents. Their influence is important in surmounting the coordination challenges found in decentralized states, where intergovernmental coordination often depends on persuasion rather than hierarchy [30].

Initially, these institutes provided key data and issued guidance. However, in the early stages of the pandemic, their role was counterbalanced by actions taken by individual states, who hold the legislative and executive competencies during a pandemic. By mid-March 2020, coordinated action was taken by the federal government and thus the advice, and public communication efforts of leading institutional officials quickly took on greater significance [31].

At the top tier of government, a crisis management team was established. The team was led by the Ministry of Health and the Ministry of Interior, Building and Community, responsible for crisis planning [32]. In addition, a so-called 'corona cabinet' was implemented to coordinate the COVID-19 response. The cabinet met twice weekly, first as a small meeting consisting of the Chancellor and Ministers of Defense, Finance, Interior, Foreign Affairs, Health and the Head of the Chancellery, and then as a large meeting, including other relevant ministers and experts [32]. Regular cabinet meetings also continued, with experts such as representatives from the Robert Koch Institute (RKI), Germany's public health institute [33]. Specialist public health agencies at the federal level played a significant role in providing advice to national pandemic response. Germany entered the pandemic with the Protection Against Infection Act (PAIA), a detailed national pandemic plan, that came into force in 2001 [34]. Three new laws "to protect the population in the event of an epidemic situation of national scope," were passed in 2020 [35].

The PAIA named RKI as the main advisory body to government authorities on "measures for the prevention and detection of serious communicable diseases and the prevention of their spread' and measures involving more than one federal state" [35], 36]. RKI collaborates with Federal authorities, the states, national reference centers, other scientific bodies and professional societies. RKI also serves as the coordinating body for Germany within the EU's communicable disease control

framework [29], representing Germany in international organizations, such as the European Centers for Disease Control and World Health Organization (WHO).

Throughout the pandemic, RKI became responsible for publishing risk assessments, strategy documents, response plans, daily surveillance reports on COVID-19, and technical guidelines; it also maintains and updates the German Influenza Pandemic Preparedness Plan, first published in 2005. During the outbreak, the institute communicated critical information to international, national, and local public health authorities, health professionals, and the public.

In Germany, the states hold the legislative and executive competence to deal with pandemics. This means that the mechanisms for coordination among states and between states and the Federal government are a key part of the German pandemic response. Within each state, Health Offices are responsible for implementing most infection prevention and control measures [31]. Early in the pandemic, the epidemiological situation varied across states, and the policy measures adopted by each state were quite different [29]. Yet, as cases rose across the country, the Federal Government's authority to handle the crisis was temporarily expanded through new laws [37].

In the early stages of the pandemic, the RKI, headed by Lothar Wieler, and Christan Drosten, Director of the Institute for Virology at Charité Berlin, took on significant roles as scientific advisers to both government and the public, instead of the usual communication agency [37]. Drosten, who had been part of the team that developed the PCR COVID test, became a national spokesperson and was often in the media [37, 38]. As the pandemic continued, the government extended its advisory group to include representatives of other disciplines [37, 39]. The federal government also used external consultants. In 2020, the German government spent Euro 433 million on consulting and support services, an increase of 46% compared to 2019. Consulting connected to the pandemic drove this increase in the Ministries of Health, Interior, Economy and Finance. The Ministry of Health accounted for 42 million Euros for the consulting firm Ernst & Young to assist with the acquisition of personal protective equipment in Spring 2020 [4].

Germany's relatively institutionalized and arms-length advice system probably contributed usefully to policymaking by making clear its advice and the bases of that advice. In doing so, it might have eased intergovernmental coordination, a perpetual problem in Germany, by making clear to other governments the reasons for adopting a measure.

Discussion

Our key findings are presented in Table 1. In France and the UK, heads of government showed a clear preference for advice systems tailored to their assumptions and needs, which meant they both sidelined advice from their existing public health agencies and attempted to control participation in their advisory groups while not being transparent about their membership and role. The UK government drew upon its SAGE system that by design responds to the government. The French approach was highly responsive to President Macron and substantially ad hoc, including

Table 1 What do we know about the advice given?

Structure	Members known to public?	Composition	Advice public?	Form of advice
UK: SAGE and related/subgroups; NERVTAG	Not initially	Interdisciplinary membership for SAGE; more specialists in particular groups such as NERVTAG	Not initially	Summaries of literature and research; emphasis on modeling effects of new developments or policies
France: HCSP, Santé Publique France	Yes	Medicine, health fields including public health; very limited behavioral science	Yes	Scientific reports and extensive guidelines on particular practical issues
France: Ad hoc committees & National Defense Council	No	Unknown	No	Unknown
Germany: RKI	Yes	Public health and medicine	Yes	Press conferences, status reports, situational reports, COVID Dashboard, FAQs, risk assessments, daily surveillance reports

Source: Authors' compilation from [self-citation]. This table excludes executive-only coordinating groups e.g., special cabinet formations or interdepartmental civil service meetings

the use of powerful civil service coordinating committees for advice. The UK and French governments, by design, heard answers to questions they asked of their advice systems. By contrast, the German federal government's advice system was more autonomous and public, and less responsive to the immediate interests of the executive.

In each country, governments used a range of informal advisors and outside private consultants to augment their pre-existing advice system. In most cases, it is unclear what consultants did or the basis on which they were contracted. There was also semi-formal use of special advisors, relying on existing systems for bringing personal advice to politicians such as the UK's Special Advisors and the French ministerial cabinets. In all three countries, politicians showed a preference for private advice that would be immediately responsive to their questions, needs, and political constraints. It is difficult to legitimate decisions as scientific, however, when the scientific advice is private. This tension between legitimacy and political preferences worked out differently in each case, with the UK becoming more transparent and German advice largely autonomous and transparent from the start. Nevertheless, in none of the three countries did the scientific advice system address all the consequences of either disease spread or public health measures; governments asked questions, and even the comparatively autonomous German advice system did not volunteer answers outside its formal remit.

Our comparison, drawing on a governance perspective, suggested that there are advantages to transparency and clear and defined accountability of scientific advice systems. The evidence on the impact of different kinds of participation was unclear and there was less variation. Transparency means making decisions and the grounds on which they were made clear [6]. Making clear what advice was given, by whom, and on what grounds, is a way to hold governments accountable for their decisions by allowing voters to know what governments had been told about developments and the likely consequences of policy. They also allow voters to more clearly see how governments might have biased their advice based on what they wanted to hear.

Out of the three cases, the UK system underwent the most significant transformation, primarily characterized by heightened transparency. In the COVID-19 crisis, the initially opaque Westminster model became more transparent because government efforts to invoke science were not credible without knowing who provided scientific advice about what [40]. There is a risk that greater transparency gives a public platform for fringe views or shows dissensus; however, our comparative analysis of the three countries suggests that the advantages of being able to hold politicians accountable for the advice they seek and the decisions they make probably outweighs the potential drawbacks. This is not only useful in terms of formulating more effective policies, but also reinforces the public's ability to hold leaders accountable.

Conclusion

Advice systems bridge the gap between scientific evidence and the political process, turning evidence into advice for policymakers and possibly also legitimating political decisions. In a democracy, they do not and should not determine policy

decisions. It is the task of politicians to balance different goals considering what they have learned from scientific advice and other sources. We compared advice systems during a health crisis in three countries with renowned scientific establishments and generally competent public administration. They varied in the extent to which the advice heads of governments received was transparent and tailored to requests from the government. Their advice systems reflected long standing practice as well as political pressures and strategies during the pandemic. The experience of Germany, as well as debates and problems in France and the UK, suggests that politicians will have no problem finding private advice but that there is real value in making the development and content of formal scientific advice as public as possible.

Declarations

Conflict of interest The authors declare no conflict of interest.

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