Dear Editors,

Thank you for giving us this opportunity to revise our article “Policymaking During Crises: How Diversity and Disagreement Can Help Manage the Politics of Expert Advice.” We would like to thank all three reviewers and the editors at the *BMJ* for their thoughtful suggestions and critical feedback. In what follows, we explain how we have responded to each critique and recommendation. We are confident that the current draft has been improved by your suggestions.

:: Editors interpreted the Venki Ramakrishnan quote in different ways. Please can you ensure the intended meaning of this is clear, including more explanation if required.

The quote from Ramakrishan is the following: “there is often no such thing as following ‘the’ science. Reasonable scientists can disagree on important points, but the government still has to make decisions.” We took this to hint at a position similar to our own, namely that reasonable scientific disagreement can — and should — coexist with political responsibility for decisions. What we effectively do in the paper is further develop arguments for diversifying and pluralising expert input, and for designing institutions that make visible the plurality of reasonable expert judgments and thereby clarify political responsibility, making it harder for politicians to hide behind 'the' science.

To avoid confusion we have removed the Ramakrishan quote and articulated our own position instead. The paragraph now reads as follows: “At the other extreme, expert authority is used to shield political leaders from responsibility. The UK government, for example, has repeatedly insisted that they have simply been “following the science” when making decisions during the COVID-19 pandemic, even though experts do not speak with one voice and scientific facts, alone, cannot determine how political (or ethical or moral) judgments should be made.”

:: We felt that a more nuanced discussion was required when highlighting those specialities that were relied upon to guide public policy. The article currently lists medical (virologists and epidemiologists) and non-medical (economists, sociologists, educators) examples. What about other specialties within medicine e.g. pathologists, general practitioners / family medicine, geriatrics? The article positions virologists and epidemiologists in the driving seat - is this something that’s proven true everywhere? What about in the US? Which experts are leading there?

We agree that this claim — that the pandemic response has been guided primarily by health experts and not other types of experts — needs to be substantiated. We have included two references that help support this claim.

This article lists the experts who have played a role in the Trump administration’s response to the pandemic: https://www.statnews.com/2020/03/20/guide-to-trump-administration-coronavirus-response-team/ Aside from non-expert politicians, all of the administration’s chief advisors on the pandemic are health professionals or health policy analysts.

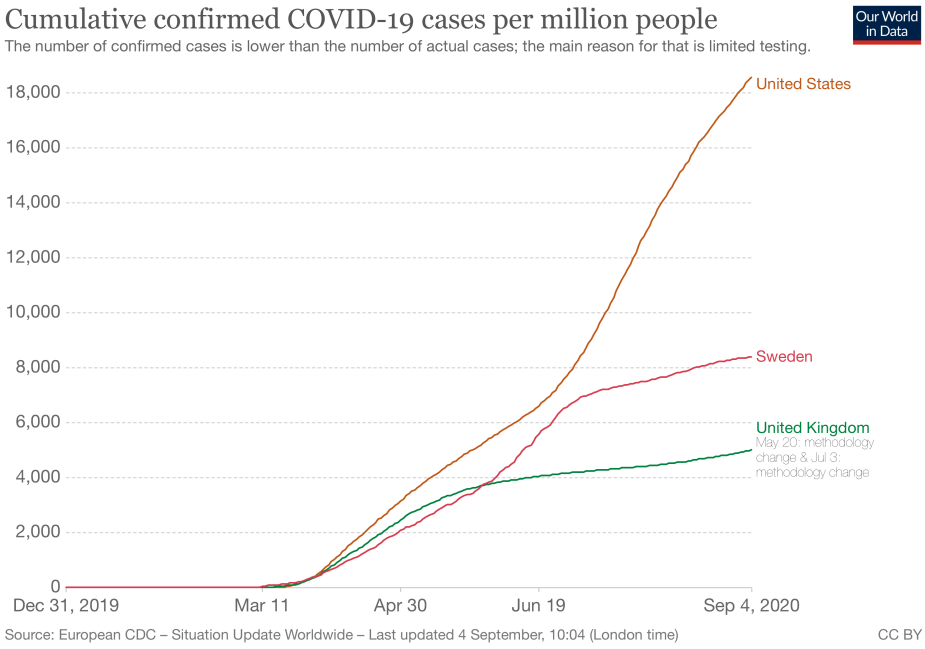
This article lists experts who have played a role in the UK’s COVID-19 response: https://www.theguardian.com/world/2020/apr/24/coronavirus-whos-who-on-secret-scientific-group-advising-uk-government-sage As in the United States, the group of experts providing advice to political leaders during the pandemic in the UK is chiefly comprised of health professionals.

The relevant passage in our article now reads as follows: “During the COVID-19 pandemic, political leaders in the United States and the United Kingdom have relied on advice primarily from medical experts (physicians, virologists, and epidemiologists), which is, of course,

appropriate during a health crisis (*8,9*). But advice from those experts should be considered alongside input from other types of experts such as economists, psychologists, sociologists, educators, and child-welfare advocates."

:: One of our editors thought that Sweden might prove an interesting example to consider. It has been reported that the Swedish response was guided by the state epidemiologist, Anders Tegnell. If this is true, it might be the only country whose decisions were really decided by a scientist, rather than politicians. This is particularly interesting given the negative press that Sweden's response has received. You might wish to explore this.

We are not experts in how the Swedish system works but our understanding is that the Folkhälsomyndigheten — the Swedish Health Agency — is a quasi-independent body charged with making decisions about public health; just as the Federal Reserve in the United States is meant to operate independently from the government when making decisions about interest rates. It is our understanding that Anders Tegnell, who is State Epidemiologist at the Swedish Health Agency, has been directing the country's response to the pandemic with minimal input from political leaders. While removing experts from the political arena (in so far as it might be possible to do so) is one way of managing the politics of expert advice, it is not the approach we recommend in our paper. One danger of this approach is that public decisions will be made from too narrow a range of disciplinary and social considerations and perspectives. Another danger is that public decisions will not be (or be considered) legitimate if they are made by specialists in isolation of other relevant disciplinary and social expertise. Experts within specific disciplines are not equipped to make legitimate decisions about how conflicting concerns and societal interests more generally should be weighed against each other when public decisions have to be made. As we argue in our paper, such decisions should be *informed* by diverse expertise, but *made* by political leaders who are accountable to the diverse publics their decisions will affect. The other danger is that people might resist decisions — or restrictions — imposed on them by authorities that they do not consider legitimate. Empirically there is evidence that Sweden has not managed the COVID-19 pandemic particularly effectively, as the following graph indicates. Whether this has to do with concerns about the legitimacy (or illegitimacy) of having health experts make public policy independently is a question that we are unable to address in this paper.



:: In the example of disciplinary disagreements we thought that posing the question as 'whether or not to mandate wearing face masks' might bring in the range of disciplines in a more intuitive way than 'are face masks effective?' Many disciplines may not feel able to comment on whether masks are effective, but are more likely to have a view on whether they should be mandatory.

Yes. We agree. Those changes have been made. Thank you for the suggestion.

:: The heading Organising Principles seems to introduce jargon unnecessarily. Editors thought this would work just as well with the heading Principles.

Agreed. We have made those changes.

:: With regard to the argument about transparency, we thought it might be worth acknowledging the progress that has been made. For example, while there is a strong case for publishing disagreements, at the start of the pandemic we didn't even know who was sitting on the advisory committees - something that has been the case in previous pandemics too.

We have clarified that SAGE has become more transparent about their membership over the course of the pandemic. We also, however, make the cautionary argument that transparency — itself — is not enough. Publishing membership lists and raw data (such as transcripts) will not necessarily help reveal or communicate the terms of disagreements between members or the degrees of uncertainty associated with specific recommendations. Transparency, itself, can lead to misinterpretation or the dissemination of misinformation; whereas the publication of carefully constructed dissents can help clarify legitimate but alternative viewpoints and uncertainties.

:: When discussing the different types of diversity you may also wish to consider age, especially given the disparity in outcomes with covid-19 by age, and the fact that older age groups may have experience of previous pandemics e.g. 1957 and 1968 flu pandemics.

Thank you for this suggestion. We have added age — and race, on the recommendation of reviewer 3 — to our list of different types of social knowledge and lived experiences that should be considered when making judgments about COVID-19 policies and restrictions. Due to space constraints we do not develop the point that people in older age groups may have useful experiential knowledge from previous pandemics, but this is an interesting example of why it is important to include people from diverse social backgrounds (and one that has not received much attention in the media thus far). To make this point effectively we feel that we would have to detail why some of the other demographic categories — race, home-ownership, etc — are relevant, but we do not have the space to do so.

:: You briefly mention differences in tolerance of risk. Editors thought that the differing approaches of countries could be discussed in a little more depth to highlight the implications e.g. of a zero-risk type approach versus alternatives.

We fear that our brief statement about tolerance of risk may have been unclear. It was not our intention to discuss the implications of different tolerances of risk in different countries during the COVID-19 pandemic. We mentioned tolerances of risk to help buttress our claims about

the importance of disciplinary diversity: there is evidence that researchers from different disciplinary backgrounds demonstrate different tolerances of risk when it comes to designating substances as carcinogenic. The relevant statement now reads as follows: “Expert committees of the US National Institutions of Health, for instance, have held votes on whether a substance can be reasonably considered to be a carcinogen, and these processes have revealed disciplinary differences in judgments about risk.”

:: Finally, editors thought you may wish to consider the political issue around governments seeking popularity rather than necessarily following the consensus, and that they may align with other groups depending on how it fits their agenda.

Thank you for this suggestion. We agree that it is necessary to address the incentives that political leaders have to pursue their own agendas and frame (or dismiss) scientific advice in ways that suit their partisan purposes. As John Dryzek points out in his review, “the problems the authors identify lie not just in the relationships between different kinds of experts, but in the broader kind of politics which expert advice enters.” We have addressed these concerns in a completely revised conclusion. The relevant statement reads as follows: “The principles and institutions we discuss in this article are, of course, not a magic bullet: their effectiveness will depend to a large extent on the political environments into which expert advice is inserted. At the same time, they would help make those political environments more receptive to expert advice by minimizing the opportunities that political leaders would have to distort that advice or simply defer to it for their own partisan purposes.”

Reviewer: 1

Comments:
The authors argue that scientific advice offered to political leaders should be (1) publicized, (2) come from diverse disciplinary experts, and (3) clearly articulate disagreements among experts. The case for (1) and (2) is extremely strong. The surprising part is (3). How to protect against politicians cherry-picking the opinions that suit their political agendas, if many dissents are publicized? It is more commonly thought important to publicize a consensus view to rally the public around the best scientific recommendations. The authors argue, however, that where the sciences is rapidly developing, as with the novel coronavirus, it is important to open space for policymakers to change their minds. This requires openness about existing uncertainties. The best scientific opinion at a given point in time could be mistaken. Authors make a strong case for this position, and offer institutional arrangements such as publication of minority reports and tribunals, that could bolster confidence in experts precisely by demonstrating that the scientific process is not dogmatic. This paper is strongly argued and well-supported by the cited literature.

We were please that the reviewer expressed broad agreement with — and interest in — our arguments. We have not made revisions in response to these comments.

Reviewer: 2

Comments:
This paper provides a nice contribution to the topic of the relationship between expertise and politics, which has been well-studied but not in the context of the current crisis, so it does come across as fresh. To avoid either experts being either attacked or used as a shield the authors propose recognizing diverse expertise and open disagreement,

meaning diversity has to be processed and decisions reached through political processing of diversity. The point about the epistemic benefits of variety is well-recognized, and explains why for example there were so many disciplines involved in the Millennium Ecosystem Assessment or Intergovernmental Panel on Climate Change. The need for open disagreement is perhaps a bit more novel, though it isn't going to stop that disagreement being weaponised in politics, as for example when climate change deniers cherrypick seemingly anomalous bits of evidence.

The paper stresses legitimate disagreement and uncertainty, without saying what makes disagreement legitimate – unless all disagreement is legitimate. What about manufactured disagreement on smoking/cancer and climate change by those Oreskes and Conway call 'merchants of doubt'? I'd use the concept of meta-consensus to delineate legitimate disagreement, though that might take a while in a short paper.

We acknowledge that we have not clearly specified what might make disagreements legitimate or illegitimate. A meta-consensus involves overarching agreements about the general nature of issues or processes without necessarily requiring agreement on the appropriate outcomes related to those issues or processes. In order for democracy to work, for example, we must have agreement on the legitimacy of elections and the practices we use to conduct them, even if we disagree on what the outcome of any specific election should be. As soon as some actors challenge the meta-consensus by questioning the legitimacy of elections *per se*, they step outside of the bounds of legitimate disagreement. (Although it may be legitimate to have deliberations and disagreements about a meta-consensus at specific, appropriate times, such as when a country is changing or establishing a constitution.) In the context of scientific expertise — and COVID-19 specifically — there needs to be a meta-consensus on appropriate scientific and ethical standards for conducting and assessing scientific research, but experts might disagree within that meta-consensus about the acceptable (or unacceptable) health, social, or economic consequences of different courses of action informed by robust scientific research. We agree with the reviewer that it would be a challenge to engage in a full discussion of meta-consensus in such a short paper.

I think ultimately the solution to the problems the authors identify lie not just in the relationships between different kinds of experts, but in the broader kind of politics which expert advice enters. Their proposals would probably not be enough to counter the toxic politics of the United States, even as it applies narrowly to the pandemic; and in the much more measured politics of New Zealand, would probably provide mostly incremental improvement. In any case, their proposals would work better if they could be joined by political reforms or innovations to render politics more deliberative.

As indicated above, we have revised the conclusion to address these important points. We agree that our proposals would not be enough to counter the toxic, hyper-partisan politics of the United States. Indeed, in such an environment it would be almost impossible to establish the sort of institutions for scientific expertise that we imagine. That being said, we agree with the reviewer that there are countries where such institutions might have a chance of taking hold, and our intention is to say something about how the politics of expert advice *should* be managed, not how we think it *will* continue to be abused in hyper-partisan political environments. We have clarified our intentions in the last line of the paper, which reads as follows: "Our proposals can thus be seen as one step towards enhancing the quality of public deliberation and, ultimately, political judgment, in our political systems by encouraging an attitude not of blind deference to the science but of allegiance to the norms of science itself: a respect for diversity of opinion and the value of disagreement in processes of inquiry."

In short: this is an interesting contribution that should get a lot of attention. And if the authors are true to their own commitments, they should welcome disagreement with their argument.

I had to look at footnote 1 several times to realise Colvin J. Trump isn't a person.

Reviewer: 3

Comments:
This is a thoughtful, clear, and compelling manuscript. It is well grounded in relevant scholarly literature, and it is written in an accessible style for a broad audience. The manuscript makes a persuasive case for two simple principles for the effective political use of expert advice: include diverse perspectives, and facilitate open disagreement among experts. The authors conclude with some interesting reflections on how these principles might be institutionalized.

I have only two suggestions. First, the authors call their principle "Inclusion of Diverse Disciplinary Perspectives," but then they rightly say that "diversity is important not just with respect to subject expertise, but also with respect to social knowledge, lived experiences or 'perspectival diversity'." As examples they mention "gender, home-ownership, or wealth." These are not matters of "disciplinary diversity," but "social diversity" or what some have called "social perspectives." Additionally, given that the authors repeatedly use the Covid-19 pandemic as an example, I recommend including a comment on racial and ethnic diversity. As many people have noted, in the United States, especially but not only, the pandemic has had a highly disproportionate impact on people of color.

We would like to thank the reviewer for noticing this inconsistency. We have clarified throughout the text that: "Expert advice should draw on diverse disciplinary specialisms and diverse social perspectives." And we added race (as well as age) to our list of examples of socially and politically relevant demographic categories.

Second, the authors' call for publicizing expert disagreement and uncertainties, while preserving the autonomy of political decision making, has similarities to Collins and Evans's proposal for a committee of social scientists that would do just that in their book Why Democracies Need Science. It would be worthwhile to add a brief comment on how the authors' proposal compares to that of Collins and Evans.

We would like to thank the reviewer for this suggestion. We are familiar with Collins and Evans' book and we have clarified how our proposal for a standing committee of diverse experts compares to their proposal for bodies designed to report expert consensus. We have imagined a large collection of experts, each of whom would be empowered to provide advice to political leaders whenever there are issues that they (i.e., the experts) judge to be relevant to their areas of expertise, even if the issues or decisions themselves appear only tangentially related to their expertise. In this model, experts on child-welfare, for example, would be empowered to contribute to discussions about how COVID-19 might affect the mental health and social development of children. In this way, instead of supporting the reporting of expert consensus, our proposal for a standing committee of diverse experts would, as we say, "serve to pluralise credible expert input."