



Supporting Health Department Decision Makers with Disease Forecasting and Outbreak Analytics

Needs Assessment Results

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Methods

ASTHO, with support from CDC Center for Forecasting and Outbreak Analytics (CFA), developed and disseminated a survey to assess state and territorial expertise and needs to use infectious disease forecasts, models, and other outbreak analytic techniques to inform health agency communications and decision-making efforts. The survey was fielded March 27 – May 5, 2023, to state and territorial health agency senior deputies. ASTHO received 29 responses representing 28 jurisdictions. One jurisdiction submitted two responses. The qualitative comments from both entries are included; however, quantitative summaries are de-duplicated to include selections from the response indicating that the jurisdiction does use disease forecasts and other outbreak analytic techniques for decision-making.

Note: Italicized text reflects qualitative entries from the respondent. This report is not for distribution.





Response Summary

Background

1. Does your agency use infectious disease forecasts (e.g., flu, COVID-19) to inform health agency communications and decision-making efforts?

ASTHO**Report**



Image 2: Survey Question #1 Responses

- 2. What barriers prevent your agency from using disease forecasts to inform health agency communications and decision-making efforts?
 - Software; skill capacity specific for disease modeling; we do monitor neighboring Pacific Island Countries (PICs) situations with disease occurrences. For example: influenza-like illness or respiratory syncytial virus.
 - Non-uniform use of reporting system throughout the country: insufficient data for forecasts.
 - Forecast variability and uncertainty. Lack of past experience using forecasting. Limited forecasting for most infectious diseases. Social and political will to implement prevention activities for COVID-19.
 - Capacity and staff with expertise and experience to develop infectious disease forecasts.
 - We do not have staff who are trained in this area, and who have the dedicated time and access to the proper resources. Also, staff would require additional training on the use cases of modeling, and how to apply and use the information.
 - I think that there wasn't adequate education to health officials on how to interpret disease forecasts and adequate education to health officials to feel confident that the forecasts were accurate for decision makers to feel confident in using the information for decision-making. Additionally, the small population of our state added to the low confidence that models were accurate at the local/regional level.
 - Disease forecasting has not been identified as a priority within the public health agency and as a result, there have not been dedicated staff members educated in the area of data modeling. In the early stages of the COVID-19 pandemic, statistical modeling was explored by epidemiologists focused on pandemic efforts; however, it was not pursued any further.
 - The only infectious disease forecast used by our health department is to predict the number of West Nile Virus cases in the state annually. The forecast information is included in communication messages, including the West Nile Virus dashboard. Development of the forecast model was made possible through a collaboration with academic researchers. Staff

capacity, in the form of staff time and expertise, is insufficient to develop and evaluate disease forecast models.

- The forecasting models appear to have limited value given the variability of the estimates originating from the selected models with their numerous assumptions. Additionally, being able to understand how accurate the model value compared with the predicted value as time passes would be helpful.
- Staffing expertise in this area is limited. We did do some forecasting during the pandemic but have since stopped. We found the models we developed to be somewhat helpful, but the forecasting was often inaccurate and caused some stakeholder pushback.

Workforce Capacity

3. How does your agency obtain infectious disease forecasts? (Select all that apply). [N=28]



Image 3: Survey Question #3 Responses

 Does your department have a dedicated staff member to conduct outbreak analytic analyses, such as an epidemiologist, statistician, data scientist, or other person with training in data analytics? (Select all that apply). [N=28]



Image 4: Survey Question #4 Responses

5. How would you rate your health agency's overall level of experience with using disease forecasts and other outbreak analytic techniques for decision-making? [N=19]



Image 5: Survey Question #5 Responses

6. Please indicate the overall frequency at which your health agency utilizes disease forecast and other outbreak analytic techniques for decision-making. [N=18]



Image 6: Survey Question #6 Responses

- 7. For which disease areas does your health agency use outbreak analytic techniques to inform decision-making?
 - Respiratory diseases for the most part.
 - SATScan for enterics and legionella; CDC COVID variant forecasts; ad hoc COVID hospitalization predictions; influenza.
 - All reportable conditions.
 - COVID-19, Varicella, Foodborne diseases, syndromic surveillance, vaccine preventable disease.
 - Enteric disease outbreaks and clusters are the most common in which outbreak analytic techniques are used for decision-making. Other areas do include COVID-19 forecasting through wastewater modeling in conjunction with our third party vendor.
 - We use a variety of traditional epidemiologic analytic methods to routinely examine
 patterns in all communicable diseases and also in overdose events. Simulation modeling
 approaches, including compartmental models or precursors such as Rt estimation, have
 been used on a more ad-hoc basis, principally for outbreaks, and were constructed and
 used for COVID-19 and our polio outbreak. Such techniques are not necessary for the
 majority of conditions we examine.
 - All notifiable diseases in our state, syndromic surveillance, wastewater, chronic disease, all areas of epidemiology where outbreak analytic techniques would be valuable.
 - Influenza and COVID.
 - Respiratory disease (primarily COVID-19).
 - COVID, respiratory outbreaks, gastrointestinal outbreaks, and opioid use.
 - Yes. Our agency uses outbreak analytic techniques to inform decision-makers among the executive leadership at the department of health as well as the leaders in the executive branch of government. These disease areas include respiratory diseases, enteric diseases and healthcare acquired infections.
 - Most frequently with respiratory illnesses like COVID and flu.
 - COVID-19 was the most striking example, and we made use of multiple online/publicly available forecasting sites early on, but this became less useful as the pandemic continued. Our in-house forecasting is not robust, though our present-time analysis and comparison to prior experience(s), when available, is more typically done.
 - COVID, flu, mpox, HIV, rabies
 - We used them to assess, predict, and respond to hospital capacity issues during COVID and then during the 2022-2023 influenza and RSV seasons.
 - COVID, flu, overdose, enterics.
 - MPox, COVID-19.
 - COVID-19 and Influenza.

- 8. What else would you like to share regarding your health agency's capacity to use disease forecasts or other outbreak analytic techniques to inform decision-making?
 - We have very small numbers at geographies below the state level. State level forecasts are useful, but public health is local and having methods for forecasting when there is a low population at risk would be useful.
 - Still very under-developed although significant capacity among local academic partners.
 - Our agency has capacity to understand disease forecasts we currently receive, which leadership may use to inform policy decisions. We seek to increase our capacity in generating our own disease forecasts and other outbreak analytic techniques while collaborating and using best practices from federal and local health agencies.
 - Disease forecasting opportunity is limited within the agency, so we often partner with our local school of public health if needed.
 - Outbreak analytics are more commonly used within our agency.
 - Building on the previous response, we routinely use traditional time series plots, maps, other descriptive methods, and space/time models (e.g. SatScan) to detect anomalies and clusters of infections. We have produced some in-house models of transmission rates and compartmental models for emerging infections. Our capacity to develop new dynamic models is limited, although we might increase this in the future.
 - We've built capacity through CARES3 funding to support biostatistician/developers who support these efforts that we hope to maintain beyond COVID-19, a data analysis crosscutting team has been established which has increased staff access and knowledge of available trainings and tools and capacity for disease forecasting, we have also created capacity for data collection and capturing utilizing IT resources that we also hope to maintain beyond COVID funding (CARES3).
 - Staffing challenges particularly with needed and/or specialty skill sets.
 - Working on workforce development across all data analytics to build in-house capability for forecasting analysis and application of analyses, but currently rely on externally developed forecasting when used. We need ongoing funding to support this work.
 - We have epi capacity, but I think we lack experience in disease forecasting/modelling. What we do in-house would be quite simple and we do refer to data models produced by external groups.
 - Apart from COVID, I really don't think we have made much use of disease forecasting. This is
 a very immature area for us and, it seems, the nation. In the past three years, apart from
 COVID, no other disease has really benefited much from disease forecasting and the mpox
 response appeared to show that we really didn't know when the epidemic would recede until
 it did, in fact, recede. We have a long way to go before real-time, active disease forecasting is
 a sufficiently accurate tool to be reliably helpful.
 - We have contracted with our School of Public Health and other data scientists to support forecasting work, particularly around COVID and healthcare capacity.

- We do not have standing capacity to do this. We relied on academic colleagues for our forecasts.
- Our agency doesn't have an outbreak management system to early detect or control outbreaks.

Data, Data Systems, and Tools

9. How effective are your health agency's existing public health data systems at delivering timely and accurate data that can be used by decision makers for public health action? [N=27]



Image 7: Survey Question #9 Responses

10. Is your agency aware of materials (e.g., technical reports, COVID-19 models, etc.) that the Center for Forecasting and Outbreak Analytics (CFA) develops? [N=28]



Image 8: Survey Question #10 Responses

11. Does your jurisdiction use materials that CFA develops? [N=21]



- 12. How does your jurisdiction use materials that CFA develops?
 - We used COVID-19 forecasts to assist with planning.
 - Awareness of national and state-level forecasts for hospitalizations and variant surveillance.
 - In conjunction with syndromic sources.
 - Informational resource (e.g., technical reports).
 - Refer individuals/organizations to the CFA materials and use for decision-making and resource allocation.
 - Reviews models for our jurisdiction. For COVID-19 case, hospitalization, and death models, shared and discussed the models with the chief medical officers from the three largest health systems in the state.
 - To understand mpox outbreak risk, potential impact of emerging covid variants.
 - Use materials to inform planning and preparedness activities.
 - We have referenced COVID-19 modeling reports on occasion but less so in recent months. We have collaborated with CFA members in our joint work with CDC to model a polio outbreak..
 - We use materials that CFA develops to inform policy decisions regarding COVID-19 guidance and preventatives. We also find the COVID-19 hospitalization forecasting useful so if we anticipate future spikes our jurisdiction is well-prepared.
 - We utilize technical reports and COVID-19 forecasting reports in discussions about response planning, where appropriate. We receive technical reports and forecasting material through a number of channels from federal, other state, and academic partners. We regularly use these materials and work with academic partners to expand our capacity, but it's not clear what all of those materials are CFA-developed.

- 13. What factors inhibit your agency's use of materials or tools developed by CFA?
 - Not aware of it.
 - At this point seem to be limited tools available for use at jurisdiction level. Forecasting on COVID hospitalization and deaths were of limited use during pandemic.
 - Epidemiologists within public heath have been able to complete basic case forecasting; however, those results have not been used to drive interventions or decision-making. The materials developed by CFA are helpful to review.
 - Knowledge about what is available and how, we do use NowCast.
 - Lack of familiarity with what is available. Uncertainty of validity/reliability. Actively evolving science of disease forecasting.
 - The agency will need time devoted to understanding and determining how these materials and tools can help support our department.
 - Usefulness and uncertainty of models. Lack of models for other infectious diseases. Other surveillance data was useful and more readily available to understand disease.
 - Variability in the various models and parameters used raise concerns regarding the accuracy of the model estimates. Forecasting estimates differ from lagged reporting of forecasted estimates (e.g., variants), which creates more confusion for the public questioning what source is accurate and why the numbers do not match.
 - With mpox, I think they came too late, and we had been looking at forecasts from the UK. With COVID and respiratory viruses we have utilized scenario hub, so didn't feel the need to make a switch.
- 14. What types of **materials or tools** (e.g., training, reference sheets, disease-specific forecasts) would help your health agency to communicate and make decisions about disease forecasts or other outbreak analytic techniques?
 - We need trainings, regional disease forecast bearings per country, training on software. CDC update; WHO update.
 - An integrated data system that can flag the possibility of an outbreak and can provide needed measures for proper and timely follow up.
 - As the field matures and becomes more robust and reliable, I suspect we'll make more regular use of it as if it helps impact real-world actions that reduce disease transmission, morbidity, and mortality.
 - Briefings, trainings, funding for specialized staff.
 - Develop a series of trainings and resource materials that can be shared during ASTHO, CSTE, and APHL meetings to help raise awareness and share examples of use cases with key leadership positions within jurisdictions. Prepare public health communicators to talk about strengths and weaknesses of forecast models. Host virtual boot camp sessions for those interested in building knowledge.

- Disease-specific forecasts.
- Disease-specific forecasts and identification of points at which guidance will change.
- Disease-specific forecasts that can be applied at the jurisdictional level (county if preferable but at least state); if those are made available would then also need trainings for state data users and then one-pagers to explain to policy makers.
- In person training is the preferred learning method for our jurisdiction.
- Information to share with leadership and emergency management on the application of forecast and analytics to readiness and response, training on analytics techniques, best practices/use cases for informing data-driven decisions.
- Interactive/plug and play type forecasting tools where I can plug in state specific metrics like population size, high-risk population size, cumulative cases, number of people vaccinated, etc.
- Limitations of modeling. How to communicate forecasting in conjunction with traditional disease surveillance. Recommended actions based on model. Inputs for model.
- Risk communication tools as well as how to effectively apply this information to impact health outcomes.
- Statistical model training for forecasting, statistical software training that allows us to forecast diseases, and integration and sharing of jurisdictional data for outbreak detection.
- To begin with, we would need more information on how it could be used and in what situations it has been helpful. Examples from other health departments that have used it would be helpful to understand how it is being applied.
- Training for staff who would like to gain knowledge/expertise in this area, reference sheets, and forecasts during large-scale outbreaks.
- Training for sure! Specific, validated, useful tools for forecasting.
- Training on application of tools and materials for practical approaches.
- Trainings and disease-specific forecasts (respiratory viruses in particular).
- Trainings and/or reference sheets would be helpful.
- Trainings for all levels of staff, from staff epidemiologists to senior level leadership, on how to use disease forecasts. Focused training on how disease forecasts perform in small, rural states.
- Trainings for internal staff and disease specific forecasts.
- Trainings for staff, forecasting tools that could be used locally at the state with in-house data, anything that would help us to maintain capacity and workforce built during COVID-19 with CARES3 funding. Any disease-specific forecasts produced external to states should be able to be used or replicated at the state level for practical use by states.
- Trainings that provide details regarding the interpretation of the model estimates and examples of how those can be communicated to the public and separately how other

jurisdictions have used the forecasting data and things have gone well AND when they did not go well.

- We have found useful expansion maps that predict the future geographic spread for vectorborne diseases, and other health issues impacted by climate change, since these help to argue for future resources. In general, outside of outbreak contexts, we find models aimed at forecasting future spread over time to be lower priority. Models aimed at comparing the impact and prioritization of different intervention approaches are more practical than outright disease prediction.
- What data is being used to inform the model, uncertainty, scenarios, how various models might be aggregated into a consensus model, limitations of data inputs?
- 15. What else would you like to share regarding your health agency's **data**, **data systems**, **and tools** used for disease forecasting or other outbreak analytic techniques?
 - We still have a budding Health Information System that needs a lot of support through capacity to the active users; data is available, but no one actually work retrospectively to map out disease patterns due to lack of man power to focus entire task on retrospective disease analysis; still need more ground work and support.
 - A lack of dedicated, sustainable funding coupled with a fragmented national public health data infrastructure make it difficult for this field to mature rapidly and well into the powerful tool it could potentially become.
 - During COVID response I found tremendous value in using interactive forecasting tools developed by our School of Public Health and other groups that allowed me to vary parameters and understand range of risk and potential impact of various interventions.
 - Funding will be key to maintain systems, tools, and workforce capacity built that is critical to these analytics and their sustainability.
 - Increased and sustained funding for disease surveillance systems. Evaluate effectiveness of models and data needs for model.
 - Nothing is "built in." All this work uses internal data but happens with analytic tools and code outside of our systems. Would really like to explore more about predicting disease risk versus disease occurrence at times and critically, including as it relates to outbreaks (think about Hep C/HIV risk among persons who inject drugs, impact of climate change on infectious disease/vectors, risk of VPD outbreaks).
 - Our agency is rich in data regarding COVID-19, mpox, flu, and other diseases. Our data
 systems are configured to collect real-time valuable information on case counts. We are wellversed in creating visualizations to describe and analyze data we currently have, including
 generating incidence curves, calculating doubling time, etc. At present, we have limited
 ability to use these data for disease forecasting but are interested in doing so.
 - Our electronic data collection system cannot detect or control outbreaks or any above expectation incidence.

- We contract with a school of public health for support with disease forecasting.
- Tableau, DOMO, and R are used by our agency to perform disease forecasting.
- We are currently working on data linkage and data modernization to help improve our abilities to extract and link data across our data systems.
- We are in the process of enhancing our data systems through the data modernization initiatives, as many of our systems are outdated. We currently use standard methods for outbreak analytic techniques (SAS).
- We could use improved access to decision-support tools; we have interested and competent staff available to be trained.
- We have established syndromic surveillance systems with triggers for action. Any forecasting used has largely been provided by external subject matter experts.
- We would be very interested in looking at equity and racial disparities linked to health with forecasting.
- What potential data sources and conditions does CDC anticipate modeling? Who will CDC coordinate with, and what resources will be provided, for ongoing evaluation of forecast models?

Communications

16. Thinking broadly about your communication audiences (i.e., local health departments, policymakers, academia, etc.), please rate your health agency's capacity to conduct the following activities as low, medium, or high. [N=28]



Image 10: Survey Question #16 Responses

17. Does your health agency communicate with partners (i.e., academia, local health departments, policymakers, and others) about disease forecasts? [N=28]



Image 11: Survey Question #17 Responses

18. Please identify the effectiveness of your health agency's communications with the following partners about disease forecasts or other outbreak analytic techniques.



Image 12: Survey Question #18 Responses

Partners	Extremely Effective	Effective	Slightly Effective	Not at all Effective
Pharmacy, lab, healthcare [N=17]	2	11	4	
Academia [N=19]	3	12	3	1
Science and data expert [N=19]	3	12	4	
Public health associations [N=18]	2	14	1	1
Local health departments [N=17]	6	9	1	1
Other state health or territorial	3	12	1	2
health departments [N=18]				
CDC [N=18]	4	10	2	2
ASPR [N=16]	3	7	4	2
Policymakers (i.e., governors)	6	9	4	
[N=19]				
Tribal partners [N=15]	1	8	4	2
Private partners [N=17]	5	7	5	
Public and community partners	5	10	2	
[N=17]				
Data suppliers/vendors [N=17]	1	5	9	2
Media [N=18]	5	9	3	1

Table 1: Survey Question #18 Responses

*Highest response counts shaded green; lowest shaded orange.

19. What kinds of information do you use to develop your communications around disease forecasts and other outbreak analytic techniques? (Select all that apply) [N=27]



Image 13: Survey Question #19 Responses

- 20. Which evidence-based behavior model or framework informs your agency's communications around disease forecasting and other outbreak analytic techniques? Select ALL that apply. [N=4]
 - Social cognitive theory [n=3]
 - Theory of planned behavior [n=4]
 - The fear appeal model [n=0]
 - The extended parallel process model (EPPM) [n=0]
 - Other, please specify: [n=0]
- 21. What else would you like to share regarding your health agency's communications around disease forecasts and other outbreak analytic techniques?
 - Communications are constant via social media and message text (SMS) on infectious disease awareness and mitigation measures.
 - All communications go through a rigorous process for approval before disseminated, so it's critical for messages included to be evergreen and easily comprehended by the general population.
 - Currently, our agency does not have communications surrounding disease forecasting. Outbreak analytic techniques are communicated with local public health partners as part of Basic and Advanced Epidemiology trainings.
 - Given the generally ad hoc nature of our forecasting work and the absence of a definition of "effectiveness," I am not sure how to respond to this question.
 - It is challenging to communicate effectively with the public post-COVID regarding these topics. We are in the process of developing communication for wastewater modeling, but this has also been challenging to provide consumable and action-oriented information.
 - Just an emphasis that as data get more and more complex, it becomes more difficult to explain in plain language. We constantly must address questions on why the "projections were wrong."
 - Our state and the nation need a modern and reliable date management that will include outbreak detection and management.
 - Primarily used to inform agency decisions and communications at this time.
 - Short staffed, no comms scientists on staff/collaborators.
 - We do not have a communications plan for disease forecasting.
 - We found COVID forecasting tools and visualizations extremely helpful in demonstrating and communicating uncertainty to the public. The tools were also very helpful in demonstrating the potential population level benefits of interventions such as social distancing, masking, vaccination.

- We have a very small number of staff who understand the limitations and challenges related to forecasting; however, for the CDC forecasting models, it is important and their responsibility to explicitly communicate the challenges, limitations, utility, and do that in plain language so that the general public understands what the estimates and models mean in the context of the data that the local and state health departments collect and report using data generated from public health surveillance systems.
- We have nothing additional to share. This is not a frequent communication need outside of an emergency response, and we are competent in this area.
- We share these data with a limited audience, and we stress that the information is based on a model, and not had data so that it is not misinterpreted.
- We take a very collaborative approach when communicating our data. We meet regularly with bordering states to discuss current issues and outbreak analytics. We work closely with our communications department to relay guidance and press releases to the public. We work with university partners to ensure cases of various diseases are reported to the department of health, and we provide assistance with outbreak investigations as needed. We collaborate with the Public Health Laboratory on COVID-19 variant surveillance. We work with private partners such as APHL, MITRE, Google, and Apple on COVID-19 exposure notifications, which is also a source of COVID-19 surveillance.

Decision-Making

22. Does your health agency use infectious disease forecasts and other outbreak analytic techniques to support decision-making on a routine basis? During crises? [N=18]



Image 14: Survey Question #22 Responses

- 23. What policy questions do you often face when using disease forecasts and other outbreak analytic techniques to support decision-making?
 - Data to action.
 - Generalizability and reliability of information.
 - How can this actually be used to change or inform policy.

- How reliable is the data analysis and resulting recommendations.
- I don't know of policy barriers. The forecasts themselves, though, are not uniformly helpful and reliable.
- Most frequent question is around confidence in the data.
- Mostly behavior change and resource allocation.
- Not sure what this question is trying to ask, but naturally I think we get questions around how forecasts should inform policy.
- Policy changes take time, is this something that warrants a policy change? How will this policy impact other existing codes or requirements/policies? Does this public health policy conflict with priorities of other private partners/businesses/stakeholders?
- Questions about assumptions and uncertainty.
- Resource needs, need for regulatory action, communication avenues, cost-benefit considerations.
- This is too broad of a question to answer well! However, a recurring lesson from interactions with leadership during COVID is that healthcare resource questions are often seen as a priority over epidemiologic ones that are more native to modelers and models. Policy-relevant models need to model both systems.
- We don't have policies that cover such activities.
- We receive questions about local guidance for COVID-19 and other diseases as well as the needed quantities of preventative measures (such as vaccines).
- What are the triggers for surge capacity and what are the triggers for downsizing.
- How accurate are the forecasts—what if they are "wrong"?
- 24. What else would you like to share regarding your health agency's use of disease forecasts and other outbreak analytic techniques to **support decision-making**?
 - Forecasting data played a key role in our health care capacity planning and public risk communication.
 - Limited in scope given that accuracy of predictions hasn't borne out, even for CCLs.
 - Models may be often discussed internally but are seldom presented externally as justification for decisions.
 - We would like to develop additional in-house capacity so that we don't have to rely so much on our academic partners.
 - The CDC vulnerability index was an effective tool we were able to successfully leverage.
 - We need simple forecasting tools that are easily explained to non-epi partners within our organization to inform decision-making.
 - We rarely use disease forecast as we don't have the expertise to do that accurately.

- We utilize variant surveillance forecasting to determine which variants are most prevalent in our jurisdiction. We find this useful especially when considering vaccine coverage and monitor effectiveness of the vaccines that are distributed on the predominant variants. As mentioned previously, we also use the COVID-19 hospitalization forecasting data and syndromic surveillance data to help with preparedness in healthcare facility capacity, making sure we have enough hospital beds to accommodate our residents.
- Would like to expand our portfolio of resources available to us for predictive analytics.

Equity

25. To what extent does your health agency incorporate health equity considerations (e.g., equitable access to healthcare) into disease forecasts and other outbreak analytic techniques? [N=26]



Image 15: Survey Question #25 Responses

26. How often are impacted communities (or organizations representing impacted communities) involved in developing the focus area or approach of the outbreak analytic technique being used to ensure community specific risks, cultural nuances, and unique needs are identified? [N=25]



Image 16: Survey Question #26 Responses

27. How often does your health agency intentionally communicate relevant disease model findings with disproportionately affected communities (or organizations representing these communities)? [N=25]



28. How often does your health agency disaggregate data to examine structural and social factors (i.e., education, socioeconomic status, the built environment) that may help explain findings, when data sets allow? [N=26]



Image 18: Survey Question #28 Responses

- 29. What else would you like to share around equity considerations your health agency makes when using and communicating about disease forecasts and other outbreak analytic techniques?
 - Plans forward to enable messaging to the difficult to reach populations (neighboring Islands) via access to text messages or internet.
 - We are committed to an equitable approach when making public health decisions and communicating information. Our epidemiology team works closely with our communications office to ensure communication about outbreaks and disease forecasts are tailored to impacted populations (e.g., the recent mpox outbreak) and those forecasts drive decisions about the location of services to address those disease outbreaks.
 - Equity considerations generally refer to remote communities on underserved outer islands.
 - Equity is a guiding principle in all our activities.
 - Equity is integrated into communications and policy decision-making.
 - I do think our health department factors how disparities in health contribute to disease risk and adverse health outcomes associated with disease.
 - In epidemiology, we have created a Health Equity working group and are being intentional about including equity considerations in new programs and responses and working to incorporate them into existing processes. All external messages have to be approved by the agency's communications office and governor's office.
 - It has been challenging to obtain data that reflect equity measures with current data acquisition techniques.
 - It's important to note that we often lack robust primary data on key factors in surveillance data sources (e.g., race/ethnicity), which would be needed for model parameter estimates. Structural and social determinant factors data often area-based (e.g. ACS) and not individually collected.
 - Post-pandemic, we are improving data collection, analysis and visualization so that communities can see themselves in public health data and partner in disease interventions. Data collection, opportunities for community analyses
 - Question 20-23 left blank intentionally since we do not routinely conduct disease forecasting.
 - Small numbers often prohibit us from looking at data by community or person characteristics. We often rely on national findings that summarize disease burden among these target populations.
 - SVI and EDI are hard concepts for the public need a way to translate this better for the public.
 - These questions are not well-constructed. I've already shared that disease forecasting is not rigorously developed within our state, so it follows that a little used tool is not robustly used in the settings described in these equity questions. We are intentional about making equity part of all we do and we actively look for equity impacts and implications. Disease FORECASTING, though, is not as robustly done, at least not in the way I am conceiving it while completing this survey.

- We are currently developing all components of disease forecasting and outbreak analytics and are including health equity considerations into all work of the agency.
- We developed an equity section on our data platform in collaboration with United Way and a racial justice coalition. Forecasting data availability through CDC is relatively new.
- We have low population denominator data in a large, but rural state (50th population; 14th land area). National and state-level forecasts and analysis don't apply at local level.

Closing Comments

- 30. What else would you like to share about your health agency's interest in or use of disease forecasts and other outbreak analytic techniques?
 - We have very active surveillance team that constantly monitors PICs situation with their disease occurrences that have passed the thresholds as well as the United States; For any outbreak occurring within PICs the health agency is on alert with weekly EpiNet meetings to update leadership and senior members on disease occurrences.
 - As priorities compete across limited staff resources and this requires a specialized skill set, focus will remain on using externally-produced forecasts.
 - Beyond epidemiologists, what education, skillsets, and knowledge should be developed in public health agencies to most effectively implement disease forecasting.
 - We are eager to expand our capacity to generate disease forecasting and other outbreak analytic tools. We are very interested in leveraging the most up-to-date strategies to optimize public health outcomes for our residents.
 - Many of the questions in this survey did not permit us to provide an accurate response reflecting the current/future state or perceptions related to forecasting.
 - There is interest but capacity and capabilities are limited at the moment.
 - This survey feels very long for a topic area that I have repeatedly expressed is not very mature, i.e., disease forecasting. We do analyze outbreaks, identify vulnerable populations, seek to identify effective ways to contain and mitigate against disease transmission and preventable harm, and take other steps to promote public health.
 - Very interested.
 - We do outbreak analysis routinely. Disease forecasts are used mostly during crisis. However, we would be interested in exploring forecasting tools.
 - We see the incredible value in this, but local capacity in states is critical to ensure timely creation of these forecasts for use and easy use of internal data in-house. This will require funding to support tools, training, and workforce groundwork laid through CARES3 funding.
 - We would like to better understand how this information is obtained and the impact it can have for prevention of disease.
 - What are CDC's expectations for states around forecasting? Will single-state outbreaks be a forecast target for CDC, or is it limited to larger or multi-state outbreaks?

Conclusion

State and territorial health agencies have varied capacity to use disease forecasts and other outbreak analytic techniques to inform communications and decision-making, though largely reported having "some" or "good" experience in this space. Jurisdictions cited barriers such as:

- Insufficient data systems and lack of robust data.
- Forecasts providing limited value due to numerous assumptions, variability, and uncertainty.
- Limited staff capacity (expertise, experience, lack of dedicated staff).

Despite these challenges, efforts have been made to increase health agency capacity, including partnering with academia and other external organizations with additional expertise. Health agencies also reported using CARES3 and workforce development funding to support staff knowledge and capabilities. Health agencies shared a variety of materials or tools that would be useful to further support the use of disease forecasts and other outbreak analytic techniques for communications and decision-making, including disease-specific forecasts and trainings which address forecasting limitations. Overall, while state and territorial health agencies have varied capacity and experience to use disease forecasts and other outbreak for communications and decision-making, there exists a clear, common interest to improve capacity in this space.