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Executive Summary

Background

From August to October 2023, the Council of State and Territorial Epidemiologists (CSTE) hosted four regional meetings in partnership with the Association of State and Territorial Health Officials (ASTHO) and the Centers for Disease Control and Prevention’s (CDC’s) Center for Forecasting and Outbreak Analytics (CFA) to promote the effective use of forecasts and analytic tools by public health decision makers during infectious disease outbreaks. Meeting invitees included State Epidemiologists and State Health Officials (or their designees) in the 50 states and the District of Columbia, territorial health agencies, the five large local health departments that are funded through CDC’s Epidemiology and Laboratory Capacity (ELC) cooperative agreement (Chicago, Houston, Los Angeles County, New York City, and Philadelphia) and the 12 Tribal Epidemiology Centers.

The goals of the regional meetings were to:
- Grow awareness and build relationships between CFA and public health decision makers
- Assess the utility of specific CFA products to inform public health decision-making
- Promote the effective use of CFA products by public health decision makers to improve future outbreak responses
- Facilitate collaboration between State Epidemiologists and State Health Officials

Methods

CSTE contracted with consultants to facilitate the meetings and to conduct a formal evaluation of the CFA tools discussed in the meetings. Pre-meeting assessments, scenario-based discussions, panel and group discussions, and post-meeting assessments were used to solicit information from meeting attendees on approaches to enhance health department capacity to implement and use forecasting and analytic tools.

Results

Across the four regional meetings, health department leadership had little awareness of CFA products, or if they had seen the products, were unaware that they were produced by CFA. Through the course of discussions, participants reported limited utility of these products to inform public health decision-making. Some themes that emerged included:
- Importance of a strong relationship between health departments and CDC that allows for bidirectional flow of information
- Improving pre-decisional engagement and communications around the development and release of CDC forecasting products is necessary
- Providing information on financial, economic, or long-term impacts of certain decisions and risk assessments to support communications with policy makers and the public is desired
- Adding specificity and customizability to analytic tools will increase utility for decision-making at state, tribal, local, and territorial (STLT) levels
Conclusions
In relation to the four stated goals of the meetings, the discussions generated valuable insights and highlighted further areas for growth. Public health leaders gained awareness of CFA and their work in infectious disease outbreak response but desired a stronger connection with CFA, as well as a clear indication of when to engage CFA in public health decision-making. While the focus of these meetings and this evaluation was specifically on CFA products, it is likely that some of the findings and challenges identified apply more broadly to integrating forecasting in public health practice and that other public health partners conducting forecasting and modeling (e.g., universities, private entities) may benefit from the lessons learned and recommendations.

Decision makers were largely unaware of the products developed and disseminated by CFA to date, and while many felt they would explore the forecasts, technical reports, or courses available going forward, many felt that they did not foresee these products significantly altering their day-to-day public health decision-making practices. Many felt that a better case should be made for the utility of forecasting and modeling products in public health decision-making before incorporating these products into their regular work.

The four regional meetings were well attended by CSTE and ASTHO members and the regional model was well received. The meetings provided a unique opportunity for regional engagement between senior health agency leaders, as well as tribal epidemiology center representatives.

Recommendations
Key recommendations emerged from the regional meetings in the areas of 1) communication, 2) STLT engagement, and 3) workforce development.

Communication: CFA, in collaboration with partner organizations, should develop a unified communication strategy that incorporates STLT health agencies for the release of new products and forecasts and other analytic tools. CFA should develop a brief overview of each product for health department leadership, including a description of the product and how it is intended to be used, what the desired public health action is, and how it differs from other products. STLT leadership requested frequent and early communication from CFA around parameters, goals and implications of products, as well as advanced notice prior to public release of information, including talking points for potential media attention. Communications training is needed at all levels of the public health workforce (including among academic and industry modelers), and CFA has an opportunity to support a unified communication strategy around forecasting, modeling, and analytic tools.

STLT engagement: CFA, in collaboration with partner organizations, should leverage an STLT health agency leader advisory panel, or similar, comprised of a small group of trusted members with whom CFA can solicit input during development of products, share pre-decisional information, and hear key questions or needs from the field. In addition to health metrics, STLT leadership would like to see economic metrics and outcomes that can better support policymaking. There should also be consideration given to health equity indicators to address health disparities.

Workforce development: CFA and partner organizations should help build national forecasting capacity by providing training and support to upskill STLT health agency staff in both interpretation and development of forecasts, models, and analytic tools for public health. Additionally, given the significant need for additional staffing, fellowships and similar programs should be supported to provide additional staffing capacity directly to STLT health agencies.
Introduction

Purpose

Analytic and visualization products, such as models and forecasts, are important tools that can be leveraged by public health practitioners to inform planning and decision-making, especially during infectious disease outbreaks and other public health responses. Their development and use have rapidly grown in recent years, particularly during the COVID-19 pandemic when mathematical modeling and forecasting helped inform decisions about pandemic planning, resource allocation, vaccination, and the implementation of social distancing measures and other interventions (Biggerstaff, 2021). In response to the COVID-19 pandemic, the Centers for Disease Control and Prevention’s (CDC’s) Center for Forecasting and Outbreak Analytics (CFA) was formed to improve the nation’s ability to prepare for and respond to infectious disease threats using data, modeling, and analytics (CDC, 2022). CFA’s core functions and goals include collaborating with federal, state, and local leaders to support decision-making and leveraging partnerships to design, build, and test novel analytics and data sources to improve the performance of outbreak forecasts and analyses. In 2023, CSTE in partnership with CFA and the Association of State and Territorial Health Officials (ASTHO) planned four regional meetings with public health leaders to better understand and enhance use of forecasting, visualization, and analytic products to improve future outbreak responses.
Meeting Design

Meeting objectives were developed collaboratively with CFA. At the time of project initiation, CFA had released specific products for public health decision maker use and requested that the meetings focus on evaluation of the previously released COVID-19, mpox, and acute pediatric hepatitis products. Evaluation activities and meeting sessions were tailored to encourage dialogue, exchange of ideas, and the discussion of potential frameworks for future collaborations between CFA and public health decision makers. While the agenda was adapted for improvement between each of the four regional meetings (Table 1), the core components stayed largely similar across meetings (Table 1, Appendix 1).

At the start of the meeting, CFA provided the workshop attendees with an overview of their organization, mission, and goals and described their plans for future tool development and engagements with state, tribal, local, and territorial (STLT) partners. Scenario-based discussions were used to elucidate evaluative feedback on the selected CFA forecasting and analytic tools. Panel discussions were included in the workshop to allow participants to address public health data policy and communication issues and challenges related to forecasting. A closing session focused on identifying action steps and resources necessary (e.g., staffing, training, data systems support, etc.) to enhance health department capacity to implement and use forecasting and analytic tools. Given the timing of the meetings, the acute hepatitis tool discussion was removed from the agenda to allow for new discussions at the final two meetings (September and October) to explore CFA’s new respiratory disease season outlook and bidirectional communication between CFA and public health agencies. Appendix 2 lists CFA products evaluated during any of the regional meetings.

Table 1. Agenda Topics

<table>
<thead>
<tr>
<th>Session</th>
<th>South</th>
<th>Northeast</th>
<th>Midwest</th>
<th>West</th>
</tr>
</thead>
<tbody>
<tr>
<td>CFA Overview</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Scenario Discussion: COVID CFA Tools</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Scenario Discussion: mpox CFA Tools</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Scenario Discussion: Hepatitis CFA Tools</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Respiratory Disease Season Outlook</td>
<td></td>
<td></td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Panel Discussion: Public Health Data Policy Experiences</td>
<td>X</td>
<td>X</td>
<td>X*</td>
<td>X</td>
</tr>
<tr>
<td>Panel Discussion: Communicating Forecasting Methods &amp; Outputs</td>
<td>X</td>
<td>X</td>
<td>X*</td>
<td>X</td>
</tr>
<tr>
<td>Discussion: CFA Communication and Collaboration with STLT Health Agencies</td>
<td></td>
<td></td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Discussion: Next Steps for Action (included workforce and training needs)</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

* Panel discussion topics were combined in one session for the Midwest meeting.
Meeting Activities

Several approaches were implemented to accomplish the goals of the meeting including:

- Pre-meeting electronic assessment distributed via email
- Scenario-based discussions to solicit feedback on existing forecasting and analytic tools and what tools would be useful to future outbreak responses
- Panel discussions on data policy and communication issues related to implementation of forecasting in health departments
- Discussion on action steps and resources necessary (e.g., staffing, training, data systems support, etc.) to enhance health department capacity to implement and use forecasting and analytic tools
- Post-meeting electronic assessment, information, and resource sharing via email

Evaluation Methods

CSTE engaged Guidehouse to evaluate how decision makers use CFA products and how these products factor into decision-making, public health action, and policy development. More broadly, this formative evaluation included the following evaluation criteria selected by CFA to assess each of their product types:

- **Utility**: What features are available in the product?
- **Usability**: How easy is it to use the product? Can users easily navigate the product to find proper information? Can the users easily communicate the information to other collaborators?
- **Accessibility**: How easy is it to obtain/access the product and is it available to the people who need it most?
- **Relevance to decision-making**: Does the product answer the right questions for decision makers?
- **Transparency**: Is it easy to understand where the data/information in the product is coming from? Are the methodologies and analyses explained?
- **Timeliness**: Is the information reaching the target audience with enough time to react?
- **Equity**: Does the product consider health disparities, or does it help address health disparities?
Attendees

Senior public health leaders that use CFA products and tools for decision-making during outbreak responses were the primary intended audience for the meetings. Two senior epidemiology personnel (e.g., State Epidemiologist, Deputy State Epidemiologist, or other senior-level epidemiology designee) and two senior health officials (State/Territorial Health Official, Senior Deputy, etc.) were invited from each state and territorial jurisdiction. Additionally, an epidemiology representative from the five large local health departments that are funded through CDC’s Epidemiology and Laboratory Capacity (ELC) cooperative agreement (Chicago, Houston, Los Angeles County, New York City, and Philadelphia) and the 12 Tribal Epidemiology Centers (TECs) were also extended invitations.

Table 2. Regional Meeting Attendees

<table>
<thead>
<tr>
<th>Attendee Type</th>
<th>South</th>
<th>Northeast</th>
<th>Midwest</th>
<th>West</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>State Epidemiologists, Deputies, or Designees</td>
<td>31</td>
<td>14</td>
<td>27</td>
<td>16</td>
<td>88</td>
</tr>
<tr>
<td>State Health Officials, Deputies, or Designees</td>
<td>14</td>
<td>11</td>
<td>12</td>
<td>12</td>
<td>49</td>
</tr>
<tr>
<td>Territorial Health / Epidemiology Officials</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>7</td>
<td>8</td>
</tr>
<tr>
<td>Large Local Health Department Epidemiologists</td>
<td>1</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>Tribal Epidemiology Center</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>4</td>
<td>7</td>
</tr>
<tr>
<td>Total Attendees*</td>
<td>46</td>
<td>29</td>
<td>41</td>
<td>39</td>
<td>155</td>
</tr>
<tr>
<td>Number of Jurisdictions in the Region**</td>
<td>18</td>
<td>13</td>
<td>16</td>
<td>17</td>
<td>64</td>
</tr>
</tbody>
</table>

* Total does not include staff from CSTE, ASTHO, CDC, or consultants.
** Does not include TECs: One representative from each TEC was invited to attend one of the regional meetings of their choice.
Location

The four meetings were held in locations across the United States that allowed for convening of the jurisdictions regionally. A regional approach provided several advantages, including cost savings due to shorter distances traveled, attendee convenience, and strengthening regional relationships and information sharing.

Figure 1. Regional Meeting Map

TECs: One representative from each TEC was invited to attend one of the regional meetings of their choice.
Baseline Modeling Capacity

Attendees of the regional meetings were asked whether their respective jurisdictions had the capacity to develop forecasts or infectious disease models in-house within their organization. Most attendees (83%) reported having limited to no internal capacity to conduct forecasting and modeling activities, with 56% reporting no capacity. Among those that did have internal capacity, most also made use of external products and just 2% reported conducting all forecasting and modeling activities in-house.

Figure: Attendees’ agency capacity to develop forecasts and/or models in-house (n=133)
CFA Products

Five existing CFA products were evaluated during the regional meetings. The products were evaluated through discussion activities, live polling, and pre- and post-assessments administered electronically. Appendix 2 lists CFA products evaluated during any of the regional meetings. Additionally, CFA’s “Infectious Disease Transmission Models for Decision-Makers” training course available on Coursera was included in electronic evaluation questions, but not evaluated formally as part of the regional meetings.

COVID-19 Forecasts

The CFA COVID-19 products evaluated included forecasts for upcoming hospitalizations and deaths. The COVID-19 Scenario Modeling Hub also produced long-range projections based on assumptions about future COVID-19 variant characteristics, availability and efficacy of medical countermeasures (vaccines), or implementation of non-pharmaceutical interventions. The key findings from discussions and assessment activities for COVID-19 forecasts were:

- Most participants were not aware of COVID-19 hospitalization and mortality forecasts or the scenario-hub ensemble projections and did not use them to inform health agency communications and decision-making efforts.
  - 26% of participants reported using hospitalization forecasts. Attendees indicated that this was because limited hospital capacity in their jurisdiction meant that they tracked hospitalization forecasts most closely.
  - 18% of participants reported using mortality forecasts.
  - 11% of participants reported using the COVID-19 Scenario Modeling Hub projections.
- Participants did not use the CFA forecasts in developing COVID-19 vaccine allocation plans. Some used models developed in collaboration with partners or simply identified populations to prioritize vaccinations based on risk, such as by age group. Many states and regions leveraged tools that measure social vulnerability to shape their equitable vaccine distribution strategies (e.g., CDC’s Social Vulnerability Index [SVI], Healthy Places Index [HPI], COVID-19 Community Vulnerability Index [CVI]).
- Participants indicated lack of awareness and time as the main barriers in using these tools. While cited less frequently, other barriers that attendees discussed and should be considered for future action are:
  - National forecasts may not be representative enough of the jurisdiction and do not encapsulate the unique nuances of the specific locality. Attendees suggested that modeling and forecasting approaches that are more localized and less broad would facilitate the utility of these tools.
  - Without the details of the methodology and underlying assumptions, some attendees felt it was difficult to have trust in the forecasting outputs and to communicate the
results to other leader decision makers, policymakers, and the public, even if the
products came from CDC.
  o Some attendees reported that well-intended third-party forecasts sometimes made
things more challenging because there were too many forecasts available, which
forced public health to educate the media and public. Public health often had to de-
conflict messaging when different models produced starkly different forecasts.

• In terms of utility of the products, most participants did not think the windows for these
projections were appropriate compared to other forecasts and were unsure if the
visualizations for these products were easy to understand.

Overall, the discussions in the regional meetings reflected a lack of awareness of and familiarity
with the COVID-19 hospitalization and mortality forecasts and the COVID-19 Scenario Modeling
Hub tools among senior health department leaders. There were varied experiences, and
therefore perceptions, among the attendees in terms of the utility of these products for public
health decision-making and uncertainty around how such tools would be used in the future.

Mpx Technical Reports

On July 25, 2022, CFA published a technical report on the “Multi-national Mpx Outbreak” in the
United States. The technical report provided an epidemiologic summary of mpx cases in the
U.S. and was followed up by three additional update reports on August 26, September 23, and
October 21, 2022. Key findings from discussions and assessment activities for CFA’s mpx
technical reports were:

• About half of the participants were aware of the first mpx technical report developed by
CFA and reported that it did increase their understanding of the mpx outbreak; however,
when asked about barriers to using the report, some attendees still reported lack of
awareness that the report existed or that it was produced by CFA.
• Most participants (65%) did not communicate the first report to external entities. Those that
did communicate the report to external entities reported sharing it with public health
partners, hospitals, and long-term care facilities.
• Most participants did not use the technical reports to inform health agency communications
and public health decision-making.
• Most participants indicated that the report did not provide them with the appropriate data to
help ensure health interventions were implemented equitably. In general, participants
indicated that the level of granularity of the data was too broad to support public health
decision-making and they had access to their own local data to make decisions.
• Most participants were split across the areas of the report that they would like to see more of
to support equitable implementation of health interventions.

Overall, attendees reported greater familiarity with the mpx technical reports than COVID-19
forecasts. Attendees emphasized the importance of ensuring that technical reports not only
share summaries of epidemiologic trends and forecasts, but that they also include actionable
information in terms of what public health partners should do with the information provided to
enhance greater usefulness and application of the reports.
Acute Hepatitis of Unknown Cause Technical Report

In 2022, children with acute hepatitis of unknown cause were identified in the United Kingdom, other European countries, and the United States prompting CFA to publish a technical report on August 17, 2022. Only the South and Northeast regional meetings evaluated this product. It was decided to retire the evaluation questions after the first two meetings because most participants were not aware of this report and therefore it did not generate much discussion during the meetings. The key findings from discussions and assessment activities for CFA’s Acute Hepatitis of Unknown Cause Technical Report were:

- Most participants (85%) did not use CFA’s Acute Hepatitis of Unknown Cause Technical Report to inform health agency communications and public health decision-making, citing a lack of awareness of the report.
- Most participants did not communicate the technical report to external entities due to a lack of awareness. For those that did communicate the report, they communicated information related to epidemiological data and summary data of patients under investigation in the U.S. equally to long-term care facilities, hospitals, and partners such as schools.
- Most participants did not use the information in the Acute Hepatitis of Unknown Cause Technical Report to update guidelines and standard operating procedures. The fraction that did use the report updated public health guidelines with the information.
- This report generated discussion among attendees regarding how this type of report would be differentiated from other types of epidemiologic summary reports that CDC produces (e.g., Morbidity and Mortality Weekly Report, outbreak reports on a CDC program website, etc.) and questions about how CFA is working with CDC programs (e.g., when would CFA issue a technical report vs. a CDC program issuing a report). Clarification from CFA on these topics for STLT leaders is desired.

Respiratory Disease Season Outlook

At the last two convenings in the Midwest and West, CFA presented participants with a new product that provided a long-range projection on the upcoming fall and winter respiratory disease season that focused on expected levels of COVID-19, influenza, and respiratory syncytial virus (RSV) cases. The key findings from discussions and assessment activities for CFA’s Respiratory Disease Season Outlook were:

- As the product was new, most participants had not heard about the product. If they had heard about it, they had seen it presented on a CSTE call, or in another venue.
- About half of the participants liked the product and were optimistic it would be useful, with higher levels of optimism reported in the Midwest meeting where the report was first unveiled.
Some participants were interested in accessing the raw data and methodology for this product so that they could develop state and local versions of the product.

Participants appreciated the opportunity to provide CFA with feedback on the new product. Participants further emphasized the importance of having the opportunity to preview future CFA products prior to release and encouraged CFA to establish a mechanism for bidirectional feedback in collaboration with CSTE and ASTHO.

Coursera Forecasting Training Course

The Johns Hopkins University – CFA Coursera online training course “Infectious Disease Transmission Models for Decision-Makers” aims to provide anyone who makes decisions about public health policies and programs with a clear understanding of how infectious disease transmission models work, the various types and functions, and how they can be appropriately used to make decisions. As a CFA product, the course was included in electronic evaluation questions, but it was not evaluated formally as part of the regional meetings. The key findings from assessment activities for this course were:

- Most participants were not initially aware of the training course; however, after the meetings all respondents reported that they would or may recommend this training to other staff within their health agencies.
- Most participants did not previously use the training to improve their agency’s utilization of public health forecasting or models; however, going forward most respondents said they would use it for this purpose.
- Most participants responding to the post-meeting assessment reported that they will recommend this training in the future to other staff within their health agency, primarily for epidemiologists and data scientists.
Discussion Topics

The regional meetings included panel- and group-facilitated discussions focused on critical topics for health agency leaders related to implementation of forecasting in health departments.

Public Health Data Policy

Ensuring access to public health data and having effective public health data policies in place are critical to supporting successful infectious disease forecasting efforts. Senior public health leaders within each region with experience promoting model data policies in their respective jurisdictions were invited to sit on a panel to discuss current public health data-related policy issues. Panelists and attendees shared challenges and strategies for working with policymakers or others to demonstrate the importance and application of these data and public health surveillance in general.

Key Discussion Findings

- Jurisdictions with legislative liaisons within their public health organization have found these types of positions helpful for monitoring potential impact of bills and being able to more proactively engage in the legislative process, as allowable.
- When working with legislators, framing issues in ways that are more acceptable philosophically can be helpful, which requires listening to all sides and understanding perspectives and interests.
- Other strategies for promoting policy are to build positive external relationships and then leverage them, allowing partners to be champions, and understanding the surrounding landscape (e.g., the policies of neighboring states).
- Some jurisdictions have found standard Data Use Agreements helpful for enabling data sharing both internally and externally to improve capacity for public health data analytics.
- Data sharing and access between tribes, states, and the federal government continue to be problematic.
Communications

Given the complex methodology and outputs of forecasts and other analytic tools, communicating the findings and how they are used to inform decisions can be challenging for public health leaders, especially as forecasts change or may even differ between institutions generating them. Senior public health leaders within each region with experience communicating the findings and outputs derived from forecasts within their jurisdictions were invited to participate as panelists for panel discussions for each meeting. Attendees and panelists discussed communication challenges and strategies for communicating how these tools are used in public health decision-making to lay audiences and managing situations where outputs from different institutions, or generated at different times, may conflict.

**Key Discussion Findings**

- There is a need for more cohesive messaging related to forecasts, especially when they are released at the national level. Attendees suggested that:
  - Better coordinated communication will lead to a more cohesive message being released by all partners.
  - Cohesive messages relate to better response from the public as a whole.
  - Coordinated, cohesive, and consistent messages build public trust.
- Over promising and under delivering when it comes to models erodes trust in CFA, forecasting, and public health in general.
- Consistently clarifying and routinely explaining data dependencies, potentials, and constraints is essential, especially when introducing the potential benefits of forecasts.
- Communication as a science is under-recognized in public health funding streams. Having specific communication professionals versus upskilling health officials into communicators is critical; however, these positions may not be funded in grant budgets.
- Embedding communication specialists can enhance framing of complex health topics, ensuring the presence of subject matter experts for tailored communication needs.
- Products should be crafted simply and specifically for the intended audience to maintain the clarity of the intended message, avoiding an overly broad presentation.
  - Providing precise bullet points highlighting the most crucial elements can streamline and focus the messaging and the subsequent responsive actions.
  - Leading messages with caveats and disclaimers can undermine the key message, which should focus on public health action. Intricate nuances of data and its limitations can overshadow and sideline the overarching message.
  - While it is important to acknowledge uncertainties in communication, dwelling on them can be counterproductive; the emphasis should be on the practical implications for the audience.
  - Tailoring messages to specific stakeholder groups can elevate their efficacy.
- Additional communications training for all levels of the public health workforce is needed, especially given the communications challenges that have emerged post-pandemic that call for public health officials to adopt new communication strategies.
Workforce and Other Needs

Attendees at all four regional meetings were engaged in group discussion to identify support needed to improve use of forecasts and other analytic tools in public health decision-making.

Key Discussion Findings

- Most attendees (56%) do not have in-house forecasting and modeling capacity, with the remaining having limited capacity (27%), some capacity (15%), and just 2% reporting they conduct all forecasting/modeling in-house.
- Barriers to hiring forecasting and modeling staff within STLT health agencies include funding, finding suitable candidates, limited buy-in from decision makers, or other unidentified barriers.
- Jurisdictions need additional support in upskilling their workforce to be able to interpret and produce forecasts and models.
- Because participants do not already have staff who are actively engaged in doing forecasting and modeling, and they cannot hire, participants noted that their preferred capacity building activities are sponsored fellowships specializing in areas of forecasting and modeling, followed by sponsored courses and other trainings to upskill the workforce.
  - In terms of the future workforce pipeline, forecasting and modeling is not a part of the curriculum of the typical MPH curriculum. Funding is needed to support post-MPH fellowship programs, such as the CSTE Applied Epidemiology Fellowship program, aimed at providing topic-specific training (e.g., forecasting) while enhancing STLT health agency capacity.
- Attendees suggested that CFA could support STLT health departments to improve modeling and forecasting capacity by providing funding, training, and supporting other capacity building activities.

CFA Communication and Collaboration with STLT Health Agencies

As a new center at CDC, leaders in STLT health agencies are still looking to learn more about how CFA will engage with jurisdictions in the future and what types of support and resources might be provided. The Midwest and West regional meetings included a dedicated session within the agenda for group discussion with CFA representatives to explore future STLT health agency and CFA engagement.
Key Discussion Findings
- There was low awareness of CFA products among participants.
- STLT leaders described being unprepared for the release of forecasting and analytic products released by the federal government and other entities. Products have often been released without notice to STLT leaders and can contain conflicting information with their own jurisdictional data. STLT leaders are asked to respond to the information in these products without having enough information to support an informed response.
- STLT leaders are hesitant to use a model/forecast/tool when the methods, parameters, and assumptions are not clear or understood. Some leaders expressed that the case has yet to be made for the utility of forecasting and modeling products in public health decision-making.
- Key messages, including an explanation of what the model can and cannot say, as well as a desired action, is crucial to ensuring cohesive messaging across the federal government and STLT jurisdictions.
- A mechanism for bidirectional communication with CFA is desired by STLT health agency leadership.
- STLT leaders requested the opportunity to preview products with state-level data prior to public release by CDC to ensure that any data issues are addressed (e.g., a jurisdiction may recognize that their data is outdated and could provide more accurate data for the CFA product).
- STLT leaders expressed interest in a mechanism to provide CFA with information on key questions from the field relative to emerging public health issues and responses.
- STLT leaders were interested in better understanding how STLT health agencies will be able to engage with and benefit from the new CFA Insight Net network.

Figure: Meeting participants of the Northeast Regional Meeting, Providence, RI, August 22–23, 2023
Overall, public health leaders gained awareness of CFA through these meetings but felt that clarity on when or how to engage with CFA was lacking. Similarly, decision makers gained awareness of CFA products, but many did not foresee these products altering their day-to-day public health decision-making processes. Some felt that the case for the utility of forecasting and modeling in public health decision-making is not compelling enough for their consistent use, and that federal communications on models and analytic products lack an explicit desired action or outcome. Risk assessments, scenario projections, and economic analyses can help decision makers communicate with policymakers; however, additional training, talking points, and coordinated messaging are needed for these products to be fully utilized. While the focus of these meetings and this evaluation was specifically on existing CFA products, it is likely that many of the findings and challenges identified apply more broadly to integrating forecasting in public health practice and that other public health partners conducting forecasting and modeling (e.g., universities, private entities) may benefit from the lessons learned and recommendations described in this report.

**Strengthen Relationship Between STLT Health Agencies and CFA**

- As a new center, CFA must develop and maintain strong relationships with STLT health agencies. These relationships can be facilitated by national partner organizations, such as CSTE, ASTHO, and others.
- A mechanism to support bidirectional flow of information between public health leaders and CFA is needed. This mechanism will allow public health leaders to provide input into CFA products during concept and product development, including the opportunity to view near final products before they are released.
- There is a need to define the use cases for forecasts, models, and other similar analytic products to enhance utility and uptake of these tools for public health decision-making.
- STLT health agencies need additional support to implement forecasting in public health practice. Not only do they need forecasting personnel resourcing and upskilling, but many jurisdictions also need support in surveillance activities and data modernization initiatives, which are both key to enabling forecasting work, regardless of where it is performed.
Improving Communications

- Communication as a science is under-recognized in public health funding streams. Having specific communication professionals versus upskilling health officials into communicators is critical; however, these positions may not be funded in grant budgets.

- Additional communications training for all levels of the public health workforce (and among forecasters and modelers) is needed, especially given the communications challenges that have emerged post-pandemic that call for public health officials to adopt new communication strategies.

- There is a need for more cohesive messaging related to forecasts, especially when released at the national level. Better coordinated and consistent communication will lead to a more cohesive message being released by all partners, which in turn will help build public trust.

- Public health can build trust in forecasting and modeling by being transparent about all aspects of the forecasting process, from the data, the data sources, the methodology, as well as any other factors that led to the development of the product.

- Providing key messages and talking points with a product’s release, including an explanation of methods and limitations, as well as a desired action, is crucial to ensuring cohesive messaging across the public health system.

- Text-heavy products, such as technical reports, should be developed using best practices for communications. Providing trusted partners an opportunity to provide pre-decisional feedback could provide CFA with valuable input in terms of utility and usability. Public health leader attendees suggested that products should include an understanding of the purpose and use of the products and should state the “bottom line up front” (e.g., the risk assessment) and consider more graphics/visuals than text-heavy products.

- Many public health leaders lacked awareness of CFA products, suggesting that CFA should consider new strategies for product release (e.g., consider attending CSTE State Epidemiologist and State Health Official calls, especially for new products).

- Data sharing across the multiple levels of public health entities and with partners can be a challenge to effective forecasting activities and requires continued attention and solutions.

Practical Application, Specificity, and Customizability for Better Utility and Decision-Making

- Having additional access to scenario projections, economic, financial, and long-term impacts of certain decisions can help decision makers communicate with policymakers (e.g., effects on sales and school-closings, cost of staffing-up in anticipation of an outbreak, supply chain shortage forecasting, etc.).
  - Consider using modeling to answer more specific and practical questions rather than predicting overall trends.
• Many participants expressed the desire to have models that explored the potential economic impacts of different public health strategies to be presented alongside the strategies so senior officials and elected officials can base their decisions on a more complete picture.

• Risk assessments were not part of the evaluation but were discussed by CFA in the regional meetings. These easy to digest risk assessments are more likely to be used than long, text-heavy reports.

• Nationwide forecasting models have limited utility to a local jurisdiction. Public health leaders need more granular, local data to inform their decision-making and communications.

• Some participants noted that forecasting may not be useful for all conditions/pathogens and that applying these tools to pathogens/conditions for which more data are available to build models rather than focusing on emerging pathogens could be useful.
  o Some attendees also expressed interest in having access to forecasts and analytic tools that address public health issues beyond infectious diseases, such as substance use (e.g., opioid overdoses), behavioral health, and chronic conditions.

• Health agencies need the ability to see and adjust the parameters of the forecasting output to better match their locality for decision-making.
Recommendations

The following recommendations resulted from discussions and assessment activities during the four regional meetings.

Communication

- CFA, in collaboration with partner organizations, should develop a unified communication strategy that incorporates STLT health agencies for the release of new products and forecasts and other analytic tools. The communication strategy should specifically ensure inclusion of tribal nations and aim towards ensuring consistent messaging across the public health system to allow decision makers and the public to easily interpret disease forecast probabilities (e.g., color-coded tables, leverage emergency reporting frameworks, such as weather reporting, for risk reporting).
- CFA should develop a brief overview of each product for public health leaders that should include a description of each product and an indication of how it is intended to be used, what the desired public health action is, and how it differs from other products.
- CFA, in collaboration with partner organizations, should identify mechanisms to communicate frequently with STLT health agencies and enable bidirectional flow of information. These mechanisms for engagement should support timely discussions on parameters and the policy, operational, and other decision support needs of future products, jurisdictional needs around making products customizable or at the right scale for usability, and for public health leaders to share with CFA the key questions that forecasting and other analytic tools might be able to help answer to support decision-making.
- CFA should provide jurisdictions with advance notice and preview of products prior to public release, especially if media attention is anticipated or desired. This notice should include talking points for the product being released to support leaders with communication.
- Communications training is needed at all levels of the public health workforce (including among academic and industry modelers), and CFA has an opportunity to support a unified communication strategy around modeling and analytic tools.

Engagement

- CFA, in collaboration with partner organizations, should leverage an STLT health agency leader advisory panel, or similar, comprised of a small group of trusted members with whom CFA can share close-hold pre-decisional information, get feedback on new forecasting or analytic products in concept through development stages, and elicit specific policy questions that can be provided to forecasters and modelers.
- CFA should share products with state-level data prior to their release to ensure that any data issues are addressed (e.g., example of CFA releasing a product for a jurisdiction and
finding out that the data were outdated, or data were missing that the jurisdiction could have provided prior to release), and to ensure alignment with any STLT-produced forecasts.

- CFA should provide information on how STLT health agencies will be able to engage with and benefit from the new CFA Insight Net network.
- In addition to health metrics, CFA should track economic metrics and forecast economic outcomes that will support policymaking. There should also be consideration given to health equity indicators to address health disparities.
- CDC and partner organizations should look for opportunities to support additional regional convenings for STLT health agencies within the topic of forecasting or to address other public health topics given that attendees found the regional meeting model highly valuable.

**Workforce Development**

- CFA and partner organizations should provide training and support to upskill STLT health agency staff in both interpretation and development of forecasts, models, and analytic tools for public health. Training and upskilling of the existing workforce could help address some of the significant workforce barriers to using these tools for public health decision-making.
- CFA and CSTE should support forecasting-specific fellowship assignments in CSTE’s 2-year Applied Epidemiology Fellowship program. CDC may also consider other fellowship and assignee opportunities to place resources in STLT health agencies to build capacity.
- CDC should provide enhanced funding to jurisdictions to support core surveillance and informatics infrastructure, which are critical to jurisdictional ability to participate in, and implement, more advanced analytic methods such as forecasting and modeling that rely on foundational epidemiology capacity to be in place.

*Figure: Meeting participants of the West Regional Meeting, Seattle, WA, October 3-4, 2023*
# Appendix 1: Meeting Agenda

## Agenda:

### Day 1

<table>
<thead>
<tr>
<th>Time</th>
<th>Session Title</th>
<th>Speakers/Moderator/Panelists</th>
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<tbody>
<tr>
<td>8:30-8:45am</td>
<td>Welcome &amp; Opening Remarks</td>
<td>Senior Leader, CSTE</td>
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<td>Senior Leader, ASTHO</td>
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<tr>
<td>8:45-9:00am</td>
<td>Meeting Overview &amp; Introductions</td>
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<td>Senior Leader, CSTE</td>
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<tr>
<td>9:00-9:30am</td>
<td>Overview of CDC’s Center for Forecasting and Outbreak Analytics</td>
<td>CDC-CFA</td>
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<td>9:30-10:15am</td>
<td>Scenario Based Discussion – COVID-19 CFA Tools; Early Phase</td>
<td>IEM</td>
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<td>10:15-10:30am</td>
<td>Break</td>
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<tr>
<td>10:30-11:40am</td>
<td>Scenario Based Discussion – COVID-19 CFA Tools; Mid- and Non-Pandemic Phases</td>
<td>IEM</td>
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<td>11:40-11:45am</td>
<td>Group Photo</td>
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<td>11:45-1:15pm</td>
<td>Lunch (On Your Own)</td>
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<tr>
<td>1:15-2:15pm</td>
<td>Scenario Based Discussion – Mpox CFA Tools</td>
<td>IEM</td>
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<tr>
<td>2:15-2:30pm</td>
<td>Workforce Discussion</td>
<td>IEM</td>
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<tr>
<td>2:30-2:45pm</td>
<td>Break</td>
<td></td>
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<tr>
<td>2:45 – 3:30pm</td>
<td>Networking Activity</td>
<td>IEM</td>
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Panel Discussion: Public Health Data Policy Experiences

This panel will focus on data policy issues related to forecasting in the jurisdictional setting. Given that enabling access to public health data is a critical policy issue for success of forecasting initiatives, panelists and attendees will discuss current data-related policy challenges and successful strategies for working with policymakers to promote model policies that support public health surveillance and data initiatives.

Moderator
Panelists:
4 jurisdictional attendees

Day 1 Wrap-up

IEM
# Appendix 2: CFA Forecasting and Analytic Tools

## COVID-19 Forecasting and Mathematical Modeling:

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<thead>
<tr>
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<tr>
<td>COVID-19 Forecasts: Deaths</td>
<td><img src="https://example.com" alt="QR Code" /></td>
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<tr>
<td>COVID-19 Long-Term Scenario Projections</td>
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## Technical Reports: Four Mpox and One Hepatitis

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<tr>
<td>Multi-National Mpox Outbreak Technical Report 3</td>
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</tr>
<tr>
<td>Mpox Technical Report #4</td>
<td><img src="https://example.com" alt="QR Code" /></td>
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## Technical Report: Acute Hepatitis of Unknown Cause

## Respiratory Disease Season Outlook

CDC Center for Forecasting and Outbreak Analytics (CFA) resources and publications website: [https://www.cdc.gov/forecast-outbreak-analytics/resources.html](https://www.cdc.gov/forecast-outbreak-analytics/resources.html)
Appendix 3: Guidehouse Evaluation Report

Link to comprehensive summary evaluation report.
For additional information on CSTE and CSTE’s Forecasting Activities, please visit:

www.cste.org

CSTE Infectious Disease Forecasting and Modeling Workgroup