CISA

Public Health Needs Assessment: Summary Report

Contents

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RISA Regional Integrated Sciences and Assessments

CISA Carolinas Integrated Sciences and Assessments A NOAA RISA TEAM

Executive Summary

The Carolinas Integrated Sciences and Assessments (CISA) conducted a needs assessment of public health practitioners across the southeastern United States to understand the impact of extreme weather and climate events in their work. The survey received 108 responses in a two-month period in the fall of 2020. The survey participants were from states in the southeastern United States, representing a diversity of professions within the emergency management or disaster services, healthcare coalitions, hospital or clinical based organizations, government-based public health agencies, or other types of community organizations. The survey gathered input from public health and clinical stakeholders whose work may not have crossed with CISA previously.

The survey respondents shared their concern about extreme weather and climate events, as well as the importance of climate information in their work. The survey respondents expressed specific needs regarding climate and weather information and tools for their work, as well as future opportunities for local capacity- and leadership-building in their communities.

Concern about Extreme Weather and Climate Events

Participants were very concerned about heavy rain, prolonged rain, heat, and hurricanes. Participants across all organization types were more concerned about heavy rain events (that may lead to flash flooding events) compared to prolonged periods of rain or flood events themselves. Participants were not at all concerned about fog and generally only somewhat concerned about drought, tornadoes, wildfire, and wind.

Healthcare coalitions and emergency management—which operate on local and regional scales—are very concerned about localized impacts of winter weather, which is a lesser concern for other organizations that may operate on a larger scale. Non-profit and community organizations expressed a higher level of concern across flood-related hazards, heat, hurricanes, and storms. Those working in hospital- or clinical-based settings (primarily based in North Carolina) were very concerned about heat and prolonged rain.

Information and Tools

Despite concern about the health impacts of heat, survey participants less frequently use wet bulb globe temperature (WBGT) in their work—a widely accepted and promoted measure of heat stress. The vast majority of respondents had not heard of WBGT and represent a key demographic that could benefit from access to more information, awareness, and tools regarding WBGT for their work, in comparison to relying on ambient temperatures alone. Across all types of extreme weather and climate events, participants trust the National Weather Service over other information sources, such as other phone apps, national TV stations such as the weather channel, or other web-based sources, such as Weather Underground. When asked to share what sources of information they are lacking in their current work, participants identified real-time phone and web alerts, showcasing opportunities here for improved climate communication.

In addition, public health stakeholders expressed interest in applying future climate projections and priority mapping to their current work. Based on these results, there may be opportunities for increased communication

Executive Summary, *continued*

about the health risks of extreme heat and climate events for those in the public health and medical fields. For example, when it comes to heart attacks as a result of winter weather events, there was a disconnect between emergency management, who were very concerned about heart attacks, and those working in hospital or clinical settings, who were mostly concerned about car accidents due to winter weather events. Further research could explore this disconnect between different types of public health stakeholders.

Local Capacity and Leadership Building

Across all types of organizations, survey participants expressed that local levels of leadership should be responsible for preparing for extreme weather and climate events. However, survey participants shared that funding, political climate, and leadership are the most prominent barriers to action regarding addressing extreme weather and climate events in their work. Participants also expressed high levels of concern about power and infrastructure failures and access to healthcare facilities, which may require more regional capacity building and leadership across stakeholder groups.

The majority of participants shared that their organizations had an emergency preparedness plan, and over half of these respondents had support the preparation of the plan. While participants reported Hazard Vulnerability Assessments (HVA) were fairly common at their organizations, less than one-third of respondents said that an HVA was prepared annually. Less than half of survey participants and their associated organizations are involved in a healthcare coalition.

This summary reports our detailed findings across the top three extreme weather and climate events concerning public health stakeholders: extreme heat, winter weather, and flooding.

Introduction

The purpose of this project is to conduct a needs assessment regarding climate services and the types of climatological and meteorological data needs of public health professionals and emergency managers in the Southeast U.S., particularly the Carolinas. The survey was designed to assess the interpretation of what different decision-makers see as extreme events and understand gaps public health practitioners face concerning information on hazardous events, climate or weather data, or tools that would help in public health-related work. Additional documentation for the survey, including the objectives and IRB information are available in Appendix A and Appendix B.

Information from this survey will assist designers of CISA decision-making tools, such as the Hazardous Extremes for Risk Assessments (HERA) and the Wet-Bulb Globe Temperature (WBGT) tools, in producing efficient and informative products. Tools developed by CISA and SERCC are intended for use by public health, emergency management/preparedness officials, and other decision-makers charged with the welfare of those at risk from hazardous weather and climate events. Based on study results, website tools can be modified to be more useful and informative to those who need them to make decisions regarding exposure to and impacts from severe weather and extreme climate events.

Methods

The survey was distributed in September and October 2020 using a snowball sampling method, starting with a list of public health related contacts from CISA's network (approximately 580 people), general organization contacts (25 emails), and 30 people in leadership positions at key organizations that were asked to distribute the survey link. In addition, the survey was distributed to networking contacts and via social media outreach. Information required to calculate a response rate is not available; based on the survey logic, every question was not asked of every participant. Although the survey outreach was focused on the Carolinas, other geographies were included.

The survey received a total of 147 responses. Whenever possible, response options were randomized to minimize order bias. Participants who completed less than 25% of the 20-minute survey were removed from final data analysis, leaving a total of 108 responses. Most participants were public health-related professionals across a variety of disciplines, including emergency management and preparedness, health departments, parks and recreation, clinical settings, and others. Due to the nature of their work, the majority of the professionals in the sample frame were responding to the COVID-19 pandemic at the time of this survey, which may have limited the response rate.

Survey results were de-identified and analyzed in R. After asking questions about the nature of their work, participants were asked questions relating to extreme heat, winter weather, flooding, and other hazards. Results are summarized in the following pages.

Summary of Survey Results

Overview of Participants

The 108 participants represented 94 distinct organizations across six U.S. states and the District of Columbia (Table 1). The majority (61.1%) of participants work in North Carolina; the next most common locations are Georgia (9.3%) and South Carolina (8.3%). Based on the employment characteristics provided, we manually categorized and confirmed a primary organization category for each participant within the options of: emergency management or disaster services; healthcare coalition; hospital- or clinical-based organization; local government public health agency (PHA); state government public health agency (PHA); non-profit or community-based organization; or other (such as research organization, university, or other government agency that is not a public health agency). We estimate that the participants have at least 1,000 years of combined years of experience in public health (Table 2). Most participants work at some level of governmental public health agency (46.3%), and less than one-quarter worked at a community or local level (23.1%); the most common organization types were local government PHA (36.7%), a hospital or clinical setting (13.8%), or a state government PHA (11.9%). The demographics and employment characteristics of the participants are available in Table 1 and Table 2. Other relevant figures are available in Appendix C, including numerically labeled plots.

Participants were also asked questions regarding their organization's emergency preparedness plans and their participation in healthcare coalitions. The majority of respondents employed at organizations or healthcare facilities had an emergency preparedness plan (85.2%, n=92). Although 13.8% did not respond to this question or were unsure (n=15), only one participant responded that their organization or healthcare facility lacked an emergency management plan. Out of those whose organizations had an emergency preparedness plan, 56.5% of participants had supported the preparation of this plan (n=61). Less than half of participants and their associated organizations are involved in a healthcare coalition (46.3%, n=50), which are essential components of public health preparedness and response infrastructure (Myers & Bearss, 2018; Runkle, Svendsen, Hamann, Kwok, & Pearce, 2018).

Participants were also asked about Hazard Vulnerability Assessments (HVA). Approximately 41% of participants worked for an organization that prepares an HVA or risk analysis. Of these respondents, 26.9% of respondents said that an HVA was prepared annually (n=29), while 13.9% indicated that HVAs were prepared less frequently (n=15). Only 35.2% of participants were "extremely confident" that they knew where to go for the extreme weather or climate information needed for their job purposes (n=38). In comparison, 51.9% were somewhat confident (n=56) and 4.6% were not very confident (n=5).

Table 1. Participant Employment Characteristics

Characteristic	n	%
Location		
Alabama	2	1.90%
District of Columbia	2	1.90%
Florida	6	5.60%
Georgia	10	9.30%
Kentucky	3	2.80%
Mississippi	2	1.90%
North Carolina	66	61.10%
South Carolina	9	8.30%
Virginia	6	5.60%
Other	2	1.90%
Organization Type		
Emergency Management or Disaster Services	8	7.40%
Healthcare Coalition	9	8.30%
Hospital- or Clinical-Based Organization	21	19.40%
Local Government Public Health Agency (PHA)	40	37.00%
State Government Public Health Agency (PHA)	10	9.30%
Non-Profit Community-Based Organization	8	7.40%
Other	12	11.10%
Job Tenure		
0-5 years	26	24.10%
6-10 years	15	13.90%
11-20 years	34	31.50%
21 or more years	33	30.60%

Table 2. Participant Demographics

Characteristic	n	%
Race		
White	83	76.90%
Black/ African American	8	7.40%
Some Other Race	5	4.60%
No response	12	11.10%
Ethnicity		
Not Hispanic or Latino	94	87.00%
Hispanic or Latino	1	0.90%
No response	14	13.00%
Gender		
Man	35	32.40%
Woman	59	54.60%
Prefer not to say	3	2.80%
No response	11	10.20%

Concern about Extreme Weather and Climate Events

The primary objective of this survey was to assess public health practitioner understanding of and concern about extreme events, including the severity or importance, frequency, and interpretation of impacts. The baseline for this understanding was the question, "Which extreme weather/climate event(s) are you most concerned about in your area/county?" After this question, the survey dives deeper into more detailed questions about extreme heat, winter weather, and flooding. Figure 1 visualizes the median level of concern for each hazard by organization type.

Participants were very concerned about heavy rain, prolonged rain, heat, and hurricanes, aligning with our study hypothesis that extreme heat and precipitation-related events would be a focus for those in public health fields (Figure A, available in the Appendix). Interestingly, participants across different organization types were more concerned about heavy rain events (that may lead to flash flooding events) compared to prolonged periods of rain or flood events themselves. These results align with the overall CISA Needs Assessment, which found that notable floods in the Carolinas may have influenced higher levels of concern for extreme rainfall.

Participants were not at all concerned about fog and generally only somewhat concerned about drought, tornadoes, wildfire, and wind. Given the geographic concentration of many participants in coastal states like North Carolina, South Carolina, and Georgia (Figure B), it is expected that hurricanes would cause more concern than some other hazard events.

Of note is the low level of concern for winter weather: healthcare coalitions and emergency management—which operate on local and regional scales—are very concerned about localized impacts of winter weather, which is a lesser concern for other organizations. Non-profit and community organizations expressed a higher level of concern across flood-related hazards, heat, hurricanes, and storms. Those working in hospital- or clinical-based settings (primarily based in North Carolina) were very concerned about heat and prolonged rain.
The following sections summarize the results for the extreme heat, winter weather, and flooding sections. Within each hazard section, participants were asked about the health risks that impact individuals from the hazards of extreme heat, winter weather, and flooding; the quantitative measures of the hazard to gauge their understanding; and the sources of information they consult about each hazard type.

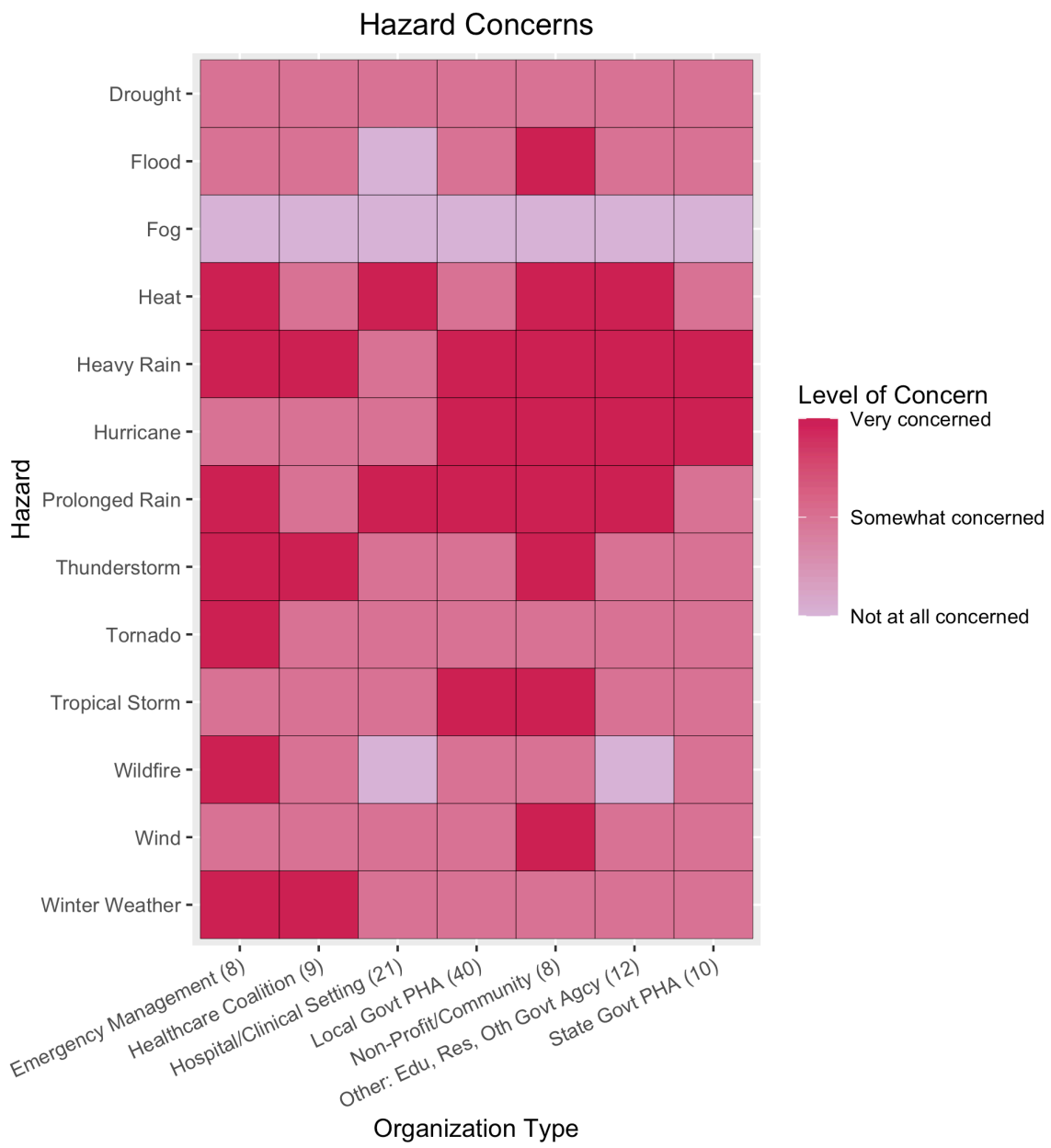

Figure 1: The median level of concern for each hazard by organization type., based on the question, "Which extreme weather/climate event(s) are you most concerned about in your area/county?"

Results: Extreme Heat

Health Risks

Participants were asked, "In your role, which of the following individual-level health risks of excessive heat concern you?" Participants were able to select all responses that applied, including heat cramps, heat stroke, death, or exacerbation of pre-existing chronic conditions (e.g., various respiratory, cerebral, and cardiovascular diseases). Figure 2 depicts the health risks of extreme heat events as selected by participants by organization type.

Across the board, heat stroke remained a major concern for survey participants. Local government public health agencies were concerned about heat stroke and pre-existing conditions. Participants in hospital and clinical settings were very concerned about heat stroke but did not express the same level of concern across all health risks of extreme heat.

Across organization type, we expected that participants who were concerned about heat stroke would express the same level of concern about the risk of death. However, this was not the case. Given the public health focus of these professionals, the consistent concern about pre-existing conditions was encouraging, given the high variability of the risk of heat stroke among individuals.

Measures

Participants were asked which indicators of temperature—in other words, the measure of extreme heat events—from a list of ambient temperature, heat index, dew point, humidity, and WBGT. Participants could select all that applied. Figure 3 represents the indicators consulted by participants when evaluating an impactful extreme heat event in their work.

The majority of participants use the heat index, followed by humidity, to assess an upcoming or current heat event. Although research supports WBGT as one of the most widely accepted measures of heat stress, especially as it relates to health impacts, participants less commonly utilized WBGT in their work. However, 76.7% of respondents (n=66) had not heard of WBGT; 20.9% had heard of WBGT but did not use it in their work (n=18); and only 2.3% use WBGT in their role (n=2).

Perhaps reflecting the availability of weather forecast measures, participants in hospital/clinical settings rely on ambient temperature readings and heat index compared to more effective measures, such as WBGT. Much of CISA's work has emphasized that ambient temperature alone is not effective enough to protect the health and safety of communities, including populations such as agriculture and outdoor workers and high school athletes. Figure 3 calls attention to the greater need for education and awareness about WBGT as a tool for combating the health impact of extreme heat.

The survey also assessed participants' understanding of the measures of extreme heat. For ambient temperature, heat index temperature, dew point temperature, level of humidity, and Wet Bulb Globe temperature,

participants submitted the numeric value at which they consider heat to be extreme. The results are available in Figure 4.

As hypothesized before the launch of the survey, there is a wide spread of temperatures considered extreme by the participants. While each measure had an outlier, participants had varied perceptions on the conditions that would define an extreme heat event. This was expected, based on the definition of an excessive heat event as occurring when the air temperature and/or heat index meets or exceeds locally established thresholds.

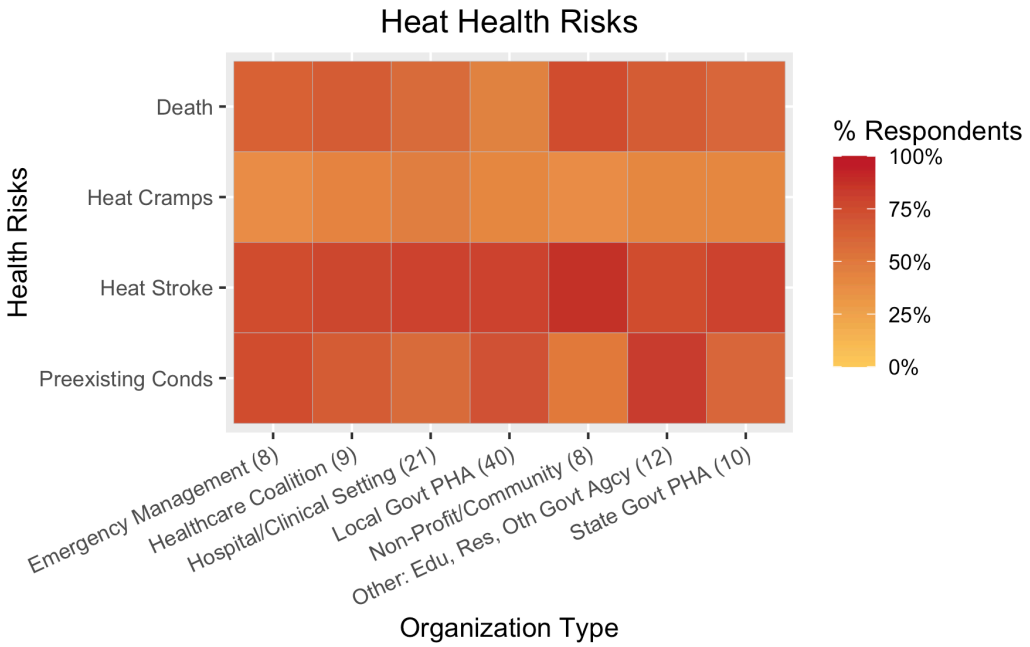

Figure 2: The health risks of extreme heat events, from the question, "In your role, which of the following individual-level health risks of excessive heat concern you?"

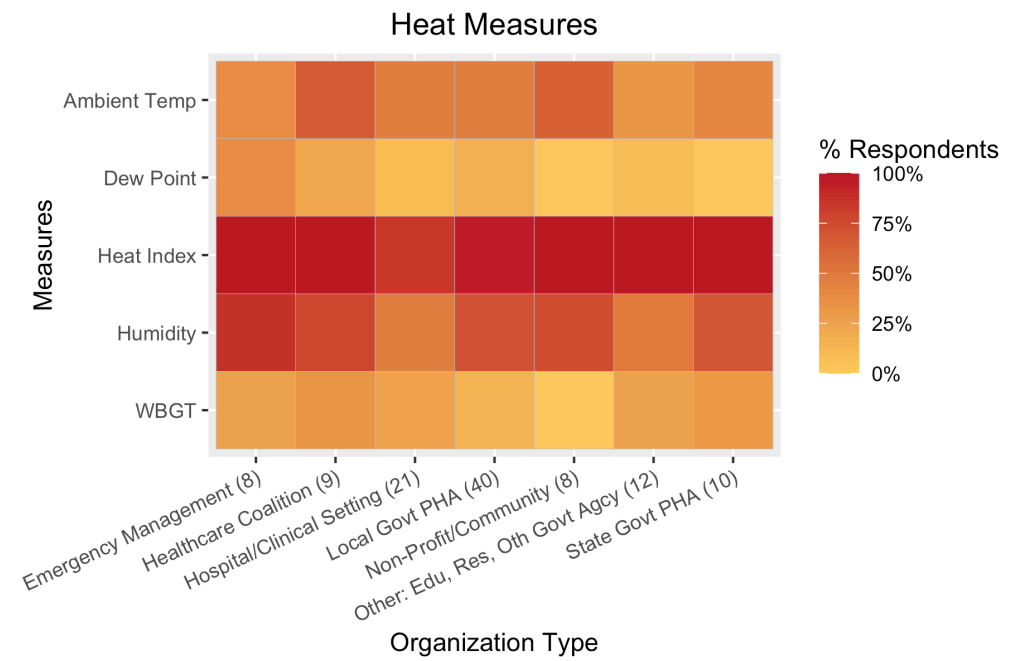

Figure 3: The indicators consulted by participants when evaluating an impactful extreme heat event in their work.

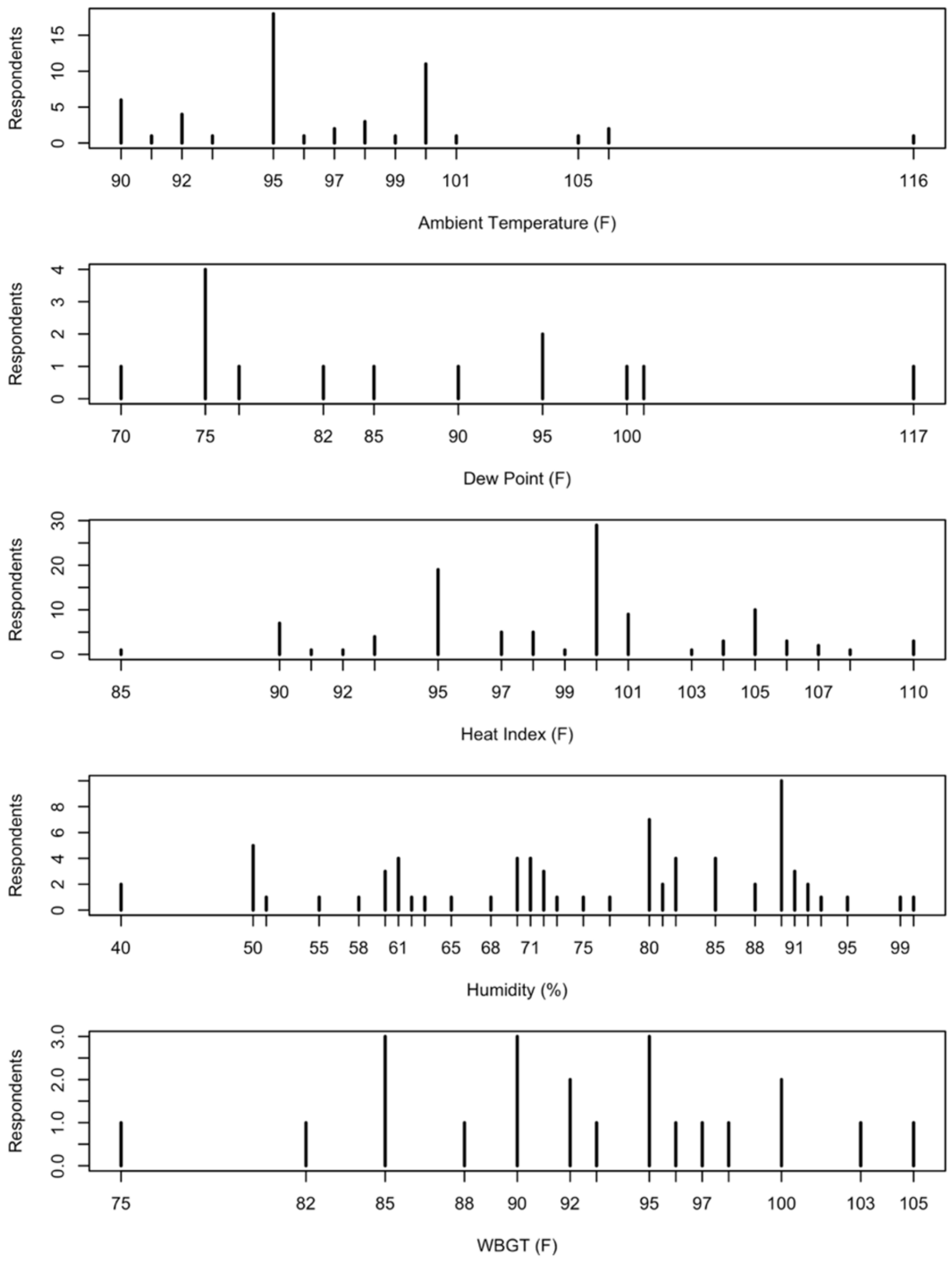

Figure 4: Value at which respondents consider heat to be extreme.

Results: Winter Weather

Health Risks

Participants were asked, "In your role, which of the following individual-level health risks of winter weather events concern you?" Participants were able to select all responses that applied, including car accidents, falling injuries, hypothermia, frostbite, carbon monoxide poisoning, cold stress, or heart attacks from overexertion. Figure 5 presents the health risks of winter weather events as selected by participants by organization type.

Car accidents were the primary concern for health risks due to winter weather events. This was true across organization types, whether at local or regional level. Local government public health agencies and local-level organizations maintained concern across all the listed health risks, and were primarily concerned about car accidents, carbon monoxide poisoning, hypothermia, and falling injuries. Participants from hospital or clinical settings were most concerned about car accidents. Those working in hospital or clinical settings were not as concerned about heart attacks related to winter weather compared to those working in emergency management or healthcare coalitions.

Measures

The survey also assessed participants' understanding of the measures of winter weather. Participants submitted the numeric value for the number of inches of snow and the number of inches of ice accumulation forecasted for a 24-hour period that would cause concern (Figure 6).

Respondents had highly variable perception in the number of inches of ice accumulation for a winter weather event, although 0.5 inches was most common. Given the hazards to business operations and transportation safety, ice accumulation over 0.5 inches may impact health outcomes across geographic locations (Geere, 2013; Jones, Ramsay, & Lott, 2004; McManus et al., 2008). However, the number of inches over a 24-hour period carries variable risks based on the locality's population, familiarity with winter weather events, and public works capacity to clear roadways.

Figure 7 illustrates the indicators consulted by participants when evaluating an impactful winter weather event. As expected, those in emergency management and in other local government departments utilize a variety of winter weather measures across warnings and advisories for heavy snow, wind chill, winter weather, storm, freezing rain, ice storm, snow, and wind chill. Participants appeared to be most familiar with winter storm warnings, winter weather advisories, and ice storm warnings among the presented options.

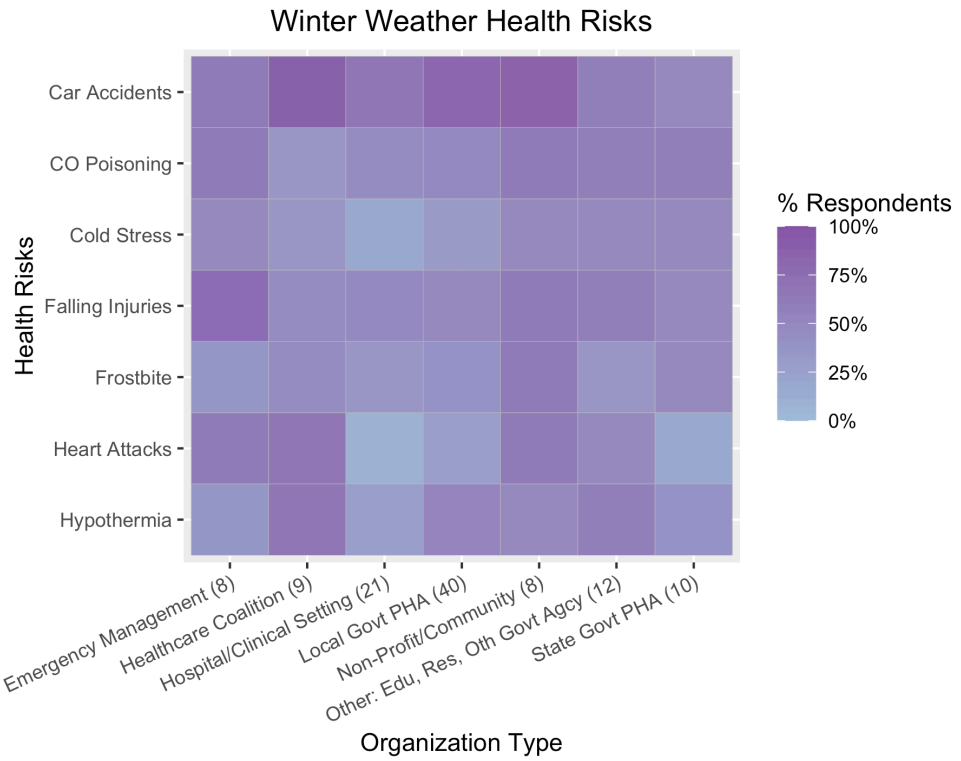

Figure 5: The health risks of winter weather events from the question, "In your role, which of the following individual-level health risks of winter weather events concern you?"

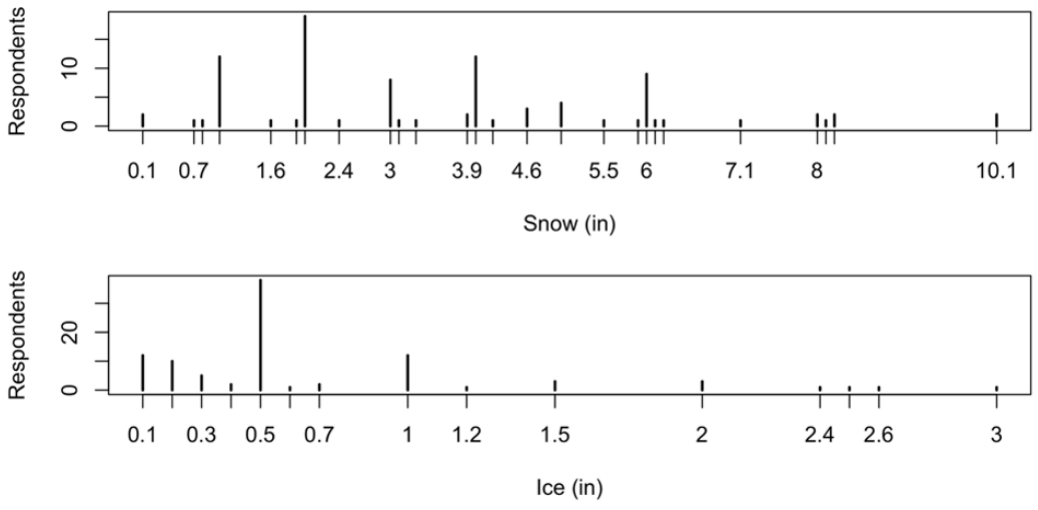

Figure 6: Participants submitted the numeric value for the number of inches of snow and the number of inches of ice accumulation forecasted for a 24-hour period that would cause concern.

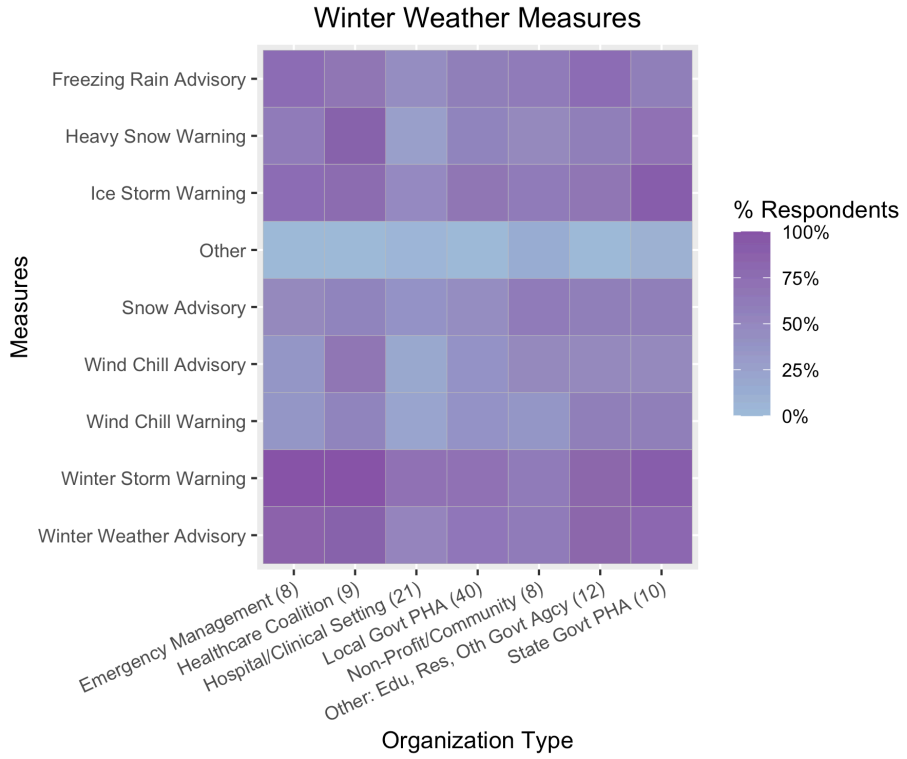

Figure 7: The indicators consulted by participants when evaluating an impactful winter weather event.

Results: Flooding

Health Risks

Participants were asked, "In your role, which of the following individual-level health risks of flooding events concern you?" Participants were able to select all responses that applied, including car accidents, drowning, injuries, animal bites, insect bites, mold exposure/respiratory illness, or vector-borne/waterborne diseases. Figure 8 visualizes the health risks from flood events as selected by participants by organization type.

The level of concern for health risks related to flooding varied and primarily involved car accidents, drowning, and injuries. Participants from hospital and clinical settings were concerned with mold exposure/respiratory illness, drowning, injury, and car accidents, due to the urgent and acute nature of these events. Non-profit and community organizations or other agencies expressed concern across all flooding health risks and were particularly concerned about flooding-related injury. Mold and respiratory health risks most concerned those in emergency management and local government public health agencies.

Measures

The survey also assessed participants' understanding of flooding measures. Participants submitted the numeric value for the number of inches of rain forecasted for a short period (1-6 hours) and a 24-hour period that would cause concern for their work. The results are available in Figure 9, which shows the wide spread of what public health professionals think of as a concerning amount of rain.

Figure 9 demonstrates that participants gauge between 2-3 inches of rain to be an impactful event in a short period (1-6 hours). In comparison, participants increased their average estimation for the number of inches of rain in a 24-hour period for a concerning event, with the majority of participants selecting 4-6 inches of rain. As evidenced by historical data in the Carolinas, the annual maximum precipitation for 1-day events would likely be up to 7.5 inches (for a non-coastal area, which would likely have more due to hurricane events).

Figure 10 summarizes the advisories and warnings consulted by participants when evaluating an impactful flooding event. Across organization type, participants most commonly relied on flash flood warnings, flood advisories, and flood warnings, which are issued by local and state weather stations. Participants from healthcare coalitions also relied on areal flood warnings.

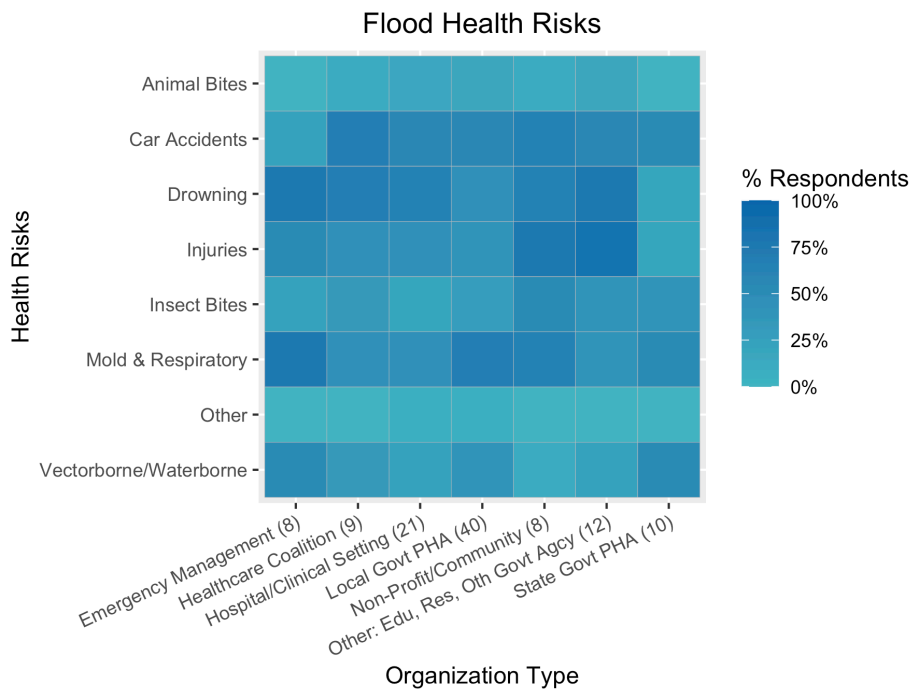

Figure 8: The health risks from flood events from the question, "In your role, which of the following individual-level health risks of flooding events concern you?"

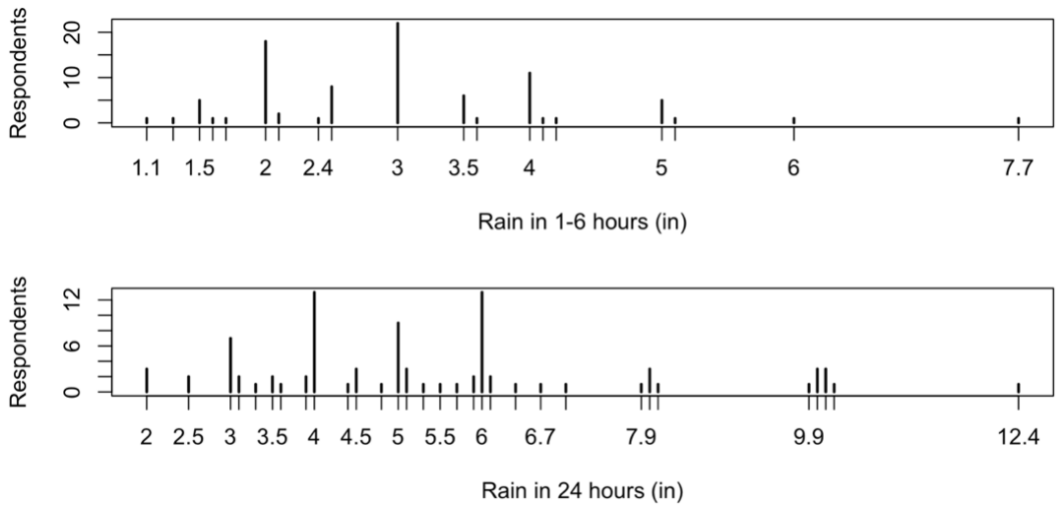

Figure 9: Participants submitted the numeric value for the number of inches of rain forecasted for a short period (1-6 hours) and a 24-hour period that would cause concern for their work.

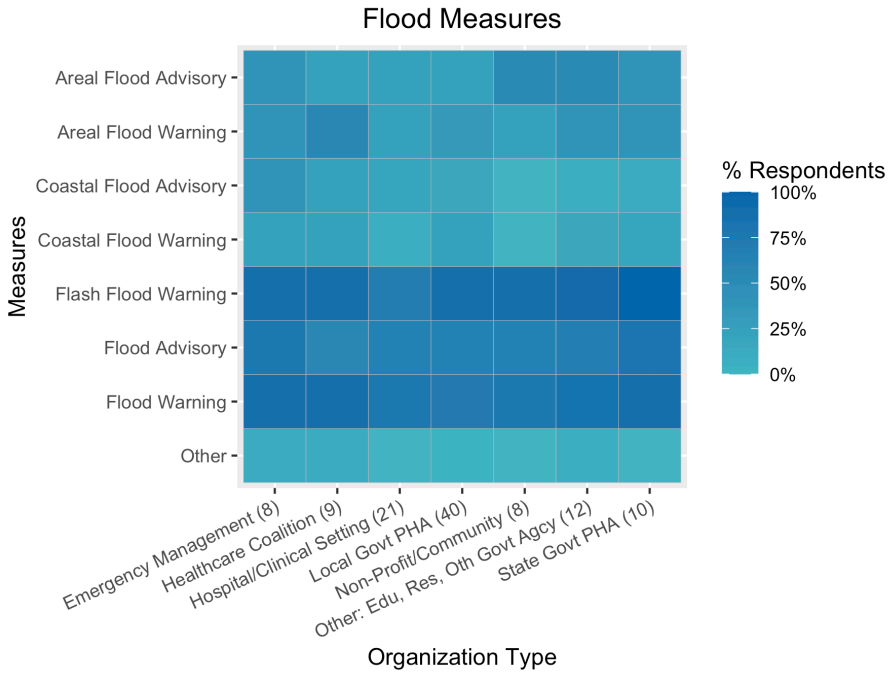

Figure 10: The advisories and warnings consulted by participants when evaluating an impactful flooding event.

Results: Concerns, Barriers, & Sources of Information

Sector-Specific Concerns

Following the questions assessing understanding and concerns about hazardous events, participants were asked more about the application of extreme hazard events information to their public health work.

Participants were asked, "In your opinion, which level(s) of jurisdiction should be primarily responsible for preparing your work environment for extreme weather/climate events?" The results are presented in Figure 11. Participants less commonly chose the regional or federal jurisdictional level responsible for preparedness, instead opting for more localized levels of agency. Local municipality, city, or town, was the most common choice from participants across organization type, closely followed by state and county jurisdictional decision-making. Participants also felt that facility and building level leadership bear some responsibility for preparedness. These results may be a reflection of the participant sample, which involved decision-makers and practitioners working on a local and state level.

Participants were asked to select the system-level and institutional impacts of extreme weather and climate events that concerned them in their role. The results are visualized in Figure 12. Power and infrastructure failures were the most concerning impact across the board. Participants from hospital and clinical settings were concerned with power and infrastructure failures, access to healthcare facilities during an extreme hazard event, evacuations, and loss of healthcare supplies. Those working in hospital and clinical settings were slightly less concerned with excess hospital admissions than other participants. Local government public health agencies and other local government departments were similarly concerned with power and infrastructure failures, access to healthcare facilities, and evacuations. Participants working for non-profit and community organizations or other types of agencies also expressed equity-based concerns for healthcare facilities access, evacuations, and emergency medical dispatches.

Sources of Information

Participants were asked to list the sources of information they consulted when evaluating measures of heat, winter weather, and flooding, presented here by organization type (Figure 13, Figure 14, and Figure 15). Across all organization types, participants most commonly used the National Weather Service for extreme heat event information. Local news stations were also consulted. A minority of participants used phone apps or other sources of information (for example, web-based sources such as Weather Underground, national TV sources such as the Weather Channel, etc.).

In a similar fashion to extreme heat, participants most commonly referred to the National Weather Service and local news stations for winter weather and flooding information, followed closely by weather phone apps.

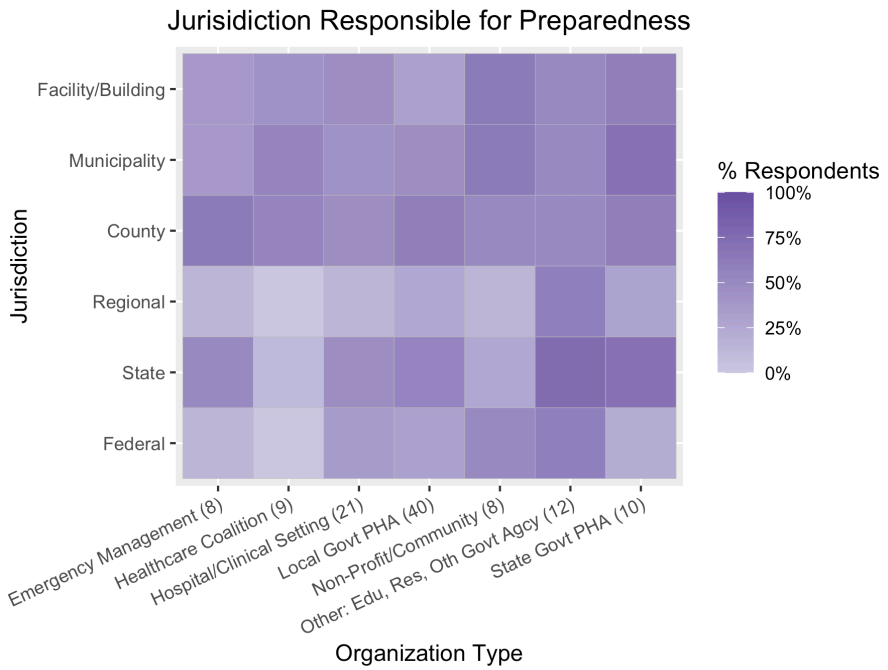

Figure 11: Results from the question, "In your opinion, which level(s) of jurisdiction should be primarily responsible for preparing your work environment for extreme weather/climate events?"

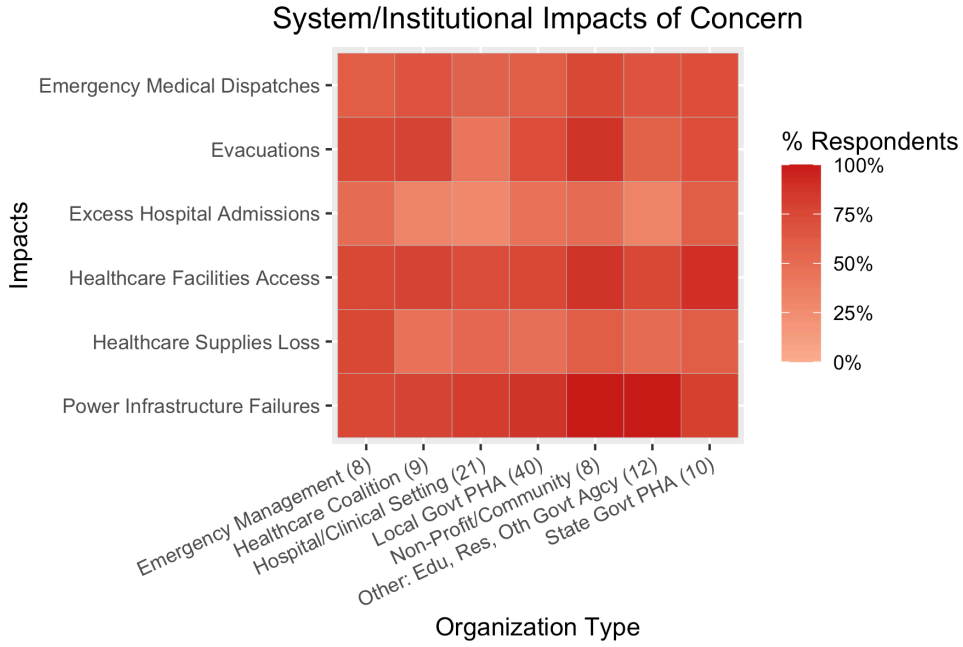

Figure 12: The system-level and institutional impacts of extreme weather and climate events that concerned participants in their role.

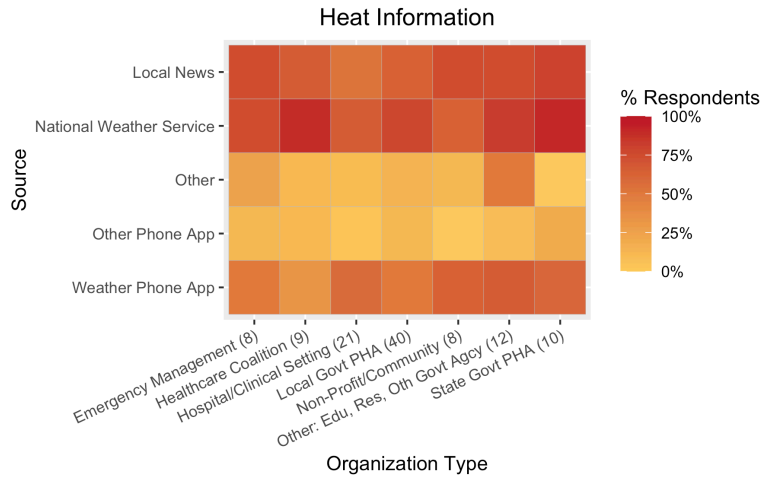

Figure 13: The sources of information participants consult when evaluating measures of extreme heat.

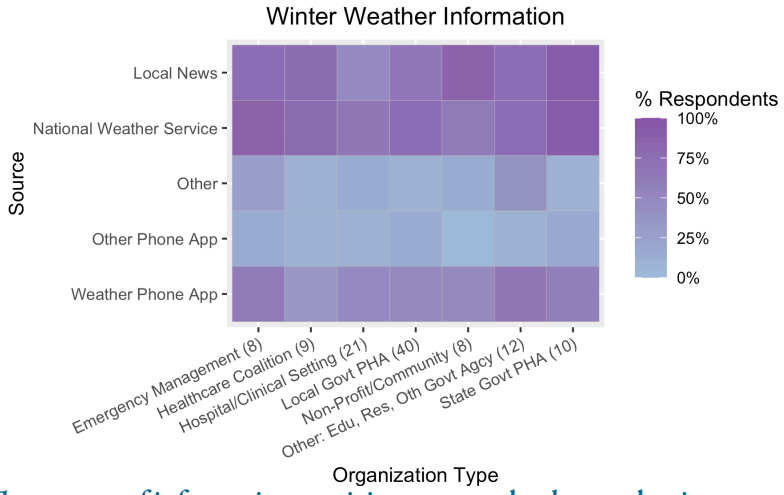

Figure 14: The sources of information participants consult when evaluating measures of winter weather.

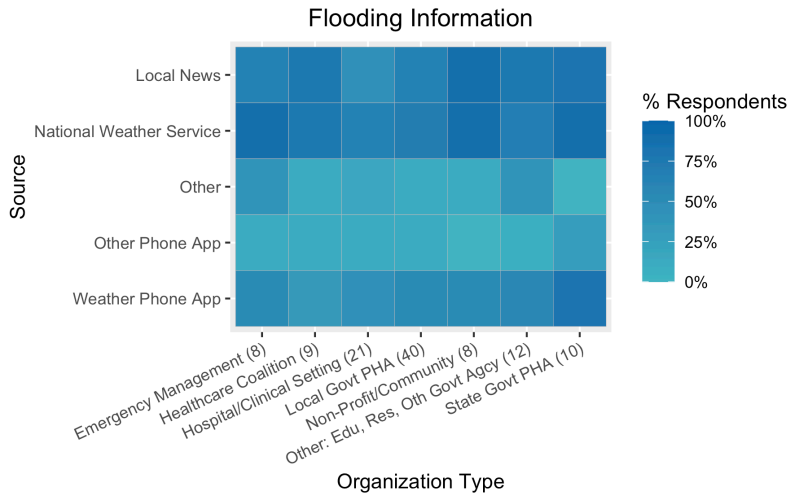

Figure 15: The sources of information participants consult when evaluating measures of flooding.

Barriers and Data Needs

Participants were requested to share the sources of information that would be useful in addressing extreme weather and climate events in their role (Figure 16) and the barriers to preparing for the impacts of extreme weather and climate in their work (Figure 17).

Most participants identified real-time phone and web alerts as their primary data needs, as well as hot-spot maps of priority populations, future climate projections and statistics, and hot-spot maps of priority areas (maps of areas most likely to be impacted). Local government public health agencies and other departments called for real-time web alerts and phone alerts, as well as natural infrastructure maps and future climate projections and statistics. Participants from non-profit and community organizations aligned with these data needs emphasizing their need for future climate projections.

When asked to identify the barriers to preparing for the impacts of extreme weather and climate in their work, participants had varied responses across organization type. The median rank (1 as most important) by organization type of 14 different barriers can be seen in Figure 17. Funding was a highly-ranked barrier, followed by political climate, leadership, and higher workplace priorities. Uncertainty about climate and weather impacts, industry siloes, and lack of public health outcomes data were less concerning to participants.

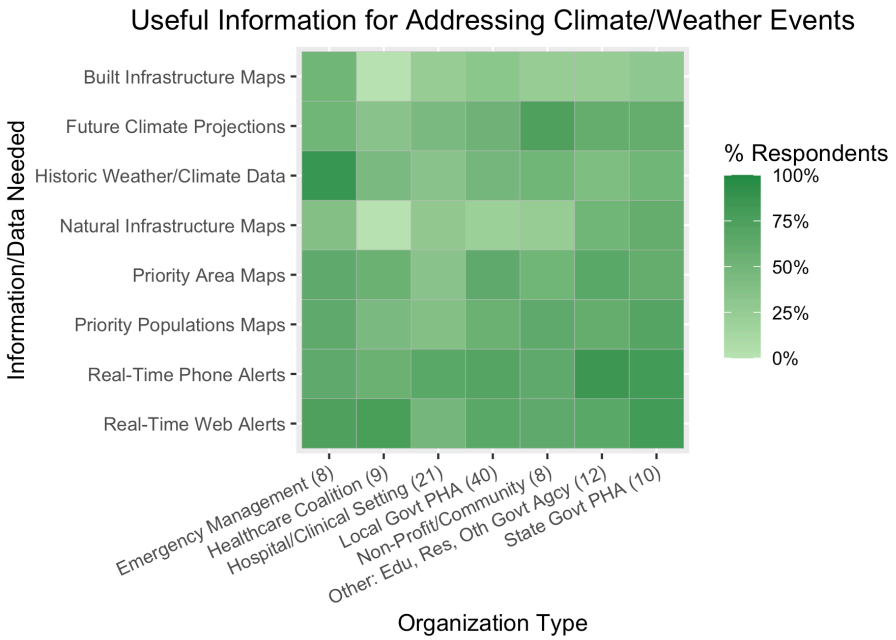

Figure 16: The sources of information participants identified that would be useful in addressing extreme weather and climate events in their role.

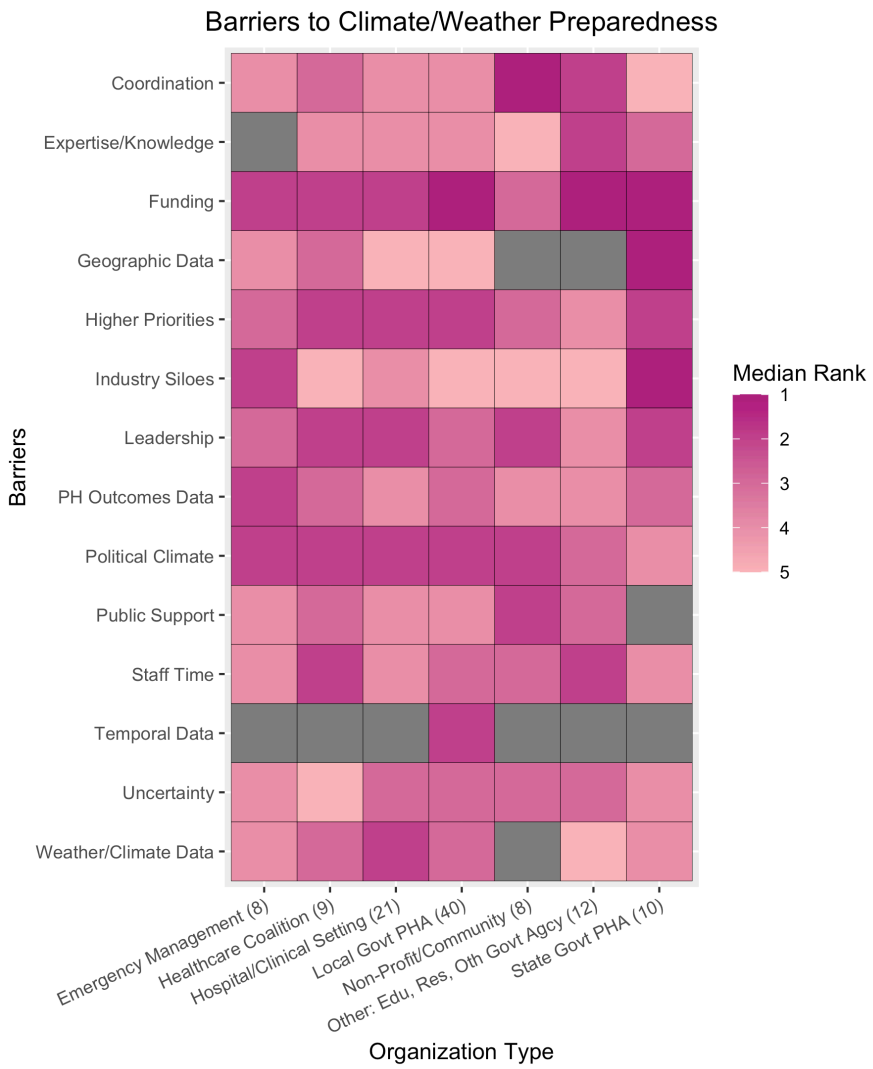

Figure 17: Participants identified the barriers to preparing for the impacts of extreme weather and climate in their work.

Conclusions and Acknowledgements

Many respondents expressed interest in receiving this summary of our findings, and we hope that this information is useful for your work. We welcome additional questions. CISA's contact options are available below. Thank you for answering this survey, and for assisting in mapping and identifying climate needs in the public health field.

Thank you to the CISA and SERCC teams (especially Montana Eck, Amanda Farris, and Dr. Kirstin Dow) for their feedback during survey development and creation of this report.

Contact Us

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Cows who survived Hurricane Florence, stranded on a porch, surrounded by flood waters in North Carolina. Photo credit: Jo-Anne McArthur, Unsplash.

Cover photo: Photo of the Blue Ridge Mountains in North Carolina by Spenser Sembrat, Unsplash.

Appendices

Appendix A: Survey Objectives

Objective 1: Assess public health practitioner understanding of extreme events.

- Objective 1A: Severity or importance of events.
- Objective 1B: Frequency of extreme events.
- Objective 1C: Gather interpretation of differences in extreme/hazardous/impactful events.

Objective 2: Assess public health practitioner understanding of public health impacts of extreme events.

- Objective 2A: Assess public health practitioner understanding of health impacts of heat-related extreme events for their locality
- Objective 2B: Assess public health practitioner understanding of health impacts of water-related extreme events
- Objective 2C: Assess public health practitioner understanding of health impacts of other extreme events (drought, wildfires)

Objective 3: Understand the application of data/information in their public health work

- Objective 3A: How do public health practitioners apply climate/weather data in their current work?
- Objective 3B: How would public health practitioners apply climate/weather data in their work, given the ideal tools or information?

Objective 4: Understand the data or tools that public health practitioners need or would find useful in their profession

- Objective 4A: What data do they currently lack to make decisions, treat patients, etc.?
- Objective 4B: What information or education do they lack about extreme events

Objective 5: Understand the barriers, whether internal or external, that stakeholders face in integrating current, accurate, and quality climate data for health-related work.

Appendix B: IRB Documentation

University of North Carolina at Chapel Hill
Research Information Sheet
IRB Study #: 20-1531
Principal Investigator: Dr. Ferdouz Cochran

The purpose of this research study is to assess the interpretation of what different decision makers see as extreme events and understand the gap that public health practitioners face concerning information on education about hazardous events, climate or weather data, or tools that would help in public health-related work.
The Carolinas Integrated Sciences & Assessments (CISA) team conducts applied research in North Carolina and South Carolina that incorporates climate information into water, health and coastal management and decision making.
You are being asked to take part in a research study because you are a medical or health care professional, public health practitioner, decision-maker, or stakeholder in North Carolina or South Carolina whose work in public health may benefit from CISA's research and tools. This survey is a needs assessment to better understand how CISA may better serve you in your work.
Being in a research study is completely voluntary. You can choose not to be in this research study. You can also say yes now and change your mind later. Deciding not to be in the research study, now or later, will not affect your ability to receive medical care at UNC.
If you agree to take part in this research, you will be asked to complete a short survey. Your participation in this study will take about 20 minutes. We expect that at least 50 people will take part in this research study.
You can choose not to answer any question you do not wish to answer. You can also choose to stop taking the survey at any time. You must be at least 18 years old to participate. If you are younger than 18 years old, please stop now.
The possible risks to you in taking part in this research are potentially feeling uncomfortable sharing your perceptions or beliefs about climate change. There are no direct benefits to participants.
The possible benefits to you for taking part in this research will be learning more about how hazardous or extreme events may impact public health or your work and learning how to engage with CISA to help you in your work.
To protect your identity as a research subject, the research data will be de-identified and not stored with your name. There will be an option to provide your email address if you would like to learn more information - in this case, this will be the only identifiable information stored. In any publication about this research, no private information will be used.
If you have any questions about this research, please contact the Investigator (Dr. Ferdouz Cochran) by calling 919-962-7470 or emailing fvc@unc.edu.
If you have questions or concerns about your rights as a research subject, you may contact the UNC Institutional Review Board at 919-966-3113 or by email to IRB_subjects@unc.edu.

Appendix C: Supplemental Figures and Graphs

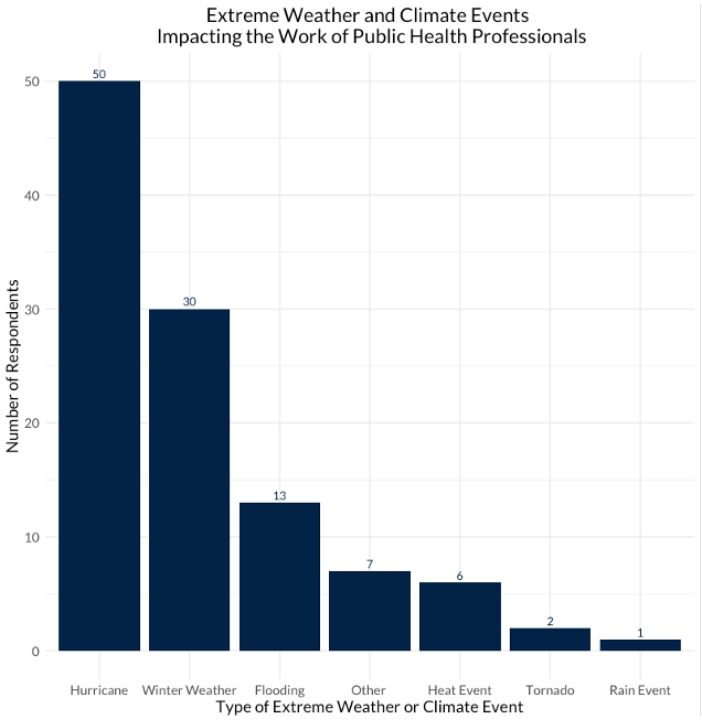

Figure A: Results from the question, "Which extreme weather/climate event(s) are you most concerned about in your area/county?"

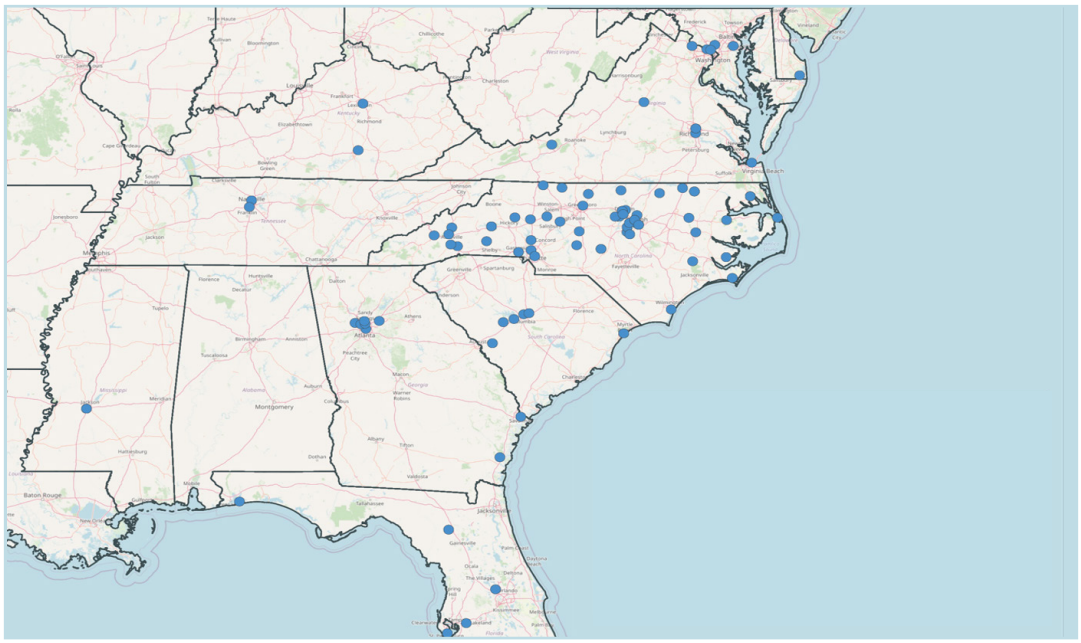

Figure B: Approximate geographic distribution of participants.

Appendix C-1: Numerically Labeled Extreme Heat Plots

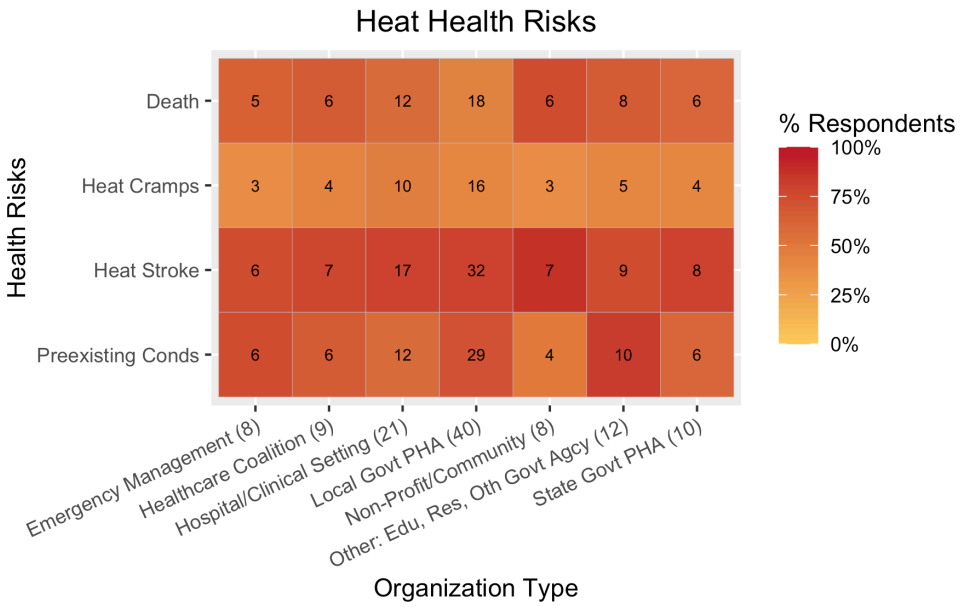

Figure 18: The health risks of extreme heat events, from the question, "In your role, which of the following individual-level health risks of excessive heat concern you?"

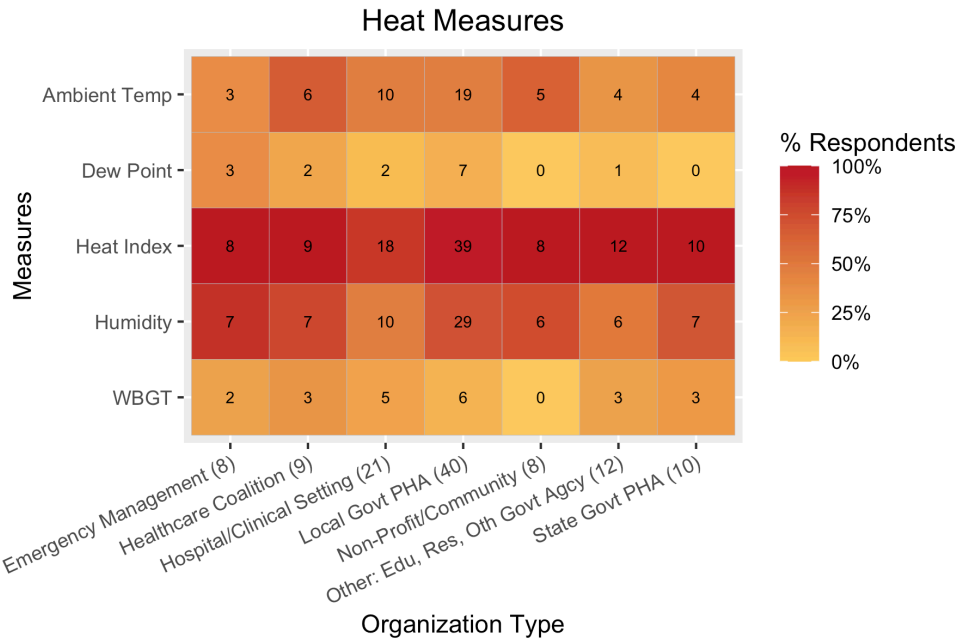

Figure 19: The indicators consulted by participants when evaluating an impactful extreme heat event in their work.

Appendix C-1: Numerically Labeled Extreme Heat Plots, *continued*

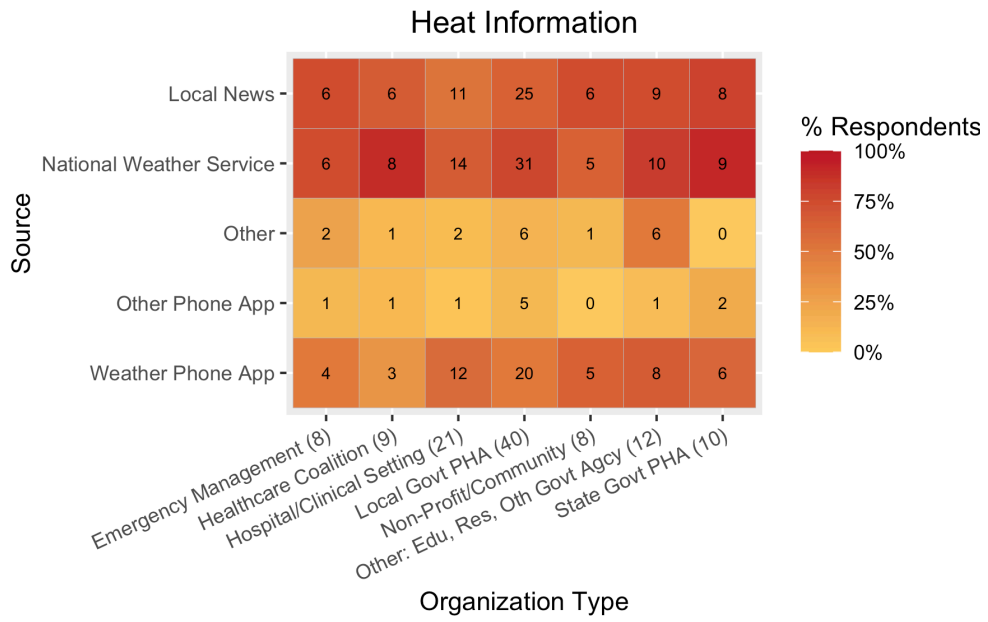

Figure 20: Insert caption here.The sources of information participants consult when evaluating measures of extreme heat.

Appendix C-2: Numerically Labeled Winter Weather Plots

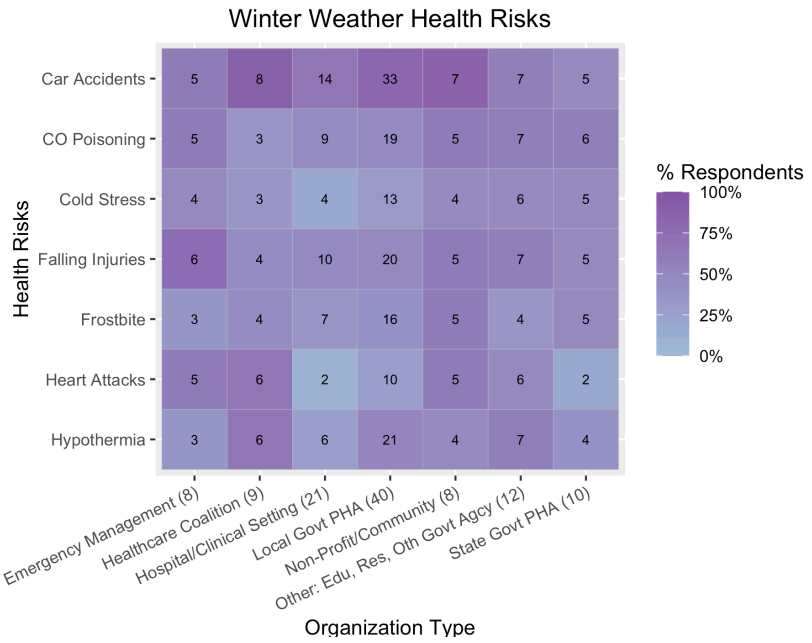

Figure 21: The health risks of winter weather events from the question, "In your role, which of the following individual-level health risks of winter weather events concern you?"

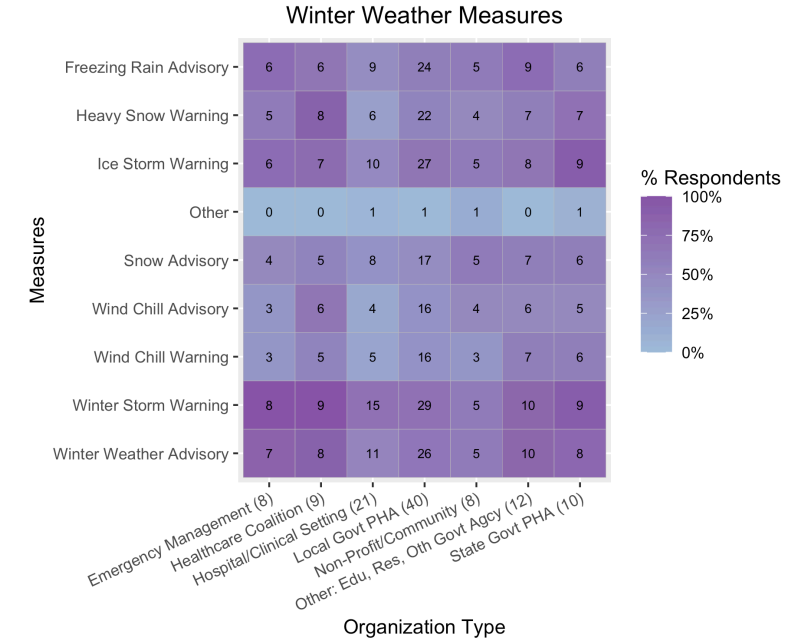

Figure 22: The advisories and warnings consulted by participants when evaluating an impactful flooding event.

Appendix C-2: Numerically Labeled Winter Weather Plots, *continued*

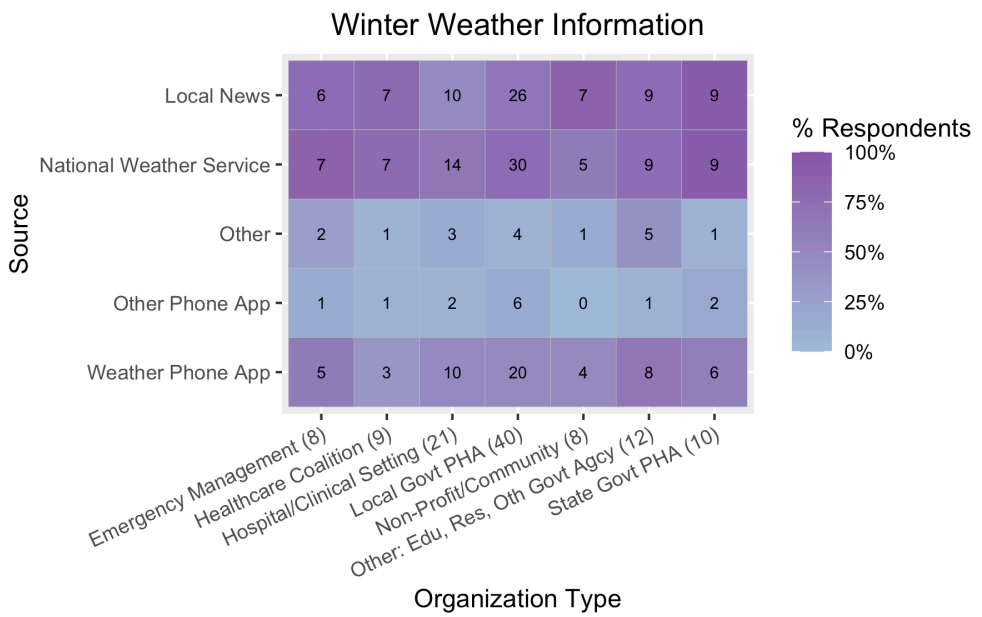

Figure 23: The sources of information participants consult when evaluating measures of winter weather.

Appendix C-3: Numerically Labeled Flooding Plots

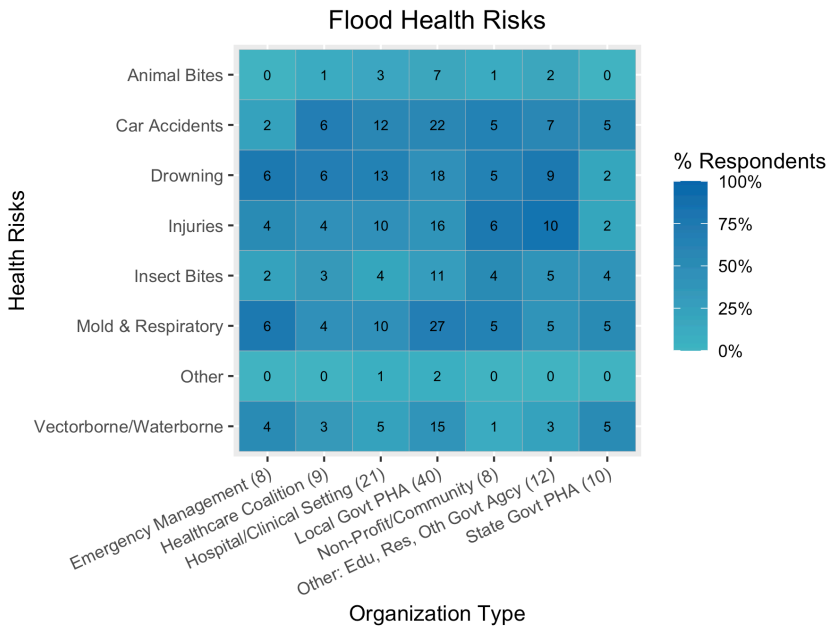

Figure 24: The health risks from flood events from the question, "In your role, which of the following individual-level health risks of flooding events concern you?"

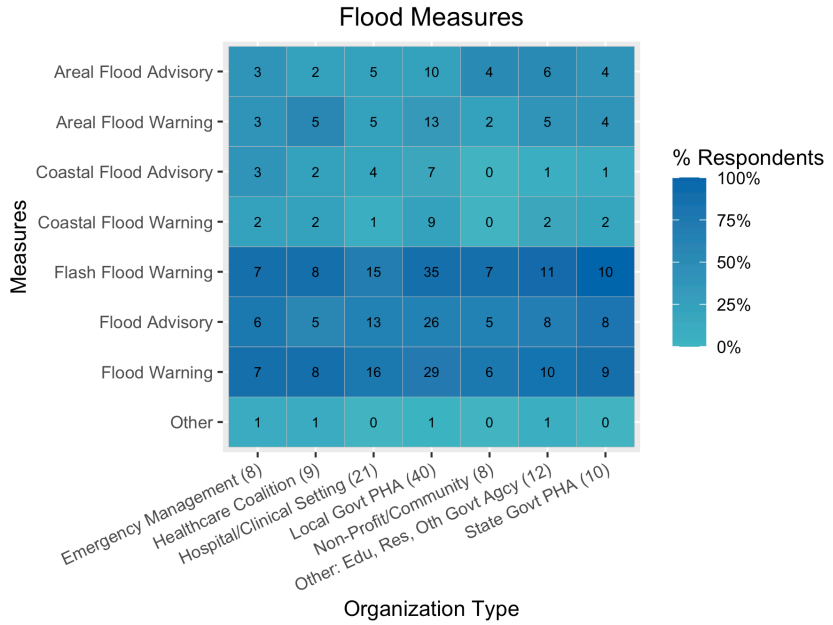

Figure 25: The advisories and warnings consulted by participants when evaluating an impactful flooding event.

Appendix C-3: Numerically Labeled Flooding Plots, *continued*

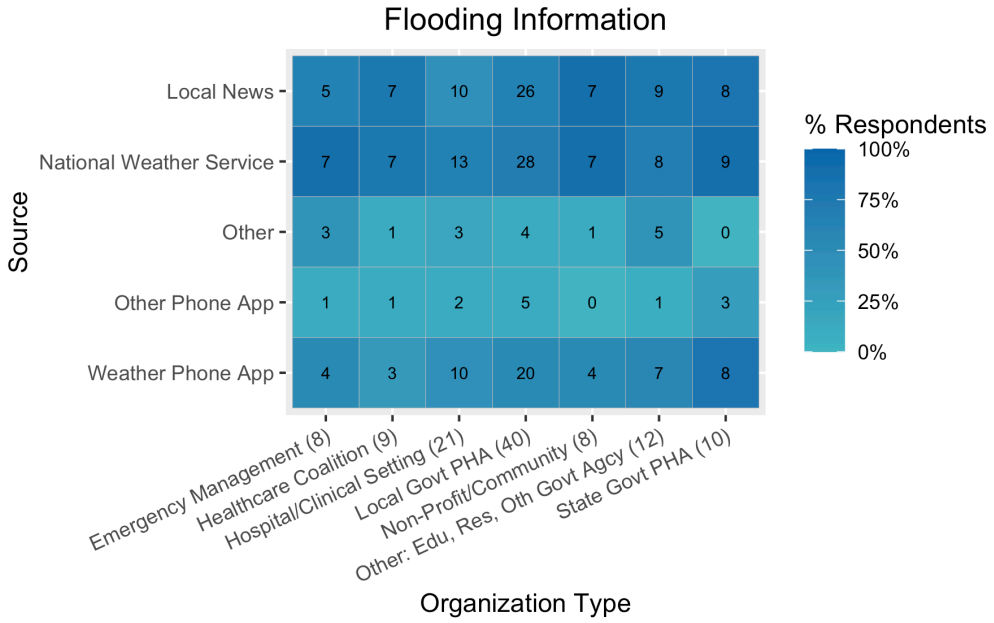

Figure 26: The sources of information participants consult when evaluating measures of flooding.

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