



Decision Making During Outbreaks:

Assessing the Data, Modeling, Analytics and Other Decision-Support Needs of Governors and Their Health Advisors





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Executive Summary

Decision making during infectious disease emergencies is exceptionally complex. In many cases, decisions are made by public health officials, but when outbreaks are novel or unexpected, involve significant illness and death, or require large societal adjustments, these decisions can have more of a public focus, with Governors, legislators, and other elected officials becoming more involved in the response. The purpose of this needs assessment is to better understand the types of decisions Governors must make in these situations and what they feel would help them improve their decision making. To complete this assessment, the Center for Outbreak Response Innovation (CORI) interviewed Governors' health policy advisors both in their offices and at the National Governors Association (NGA) Center for Best Practices' Health and Human Services Policy Advisors Institute and compiled their responses. Through these discussions, Governors' staff identified critical gaps in five key areas: 1) data availability, access, quality, and timeliness; 2) modeling and analytic capabilities; 3) decision-making tool development and use; 4) emergency communication and coordination capabilities; and 5) staffing. Governors' staff identified 27 gaps and 23 barriers, along with 16 facilitators and 27 needs to overcome these challenges.

The report highlights the interest of Governors' staff in having access to better data through increased data sharing, improved infrastructure, and stronger relationships among the relevant parties that hold this information. Staff also noted the importance of having increased access to forecasting and prediction models so they can better determine where resources are needed to aid in response planning. They also noted their need for more access to timely risk-benefit analysis, worst-case and likelihood scenario planning, evidence-based public interventions, and cloud-based tools that synthesize data from multiple sources and relevant parties. These advisors highlighted the importance of formalized communication structures during public health emergencies, which can enhance information transparency and support and strengthen gubernatorial crisis communication. They also expressed desire for consistent funding and training for staff during non-emergency periods, thoughtful transition planning, and improved national coordination of surge staffing.

This assessment will help Governors and their staff in responding to outbreaks, as well as help guide CORI, the NGA Center for Best Practices, and the broader Centers for Disease Control and Prevention (CDC)-funded Insight Net network work toward building, disseminating, and evaluating decision-support tools for Governors. Using this guide can



also help other decision makers be better equipped for disease emergencies, which can help improve their future responses.

Background

Introduction

Decision making during infectious disease emergencies is exceptionally complex. In many cases, decisions are made by public health officials, but when outbreaks are novel or unexpected, involve significant illness and death, or require large societal adjustments, these decisions can be elevated to the political level. During the COVID-19 pandemic, Governors and their staff needed to quickly decide on public health-related actions, ranging from executive orders impacting business operations, guidance and requirements on mask wearing, and budget decisions regarding how to spend funds or where to send critically limited supplies.

Pandemics are not the only scenarios in which Governors are heavily involved in making public health decisions. There may be similar types of decisions that also land on a Governor's desk during an outbreak of a novel infectious disease or during a severe flu season. In these cases, there are existing tools, as well as instruments yet to be developed, that can help Governors make these difficult decisions.

CORI Partnership with the National Governors Association Center for Best Practices

The Center for Outbreak Response Innovation (CORI) is funded under a cooperative agreement from the Centers for Disease Control and Prevention (CDC), Center for Forecasting and Analytics (CFA), as one of 13 Centers that make up Insight Net—a network of centers aimed at advancing and better integrating modeling and analytics into public health practice related to infectious diseases. CORI is one of the implementing partners within Insight Net, which means CORI's work is to bring modeling and analytics tools to scale with public health and other partners around the country. CORI is focused on developing and using these tools to improve decision making and outbreak response operations of US public health state, territorial, local, and tribal (STLT) partners, as well as other decision makers such as large companies, the public, and political leaders.

The National Governors Association Center for Best Practices (NGA Center) serves Governors in the US states, territories, and commonwealths, to develop innovative solutions to important public policy challenges. The NGA Center's Health focus area



includes policy efforts to tackle the multifaceted challenges within the public health and healthcare landscape, such as addressing social determinants of health, promoting disease prevention and management, enhancing cost and coverage mechanisms, advancing health equity, and maternal and child health. This work is aimed at supporting Governors and their advisors in shaping policies that have a tangible impact on the health and well-being of communities nationwide.

CORI and NGA have teamed up to specifically engage political leaders at the Governor level to analyze needs for outbreak data, modeling, and analytics as well as build resources and tools Governors can incorporate and use to help with decision making during outbreaks and other public health emergencies. Together, CORI and the NGA Center undertook this needs assessment to better understand the types of decisions Governors must make in these situations, as well as their needs for information and other tools that can help improve the way these decisions are made and implemented.

Decision-Making Framework

The decision-making framework below (Figure 1) illustrates the processes and timeline for public health decision makers during infectious disease and other public health emergencies. Within the decision-making process, there are varied opportunities for public health leaders to apply information, tools, and processes that can provide context for, or help guide, decision making.

- **Data:** Epidemiological and demographic data can help public health leaders assess the initial situation assessment and evidence gathering (Observe, Orient).
- **Modeling and Analytics:** These efforts can help in the phases of evidence/information gathering, risk assessment, and tradeoff analysis, as well as decision implementation (Orient, Decide, Act).
- **Decision-Support Tools:** These instruments can incorporate data, models, and analytics and package them with other tools for situational assessment and evaluation of societal considerations to inform risk management intervention development and implementation. Decision-support tools could be as simple as a checklist or as complex as an AI-enabled decision-making support process.

Figure 1: Emergency Decision-Making Framework

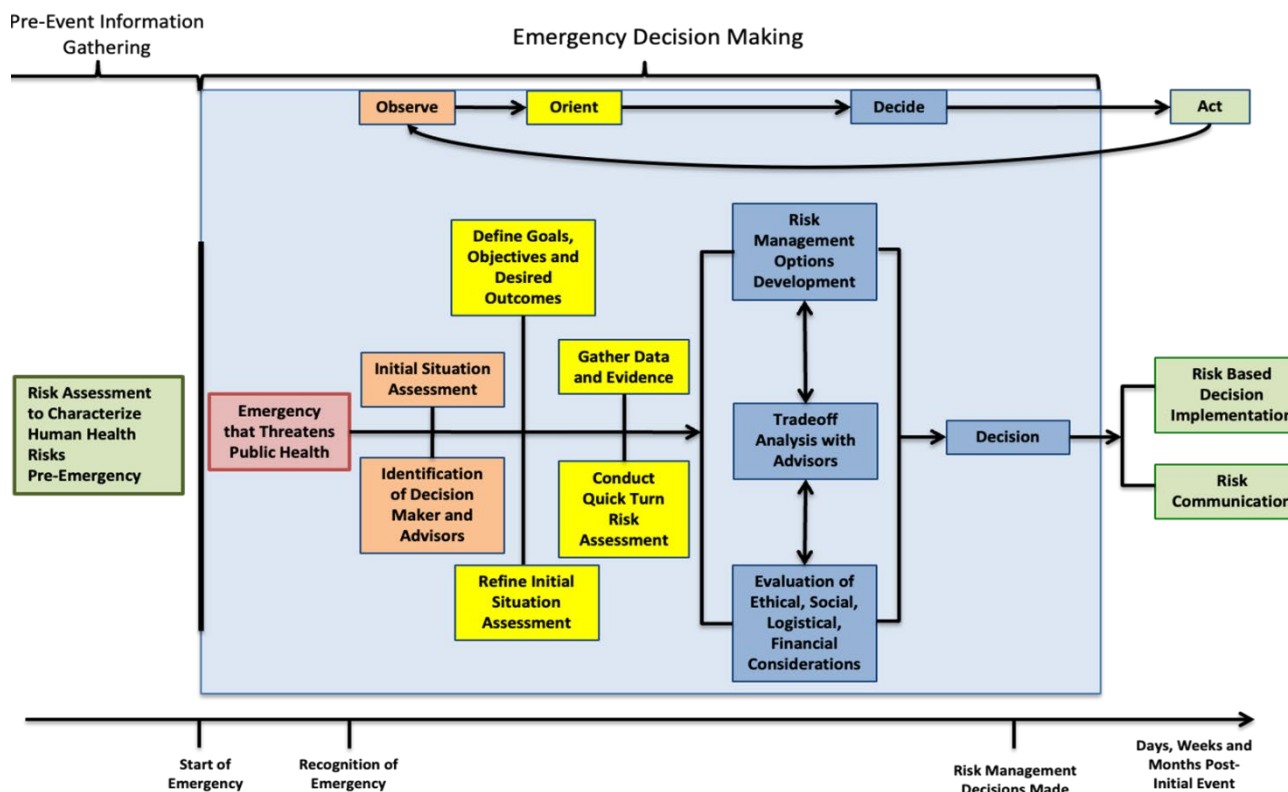


Figure 1 was adapted from Watson C. Risk-Based Decision Making During Public Health Emergencies Involving Environmental Contamination [Dissertation]. Johns Hopkins University. 2017. Available at: <http://jhirlibrary.jhu.edu/handle/1774.2/40880>.

Methods

Key Informant Interviews: In August 2024, CORI and the NGA Center conducted a series of three semi-structured key informant interviews with public health advisors in Governors’ offices. Interviews lasted approximately one hour each and were conducted on a not-for-attribution basis. Audio was recorded and transcribed, with participants’ consent. A semi-structured interview guide was used, which covered specific topic areas but also enabled interviewees to discuss their own priorities. Not every question in the interview guide was addressed in each interview.

Group Discussion and Polling: CORI and the NGA Center held a breakout session during the annual NGA Health and Human Services (HHS) Policy Advisors Institute, held August 29, 2024, in Atlanta, Georgia. During this breakout session, policy advisors agreed to



participate in a group interview process where participants were asked a series of instantaneous polling questions followed by a series of discussion questions similar to those posed in the one-on-one interview guide. To encourage open discussion, the session took place under the Chatham House Rule, which allows participants to freely use the information received but without revealing the identity or affiliation of the speaker or other participants. The session lasted one hour, and the polling results and discussion were recorded with participants' consent.

After completing the interviews and group session, the research team reviewed all transcripts and used the DeDoose software package to code common themes and key points. The team then extracted relevant themes and points from the coded transcripts to contribute to this report.

Participants in both the individual and group interviews agreed that their state or territory would be listed in this report as having participated. This research was determined to not be human subjects research by the Johns Hopkins Bloomberg School of Public Health Institutional Review Board (IRB# 00028761).

Participating States

Overall, advisors to the Governors of 18 states and territories participated in research and contributed to this needs assessment, including three states that participated in the interviews and 15 that participated in the group discussion and polling at the NGA annual HHS Policy Advisors Institute (one state participated in both).

Figure 2. States With Participants in Interviews, Group Discussion, or Both



Interviews: Representatives of Governors’ offices of the states and territories of Connecticut, South Carolina, and U.S. Virgin Islands participated in the one-on-one interviews with the CORI and NGA teams.

Group Discussion and Polling: Health policy advisors to the Governors of the states and territories of Alabama, Arizona, Guam, Hawaii, Louisiana, Maine, Maryland, Missouri, New Jersey, Northern Mariana Islands, Pennsylvania, Rhode Island, South Carolina, Vermont, Wisconsin, and Texas participated in the group discussion and polling.

Findings

Decisions Facing Governors and Their Health Advisors During Outbreaks

Governors face difficult decisions during infectious disease emergencies. Many of the decisions that rise to the level of the Governor’s office are multifaceted, time sensitive, and involve consideration of data and epidemiological analyses, as well as complex social and political tradeoffs. In discussions, staff identified the following as common decisions that were often made by Governors during infectious disease emergencies:

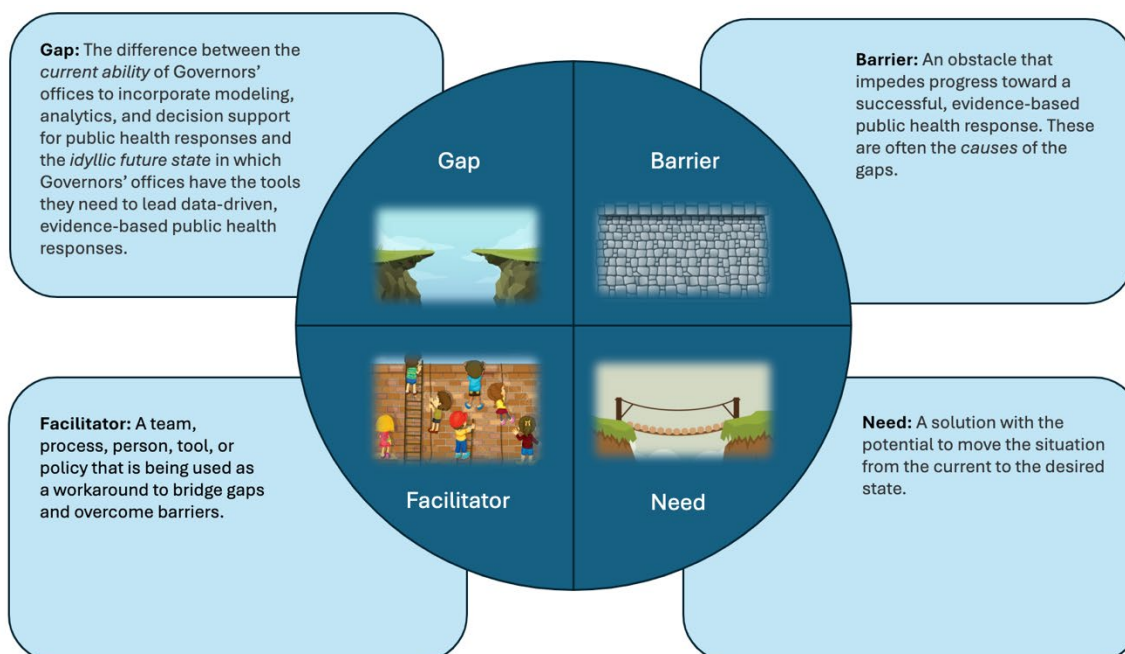


- Coordination and response – activating an emergency coordination center (EOC) or declaring a public health emergency
- Resource procurement – deciding when to intervene at the state level to purchase critical supplies or obtain other resources from nearby states, companies, or the federal government
- Resource allocation and distribution – deciding where to send critically limited supplies such as ventilators or masks
- Public health interventions – deciding whether and when to implement nonpharmaceutical interventions, such as business closures, and when to discontinue them
- Information sharing – deciding where and with whom to share important outbreak-related information
- Deactivation – deciding when to end an emergency activation or emergency declaration

One of the first and most critical decisions that Governors face is whether to declare a public health emergency. While authorities and emergency powers may vary, declaring an emergency generally activates increased resources and manpower within the state or territory, which requires increased coordination and funding. As part of a declaration, a Governor’s office or state health official will outline specific emergency orders or variations in existing policy or law and the timeline for these orders. Depending on the state and timeline, these orders may require coordination with the state legislature. The Governor’s office may take a more active role during emergencies in setting or approving response strategies, assisting with procurement and allocation of scarce resources, and coordinating across levels of government. In large-scale responses, this could include procuring and allocating ventilators, personal protective equipment (PPE), and/or diagnostic tests, or communicating staffing contacts. During an emergency, Governors and their staff may also be responsible for making decisions about significant public health actions such as school, business, or port closures or masking guidance. A Governor’s office communication staff may take a leadership role for response communications, working with the lead response agency to coordinate information-sharing and communications regarding the disease and the response; this can include information-sharing across state agencies, between state agencies and the Governor, and between the Governor’s office and the White House.

During participants' discussions about Governors' decision-making responsibilities in the event of a novel or severe public health event, they highlighted many gaps and barriers that could impede a successful, evidence-based response. However, they also described workarounds (facilitators) and specific solutions (needs) that could guide an effective national strategy for improving the ability of Governors and their teams to make evidence-based decisions. These gaps, barriers, facilitators, and needs are discussed below.

Figure 3: Needs assessment framework



Identified Gaps

Gaps were defined as the difference between the current ability of Governors' offices to incorporate modeling, analytics, and decision support for public health responses and the idyllic future state in which Governors' offices and their teams have the tools they need to lead data-driven, evidence-based public health responses. The group identified five key areas: 1) gaps between the data needed and the data available to make decisions, 2) gaps between the modeling and analytic capabilities available and those needed to guide a public health response, 3) gaps related to available decision-making tools, 4) gaps in emergency communication and coordination capabilities, and 5) gaps in current staffing and ability to scale-up trained staff during a response.



Gaps between the data needed and the data available to make decisions

Each state or territory identified gaps in current data availability when it came to making decisions in the face of a public health emergency. Multiple participants in several regions highlighted their lack of high-quality data in rural environments. Another often-mentioned gap was a lack of rapid sharing of disease-specific data for outbreaks of novel or unexpected pathogens, even if the data was limited. Examples of critical data needed that may not be immediately available include information about severity, transmissibility, populations who live or work in settings that put them at higher risk of infection, effectiveness of pharmaceutical interventions, disease course and duration, and effectiveness of nonpharmaceutical interventions. One state's health policy advisor noted a gap in the utilization of wastewater surveillance systems, which are not widely used despite their potential to help identify disease outbreaks.

Several advisors from Northeastern states noted gaps in supply chain data and forecasting capabilities, which hamper predictions of high-need areas for supplies of all types. They also highlighted a dearth of data, or lack of access to data and analyses, that could help them understand hospital surge capacity and resource needs when making healthcare resource allocation decisions. These gaps prevent Governors from taking executive actions that might alleviate supply chain and healthcare disruptions.

Lastly, health policy advisors identified gaps in regional situational awareness and cross-state/territory data sharing. This includes information about populations that routinely move between states/territories, including data on traveling health professionals such as nurses. Advisors identified this information gap as hampering Governors' ability to anticipate how outbreaks are evolving, and they might affect their own state or territory.

Gaps between the modeling and analytic capabilities available and those needed to guide the public health response

Health policy advisors outlined several gaps between the modeling and analytic capabilities that exist and are accessible to governors and those that are needed to best inform a data-driven response. The first observation included a gap in forecasting and predictive modeling capabilities to inform state-level coordinated decision making about high-consequence actions such as port closures, school closures, stay-at-home orders, and other critical interventions.

Advisors from states and territories that have previously been at the epicenter of novel outbreaks emphasized the importance of predictive capabilities. This is especially vital for jurisdictions that are the first to experience an outbreak or that have densely populated



cities that may face more acute outbreak impacts. Participants stressed the need to understand both the most likely and worst-case outbreak scenarios.

Likewise, states and territories that are not yet affected would like to have immediate access to outbreak data, analysis, and forecasts from states currently experiencing the outbreak so their preparations and response can be evidence-based. This type of modeling also allows leaders to make informed decisions about travel interventions, including screening, restrictions, or closures.

Gaps related to available decision-support tools

Health policy advisors identified specific gaps in the availability of decision-support tools when faced with a public health crisis. Advisors broadly wished to have access to dashboards showing healthcare resources and resource needs. One Southern state advisor highlighted the need for risk-benefit analyses to understand the consequences of different public health-related actions. These analyses could evaluate both the health and non-health consequences of interventions such as a one-month school closure, including potential impacts on case numbers, hospitalizations, physical and mental health, learning outcomes, and economic effects.

Gaps in emergency communication and coordination capabilities

Health policy advisors stressed key gaps in emergency communication capabilities when making decisions during a public health crisis. Multiple states with a wide variety of demographic characteristics identified a gap in their ability to reach certain populations, including those that are historically underserved, have first languages other than English, or are most at risk of developing severe illness or contracting an infectious disease, such as people with existing medical conditions.

Policy advisors from Midwestern and Southern states expressed difficulties in identifying and communicating uncertainty to both Governors and the public. Advisors also identified gaps in their ability to effectively communicate data in ways that lower the likelihood of mis- and disinformation.

Health policy advisors from a northeastern state identified critical lag times in data sharing from nearby states and CDC, often leading Governors to rely on informal, news, or academic sources (eg, X/Twitter, *The New York Times*, or private universities) for gathering data and other critical information to make their decisions.



Gaps related to current staffing and ability to scale-up trained staff during a response

The last category health policy advisors highlighted centered on gaps in surge capacity for staffing and training during crisis response. Advisors noted that Governors' offices face challenges in filling needed positions during outbreak responses, especially identifying staff who can interpret and communicate modeling and analytics results.

One advisor noted that the public health infrastructure was not as agile as other systems, especially in terms of staffing, she asked "from the human services infrastructure that you already have, how do you make that better, more resilient, just like [other aspects] of public health?"

Barriers to Filling Gaps

When participants described the various gaps in their response capabilities, they attributed them to specific barriers. Barriers were defined as obstacles that prevent Governors and their teams from addressing identified gaps to ultimately achieve successful, evidence-based public health responses. These barriers are organized by the key gaps they hinder: 1) data availability, access, quality, and timeliness, 2) modeling and analytic capabilities, 3) decision-making tools, 4) emergency communication and coordination capabilities, and 5) staffing.

Barriers to data availability, access, quality, and timeliness

When discussing barriers in decision-making capabilities, the health policy advisors mentioned several issues centered on the availability of and access to timely and quality data such as a lack of cooperative agreements and a limited data infrastructure. One noted barrier focused on the complex and sensitive historical relationship between sovereign tribal nations and Governors' offices, which can impact data sharing and collaborative response, especially when information must be transmitted through manual processes. At a broader level, data sharing between federal agencies such as the CDC and Governor's Offices can be problematic, with agencies sometimes reluctant to share critical information in a timely fashion. Health policy advisors noted that erosion of trust between these entities presents an additional obstacle to effective decision-making and response coordination.

Barriers to modeling and analytic capabilities

Health policy advisors from a variety of states noted barriers to the use of modeling and analytic capabilities for public health emergencies. One repeated barrier was limited staffing capacity, both in terms of personnel as well as knowledge and expertise related to



modeling and coding. Systemic technological limitations were also noted, with participants stating that the systems that would be used to access data and conduct modeling are not cloud based, which means that they are inaccessible during other emergencies such as cyber incidents, localized power outages, or hurricanes.

Barriers to decision-making tools

Participants reported that health departments, as well as Governors and their staff, have limited expertise in reviewing and interpreting modeling outputs, making it particularly difficult to understand and communicate their limitations. Conversely, participants reported other tools that could be easily understood and incorporated in decision-making processes but were not available due to the staffing expertise required to develop them. Participants noted that decision-making tools such as risk benefit analyses and risk assessment are helpful, but that the technical expertise to develop these types of tools is not available in their current staffing capacities. Similarly, participants noted that cloud-based dashboards synthesizing data from multiple sources would be helpful and could be utilized by staff to inform decision-making, but the expertise to develop such tools is not available on the current staff.

Barriers to emergency communication and coordination capabilities

Participants reported barriers to efficient, effective communication at multiple levels. They highlighted several key barriers: a lack of well-defined mechanisms between states and CDC to facilitate timely and open communication; a deficit of evidence-based information when trying to make accurate statements about an outbreak, especially one involving a novel disease, without potentially misleading the public; and significant challenges in developing culturally competent, multilingual health communication materials. The discrepancies between public health communication and news media coverage and timeliness of dissemination presents another challenge. One health policy advisor emphasized the dual nature of rapid data compilation and public dissemination ahead of the 24-hour news cycle – while helpful in combating misinformation during emergencies, this urgency creates operational challenges.

Barriers to current staffing and scaling-up trained staff during a response

Health departments face significant barriers when needing to rapidly scale-up staffing for various skilled positions during emergencies, particularly when there is high national demand for such workers. This includes difficulties in establishing and managing staffing contracts to increase the number of healthcare workers, such as nursing capacity across different levels (LNAs, LPNs); one New England state participant compared the competition for clinical staff to the survival competition in *The Hunger Games*. Beyond



clinical staff, health departments have limited capacity to employ technical experts such as programmers and policy analysts. Smaller jurisdictions operate with minimal policy staff and rely heavily on data and analytics from federal partners such as CDC, HHS, and the Health Resources and Services Administration (HRSA).

While some jurisdictions have access to information technology support, many still face limitations in their capacity to design, implement, and translate in-house predictive modeling programs. One Mid-Atlantic state participant emphasized the need for modeling applications at the regional and national levels. They stated, “That predictive modeling piece is something that we just don’t have the in-house capacity for, and to your point, just having that not just at the nationwide level, but really regionalized, I think it’s incredibly helpful for us.”

Facilitators to Overcome Barriers

Based on their experiences, participants identified key facilitators for mounting a data-driven and successful response. Facilitators were defined as a team, process, person, tool, or policy that is used as a workaround to bridge gaps and overcome barriers. These facilitators are organized by the key gaps that they aim to address: 1) data availability, access, quality, and timeliness, 2) modeling and analytic capabilities, 3) decision-making tools, 4) emergency communication and coordination capabilities, and 5) staffing.

Facilitators for data availability, access, quality, and timeliness

Through both individual interviews and the group session, it became clear that states’ access to data from neighboring regions is a major facilitator for effective public health responses. Participants from both Northeastern and Southern states, as well as one of the territories, described this interstate data access and sharing as crucial for understanding how to plan for peaks and lows of infections during a widespread outbreak like COVID-19, and for understanding which policies work or do not work.

According to participants, cloud-based systems have emerged as particularly valuable facilitators for sharing timely, relevant data. These systems offer flexible, resilient, and rapid ways to share information during multiple concurrent emergencies, to enable remote access during social-distancing requirements, and to integrate data from multiple sources. Notably, however, participants recognized that these systems are not widely implemented and described difficulties in accessing data, especially from other jurisdictions or tribal nations. In these situations, diplomatic relationships and personal connections, which take time to develop, were critical for accessing otherwise unavailable health information.



Facilitators for modeling and analytic capabilities

Participants reported that embedding modeling experts directly within health departments led to more accurate and timely data products using state-level information. One Northeastern state participant shared that the impact of this embedded expert was so highly valued by their state government leadership that additional funds were allocated to maintain this ability.

Facilitators for decision-making tools

Participants described that decision-making tools were limited; however, when risk-benefit information was available, including data points across rural, county, state, regional, and national levels, it allowed leadership teams to make evidence-informed decisions about critical actions like port closures, staffing adjustments, and crisis communications.

Facilitators for emergency communication and coordination capabilities

One participant shared that successful emergency communication relies on several key principles: being the first to share information, explaining how the information was obtained to build trust, describing what is unknown, and defining clear indicators for when emergency measures will end. This participant shared that, in their experience, using these principles in all emergency communications is essential for facilitating clear messaging in every crisis response.

Participants found that establishing regular communication methods and channels, such as consistently scheduled media briefings and press releases, helped facilitate public trust through predictability. Participants noted that another strong facilitator for smooth emergency communication and coordination was federal agencies or taskforces providing advance notice to Governors' offices before public releases, whenever possible, to help leadership teams prepare their communications and response strategies effectively.

Participants also emphasized that local trusted leaders such as mayors and religious figures are particularly effective messengers. One participant felt that messages delivered from trusted local leaders are often more persuasive and influential for the public than those that come from state health officials.

Facilitators for current staffing and ability to scale-up trained staff during a response

Participants described three critical facilitators for having the ability to have adequate staffing during a response: 1) maintaining skilled epidemiologists and data analysts during normal operations, 2) having pre-arranged surge staffing contracts for medical personnel,



and 3) having access to guidance and analytics to inform staffing needs during public health events. These strong facilitators have several dependences: funding availability for health departments to recruit and retain staff; legal and leadership support for establishing staffing contracts; and timely, relevant data to predict staffing needs during an emergency.

Needs for Successful Response

Participants also identified specific needs that could help Governors' offices overcome the recognized gaps and barriers to lead to a successful and data-driven response. These needs were any solutions they described as critical to improving: 1) data availability, access, quality, and timeliness, 2) modeling and analytic capabilities, 3) decision making, 4) emergency communication and coordination capabilities, 5) staffing, and 6) funding.

Data needs

Participants shared that data needs can be summarized into two main categories: 1) rapid, transparent data about the disease and 2) rapid, transparent data about the effectiveness of interventions. One state advisor said, "You have to respond quickly, and the better information you have, the better your response will be." To meet both of these needs, states highlighted the importance of data sharing across states, especially those who neighbor one another or share connected transportation hubs. Data sharing about the impact on at risk populations, the morbidity, mortality, and hospitalization rates, the effectiveness and public perception of interventions is critical for states that share borders, routes along transportation hubs, and cultural similarities. Advisors shared that this data is crucial for planning when increases or decreases in diseases may be expected and for communicating expected risk and risk mitigation to the public. Data sharing agreements and socialization of these agreements would be critical for success of these initiatives.

Modeling and analytic needs

States highlighted many specific modeling and analytic needs. One need is the availability of specific predictive models that can identify areas of highest demand for resources and supplies. There was particular interest in validated statewide models for rural areas to predict supply needs and warehouse planning. Another critical need, described by several participants, is heat maps showing various datasets by county, including case counts and vaccination rates.

Multiple state advisors highlighted a need for models that can account for compound emergencies, such as natural disasters occurring during a pandemic. They expressed specific need for forecasting tools that could predict hospital utilization, the risk of disease



importation from neighboring states, and the effectiveness of interventions based on real-time data. Some participants showed great interest in modeling similar to National Weather Service forecasting but adapted for infectious diseases.

Decision-support needs

Several participants highlighted the need for risk-benefit analyses to assist Governors when considering public health interventions such as school closures and mask mandates. They also stressed the need for guidance to help Governors communicate the limitations and strengths of underlying data when explaining their decisions to the public.

Emergency communication and coordination needs

Participants identified several needs when it comes to improving emergency communication and coordination. One highlighted the need for complex medical information to be presented in ways that help leaders without a health background more effectively communicate to their communities about critical public health issues, risks, and decisions.

In the event of a new pathogen or threat, states would also need tailored communication materials to send to healthcare providers serving populations that live or work in settings that put them at higher risk of becoming infected or exposed to hazards. “I think one of the things that we learned during COVID was that working through individuals’ personal medical providers was very helpful,” one participant said, noting that continuing to improve communication with healthcare workers is worthwhile. Similarly, participants noted there is a need for a more intentional effort to build relationships with farm owners and operators to build trust and communication with migrant workers and their families.

Staff capacity and staff training needs

States require consistent funding to support and train staff. They also need guidance on scaling up staffing and executing temporary surge contracts during emergencies, particularly given staff turnover following COVID-19.

Funding needs

There is a critical need for sustained, flexible, and consistent funding at all levels of government that extends beyond single emergency responses.



Discussion

When outbreaks are novel or unexpected, involve significant illness and deaths, or involve large societal tradeoffs, Governors and their staff often bear critical decision-making responsibilities. Based on this needs assessment, these decisions can involve multiple domains, including economics, public safety, education, employment, and public health and the ramifications can extend beyond the scope of the initial outbreak. During significant events, Governors' offices play a vital role in early coordination with public health agencies to identify and assess the threat's severity, determine crisis communication strategies, and decide whether to declare a public health emergency. If an emergency is declared, Governors and their staff become responsible for coordinating the entire response strategy, which can include overseeing emergency coordination, procuring and allocating resources, implementing public health interventions, managing information sharing, and, eventually, deactivating the emergency.

When meeting with Governors' health advisors to discuss their decision-making responsibilities during novel or severe public health events, participants highlighted many gaps and barriers. The identified gaps underscore the difference between the current state of Governors' and health departments' capacities and capabilities to respond to novel diseases—particularly in terms of data utilization, modeling and analytics, and guided decision making—and the desired state of an evidence-based approach.

Participants identified critical gaps in five key areas: 1) the gap between data needed to make decisions and data actually available, 2) the gap between existing analytic capabilities and those required to guide the public health response, 3) the gap in available decision-making tools and those desired during events, 4) the gap in emergency communication and coordination capabilities, and 5) the gap in current staffing and ability to scale up trained staff during a response. Taken together, these gaps can make it challenging for Governors to make evidence-based decisions, leading instead to a reliance on limited available information and “gut”-informed judgments. Broader implications for making public health decisions when faced with these gaps can include a long-term loss or gain in confidence in public health leadership or political leadership, as seen in several states during the COVID-19 pandemic.¹

Participants described taking action to address these gaps in capabilities and capacities, but they articulated many challenges to progress. One of the most cited barriers was limited access to data. All interview participants described the importance of knowing epidemiological trends in neighboring states, as these data are helpful for understanding when and how a disease may impact their state/jurisdiction. This information, however, is



rarely shared and, if so, is shared only in limited, informal ways. For example, a participant from an island territory noted the importance of monitoring disease trends in the continental U.S., as “spikes” in cases can sometimes be observed on the mainland first and then in the islands. Only one participant specifically noted open communication with neighboring jurisdictions related to data sharing, and this was limited to an internal data dashboard. Another participant underscored the need for a national effort to collect and publish the same data points across jurisdictions to ensure the collection and sharing of homogenous data. There is currently no unified, expedited way for states to establish data sharing agreements within their own or across other states (and this process can be made more complicated when including sovereign or tribal nations and territories). Some participants noted the need for specific data sharing of non-standard health data, like the movement of and need for travel nurses during peak periods of COVID-19 infections, but there was no discussion of concrete solutions. Future studies could examine standardized and expedited data-sharing process development, pilot, and launch.

All interview participants said they believed in the value of modeling and analytics, but only one had access to timely, state-specific models for decision-making. Participants identified many modeling and analytic needs, including for predictive models to help identify areas of greatest demand for supply distribution and to assist states in deciding on which interventions to implement, including by using real-time data from neighboring states. Participants also expressed interest in heat maps to show which areas have the greatest challenges (highest cases, lowest vaccination rates, etc.), ideally by county. Across all the interviews and group discussion, participants also expressed a need for dashboards that integrate multiple data sources from various public and private entities to inform decision making related to purchasing supplies, allocating resources, implementing staffing contracts, and taking public health actions. In future outbreaks, these models and analytic tools can help decision-makers understand where the flow of people and resources need to be focused and reallocated as needed more agilely, thus shortening the length of outbreak and reducing the associated cost of outbreak response for the affected regions.

The gaps, barriers, and needs identified in data, modeling and analytics, decision-support tools, and staffing are interconnected and dependent on one another and as discussed during the interviews and listening session, need to be robust and capable before an outbreak occurs. To support Governors in mounting a data-driven response in the future, strategies are needed to address each of the gaps and barriers simultaneously, while preparing for the inevitability of multiple scenarios occurring simultaneously, like a grid power outage in the middle of an infectious disease outbreak or a hurricane during peak Dengue transmission season.



Limitations

This needs assessment was a combination of three interviews with individuals and one group discussion session. Interview participants were identified using a convenience sample of referrals from NGA. Group discussion participants self-selected to participate, and group discussion participation was limited to individuals attending the NGA Annual Health and Human Services Institute. The findings of this needs assessment are not intended to be nationally representative. Instead, the results are meant to highlight decision makers' and advisors' experiences during public health-related events, create a better understanding of the tools they have and need to make decisions in those events, and offer ways to better support Governors and their staff during future outbreaks.

Conclusion and Next Steps

This needs assessment underscores the information challenges Governors and their staff face during public health emergency responses and outlines a range of data, modeling, analyses, and communications tools that could help Governors make decisions during these events, if they are implemented in a thoughtful way. The findings will help guide the work of CORI and NGA, along with the broader Insight Net network, to develop, deploy, and evaluate these tools for Governors. Providing decision makers with timely and reliable information and analyses will enhance their responses during future infectious disease emergencies, ultimately minimizing impacts and saving lives.



References

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<https://onlinelibrary.wiley.com/doi/10.1111/1467-8551.12577>

Appendix A: Survey Analysis

Figure A.1. Outbreak Decision-Making Experience

Have you participated in outbreak decision making at the Governor level in your current position or in prior positions?

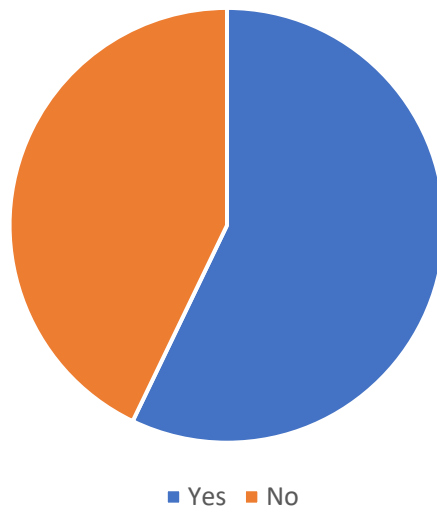


Figure A.2: Forecasting Prioritization and Ranking

How would you prioritize disease forecasting and outbreak response in the future in your state/territory, on a scale of 1 to 5

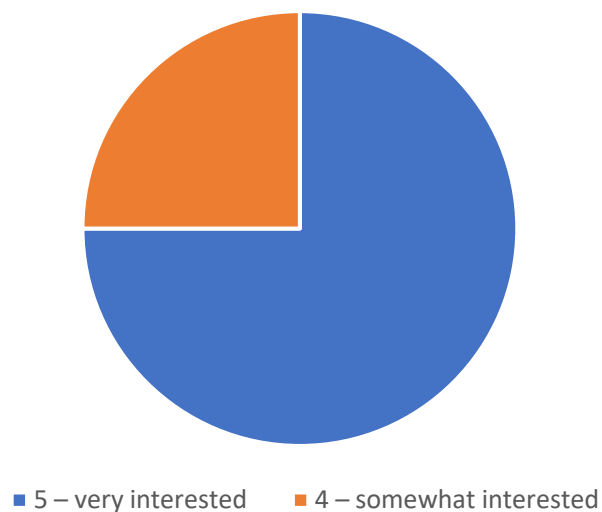




Figure A.3. Information and Analysis Needs for a Future Pandemic

If you were in a decision-making role in a future pandemic, what types of information/analyses would be most helpful to making consequential decisions?

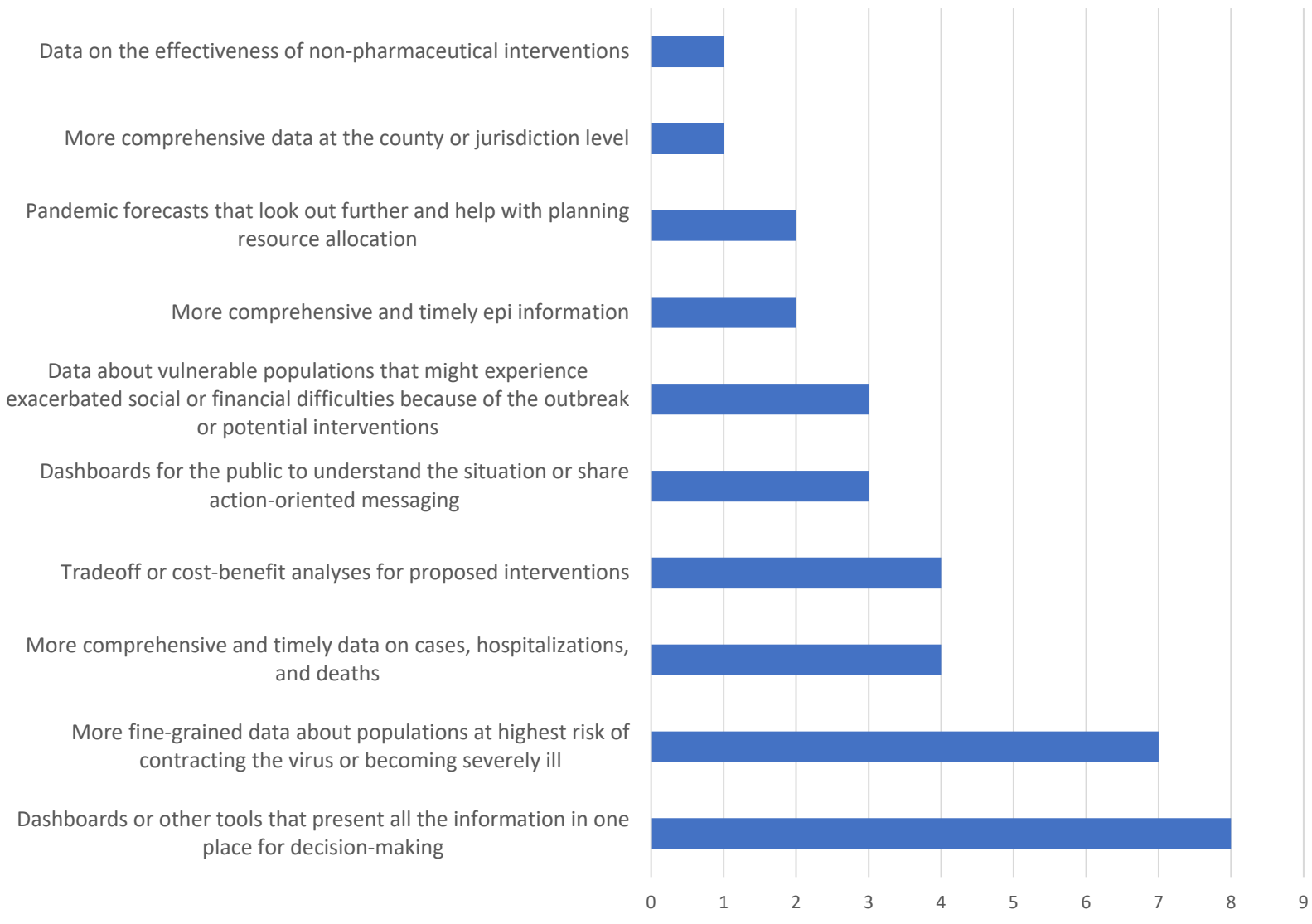




Figure A.4. Information and Analysis Wants for Current Pandemic

What additional information/analysis would you WANT to have access to now that we know we are in a pandemic?

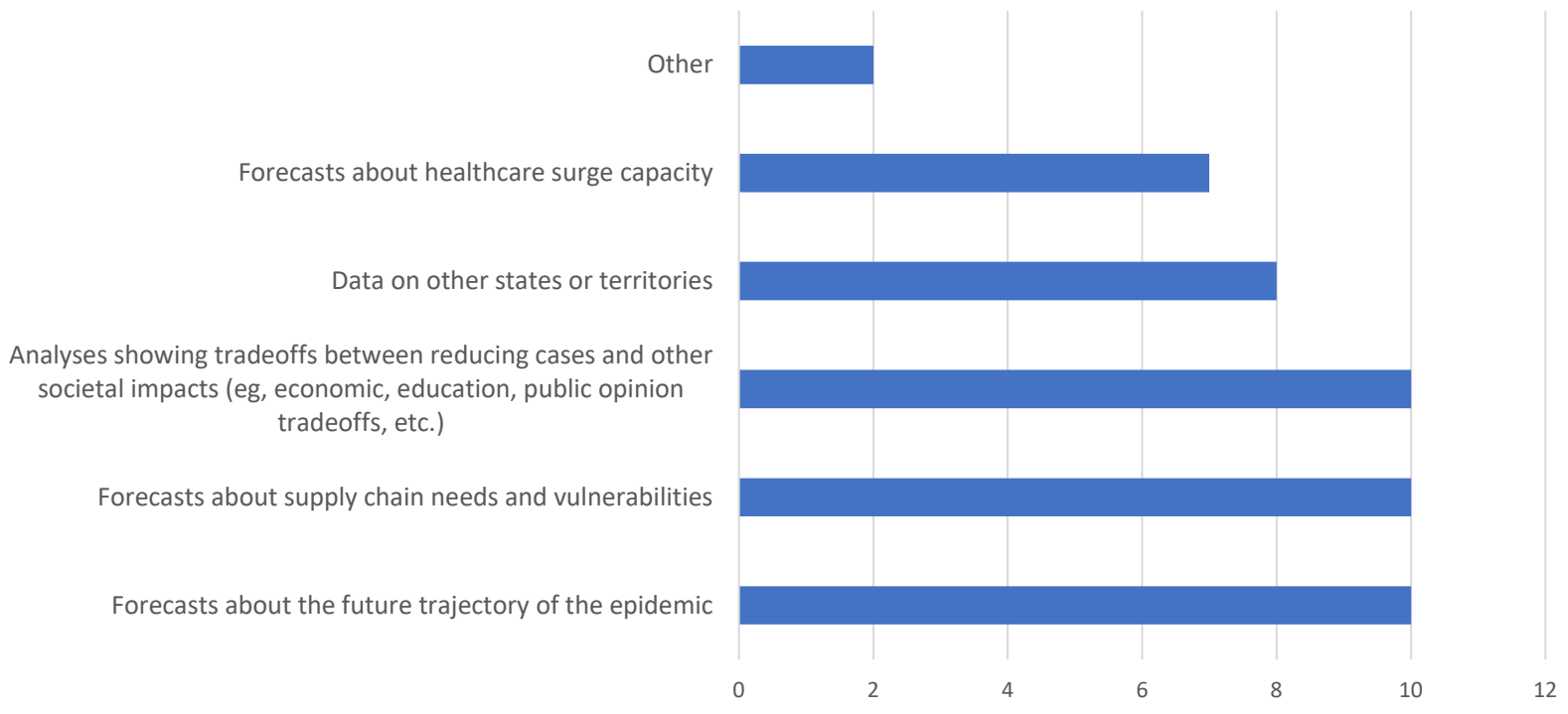




Figure A.5. Access to Current Information and Analysis Tools in Initial Crisis

What information/analysis would you currently have access to in the early days of this crisis with five cases in your state/territory?

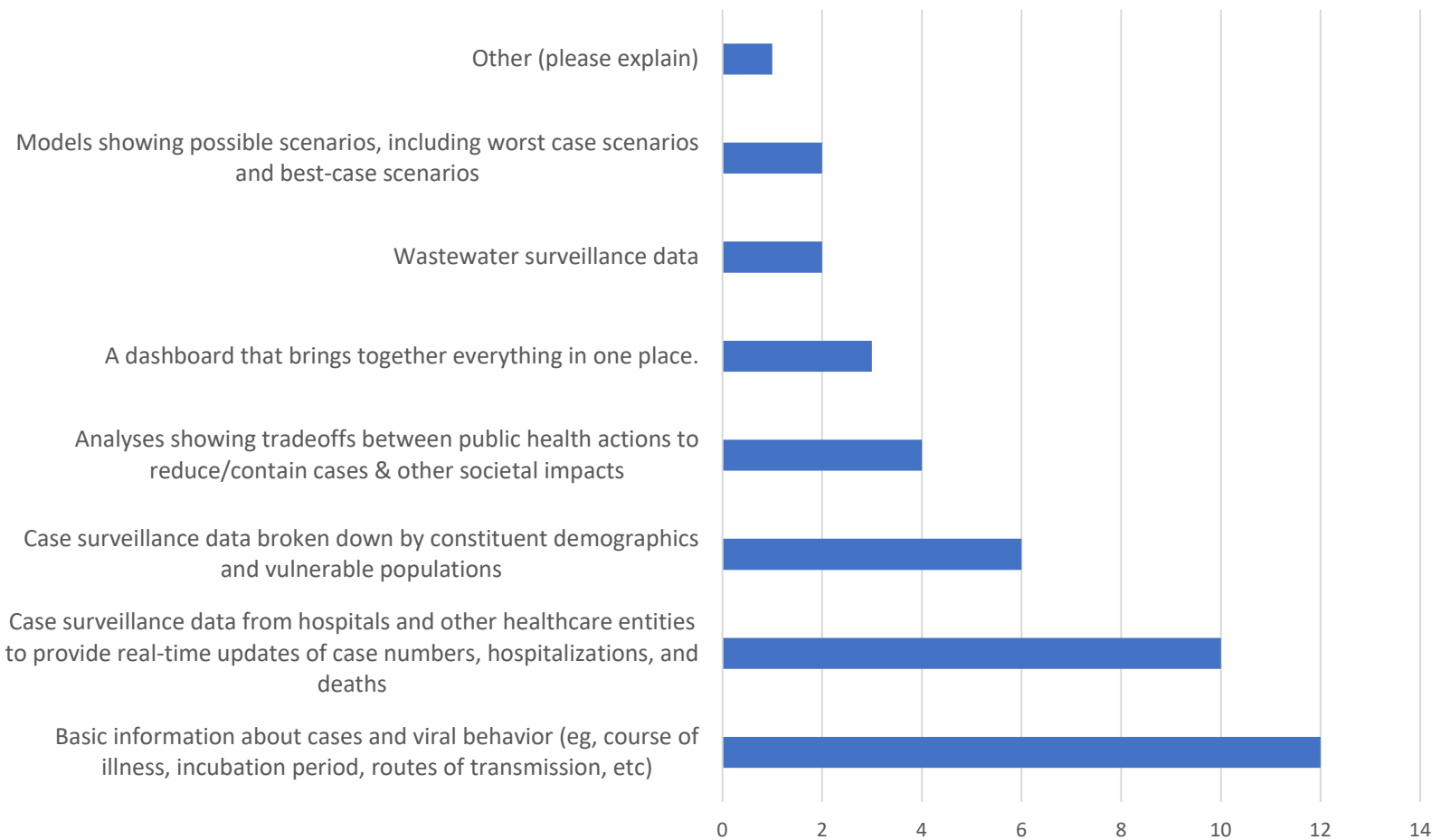




Figure A.6. Information and Analysis Wants for Early-Stage Crisis

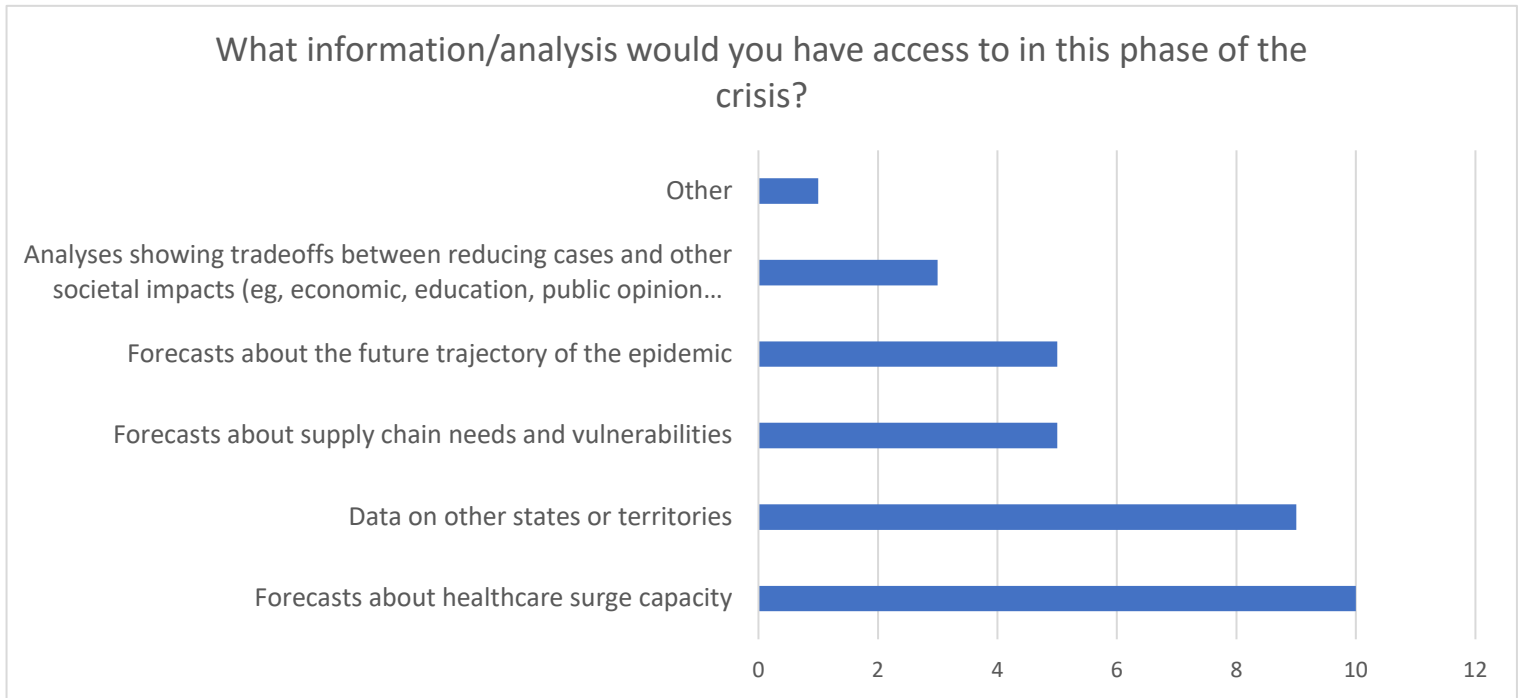
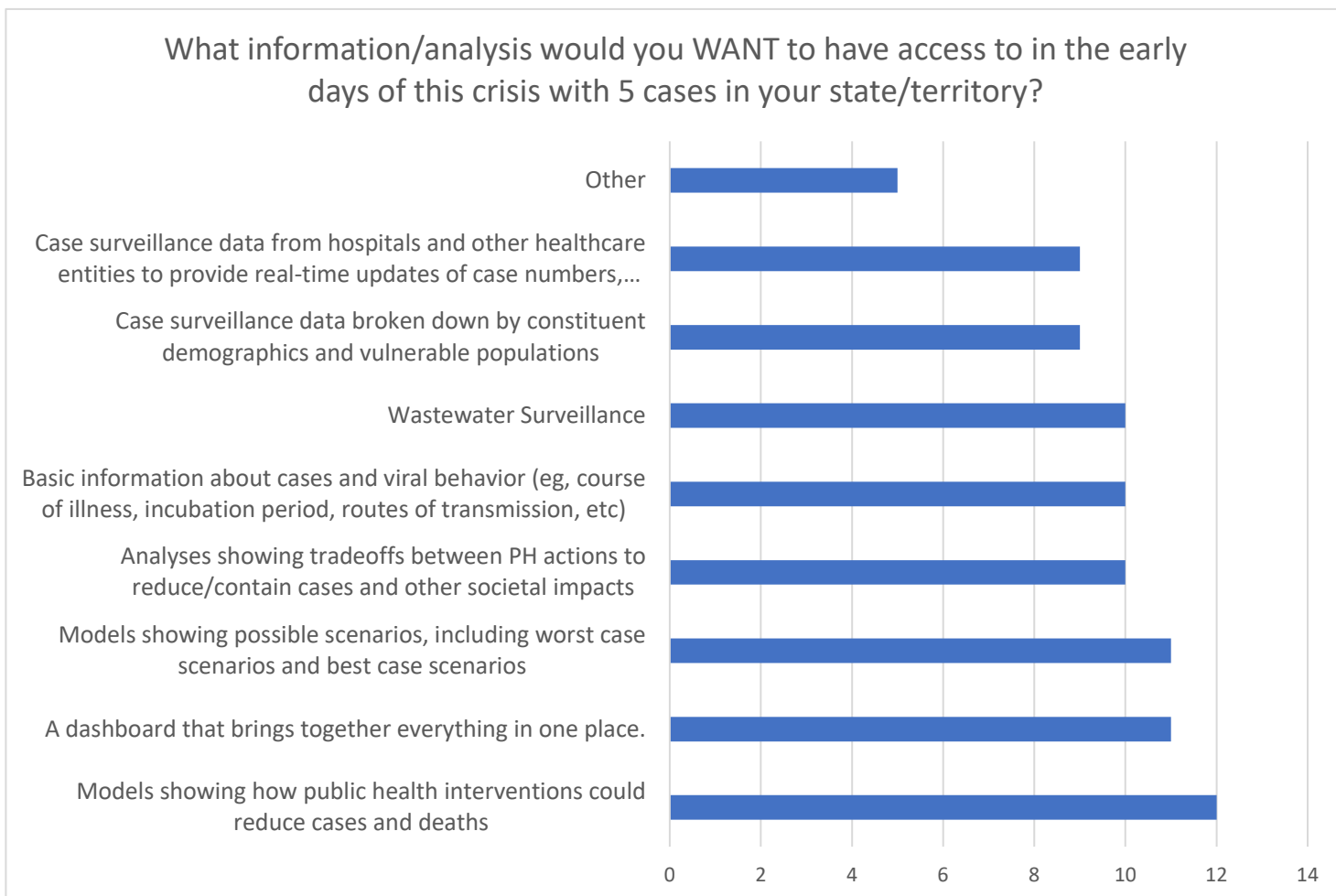




Figure A.7.
Access to Current Information and Analysis Tools During Mid-Phase Crisis



Appendix B: Qualitative Results Summary Table

Table B.1. Summary of Gaps, Barriers, Facilitators, and Needs by Capability and Capacity.

Focus Area	Capability or Capacity				
	<ul style="list-style-type: none"> • Limited disease-specific data for novel/unexpected pathogen outbreaks • Lack of high-quality data in rural environments • Gaps in supply chain data and forecasting capabilities • Limited data for predicting high-need areas for supplies • Dearth of data on hospital surge capacity and resource needs 	<ul style="list-style-type: none"> • Limited forecasting and predictive modeling capabilities for state-level decisions • Absence of capabilities to inform high-consequence actions (port closures, school closures, stay-at-home orders) • Limited analysis for understanding hospital surge capacity 	<ul style="list-style-type: none"> • Limited access to dashboards showing healthcare resources and needs • Lack of risk-benefit analyses for understanding consequences of public health actions • Limited tools for evaluating health and non-health consequences of interventions 	<ul style="list-style-type: none"> • Limited ability to reach certain populations (historically underserved, non-English speaking, high-risk groups) • Difficulties in identifying and communicating uncertainty • Challenges in communicating data strengths and limitations to reduce mis/disinformation • Critical lag times in data sharing from nearby states and CDC 	<ul style="list-style-type: none"> • Limited surge capacity for staffing during crisis response • Challenges in filling needed positions during outbreak responses • Insufficient staff who can interpret and communicate modeling/analytics results • Limited agility in public health infrastructure regarding staffing

	<ul style="list-style-type: none"> • Limited data for healthcare resource allocation decisions • Gaps in regional situational awareness • Limited cross-state/territory data sharing • Limited data about populations moving between states/territories • Insufficient data on traveling health professionals (like nurses) • Underutilization of wastewater surveillance systems 	<ul style="list-style-type: none"> • Lack of analysis for resource needs and allocation • Limited analysis for understanding most likely and worst-case outbreak scenarios 			
	<ul style="list-style-type: none"> • Complex and sensitive historical relationships between sovereign tribal nations and Governors' offices, impacting data sharing 	<ul style="list-style-type: none"> • Limited staffing capacity for modeling • Limited knowledge and expertise in modeling and coding 	<ul style="list-style-type: none"> • Limited expertise in reviewing and interpreting modeling outputs • Difficulty in understanding and communicating 	<ul style="list-style-type: none"> • Lack of well-defined mechanisms between states and CDC for timely/open communication • Deficit of evidence-based information for novel disease outbreaks 	<ul style="list-style-type: none"> • Difficulties in rapidly scaling-up staffing for skilled positions during emergencies • High national competition for healthcare workers • Challenges in establishing and

	<ul style="list-style-type: none"> • Limited data infrastructure • Lack of cooperative agreements for data sharing • Erosion of trust between federal agencies and Governor's Offices • Agencies' reluctance to share critical information in a timely fashion 	<ul style="list-style-type: none"> • Insufficient technical infrastructure 	<p>limitations of models</p> <ul style="list-style-type: none"> • Limited technical capacity 	<ul style="list-style-type: none"> • Risk of potentially misleading the public when making statements about outbreaks • Significant challenges in developing culturally competent, multilingual health communication materials • Discrepancies between public health communication and news media coverage 	<p>managing staffing contracts</p> <ul style="list-style-type: none"> • Limited capacity to employ technical experts (programmers, policy analysts) • Smaller jurisdictions operating with minimal policy staff • Heavy reliance on federal partners (CDC, HHS, HRSA) for data and analytics • Limited capacity to design, implement, and translate in-house predictive modeling programs
	<ul style="list-style-type: none"> • Access to data from neighboring regions, which helps understand peaks and lows of infections • Cloud-based systems for sharing timely, relevant data that: 	<ul style="list-style-type: none"> • Embedding modeling experts directly within health departments • State allocation of additional funds to maintain modeling capabilities based on demonstrated value 	<ul style="list-style-type: none"> • Risk-benefit information available across multiple levels (rural, county, state, regional, national) • Access to this information allows leadership teams to make evidence- 	<ul style="list-style-type: none"> • Regular communication methods and channels (scheduled media briefings and press releases) • Federal agencies providing advance notice before public releases • Local trusted leaders (mayors, 	<ul style="list-style-type: none"> • Maintaining skilled epidemiologists and data analysts during normal operations • Having pre-arranged surge staffing contracts for medical personnel • Access to guidance and analytics to inform staffing needs during public health events

	<ul style="list-style-type: none"> • Offer flexible, resilient, and rapid information sharing • Enable remote access during social-distancing requirements • Can integrate data from multiple sources • Diplomatic relationships and personal connections that help access otherwise unavailable health information 		<p>informed decisions about: port closures, staffing adjustments, crisis communications</p>	<p>religious figures) serving as effective messengers</p>	
	<ul style="list-style-type: none"> • Rapid, transparent data about the disease • Rapid, transparent data about intervention effectiveness • Data sharing across states, particularly for: neighboring states, states 	<ul style="list-style-type: none"> • Specific predictive models to identify areas of highest demand for resources and supplies • Validated statewide models for rural areas to predict supply needs and 	<ul style="list-style-type: none"> • Risk-benefit analyses for public health interventions (school closures, mask mandates) • Guidance for communicating limitations and strengths of underlying data 	<ul style="list-style-type: none"> • Tools to present complex medical information in ways that help leaders without health backgrounds communicate effectively • Tailored communication materials for healthcare providers 	<ul style="list-style-type: none"> • Consistent funding to support and train staff • Guidance on scaling up staffing • Guidance on executing temporary surge contracts during emergencies • Support for managing staff turnover post-COVID-19

	<p>sharing transportation hubs</p> <ul style="list-style-type: none"> • Impact on at-risk populations • Morbidity, mortality, and hospitalization rates • Effectiveness and public perception of interventions • Data sharing agreements and socialization of these agreements 	<p>warehouse planning</p> <ul style="list-style-type: none"> • Heat maps showing various datasets by county (case counts, vaccination rates) • Models that can account for compound emergencies (like natural disasters during a pandemic) • Forecasting tools for: Hospital utilization, risk of disease importation from neighboring states • Effectiveness of interventions based on real-time data • Disease forecasting similar to National Weather Service forecasting 	<ul style="list-style-type: none"> • Tools for explaining decisions to the public 	<p>serving high-risk populations</p> <ul style="list-style-type: none"> • Improved communication with healthcare workers • More intentional effort to build relationships with: <ul style="list-style-type: none"> • Farm owners and operators • Migrant workers and their families 	
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