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A Qualitative Exploration of the Information Sources Used at the State Level During the COVID-19 Response in the United States

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Abstract

As the COVID-19 pandemic spread throughout the United States, governments at all levels were required to make quick and consequential decisions This paper uses interview data from key players involved in the COVID-19 response to explore the sources of information which were drawn on and the related informational challenges. The responses describe a policymaking environment characterized by a surfeit of some types of information and the absence or insufficiency of others. Our results suggest there may be value in future public health emergencies in adopting a formalized process for considering heterogenous information as well as centralized resources or systems dedicated to gathering and synthesizing relevant information. This paper provides important insight into how information is sought and managed in a time of crisis, which may help to improve policy responses in future public health emergencies.

Introduction

During the COVID-19 pandemic, governments at all levels in the United States (U.S.) enacted a range of policies aimed at reducing the health toll of the pandemic. While these policies had public health and other benefits, some also curtailed fundamental freedoms, caused economic harm, and had a range of social costs. Ideally, these kinds of high-stakes decisions would be based on a good understanding of the policies' likely effects, both positive and negative.

Prior work has identified ways in which COVID-19 policymaking may have fallen short of this ideal. For example, research has drawn attention to the possibility that some state lawmakers were impacted by or promoted false information about COVID-19 (Harvey, 2020). This study identifies an additional barrier to meeting this decision-making ideal: challenges related to the gathering and synthesis of relevant information.

To understand the types of information and information sources used in COVID-19 policymaking, we analyzed interviews conducted with individuals involved in COVID-19 policymaking at the state level in the U.S. "Information" is interpreted broadly to include everything from evidence generated in high-quality scientific studies to information gleaned from social media and personal phone calls. Our results show that state officials drew on multiple sources of information, and there were distinct challenges associated with each information source. Additionally, we identify general challenges related to the integration of large amounts of heterogenous information.

Methods

Data and Sampling

Participant recruitment occurred from February to December 2022. Recruitment and semi-structured interviews occurred in two phases:

> 1) *Interviews with government officials and advisors involved in the pandemic policymaking process across six states that were selected for their political and geographic diversity.* Potential participants were identified through outreach to governor's offices, snowball sampling, and Internet searches. Recruitment emails were sent to potential participants. Through this process 25 interviews were conducted with 26 individuals in 6 states.
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> 2) *Interviews with state epidemiologists, who could come from any state*. Through this process 11 interviews were conducted with 12 individuals. Contact information for State Epidemiologists was identified using internet searches of both official government websites and secondary sources, and they were then emailed a recruitment email.

Recruiting participants was challenging; most of the prospective participants that were contacted did not respond to our invitation. Following the interviews, some participants also did not want us to use particular statements that they had made due to concerns that the information contained in the quote might reveal their identity to their colleagues or to others.

Our ability to maintain confidentiality was important for participant recruitment and retention, as well as ethically given the possibility for harassment or reprisal from their employers should quotations from their interviews come to be associated with them. To this end, to maintain confidentiality, we will not identify the state in which each participant was working, and throughout the manuscript we will be using the non-gendered pronoun "they" to describe participants and the governors of the states in which they worked. At the end of each interview, participants were asked how they would like for us to refer to their job title in project outputs, and in this paper, we use the job descriptors that were provided by participants or the generic term "interviewee" (see table 1).

An interview guide was used covering a range of topics, including policy decision-making processes and participants; how policymakers managed multiple policy objectives and trade-offs between them; and whether ethics guidance was used in the policy response. The interview guide was developed with feedback from experts on both semi-structured interviews and state government/pandemic policy on multiple iterations. Interviews were conducted over Zoom or a similar platform and were recorded and transcribed verbatim using transcription software or a transcription company. Interviews ranged in length from 36 minutes to 1 hour and 34 minutes and were conducted by multiple members of the research team. All procedures were approved by the [University] Institutional Review Board.

Data Analysis

Throughout and following the interviewing process, data analysis proceeded following the approach of Miles, Huberman, and Saldaña (2014). First, an initial code book of 126 codes was developed for first cycle coding. These codes were selected based on the research questions, the interview guide, and a read-through of the transcripts. The code book was validated using intra-rater reliability, whereby a research team member coded 5 interview transcripts and then later recoded these 5 transcripts after at least a week of time had passed. The overall unweighted Cohen's kappa based on character was 0.82 which was in the target range. Minor adjustments were made to the codebook before transcripts from the second phase of interviews were coded. These adjustments included, for example, the addition of subcodes. The results of this paper were compiled from an analysis of interview material identified by the following codes: (1) information/data about the pandemic including the subcodes for information type, (2) reference to other COVID policies/guidance, (3) misinformation in the pandemic, (4) expert input vs public input, (5) challenges related to information and data, and (6) good practices related to information.

Results

Interviewees relied on a range of information sources during the COVID-19 policymaking process. These sources included: (1) public health data gathered by governments, (2) personal communication, (3) articles and preprints reporting scientific research, (4) expert institutions, (5) advisors and experts, (6) news and social media, and (7) additional inputs.

Public Health Data Gathered by Governments

Multiple interviewees identified that public health data gathered by governments was an important driver of their state's response to COVID-19. As one state government official emphasized, "we had a daily report coming in that had a consistent list of data that we were looking at and tracking. So that was the daily cases, the number of tests, the percentage positive of those [tests], the hospital capacity, ventilator capacity, number of deaths. That was a reoccurring daily data point that we would use to kind of judge where things were and where they were moving" (1). Hospitalizations, number of ICU patients, vaccination rates, number of respirators, and number of COVID-19 deaths are additional metrics that were referenced by the interviewees.

> Data was a big driver. So at least from a hospital capacity standpoint, they [the governor] watched the positivity rates, they watched the testing rates, they watched the CDC sites and how each of our counties were being categorized and the color they were. (2)

For one state epidemiologist, the public health data from their respective state was uniquely valuable compared to other sources of information.

> There are studies and we can talk about those, but believe me, I've seen every study and every study has been used by people's opinions to support it. So, there's enough studies. You got to be somewhat careful about looking at these...What tends to be functional is observing what actually happens. So really looking at deaths and looking at

> hospitalizations and infection rates, what we actually observe, not opinion, not studies, but what we actually observe in [my state]. (3)

Responses from some interviewees highlight how public health data was drawn upon to support emerging policy objectives. Over time, interviewees noted a change in which metrics were most helpful for informing the COVID-19 response.

> I think once vaccination was available widely and again, based on analysis of the data, we stopped focusing on case counts to a large degree and really honed in what had always been our focus, what was serious illness, hospitalization, and death. Because, especially with the introduction of the new variants, especially the Omicron variant, we really wanted to de-emphasize the focus on cases. (4)

Public health data was also drawn upon in order to create models for predictive or analytical value. 10 out of 11 state epidemiologists and 11 out of 27 interviewees from the 9-state sample referenced that modeling was used in their state. Modelling was typically used to predict surges, cases, mortality, and hospitalizations in order to prepare and protect the healthcare system. COVID-19 created an enormous data management task for the state public health systems. One state epidemiologist described how having an academic partner was vital in supporting their data management efforts.

> Our academic partner is [name removed]. And so, we had been working closely with them because they were staff that have a lot of expertise, especially because we were being asked to do all these analyses on the fly. They're like, we want to know blah blah about hospitalizations or about this or about that. And we were just busy trying to get the data in the system. We didn't necessarily have time to do the analysis. We had people that could do it, but no one had time to do it. So, then we would ask some of those staff to help us with certain things. (5)

Although valuable in the COVID-19 policymaking process, the interviewees discussed the challenges associated with accessing the public health data. One state epidemiologist described how there is a misconception about the accessibility of data:

> I think early on what could have eased some tension with [the Governor's Office] and just with even our commissioner's office in general was the data needs at the very beginning quickly overwhelmed our system. We had to quickly upgrade with servers. We actually have a very robust data management system, but I think there was such a demand for data to help drive the quote unquote policy that there wasn't a recognition about what it takes to collect primary data. [...] [T]here was such a pummeling, this hunger for all this stuff and there was this lack of understanding because I guess the movies portray data being accessible. (6)

Interviewees also raised concerns about the quality or adequacy of the data that informed policy decisions. In particular, interviewees voiced concerns about the economic data that was brought to bear. One state health official stated that the economic data "wasn't as sophisticated as the health data" and this made it difficult to make trade-offs related to protecting public health and

protecting the economy (7). A local health official and health company CEO noted the inadequacy of economic data and commented on the type of economic data that would have improved the policymaking process:

> There wasn't enough data at all on the economic side. I think there was a lot of reaction-and emotion, no science applied that I saw. It would've been really helpful if somebody had sat down and brought to the table, look, this is the financial impact. This is what it's costing every citizen, dot, dot, dot. This is what a closed school means derivatively, dot, dot, dot, dot. I think it would've started to cut through a lot of the noise if people from both sides could have gotten good, clear data on that. (8)

An additional data challenge encountered by a state epidemiologist related to how the existing public health infrastructure can negatively impact data transferability between states and to institutions like the CDC. This interviewee described how the data systems among the states are unable to share data and "talk" with one another and voiced the need for an infrastructure of data systems that is standardized to CDC data reporting (3).

COVID-19 presented states with a daunting data management challenge. However, one state epidemiologist described a silver lining: the improved data systems created during the COVID-19 pandemic can be leveraged for future public health emergencies.

> [T]he system we've set up in terms of reporting is now totally automated. We're able to pull all that data out every day. We're able to match it to vaccine data really easily. We're able to do all these things. I can't imagine having made that same stride without the pandemic in the periods of time that we did. And then we've been able to leverage that for things like Monkeypox. (5)

Personal Communication

Information derived from personal communications helped inform policy makers and their advisors. One state health official described how phone calls with hospitals provided valuable contextualizing information for the public health data that was being analyzed.

> But we were really pulling information from different sources, getting on phone calls, making phone calls, actually talking to people about what the situation was. Now, was it all data driven? No, not really. Was it useful? Totally. You know, once we realized what we needed the hospitals to tell us, and we got those systems in place it became less about those conversations and more about analyzing the data as it was coming in. But they were under a lot of pressure too. Their data was behind. So, I would say that the data was super important, but what was equally important was having the conversations and getting the context behind the data. (9)

Interview responses indicated that phone calls were a means of gaining information about how different stakeholders were reacting to the imposed public health measures, such as the shutdowns of schools and businesses.

> We were also on the phone with the Department of Education with regard to how are the kiddos doing and we were also with some elements of industry finding out, how things were being impacted after we shut down. [We would ask], "What are you seeing with your employees? Are your employees staying in? Are you hearing about infections?" That sort of thing. (9)

> The governor shut down some businesses for short periods of time, but he would always want to know a reaction from the [economic recovery] committee. For example, salons…So we called around to see what was the reaction to that or how were they feeling about that. […] It wasn't scientific, it was more anecdotal. But we would just reach out to salon owners that we knew. (10)

Additionally, the responses suggested that peer-to-peer communication and learning with colleagues within and outside of one's own state also yielded important information that supported the pandemic response.

> Our Secretary of Health collaborated with other secretaries of health just [about] what they were seeing with cases outbreaks, and clusters. It was helpful to see, as I mentioned, what other parts of the country [were dealing with]. [We would then anticipate that] this is coming [to our state] at some point, maybe three weeks behind something like that. It was more of an information sharing and just awareness type thing. (11)

One state government official mentioned that there was communication amongst state governors via text messaging that was facilitated by the National Governor's Association. Overall, the interviewee evaluated the governor-to-governor discussion as a positive state level communication practice (12).

Similarly, other interviewees commented on how peer-to-peer learning was supported by formal organizations such as the Council of State and Territorial Epidemiologists (CSTE) and the National Governor's Association:

> So, the other thing was is you know, I'm pretty heavily involved in the Council of State and Territorial Epidemiologists (CSTE), and we were talking minimum weekly more like three times a week really, but informally. And we were keeping each other informed on what we were seeing in our jurisdictions. That was super critical too because we could use peer to peer communication and peer to peer learning to find out what was happening, what were the struggles, what were the challenges, what were the solutions. So that was a super important thing. (9)

> The National Governor's Association was an important venue for us to understand how others were reacting to the pandemic. (13)

Altogether, the interview results suggest that personal communications provided COVID-19 policymakers and their advisors with timely information from their colleagues and from stakeholders who were experiencing the impacts of the COVID-19 policies. However, although lines of personal communication such as phone calls or emails were pathways to acquiring helpful information, one state epidemiologist noted how lines of personal communication could

be used to purposefully hinder policy efforts. This interviewee described how an email campaign was mounted against them and their colleagues by people in their state.

> There was a campaign at one point, and they were just slamming everybody's email mailboxes. And it was a little bit amazing because you sit there and go, we are trying to help save your lives, right? And you think that it's cute to have us open up our mailbox and have 3000 new emails today? I can't even sort through what is real and what is not from this. And then of course, all the messaging becomes, well, the state didn't respond to me. And it's because it wasn't even a real request, it was that you shared this with your buddies because you're pissed off about some policy and literally just spammed us constantly. (14)

Articles and Preprints Reporting Scientific Research

The interviewees reported drawing on published and pre-published scientific papers on COVID-19. Responses from the interviewees demonstrated that scientific experts were integral in helping assimilate scientific information from the accumulating body of evidence on COVID-19. For example, having infectious disease physicians as part of the response was characterized by one state government official as helpful because they understood the virology of the disease itself and they possessed the capacities to assimilate and operationalize the scientific information being generated during the pandemic (11). Similarly, one state public health official described the benefit of being able to access information about COVID-19 that had already been curated and digested by experts.

> A group of virologists that started doing this blog thing, you could go in and listen to them chat and talk about the COVID stuff, and that was so helpful. Especially early on when it was really about the virus, and the virology, and how fast it was mutating, and all that. That was wonderful. (15)

Additionally, given the exceptionally large quantity of relevant scientific information, this interviewee also described how it was helpful to have individuals who would collate and disseminate relevant scientific research.

> The state epi of Minnesota, he took it upon himself and started sending out journal articles every day. He still does, thank God. Because there are hundreds being published every day, there's no frigging way you're going to keep up with it. I certainly was trying on my own. But he actually sends probably eight to ten articles a day. It's a mix of stuff, but he's already curated it. I certainly get other articles independently, but that's been so helpful. And I think he just did that on his own, but for best practices or recommendations, that was so helpful. Especially because I have subscription to New England Journal and JAMA [Journal of the American Medical Association], but I don't have subscription to every journal out there. (15)

Although scientific research was cited as a valuable source of information, interviewee responses described challenges related to using articles and preprints reporting scientific research. For example, the prior quote from the state public health official noted that accessing relevant

scientific information was complicated by the fact that they did not have subscriptions to the relevant journals (15). One interviewee who was a former chief of staff to a governor shared that scientific research from academic institutions was drawn upon only with the luxury of time.

> Those kinds of sources [academic papers] are the kinds of things you start to go to in any situation when you have the luxury of time. And so, I will say in the early days that those kinds of sources weren't what we used because you didn't have the time to find them and to understand them. That kind of stuff popped up much, much later on, certainly after the first six or eight weeks. (13)

According to one interviewee, the nature of scientific information itself posed a different sort of informational challenge during the COVID-19 policymaking process. In the words of one state epidemiologist "good science changes" (3). However, the fact that good science produces changes in understanding can be at odds with the expectations of some policymakers and members of the public who look for scientific information that is presented in terms of simple, binary, and absolute truths.

> At the end of the day, that kind of stuff tends to come to the fore when it is encapsulated in an op-ed, right? You have to really dumb it down and, unfortunately, you often have to, and this where the disconnect in my experience always is. The governor, and most executive branch elected officials, and frankly voters, are often looking for binary truths, right? Wear a mask and you won't get COVID. Don't wear a mask and you will get COVID. People tend to perceive the world in terms of those absolutes. Elected officials like to talk in those absolutes. So, one of the challenges with academic research, whether it's medical research or social science research, or whatever, is it's never presented in that way, right? […] Voters look for binary types of decisions. Therefore, elected officials look for those, and research often can't and shouldn't be presented in that way, but when it is people tend to gravitate towards it, again for better and definitely for worse. (13)

Interviewees also drew attention to the fact that they needed more than just biomedical information about COVID-19. Namely, they reported needing information from the social sciences to help them understand how pandemic policies would affect the public and public attitudes towards these policies.

> Before the next pandemic, we need a better understanding – from social science – about how people tend to respond to unproven policies where they don't see direct benefit to themselves. (13)

> We had never exercised or contemplated the sociological impacts of public health mitigation measures, not once, not once. So, we did it on the fly during the pandemic, creating policy and having to use your gut for how this was going to impact people. That's what happened. And we did it really well because in my opinion, we stayed informed and we stayed connected and we had the fundamental priorities which are protecting the healthcare system and the most vulnerable to guide us. (16)

It is worth noting that some interviewees questioned the utility of scientific research in the COVID-19 response or reported that others questioned its utility.

One state public health official questioned the utility of new scientific research on COVID-19 entirely. In their words regarding COVID-19, “it may be a novel virus, but it's still a virus and we know exactly how to control every respiratory virus there is” (17). Consequently, this interviewee characterized scientific input and research in the following way:

> Totally worthless, it’s totally worthless! The science is simple, okay? It's not about science. It is about society. And even more than that, the science was simple. Our task was not to figure out the science. (17)

It is worth considering this interviewee’s final remark on the place of science in the COVID policymaking process:

> Science should advise but science should not decide policy. And it's not about the science. It's about society. (17)

Overall, the interview results are consistent with the claim that science should inform but not dictate the policy response. Articles and preprints reporting scientific research represented one important source of information for policymakers and their advisors, but it was one of many sources of information that helped guide the COVID-19 policy response.

Expert Institutions

Interviewees identified a range of expert institutions – here understood as organizations recognized as having authoritative knowledge on issues related to COVID-19 and the COVID-19 response—as sources of information and guidance. These include the World Health Organization (WHO), the U.S. Food and Drug Administration (FDA), the U.S. National Institutes of Health (NIH), the National Academies of Science, Engineering, and Medicine (NASEM), and the U.S. Centers for Disease Control and Prevention (CDC), including the CDC’s Advisory Committee on Immunization Practices (ACIP). These institutions were often a source of public health data and scientific information, as well as public health recommendations and guidance.

The interviewees reported relying strongly on the recommendations and guidance provided by these institutions. One state epidemiologist gave NASEM’s guidance regarding the equitable allocation of vaccine and for crisis standards of care as specific examples of the type of expert institutional guidance that was drawn upon during the COVID-19 policymaking process (18). An interviewee who was a former chief of staff to a governor noted that expert institutional guidance from federal agencies was perceived as being the most consistent and reliable source of information (13). Reliance on guidance from the CDC as well as the aim to align policy responses with CDC guidance emerged as a repeated theme.

> And so, even from a communication perspective, we said we needed to have some national regulatory north star that we would use. So, I would say that 95 plus percent of the time we aligned with the CDC. Rarely did we go off rails. And I think that gave some level of confidence to our associates that worked within the healthcare system. (19)

> But we in public health try always to stay aligned with CDC, because otherwise you get, "well, you're saying this and they're saying that." And because we'd like to defer to them for many routine things like, "oh, check the CDC site. They're the trusted source". It was very hard to go off from their message. We did a few times occasionally not a hundred percent align. But that's a risk because then you get the whole, "you're not saying what they're saying and you're confusing us" message. So, it was a very constant challenge to try to stay aligned and yet also make sure we agreed with them. (15)

A state government official highlighted how guidance from the CDC supported their approach to vaccine prioritization:

> So early on we followed the CDC phasing approach. Now there were little tweaks to that, like we did the teachers early. We did a few things that were a little different than what the CDC gave out, but that gave us some cover. And it gave me time to sit there and distribute the vaccine pretty damn equitably. And it gave me time to then go talk to the companies as we went into phase two, where we're trying to get the economy back going. (20)

However, following CDC guidance was not without its challenges. One state epidemiologist described a challenge related to the timing of when the CDC released guidance and how this challenge impacted their ability to align themselves with the CDC.

> And we were trying really hard to do what CDC recommended because that's generally what we do. But sometimes that became hard and it was hard sometimes to interpret it for other people especially if we were, we wrote some of our own guides in the beginning, but it became really hard to do that. It was, just didn't have the time to do that. And it always came too late like by the time they got around to the school stuff, we're like, well, we already had to deal with this. We couldn't necessarily wait around. So then it was a matter of, okay, are we going to do what CDC says? Are we not going to do what CDC says? And then we had to be in the situation, we're like, okay, these are the CDC recommendations, but we've already let people be three feet close so we're going to keep it that way. Cause we couldn't really go backwards. (5)

As we have described elsewhere [citation removed], the CDC also failed to give states an adequate amount of time to fully brief their leadership on impending guidance changes, which negatively impacted states' policymaking processes.

Advisors and Experts

A shared feature of the COVID-19 policymaking responses described by the interviewees was the creation of task forces, working groups, or advisory committees in their respective states. These groups were specifically formed in response to the pandemic and were often dedicated to specific domains of interest. For example, states created medical and health advisory committees, economic advisory committees, equity advisory committees, and advisory committees dedicated to COVID-19 vaccination among others:

> So, the governor's office set up multiple work groups on various aspects of the response. There was a safe [state removed] reopening group, a testing group, an education and childcare group, community resiliency and recovery, legislative and communications support, food security, finance, cultural faith and disability. So, lots of different work groups that were involved in the policy making. (21)

These groups were composed of different experts and advisors from within government as well as outside of government:

> There were core groups of advisors that the governor would meet with. And a lot of doctors, nursing home industry representatives. A little bit later, [we had our] superintendent of public schools. It's kind of a blur. The businesses did play a role eventually. There were two different work groups around this. But right in the beginning though, it was just the healthcare advisors advising the governor, but these were outside of government. Like I said, they were, hospital leaders, CEOs, public health officers, that sort of thing. (22)

The interviewee responses suggest these groups of advisors and experts played a variety of different informational functions. In many cases, this function was to provide information; experts and advisors were convened to lend their expertise and provide information on topics related to COVID-19. For example, one state convened a working group composed of advisors from outside the government which provided additional information on COVID-19 vaccination to policymakers in the state public health department.

> We ended up convening a [task force related to vaccine safety]. A formal group that had experts in vaccinology. Many of them served on ACIP [Advisory Committee on Immunization Practices] or part of the FDA process. The idea was to have a team of people who could independently review what was coming out from the federal government and make sure that there weren't any safety concerns that we should have as a state. That was incredibly useful because we could run issues by them as things came up. (23)

Multiple interviewees referenced how groups of experts and advisors were convened in order to make recommendations for their state governor. An interviewee that worked at a large healthcare institution described their role in the following way:

> It was to really provide medical advice. [...] What they wanted were recommendations related to best medical evidence as to what the state should do and what the governor should do. (19)

It is worth highlighting that the experts and advisors who were convened into different COVID-19 related groups typically were each connected to their own informational networks. This was beneficial because it connected the task forces, work groups, and advisory committees to information from the field and enabled them to acquire valuable insight into the effects of COVID and the COVID-19 policies.

> The [name of task force removed] was really a tool that the governor used to understand the impact of COVID at various levels and in various geographies across the state. (24)

One interviewee who served as an external advisor to a governor described how their group of economic advisors helped ascertain how businesses were experiencing the COVID-19 policies.

> It [the group of economic advisors] was mostly representatives from business, so it was auto dealers and retailers, and the food and beverage hotel lodging. It was really with that group of businesses. And what we talked about would generally start with a round table of "What is everybody seeing within their business?" (25)

Throughout the COVID-19 policymaking process, groups of experts and advisors were convened to provide governors and other policymakers with insight, policy recommendations and guidance, and feedback on how people were experiencing the COVID-19 policies. However, one interviewee who served as an external public health advisor to a governor suggested an additional function of their COVID-19 task force that is worth drawing attention to:

> I think the [COVID-19] task force was a source of information for the governor, and they definitely used it that way. But the task force also, frankly, was a political tool for the governor to provide themselves with some cover. And that may have been more of their motivation than getting information was to be able to say, whenever they've made a policy decision that they could say, "Look, I've been talking to all these people. And what they're telling me is informing the decisions that I'm making." (24)

In terms of the challenges associated with getting information from groups of experts or advisors, a state government official commented on how having a large group of experts or advisors may not be conducive to efficiently providing input and information during a time of crisis.

> During my tenure, I think it had been clear that a larger group may not be the right forum to provide really tailored and timely input. You certainly want to hear from diverse voices with different points of view in different industries and different parts of the response. But when larger bodies are sort of integral to decision making, sometimes that can slow what needs to be, in an emergency environment, a very effective and efficient process. (4)

This highlights the challenge of balancing a need to make timely decisions, which often necessitates limiting the size of the group offering their input, with a need to hear from diverse voices with different viewpoints and areas of expertise.

News Media and Social Media

There were mixed responses concerning the usefulness of news media and social media during the COVID-19 response. Compared to other information sources, information from news media and social media seems to have played less of a formative role in the policymaking process. Instead, information from news media and social media may have operated as a calibration tool

whereby policymakers could understand how other countries or how their constituents were reacting and possibly adjust their decisions accordingly.

> News media and social media were good. As is the case for all politicians, right? You're always looking at media and social media to understand sentiment and get a feel for what people are thinking and feeling. (13)

When one state government official spoke about the influence of news reports on policymaking it was to note how news media could potentially confound information from experts:

> Everyone was consuming a lot of news, a lot of media, a lot of commentary about the pandemic. Something that I tried to prioritize was ensuring that we were getting clinical advice from clinical advisors that had clinical expertise and getting operational advice from operational advisors with that expertise. I think it's very normal, especially when there's a lot of information flying around, for people to kind of opine on areas that aren't [their area of] expertise. And trying to make sure that the advice we were getting was really coming from a place of expertise, and not from having seen it on CNN, was important to filter the information the governor was receiving. (4)

This challenge of news media and social media confounding information from scientific experts was echoed by another interviewee who served as a local health official and health company CEO:

> And again, you have to understand, my state is mostly rural and frontier. We have more cows in my state than human beings. Many of the county commissioners are farmers. They're ranchers. These aren't people of science. They're good people if you have a beer with them and just talk about life. But in a situation like this, boy, the politics really becomes really apparent quick and there's no scientific approach to it. It is all gut feeling. It is all well, "That's not what Fox News said," or their social media outlet of choice, and that's the data they're bringing in. (8)

This suggests that in at least one state, individuals who were not scientific experts and who were heavily influenced by news media and social media, played a formative role in COVID-19 policymaking. In the view of this interviewee, this was problematic because it led to decisions being based on political orientation, misinformation, and gut feeling as opposed to scientific guidance.

Additional Inputs

Interviewee responses also suggest that some effort was put into acquiring information about public attitudes from multiple sources. One state public health official described the utilization of polling as a means of gauging public opinion on topics related to COVID-19.

> The state employs, in fact, I think it was out of the Governor's Office, an opinion polling service that would, not constantly, but would regularly do public opinion polls. And those

> would be shared with us. So, we knew what the public was saying, with a certain amount of certainty, and what they were thinking about. (15)

Another state government official described the way that calls, emails and letters from members of the public were used to determine the public's understanding of issues related to COVID-19 and where understanding could be improved.

> We get calls, emails, letters. And every week we have a top five roundup of the top five issues people are calling in. And then samples of those communications of voicemails, of emails, of phone calls that are written up and that would go to the Governor and everyone on our senior team. And I always read it in detail every week and sometimes would go down and say, you know, can we get all of the messages on under five vaccines? (4)

Town halls were an additional way in which feedback from the public was gathered, particularly as concerned the COVID-19 vaccination effort. When asked about receiving input from the public, one state government official spoke about the central role of town hall meetings held by their state's governor.

> He [the governor] we went all over the state and had [what were] basically town halls. [He] took feedback from every part of the state. We went everywhere. (1)

Additional ways of getting input from stakeholders were also identified by interviewees, including informal mechanisms such as one-on-one phone calls. A full accounting of the forms of public and stakeholder input identified by interviewees is beyond the scope of this paper.

Challenges Related to Information Integration

A recurring theme that emerged from the interview results concerns the challenges of information integration – that is, the challenges of combining information from a variety of heterogenous sources to inform decision making. Some interviewees expressed that the sheer volume of information and the associated workload was a challenge.

> But our Department of Health leader and the leadership at the top, they were working practically 24 hours a day to stay ahead of the pandemic to understand best practices, learn from other states and the CDC. (10)

In response to question that asked why they did not personally use ethics guidance, an advisor to a governor described how their workload made it necessary to rely on the expertise of others.

> In my role, I quickly learned that there was nothing I could really dive in the weeds on, or I would not survive. So, I needed to stay at a very high level and trust that the people that were working with me really were educated on things that you just talked about. So, it was just me trying to keep my head above water. (22)

One interviewee that worked at a large healthcare institution described the Herculean task undertaken by their institution to synthesize relevant information and develop best practices:

> So it was a full run and we have good resources we could bring to bear on this thing, but it was pretty overwhelming…Everybody who was involved, which were a lot of people managing COVID patients, everybody had ideas about how they did things, how they screened, what they tested for. Even to the point of, remember the old temperature screening, here's what we used that proves to be effective, the other things didn't work. I mean, it was literally thousands of things. (19)

This interviewee went on to note that health care institutions, his own included, were each doing this independently.

> And everybody did this independently. […] And so if you thought about is there a better way to curate all of this information and make it publicly available for everybody on a daily basis? My God, that would've been a better approach for sure. (19)

While multiple interviewees expressed that the amount of information was overwhelming, one interviewee who served as a former chief of staff to a governor also noted that policy decisions were based on less information than usual due to the nature of the public health crisis.

> The fundamentals of the policy making process weren't any different than they were in normal times. They were just super compressed and done often with a lot less information. Not none, but a lot less information that you might have outside of a crisis. (13)

The interview results suggest that COVID-19 policymakers and their advisors put significant effort into acquiring information from various sources. However, one interviewee who served as an external public health advisor to a governor brought up a critical point regarding how the information was ultimately integrated into the policymaking process. This interviewee expressed frustration that the information brought to the table by health advisors was discounted by some government officials and others.

> The value placed on information was very different. Even if information was brought to the table, often it was highly discounted by some parties. And so, it was very frustrating, and I think that I speak for the entire medical profession. (24)

COVID-19 policymakers and their advisors experienced challenges related to the acquisition and synthesis of information from multiple sources. This quote suggests that even when adequate information is brought into the policymaking process, policymakers will face additional challenges in translating the acquired information into knowledge that can inform policy decisions.

Discussion

Our interviewees described an intense environment for COVID-19 policymaking in which they and their superiors were compelled to make quick and consequential decisions in an environment characterized by a surfeit of some types of information and the absence or insufficiency of

others. For example, the quantity of relevant biomedical research was perceived as overwhelming. On the other hand, interviewees expressed there was insufficient information on how the public would respond to the COVID-19 policies as well as inadequate data about likely economic outcomes of different policy options. Thus, it seems that there was both too much information that strained the capacity of policymakers to make effective use of it all, and a dearth of information or high-quality information about critical matters like the economic impact of COVID-19 policies.

Our results also suggest there will be many kinds of information of varying quality brought to bear in pandemic policymaking and that those involved in policymaking may disagree about which information is relevant and valuable, discounting certain pieces of information in the process. As suggested by one interviewee, some individuals discounted or misunderstood scientific information and instead relied on their gut feeling, social media, and news media to make decisions regarding COVID-19. It is possible that a formalized process for considering the relevance and assimilation of information might have helped with this challenge but, interestingly, no interviewee described such a formalized process as being in place.

For future public health emergencies, our results support the usefulness of having a centralized resource or system dedicated to determining what information is relevant, and then gathering and synthesizing that information. One form this could take is timely synthesis of key scientific research by trusted entities, as reflected in the suggestion made by one health official who described how the Minnesota state epidemiologist took it upon themselves to collate and send out curated journal articles every day. The synthesized and curated scientific research could then be disseminated to multiple types of stakeholders involved in the pandemic response – including but not limited to hospitals and health systems, and government at all levels – thus reducing the need for each of them to devote their individual resources to this task. The need to efficiently synthesize information is not limited to scientific research, however. Clearinghouses for emerging best practices, exemplified in the roles played by the National Governors Association (NGA) and the Council of State and Territorial Epidemiologists (CSTE) between the information and guidance-generating arms of the CDC and the states could be strengthened. Also important is the development of systems for gathering information in real time about the effects of the pandemic and pandemic policies on socially important outcomes other than health, including economic well-being, indicators of public trust and fraying of the community supports and morale.

The following limitations should be considered when interpreting the findings from this study. First, this research is limited to the personal experience and knowledge of the interviewees, most of whom were not involved in every aspect of pandemic response for the entirety of the pandemic. It is likely that the interviewees were not aware of all possible sources and types of information that were being used throughout the policymaking process, or the extent to which the different sources of information shaped policy decisions. Next, the response rate for this study was low. It is possible that individuals feared professional repercussions if they were to go on the record and discuss internal policy decisions. Similarly, there may be differences between the individuals who agreed to participate in the study compared to those who declined. For example, individuals who agreed to participate may have held a more positive view of their state's pandemic response compared to those individuals who did not participate. Additionally,

some individuals who agreed to participate were current government officials and so they may have been hesitant to say anything critical of their employer. Finally, most interviewees were from states that had Republican governors during their tenure, and the policymaking processes in Republican-led states may have differed from those in Democrat-led states. Despite these limitations, the individuals who agreed to participate in this study shared important insights into the COVID-19 policymaking process. This knowledge can help to improve how government officials and their advisors respond to future public health emergencies.

Conclusion

Public health emergencies like the COVID-19 pandemic present governments at all levels with significant information management challenges. This study identified multiple sources of information that were drawn on during the COVID-19 policymaking process, and multiple challenges associated with each information source as well as general challenges related to information integration. Learning from these informational challenges and about existing information sources provides policymakers with an opportunity to improve how information is sought and managed before another public health emergency emerges.

References

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Table 1: Interviewee Number and Role Description

Interviewee Number	Role
1	State government official
2	Option 1: Person from outside state government who was a member of a COVID-19 working group advising the governor Option 2: COVID-19 working group member
3	State epidemiologist
4	State government official

5	State epidemiologist
6	State epidemiologist
7	State health official
8	Option 1: Local health official and health company CEO Option 2: Local health official
9	State health official
10	Option 1: Government official who was an advisor to a governor Option 2: Advisor to a governor
11	State government official
12	State government official
13	Former chief of staff to a governor
14	State epidemiologist
15	State public health official
16	State government official
17	State public health official
18	State epidemiologist
19	Option 1: COVID-19 Task force member Option 2: Interviewee that worked at a large healthcare institution
20	State government official
21	State epidemiologist
22	Option 1: Government official who was an advisor to a governor Option 2: Advisor to a governor
23	State health official
24	Option 1: Person from outside state government who was a public health advisor to a governor Option 2: External public health advisor to a governor
25	Option 1: Person from outside state government who was an advisor to a governor Option 2: External advisor to a governor

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Competing interests

The authors declare no competing interests.

Data availability

This paper reports results from interviews with research participants. Interview transcripts are not available, in order to protect the identity of research participants. As part of the informed

consent process, interview participants were assured that interview transcripts would not be shared by anyone outside of the research team.

Ethical approval

This research was approved by the [University] Institutional Review Board, and research was performed in accordance with relevant regulations. The procedures used in this study adhere to the tenets of the Declaration of Helsinki.

Informed consent

Informed consent to participate in this research was obtained by all participants.