Improving Public Understanding of Heat Terminology: Findings and Recommendations for the National Weather Service

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Executive Summary

Extreme heat is the leading weather-related cause of death in the United States. The National Weather Service (NWS) plays a central role in translating meteorological conditions into public-facing products such as *Heat Advisories*, *Extreme Heat Warnings*, *Heat Index* values, and the *HeatRisk* tool. However, the effectiveness of these products depends not only on scientific accuracy, but on how the public interprets and acts on the language used. This project examined how people across the continental United States (CONUS) understand NWS extreme heat terminology and where opportunities exist to strengthen clarity, consistency, and actionability in heat communication.

To accomplish this, we used a mixed-methods design. First, sixteen virtual focus groups (*N* = 121) were conducted across the four NWS CONUS regions. Participants reviewed location-tailored, fictional NWS-style social media posts and discussed their interpretations of key terms, perceived severity, and intended behavioral responses. Findings from the qualitative phase informed the development of a national survey that measured accurate and inaccurate beliefs about heat terminology, vulnerability, symptoms, protective actions, information sources, and mental health impacts. Regression analyses were used to identify predictors of belief accuracy, including geography, prior heat experience, and demographic characteristics. Together, these approaches provided both depth and national-level generalizability.

Across both phases of the study, several consistent patterns emerged. Participants demonstrated partial familiarity with commonly used terms such as *heat index* and *heat advisory*, but understanding was uneven. The term *apparent temperature* was particularly confusing and frequently misinterpreted. Many participants expressed a clear preference for intuitive phrasing such as “feels-like temperature.” When multiple technical terms appeared to describe similar concepts, participants perceived redundancy and uncertainty. These findings suggest that technical terminology may benefit from clearer explanation or simplification.

Word choice strongly shaped perceived severity. In the absence of numerical thresholds or duration information, participants relied on linguistic cues to infer risk. The term “extreme” consistently signaled greater danger than “advisory,” even among those unfamiliar with formal definitions. This pattern indicates that modifiers meaningfully influence urgency and behavioral intent. Providing temperature ranges, duration, and contextual information alongside advisory labels may reduce reliance on assumptions and improve risk interpretation.

The study also revealed substantial conflation between *heat exhaustion* and *heat stroke*. While participants recognized many core symptoms of heat-related illness, they frequently attributed overlapping symptom profiles to both conditions. This lack of differentiation is consequential because heat stroke is a life-threatening emergency requiring immediate medical intervention. Similarly, the term *heat illness* was often interpreted as a broad catch-all that blended medically defined conditions with outcomes related to sun exposure or general discomfort. Clearer distinctions in messaging may improve public understanding of severity and appropriate response.

Findings further showed that vulnerability is often narrowly framed. Survey respondents strongly identified older adults, pregnant individuals, and people with chronic conditions as high-risk groups. However, social and structural vulnerabilities such as low income, social isolation, language barriers, and lack of transportation were substantially under-recognized. This gap suggests an opportunity to expand public understanding of vulnerability beyond individual health status to include contextual risk factors.

Misconceptions were also evident regarding cooling centers and medication susceptibility. Although most participants understood that cooling centers are intended for heat events, many believed they were available only to the unhoused or “needy,” and uncertainty was common regarding eligibility and activation criteria. Awareness that common medications can increase heat susceptibility was similarly mixed. These misunderstandings may unintentionally discourage protective behavior and indicate a need for clearer public guidance.

Regression analyses showed that experience with extreme heat and interest in weather were associated with greater belief accuracy in some cases, but misunderstanding was broadly distributed across regions and demographic groups. Therefore, communication challenges appear structural rather than confined to specific audiences.

Taken together, the findings demonstrate that scientific precision alone does not guarantee public understanding. Terminology that is technically accurate may still be interpreted in unintended ways. Small differences in phrasing can meaningfully shape perceived severity, personal relevance, and behavioral response. Strengthening extreme heat communication will require prioritizing plain language, pairing categorical labels with numerical context, clarifying distinctions between related health conditions, broadening definitions of vulnerability, and reducing ambiguity around protective resources such as cooling centers.

As extreme heat becomes more frequent and severe, improving clarity and consistency in public messaging will be critical to supporting protective action. Aligning communication strategies with how people interpret risk in practice can enhance the effectiveness of NWS products and contribute to greater community resilience nationwide.

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Chapter 1: Introduction

Extreme heat is the leading weather-related cause of death in the United States (National Weather Service, n.d.-a). Unlike hazards such as tornadoes or hurricanes, extreme heat lacks visible cues. Furthermore, its risks accumulate gradually, are shaped by humidity and nighttime temperatures, and disproportionately affect people based on age, health status, occupation, housing, and social isolation. As extreme heat events increase in frequency, duration, and intensity, public understanding of heat terminology becomes a central component of preparedness and response.

The National Weather Service (NWS) plays a critical role in communicating heat risk to the public. Through products such as Heat Advisories, Extreme Heat Warnings, Heat Index values, and the HeatRisk tool, the agency translates meteorological conditions into public-facing language intended to promote protective action. However, effective communication depends not only on scientific accuracy, but also on how people interpret, internalize, and act upon that language (Mileti & Sorensen, 1990).

This report examines how people across the continental United States (CONUS) understand, interpret, and respond to extreme heat terminology. The goal is not to evaluate meteorological thresholds, but to assess public meaning-making and identify opportunities to strengthen clarity, consistency, and actionability in heat communication.

Specifically, this project had three objectives:

1. To explore how members of the public define and interpret key heat-related terms used by the NWS.
2. To quantify the prevalence of accurate and inaccurate beliefs about extreme heat, its impacts, and protective actions.
3. To generate evidence-based recommendations for improving heat risk communication.

To accomplish these objectives, we used a mixed-methods design. First, we conducted 16 focus groups across diverse geographic regions to explore interpretations of heat terminology in participants' own words. Findings from the qualitative analysis informed the development of a national survey that assessed beliefs, misconceptions, information sources, perceived vulnerability, and behavioral intentions. The survey also examined predictors of accurate and inaccurate beliefs, including geographic location, prior heat experience, and demographic characteristics.

The findings presented in this report provide insight into how technical heat language is understood, where confusion persists, and how messaging can be refined to better support protective action. Recommendations are grounded in both qualitative and quantitative

evidence and are intended to inform ongoing efforts by the NWS and its partners to strengthen extreme heat communication nationwide.

Chapter 2: Focus Groups

2.1 Focus Group Method

In order to identify how various public(s) describe and define heat and heat risks, while taking into consideration participants' contextual, experiential, cultural, and localized understanding of heat, we first conducted 16 virtual focus groups in the four NWS CONUS regions.

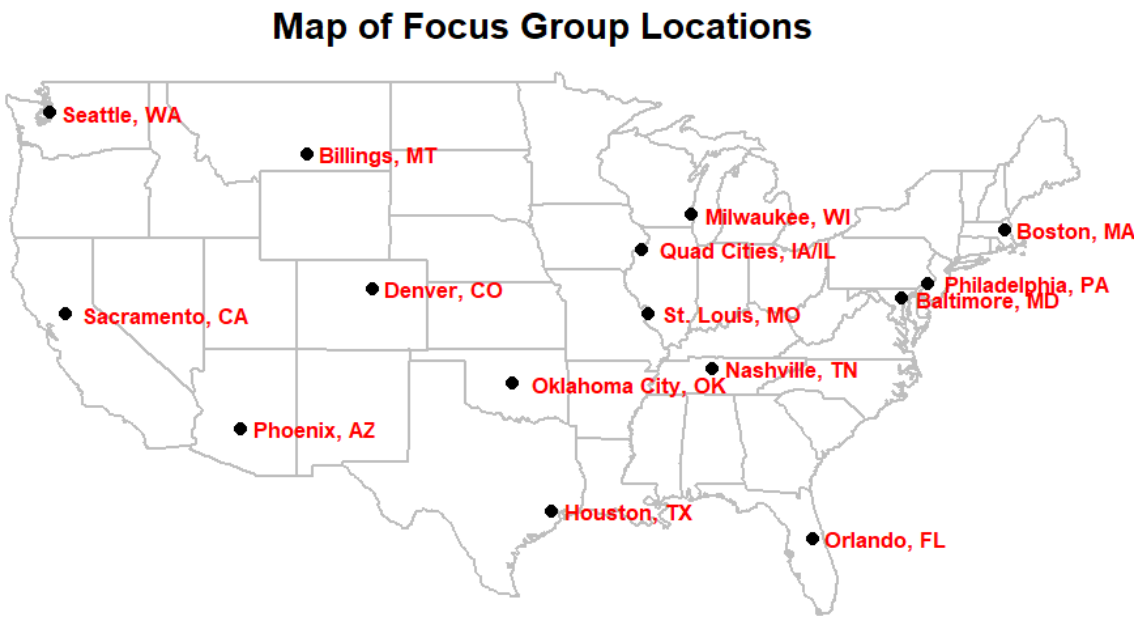
2.1.1 Focus Group Locations

We selected 16 focus group locations, with the goal of conducting four groups in each of the NWS four CONUS regions: Central, Eastern, Southern, and Western. We selected locations using a multi-staged process that was designed to capture key demographic, climatological, and experiential differences that could shape public understanding of heat communication.

- *Step 1: Demographic Variation*
    - We began by identifying cities that varied demographically, with the goal of including metropolitan regions with a range of ages, racial and ethnic backgrounds, education levels, and gender distributions. We use the U.S. Census Bureau data from 2020 to determine if we had a diverse cross-section of the population across all selected sites.
- *Step 2: Climatological Diversity*
    - Next, we prioritized geographic variation in climate. Our aim was to capture a mix of environments that experience heat differently, such as coastal humidity (e.g., Orlando, FL), desert heat (e.g., Phoenix, AZ), and more temperate regions with episodic heat events (e.g., Seattle, WA). This allowed us to observe whether individuals in regions where heat is common may interpret technical terms differently than those in areas where heat is less frequent but still dangerous.
- *Step 3: Recent Experience with Heat Events*
    - We then reviewed historical NWS products to identify cities that experienced at least one significant heat event in the prior summer. This criterion was used to ensure that participants had a recent, tangible experience with extreme heat to make their interpretations more grounded and reflective of lived experiences. A "heat event" was defined as a period during which local NWS offices issued a heat advisory, watch, or warning for at least two consecutive days, based on region-specific thresholds.
- *Step 4: Partner Review and Feasibility*
    - Finally, we reviewed the list of locations with our collaborators at the NWS for geographic balance/interest and logistical feasibility for participant recruitment. The selected cities were determined to be reasonable proxies for broader regional patterns in public interpretation. A map of the final locations is presented in Figure 1.

By using this approach, we intentionally included both (a) cities where heat is a regular seasonal concern (e.g., Houston, Phoenix), and (b) cities where heat may be perceived as an abnormal or secondary risk (e.g., Boston, Seattle).

Figure 1. Focus Group Locations Across NWS CONUS Regions



2.1.2 Participant Recruitment

Participants were recruited via targeted Facebook advertisements in each city. These ads invited participants to take part in a study about extreme heat (see Figure 2). To be eligible to participate, interested individuals first completed a brief survey that collected demographic data, including age, gender, race, and education. Participants whose IP addresses and zip codes did not match the location of interest were excluded. We then invited a diverse sample of participants to each focus group based on the demographic data collected, with the goal of having 6-8 people per group (Krueger & Casey, 2009; See Table 1).

Figure 2. Example Facebook Advertisement.

Table 1. Location and Number of Participants

Location	Number of Participants
Baltimore, MD	5
Billings, MT	6
Boston, MA	10
Charlotte, NC	10
Denver, CO	8
Houston, TX	9
Milwaukee, WI	8
Nashville, TN	10
Oklahoma City, OK	5
Orlando, FL	9
Philadelphia, PA	4
Phoenix, AZ	7
Quad Cities, IA/IL	5
Sacramento, CA	4
Seattle, WA	12
St. Louis, MO	9
Total	**121**

2.1.3 Procedure

Focus groups were conducted virtually via Zoom in early Spring 2024. Each session lasted approximately 90 minutes and was facilitated by a consistent research team consisting of a moderator, a notetaker, and a research observer.

All participants completed informed consent documents prior to the session. The moderator began by reminding participants of their rights as outlined in the informed consent document and consent to record. Throughout the session, the research observer communicated follow-up questions to the moderator via private Zoom messages to help guide deeper discussions. Upon completion, participants received a $50 Amazon gift card as compensation.

2.1.4 Materials

Stimuli

We developed message stimuli to elicit participants' thoughts, feelings, and interpretations of heat-related terminology included in our research questions. These materials took the form of fictional social media posts created to resemble X/Twitter messages that might be shared by local NWS offices. Each post contained both visual and textual elements that was based on two sources: (1) a prior content analysis of NWS heat-related messaging on social media (Olson et al., 2023), and (2) our review of posts published by NWS offices during recent heat events across different U.S. regions.

Each focus group was shown location-tailored versions of each post, including maps and images. All posts referred to a hypothetical heat event occurring on June 24, which we chose as a mid-summer date when most schools are out of session and households are actively managing seasonal heat risks.

Full versions of the focus group guides and stimuli used in this study are available via the Harvard Dataverse.

Discussion Guide

We used a semi-structured discussion guide to explore participants' experiences with heat and interpretations of NWS terminology. The guide was designed to elicit both surface-level reactions and deeper reflections on language and message relevance. Our guide included five main sections:

1. **Personal Experience with Extreme Heat**
    - Participants were first asked about recent heat experiences in their communities, including perceived impacts and personal adaptation strategies. This set the context and helped build rapport.
2. **Interpretation of NWS Messaging**

Participants reviewed location-tailored, fictional NWS-style social media posts related to a hypothetical heat event (described above).

3. **Message-Specific Probing**
   For each post, participants were asked:
   - "What are your thoughts about this message?"
   - "What stands out to you?"
   - "Is there anything that is confusing or difficult to understand?"
   - "What does [specific term] mean to you?"

   These questions were designed to go beyond general impressions and surface-level confusion by encouraging participants to define or describe the meaning they assigned to each term and how they arrived at that interpretation.
4. **Understanding of Vulnerability and Risk**
   Later messages explored terms like *"vulnerable," "heat illness," "elderly,"* and *"chronic illness."* Participants were asked to define these terms in their own words and reflect on whether they identified with the populations referenced.
5. **Wrap-Up and Final Reflections**
   Sessions concluded with an open-ended prompt inviting participants to share any additional thoughts or experiences not yet discussed.

Moderators were encouraged to ask follow-up "how" and "why" questions throughout (e.g., "How do you know that?" or "Why do you interpret it that way?"), often directing participants back to the visual/textual content of the message or to their personal experiences. This method helped us move beyond general confusion to a more nuanced understanding of how technical heat language is internalized and interpreted.

2.1.5 Data Collection and Analysis

Transcripts were generated using Zoom's automatic transcription feature and manually cleaned for accuracy. Researcher notes taken during and after each session were also integrated into the analysis process to capture non-verbal reactions and contextual nuance.

We then conducted a reflexive thematic analysis to examine how participants made sense of the technical terms and messages presented during the focus groups. This analysis followed Braun and Clarke's (2006) framework for reflexive thematic analysis: (1) familiarization with the data, (2) generating initial codes, (3) searching for themes, (4) reviewing themes, (5) defining and naming themes. Our approach incorporated both inductive coding (i.e., allowing themes to emerge directly from the data) and deductive coding (i.e., guided by prior research and key terms used in the stimuli).

Throughout the process, we remained attentive to how meaning-making varied across environmental and social contexts. For example, whether terms like "heat advisory" were interpreted differently in cities with frequent heat events versus those with fewer occurrences. After we compiled thematic summaries for each term, we extracted illustrative quotes for each finding.

2.2 Focus Group Results

2.2.1 Heat Index

Across the focus groups, most participants who responded to the term *heat index* described it as the temperature as it "feels" to the human body. This interpretation was often expressed using phrases such as *"how it really feels," "real feel temperature,"* or *"feels-like temperature."* One participant summarized this succinctly: *"I would flat out say the heat index is what the temperature feels like to the human body"* (Seattle WA, 51-year-old male).

Although many participants demonstrated awareness that the heat index incorporates modifying factors beyond temperature (most notably humidity*),* some participants mentioned wind, sun, or precipitation as the cause for it "feeling different." As one participant described: *"You take the actual temperature, then you add in humidity, and it increases the temperature. Wind speed has an effect, but you know, the higher the humidity, the warmer it's gonna be"* (Oklahoma City OK, 62-year-old male).

Familiarity with the term appeared somewhat higher in high-humidity regions, where participants emphasized humidity as the main driver of discomfort. For example, one participant said *"We talk about the temperature being anywhere 97 to 100 degrees, but we don't talk a lot about the humidity. The humidity is what really causes the uncomfortable feelings here. You can deal with 90 degree heat if it's just the heat like there is out West. But here in central Florida, which is a tropical climate, you've got the humidity to match, and that's what really makes it uncomfortable. And that makes you sweat as soon as you walk outside your front door"* (Melbourne FL, 77-year-old male). However, it is hard to say definitively if there are differences between locations.

Despite the general familiarity, several participants admitted they did not fully understand what the term meant. For example, one participant said: *"I don't know what heat indices are. Is that actual temperature? Is that the real feel temperature?"* (Quad Cities IA, 53-year-old female).

Some participants focused in on the term "index" to make sense of what the term means by treating *heat index* as either a temperature range or a numerical index from 0 to 100: *"it's an index from like 0 to 100, and close to 100 would be the hottest…I never really thought about it too much until now"* (Charlotte NC, 60-year-old female).

A significant number of participants expressed a preference for the phrase *"feels-like temperature"* over *"heat index"*, citing it as more intuitive and familiar. For example, one participant said "*News spaces will say temperatures in the nineties, but it's going to feel like 97 to 100… because of the humidity"* (Charlotte NC, 43-year-old male). And a few participants said they preferred to see the actual air temperature and suggested that heat index be presented as a secondary or supporting measure: "Show me what the actual temperatures are, and then if you wanna include a second graphic that shows the [heat index] temperature, fine. But don't hide the real temp" (Billings MT, 65-year-old female).

In sum, while *heat index* was often interpreted accurately as a "feels-like" temperature influenced by humidity, understanding was inconsistent. Preferences leaned toward plain-language alternatives such as “feels like temperature(s).”

2.2.2 Apparent Temperature

According to the NWS (n.d.-b), “apparent temperature is the perceived temperature derived from either a combination of temperature and wind (Wind Chill) or temperature and humidity (Heat Index) for the indicated hour. When the temperature at a particular grid point falls to 50 F or less, wind chill will be used for that point for the Apparent Temperature. When the temperature at a grid point rises above 80 F, the heat index will be used for Apparent Temperature. Between 51 and 80 F, the Apparent Temperature will be the ambient air temperature.”

Compared to heat index, the term apparent temperature was less familiar and often generated uncertainty. Many participants acknowledged they were guessing when asked what it meant. As one participant noted, *“I think it means like what it’s going to actually feel like, but I don’t know”* (Boston MA, 41-year-old female). However, some understood the term to be equivalent to heat index: *“It’s just another way of saying heat index”* (Seattle WA, 70-year-old female).

Other interpretations of apparent temperature varied widely. Some viewed it as the actual air temperature, in contrast to a perceived or subjective temperature: *“I think it would be the opposite of like the feel-like temperature. So, it'd be like the actual temperature”* (Charlotte NC, 22-year-old female). Others interpreted it as an estimated or approximate value based on radar or weather maps: *“Apparent cause that’s what they think from the radar and everything… but feels like estimated is more inclusive”* (Denver CO, 41-year-old male). Still others interpreted apparent temperature as a forecasted maximum or “supposed” temperature: *“Maximum apparent temperature… the temperature might apparently get as high as 110… like a prediction”* (St. Louis MO, 60-year-old female).

A few participants correctly inferred that apparent temperature likely incorporated environmental modifiers such as humidity, wind, or sun. For example, one participant said, *“Taking everything into account like the intensity of the sun, the humidity in addition to the actual temperature”* (Philadelphia PA, 24-year-old female). Others elaborated that these factors for apparent temperature and heat index might work similarly to wind chill: *“Apparent includes the variables which could be wind index or wind factors. You know, wind conditions in cold, they say wind chill factor. So that I’m thinking that the heat that the temperature gauge includes that variable that could be conditioned in”* (Sacramento CA, 64-year-old male). A participant in Denver, CO emphasized the impact of direct sunlight, and questioned whether apparent temperature adequately captured that intensity: *“If we’re talking about comfort level… you could probably throw in sun, you know, cloudy versus sun… anybody in Colorado pays attention to the sun… If you’re trying to convey comfort level, we’re gonna have to come up with a term and define what that means”* (Denver CO, 75-year-old female).

Again, many participants expressed a strong preference for the term *"feels-like temperature"* by finding it more intuitive and relatable: *"Feels like temperature makes more sense and I think more people would understand what that means. That's a better phrasing than apparent for a lot of people, I think"* (Milwaukee WI, 42-year-old female).

There was also a common complaint about redundancy and confusion between apparent temperature and heat index. Several participants said that if the two terms mean the same thing, only one should be used: *"I don't like when there's two different terms that mean the same thing… They should just pick one."* (Seattle WA, 57-year-old female).

Overall, while some participants drew accurate or partially accurate conclusions about apparent temperature, the term was less consistently understood than heat index. Preferences leaned strongly toward simplified, intuitive language (i.e., "feels-like temperature") and away from less familiar or ambiguous terms.

2.2.3 Heat Advisory

Across all focus groups, participants commonly interpreted a heat advisory as a prompt to "take extra precautions." This phrase often anchored responses, with individuals describing protective behaviors such as staying indoors during peak hours, hydrating, dressing lightly, and checking on vulnerable individuals. For example, one participant explained, "*Take precautions before you go outside. It's gonna be hot [and] you may wanna be careful*" (Denver CO, 56-year-old male).

However, perceptions varied in perceived urgency. Some participants viewed heat advisories as routine or background noise (especially in hotter climates), leading some to ignore the message entirely. One Houston, TX participant stated, "*Personally, I've seen it so often in the summer that I disregard it… We did [a BBQ] anyway and it was so hot and we were miserable*" (Houston, TX, 37-year-old female).

Furthermore, many viewed heat advisories as primarily relevant for vulnerable groups (e.g., elderly, unhoused, chronically ill), with one participant noting: "*I think of them for people who like don't have any A/C or maybe have like conditions that extreme heat would put extra stress on them. So don't really see it as…something for me. Specifically, I think of it more is for people who are more vulnerable*" (Milwaukee, 27-year-old female). Participants also described broader community-minded actions, such as conserving electricity or aiding unhoused individuals.

Participants often struggled to determine if a heat advisory represented a serious health risk or just a notification of hotter-than-normal weather. One participant requested a clearer scale or visual system akin to the Homeland Security Advisory System to distinguish levels of severity. Others questioned the criteria and called for more context: "*I need the temperatures. At least the range of temperatures*" (Quad Cities IA, 49-year-old female).

2.2.4 Extreme Heat Warning

Participants overwhelmingly interpreted an extreme heat warning as more serious than an advisory. Many explicitly stated that they would change their behavior if they saw a warning, with comments such as: "*I would take it more seriously…like a guaranteed tornado…it's guaranteed it's gonna be 110 degrees*" (Charlotte, 30-year-old female). It also appeared that the word "extreme" often triggered more alarm and attention, even among those unfamiliar with the specific NWS definitions.

Several participants inferred that a warning implied danger for everyone, not just vulnerable groups. This danger may warrant limiting activity altogether. For instance, one participant said, "*I think when it when it says extreme heat warning, it's telling you maybe you should choose an alternate day to do some of these activities*" (Boston MA, 50-year-old female). Some described the warning as signaling a public health risk, equating it to stay-at-home guidance during other emergencies.

Despite the stronger language, participants still expressed a need for clarity. Similar to advisories, most participants wanted actual temperature ranges and clearer guidance about what "extreme" meant. One participant noted, "*I feel like extreme heat warning does get my attention, but I feel like for other people they might overlook it because it doesn't tell us how long…the extreme heat warning is going to last. It doesn't show any temperatures, [and] it doesn't show how high the humidity is going to*" (Houston TX, 22-year-old female).

There was also concern about potential overuse and "alert fatigue." Participants worried that repeated warnings without context or variation could lead to reduced credibility over time: "*If you just keep saying warning every day… no one's gonna take you seriously"* (Milwaukee, 46-year-old male).

2.2.5 Heat Advisory vs. Extreme Heat Warning

Overall, participants broadly interpreted the warning as more serious than the advisory, often using comparisons to tornado or hurricane systems to frame their thinking. However, without explicit information, many relied on assumptions from word choice ("extreme" vs. "advisory") rather than prior knowledge.

It also appears that heat advisories may prompt more moderate, precautionary behaviors aimed at comfort and convenience, particularly among those who perceived themselves as healthy. This may be due, in part, to advisories being viewed as relevant primarily for vulnerable groups, wheras warnings were perceived as applicable to everyone. Similarly, extreme heat warnings were more likely to lead to behavioral change, especially regarding staying indoors and modifying plans.

However, both terms were criticized for lacking specificity, but this concern was especially strong for advisories. Participants desired numerical thresholds, temperatures, or other contextual information to help them evaluate their risk and, in turn, respond appropriately.

2.2.6 HeatRisk

Focus groups in five cities (i.e., Seattle, Phoenix, Sacramento, Billings, and Denver) were exposed to the term. Most participants had not encountered it before and many questioned its meaning and how it connected to personal safety. One participant summed up the confusion, asking, "*What does 'heat risk' actually mean?"* (Billings, MT 44-year-old female). Others assumed the term was a typo by objecting to the lack of spacing: *"I think 'heat risk' [is] two words. I think"* (Billings MT, 47-year-old male).

Despite the unfamiliarity with the term itself, most participants responded positively to the accompanying HeatRisk chart. They appreciated the tiered color-coded levels (or minor, moderate, major, extreme) and found them more intuitive than the advisory and warning formats. The visual gradient also allowed participants to quickly assess conditions and make rough judgments about their own vulnerability. "*I just take this one as more of an educational [tool]… digging deep into what the different levels mean*," said one participant (Billings, 44-year-old female).

However, participants varied in their perception of HeatRisk being relevant to themselves if it is more broadly about public health. Some immediately interpreted the risk levels—especially "major" or "extreme"—as serious and personally applicable. For example, on participant said: "*Well, to me it kind of means like it's serious, like, major, it's serious*" (Phoenix, 60-year-old female). Others associated the term with health conditions such as heat stress or heat stroke, particularly for sensitive populations.

At the same time, several participants indicated that terms like "major heat risk" did not resonate due to their acclimatization to hot weather. "[*Major heat risk] doesn't mean anything to me. It has to be like an extreme, bold word for me to even take notice*," explained one Phoenix participant (49-year-old White female), despite the fact that "Major" heat risk can affect anyone. Another added, "*I prefer 'excessive heat warning' to 'major heat risk'*" (Seattle, 66-year-old female), highlighting continued reliance on more established terminology.

When asked directly, participants generally found the modifiers "minor," "moderate," "major," and "extreme" intuitive and easy to follow. However, they expressed mixed views on the descriptive language accompanying each level. Some praised the scale as more informative than other formats, while others felt it was too dense or repetitive. "*The verbiage in the panes is a little much. I think they ought to be less wordy,"* said a participant in Denver (56-year-old male). Another noted that the text could be simplified to highlight what changes across levels instead of repeating similar statements.

Like heat advisories and warnings, participants still wanted temperature ranges to be included alongside color categories, especially to accommodate people with visual impairments or those less familiar with color-based alerts.

2.2.7 Heat Illness

When presented with the term *heat illness,* most participants interpreted it as referring to well-known physical outcomes such as heat stroke, heat exhaustion, and dehydration. These were the most mentioned conditions across all focus groups. As one participant explained, "*I'm assuming they mean like heat exhaustion, heat stroke. That's what I think of when I see heat illness*" (Phoenix, 50-year-old female). Others simply stated "heat stroke" or "dehydration" as the first thought that came to mind.

However, participants also offered a wide range of other symptoms and effects they associated with heat illness. Some listed physical responses such as sunburn, overheating, muscle cramps, nausea, vomiting, and dizziness. Others noted cognitive or emotional symptoms, including fatigue, mental slowness, bad mood, and even depression. A few referenced respiratory challenges or loss of appetite, while one participant mentioned skin cancer as a possible long-term outcome of heat exposure. These responses reflect a broader public perception of *heat illness* as encompassing not just medically defined emergencies, but a wide spectrum of heat-related discomforts and conditions that may affect one's daily life and well-being.

Despite offering a variety of interpretations, a few participants admitted they had not encountered the term *heat illness* before. "*No, I'd actually never heard that term before*," noted one participant (Oklahoma City, 73-year-old female), while another described it as *"a new term"* (Quad Cities, 53-year-old female).

Several participants criticized the term as overly vague or lacking in clarity. One described it as *"kind of meaningless"* (Seattle, 70-year-old female), while another said, *"It's vague. It doesn't say much"* (Seattle, 52-year-old female). This suggests that, although participants could infer a general meaning, the lack of specificity in the term made it less useful as a public health communication tool.

2.3 Focus Group Summary

Sixteen virtual focus groups (*N* = 121) were conducted across the four NWS CONUS regions to examine how members of the public interpret extreme heat terminology and messaging. Participants reviewed fictional, location-tailored NWS-style social media posts and were asked to define terms and explain how they would respond. Overall, participants demonstrated partial familiarity with common heat terms, but understanding was uneven and often shaped by word choice rather than formal definitions.

Heat Index was generally interpreted as a "feels-like" temperature influenced by humidity. Although many participants correctly linked it to discomfort caused by moisture in the air,

others treated it as a simple numerical scale or remained uncertain about how it differed from actual air temperature. Participants frequently expressed a preference for the plain-language phrase “feels-like temperature.”

Apparent Temperature was less familiar and generated confusion. Some participants assumed it meant the same thing as heat index, others believed it referred to actual air temperature, and still others interpreted it as a forecasted estimate. The co-existence of multiple similar terms was criticized as redundant and unnecessary.

Heat Advisory was typically understood as a cue to “take precautions,” such as hydrating or limiting activity. However, many participants perceived advisories as routine, particularly in hotter climates, and viewed them as primarily relevant for vulnerable groups rather than themselves. This perception reduced perceived urgency and, in some cases, led to messages being disregard.

Extreme Heat Warning was consistently interpreted as more serious than an advisory. The word “extreme” triggered higher concern and stronger behavioral intentions, including canceling outdoor activities. However, participants still desired clearer temperature thresholds and duration information to assess severity.

HeatRisk, although unfamiliar to most participants, was positively received when paired with its color-coded scale. Participants found the tiered structure intuitive and educational, though some felt the accompanying text was overly dense. The scale was generally perceived as more informative than advisory or warning language alone.

Regarding health-related terminology, participants correctly identified core symptoms of heat illness (e.g., heat stroke, heat exhaustion), but often conflated distinct conditions and included unrelated outcomes such as sunburn or long-term UV effects. Similarly, participants recognized medically vulnerable groups (older adults, pregnant individuals, those with chronic illness), but less frequently identified socially or structurally vulnerable populations.

Across terms, several consistent themes emerged:

- Strong preference for plain, intuitive language
- Desire for specific temperature ranges and contextual detail
- Reliance on word cues (e.g., “extreme”) to infer severity
- Potential for alert fatigue when terminology is repeated without variation
- Conflation of distinct health conditions

Taken together, the focus group findings indicate that while foundational awareness of heat risk exists, technical terminology is not consistently interpreted as intended. Misunderstandings are often subtle but meaningful, particularly when they influence perceived personal relevance and behavioral response. These findings informed the development of the national survey and highlight opportunities to improve clarity, specificity, and actionability in extreme heat communication.

Chapter 3: Extreme Heat Survey

Building on findings from the 16 focus groups, we developed a national survey to assess how widespread the observed interpretations, misunderstandings, and beliefs about extreme heat terminology are across the United States. While the focus groups provided in-depth insight into how people define and reason through heat-related language, the survey allowed us to quantify the prevalence of accurate and inaccurate beliefs and examine patterns across geographic, demographic, and experiential factors.

The survey measured understanding of key hazard terms, perceptions of vulnerability, beliefs about protective actions, and sources and channels of heat information. It also assessed predictors of accurate and inaccurate beliefs and how they are influenced by prior experience with extreme heat, interest in weather, geographic region, and demographic characteristics.

Together, the survey results provide population-level evidence to inform recommendations for improving clarity, consistency, and effectiveness in extreme heat communication.

3.1 Survey Method

3.1.1 Sample and Regression Predictor Measures

Location

Participants reported their primary state of residence, which was then classified into one of the nine NOAA climate regions (see Figure 3). These regions were selected because they capture climatologically distinct patterns of extreme heat across the CONUS. For regression analyses, the Southwest region was designated as the reference category, and eight dummy variables were created to represent comparisons between the Southwest and each of the other regions.

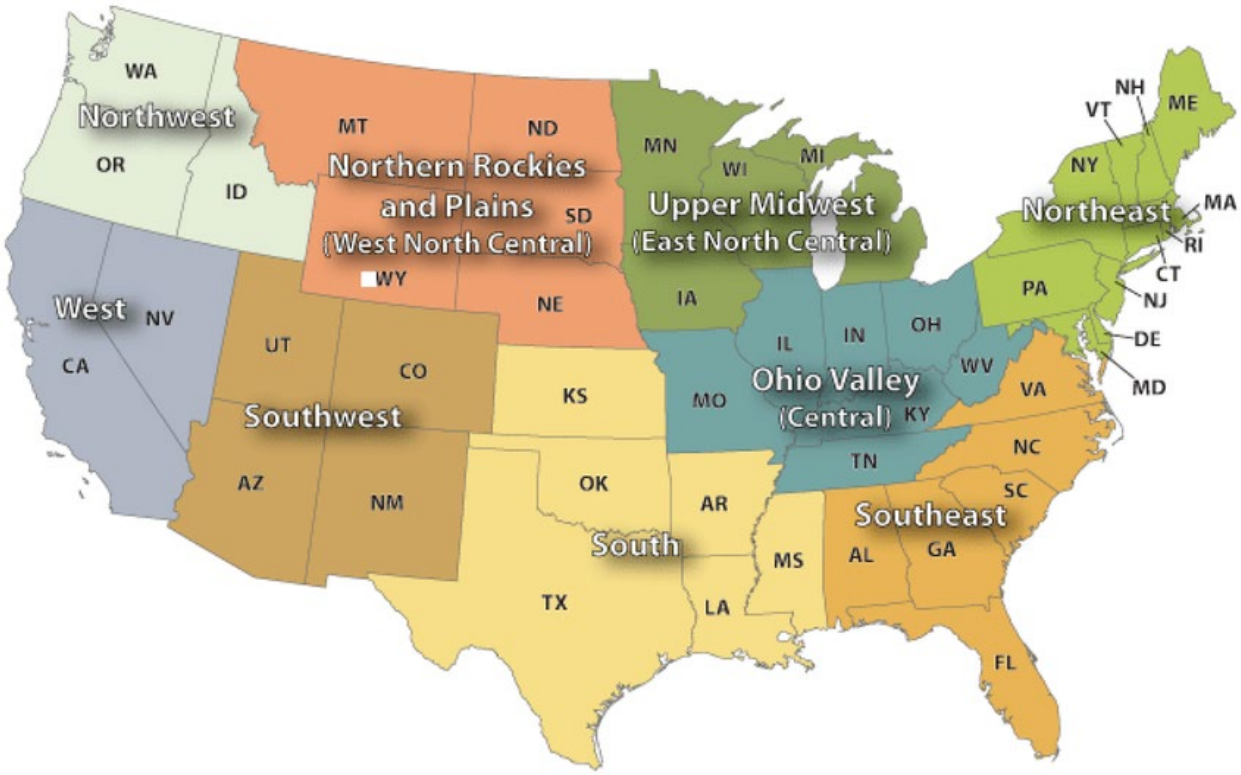


Figure 3. NOAA Climate Regions

Experience with Extreme Heat

Direct experience with extreme heat impacts was measured using items adapted from Wilhelmi et al. (2021). Participants were asked: "During the past year, have you or a member of your household experiences any of the following that you suspect were caused by extreme heat or very hot weather? Please select all that apply." Participants were presented with 17 response options (see Appendix A for full item list). The number of selected responses, excluding the "none of the above" option, were summed to create a score for the number of direct heat-related impact experiences.

Indirect experiences with extreme heat were measured using four items adapted from Demuth (2018; see Appendix A for full item list). Participants indicated the extent to which they agreed or disagreed with each statement on a 5-point Likert-type scale (1 = Strongly disagree to 5 = Strongly agree). Items asked about experiences in the past year, such as being under a heat warning or hearing/watching news coverage about extreme heat. A composite score was calculated by averaging responses across the four items.

Interest in Weather and Exposure to Weather Forecast Information

Interest in weather was measured using a single item adapted from Vaughn et al. (2023): "How would you describe your interest in the science of weather?" Responses were recorded on a 5-point scale ranging from 1 = Very low to 5 = Very high.

Exposure to weather forecast information was measured with a single item adapted from Nunley and Sherman-Morris (2020): “How often do you typically watch, hear, or read a weather forecast?” Responses were recorded on a 5-point scale: 1 = Multiple times per day, 2 = Once per day, 3 = Multiple times per week but not daily, 4 = Multiple times per month, and 5 = Never.

These measures capture both intrinsic interest in weather science and habitual exposure to forecast products, which may shape understanding of heat-related terminology.

Rurality

Population density of participants’ residential areas was assessed with a single item: “What type of area do you currently live in?” Response options included: (1) Urban location in a densely populated area, (2) Suburban location in a neighborhood near a densely populated area, and (3) Rural location in a sparsely populated area. For analysis, suburban residence served as the reference category, and two dummy variables were created to compare suburban with urban and suburban with rural in the regression models.

Demographics

Gender was measured by asking participants to identify the gender with which they most closely identified (“Man,” “Woman,” “Non-binary,” or “Prefer to self-describe”). For analysis, responses were recoded into a binary variable, with “Man” coded as 1 and all other responses coded as 0. Race/ethnicity was measured by asking participants to select all categories with which they identified from a provided list. Responses were then recoded into a series of dummy variables for Non-Hispanic Black, Non-Hispanic Asian, Hispanic, and Multiracial/Other, with Non-Hispanic White serving as the reference category. Education was measured by highest level of education completed (1 = Less than high school to 7 = Master’s, Doctoral, or Professional Degree). Household income was measured by total pretax income during the past 12 months (1 = Less than $20,000 to 7 = $200,000 and above). Age was measured as participants’ self-reported numeric age in years.

3.1.2 Descriptive Outcome Measures

Sources

Drawing on prior research examining where people obtain weather and hazard information (i.e., Armstrong et al., 2021; Krocak et al., 2024; Lazo et al., 2009; Wilhelmi et al., 2021), we asked participants to indicate the sources they typically rely on for information about extreme heat events. Participants were instructed to “Select all that apply.” Response options included both interpersonal sources (friends, family, co-workers, employers or supervisors) and formal sources such as the National Weather Service, local news stations, national or cable news networks, and weather-specific outlets (e.g., The Weather Channel, AccuWeather). Digital and

personal sources were also included, such as smartphone default weather apps and personal observations (e.g., how it feels outside). In addition, participants could select community-based or institutional sources, including local, state, or federal health or emergency management agencies, schools, religious organizations, utility providers, local health clinics or primary care providers, and nonprofit organizations (e.g., American Red Cross). An open-ended "Other" option was provided to capture sources not represented on the list (see Appendix A for all items).

Channels

Based on the same research used to identify weather information sources, participants were also asked to indicate the channels through which they typically seek information about extreme heat events, with the instruction to "Select all that apply." See Appendix A for full item list.

Vulnerable Populations

To assess participants' perceptions of populations at elevated risk during extreme heat, respondents were asked: "Which of the following groups are at an increased risk of getting sick on hot days? Please select all that apply." The response options can be found in Appendix A.

Medication

To assess beliefs about the role of medications in heat vulnerability, participants were asked to indicate their level of agreement with the statement: "Most prescription and/or over the counter medications can make you more susceptible to getting sick from extreme heat." Responses were recorded on a 5-point Likert-type scale ranging from 1 = Strongly disagree to 5 = Strongly agree. This item was designed to capture general awareness of how common medications can increase heat-related health risks.

Mental Health

To assess beliefs about the relationship between extreme heat and mental health, participants were asked to indicate their level of agreement eight items. Responses were captured on a 5-point Likert-type scale ranging from 1 (Strongly disagree) to 5 (Strongly agree). Appendix A displays the final items.

Cooling Centers

To assess beliefs about cooling centers, participants were asked to indicate their level of agreement with a series of statements describing who can access cooling centers and under what conditions they may be open. Responses were recorded on a 5-point Likert-type scale ranging from 1 (Strongly disagree) to 5 (Strongly agree). Appendix A lists these items.

Checking on Neighbors

To assess beliefs about checking on neighbors during extreme heat, participants completed two questions. The first question asked participants to select all the factors they believed were important to assess when checking on neighbors (see Appendix A). The second question asked participants to indicate how often someone should be checked on during an extreme heat event (see Appendix A).

Heat Illness

Participants were also asked to identify symptoms of "heat illness" through a multiple-choice checklist format. The stem read: "Which of the following are symptoms of heat illness? Select all that apply." The response list intentionally included both medically accurate conditions (e.g., heat rash, heat cramps, heat exhaustion, heat stroke) and inaccurate or unrelated options (e.g., sunburn, depression, weight gain, premature aging/skin cancer) to assess the degree to which participants distinguish between true symptoms of heat illness and outcomes associated with other hazards such as sun exposure or chronic health stressors (see Appendix A).

Heat Exhaustion and Heat Stroke

Participants completed a series of questions related to heat exhaustion and heat stroke. Each participant was randomly assigned to receive only one of these two terms (i.e., participants responded to either the heat exhaustion questions or the heat stroke questions, but not both). For heat exhaustion, participants first rated their agreement with several belief statements (e.g., "Heat exhaustion is not life threatening"; "Heat exhaustion occurs when your body temperature rises above a certain point") using a 5-point Likert scale (1 = Strongly disagree to 5 = Strongly agree). They were then asked to identify symptoms of heat exhaustion from a checklist of possible options (e.g., dizziness, cool/moist skin, nausea or vomiting, muscle cramps). A separate single-item measure asked participants to rate their agreement with the statement "Heat exhaustion can happen to anyone regardless of their health" (1 = Strongly disagree to 5 = Strongly agree). Finally, participants were presented with a multiple-choice checklist of recommended protective actions (e.g., moving to a cooler place, making the person drink water, applying cool cloths) and were instructed to select all that apply.

For heat stroke, the structure was parallel. Participants rated their agreement with belief statements (e.g., "Heat stroke is not life threatening;" "Heat stroke can occur even if you are not over-exerting yourself") using the same 5-point Likert scale. They then identified symptoms of heat stroke from a list of possible options, and rated agreement with the statement "heat stroke can happen to anyone regardless of their health." To assess protective actions, participants were asked to indicate what the first action should be if someone is experiencing heat stroke. Response options included both medically correct (i.e., "Call 911/emergency services") and medically acceptable (e.g., "Move them to a cooler place") statements and inaccurate statements (e.g., "Make them eat"; "Call their doctor"). See Appendix A for the full list of questions.

3.1.3 Regression Outcome Measures

Accurate/Inaccurate Beliefs for Heat Hazards

For heat index, relative humidity, heat advisory, and extreme heat warning, initial items were derived from our qualitative analysis of focus group transcripts. Through this analysis, we identified recurring beliefs, common points of confusion, and areas of disagreement expressed by participants when discussing heat hazard terminology. To structure this content systematically, statements were grouped into three conceptual categories:

- Hazard – how the weather phenomenon works (e.g., meteorological mechanism)
- Impacts and Susceptibility – who or what is at risk and how
- Protective Action – what people should do in response

Because the focus group discussions generated both accurate and inaccurate statements, we supplemented the item pool with scientifically accurate statements from the glossaries and public guidance documents of the National Weather Service (NWS), Federal Emergency Management Agency (FEMA), and Centers for Disease Control and Prevention (CDC). This ensured a balanced set of items representing both accurate and inaccurate beliefs.

After compiling the initial pool of items, we revised statements for clarity, consistency, and difficulty. This process included eliminating redundancies, resolving contradictions, and refining statements that were overly vague or narrowly technical. Revisions were made with the intent of reducing the impression that the survey functioned as a "knowledge quiz" while still capturing meaningful differences in public understanding.

Participants were randomly assigned to receive questions about either heat index or relative humidity, and either heat advisory or extreme heat warning. For each assigned term, participants indicated the extent to which they agreed or disagreed with a series of statements (1 = Strongly disagree to 5 = Strongly agree). The full set of statements is provided in Appendix A.

Accurate/Inaccurate Beliefs for Mental Health

To assess beliefs about the relationship between extreme heat and mental health, participants completed a series of items introduced with the prompt: *"Hot temperatures…"* Here, participants were asked to indicate their level of agreement with a series of statements describing potential psychological, behavioral, and social effects of heat. Items included whether hot temperatures make people irritable, make it hard to concentrate, help relieve stress, make people behave more impulsively, do not impact mental health, make it hard to sleep, make people less social, and make people sleep more. Responses were recorded on a 5-point Likert-type scale ranging from 1 = *Strongly disagree* to 5 = *Strongly agree.* Consistent with other questions, the set of items intentionally blended scientifically accurate statements (e.g.,

irritability, difficulty concentrating, sleep disruption) with inaccurate or misleading statements (e.g., heat relieves stress, has no impact on mental health, or makes people sleep more), both of which were derived from our focus group findings and public health guidance. This design allowed us to assess both accurate and inaccurate mental health beliefs related to extreme heat (see Appendix A list of items).

3.1.4 Survey Validation

After our survey was complete, we solicited structured feedback from subject matter experts at the NWS and the NOAA Extreme Heat Working Group. Their review confirmed the overall structure of the survey but emphasized the importance of distinguishing clearly between hazard definitions, health impacts and susceptibility, and protective actions. Specific recommendations included clarifying that the heat index represents perceived hazard rather than the hazard itself, simplifying language for certain extreme heat warning items, and ensuring protective action items were not redundant across advisory and warning categories. Feedback also highlighted the need to reduce misconceptions around cooling centers (e.g., that they are only for the "needy"), refine wording on medication susceptibility to avoid overgeneralization, and add nuance regarding cumulative exposure and vulnerable populations. These suggestions were incorporated into item revisions prior to pilot testing.

We then tested the survey with members of our professional networks to evaluate question clarity and survey flow. Feedback led to adjustments in response formats (e.g., clarifying when items were "select all that apply" or "first action" questions), refinements to wording for readability, and the addition of timeframe cues (e.g., specifying "in the last year"). Several items were rephrased to reduce ambiguity (e.g., "heat combined with humidity"), and conceptual distinctions were clarified (e.g., between living alone and being socially isolated). These revisions improved clarity and alignment with survey objectives prior to fielding.

We conducted a final pilot with 50 participants recruited through Qualtrics. This step allowed us to test the instrument with a more diverse sample outside of our professional networks, ensure that survey items were clear, and confirm that question wording, randomization, and response formats functioned as intended on the Qualtrics platform. The pilot also provided a check on survey length and flow. No additional substantive changes were required after this stage. The final survey can be found in Appendix A.

3.1.5 Data Analysis

Descriptives

We provide frequencies for responses to the sources, outcomes, vulnerable populations, checking on neighbors, heat illness, heat exhaustion, and heat stroke in the results section. In addition, we include the distributions of responses for each of the beliefs for the hazard terms and effects of extreme heat on mental health.

Factor Analysis

In order to assess interrelationships between beliefs within each term we conducted a series of exploratory factor analyses. Factor analyses were conducted using Principle Axis Factoring extraction with an oblique promax rotation (delta = 4) that allows extracted factors to be correlated with one another. We initially extracted factors with eigenvalues above 1, then examined scree plots and looked for inflection points that would indicate the most probable number of factors. Once we had identified the most likely number of factors based on the scree plots, we reran the models to extract that fixed number of factors and examined the rotated factor loadings to assess the nature of the underlying factors.

Results for each of the heat terms extracted 4 factors with eigenvalues above 1. Examining scree plots indicated that 2-factor solutions for each provided the best explanation for inter-item covariation. Examining the factor loadings revealed that the items primarily loaded onto one factor for accurate beliefs and another for inaccurate beliefs. Reliability for accurate and inaccurate beliefs at the subscale level (i.e. separated into Hazard, Impacts and Protective action subscales) was not sufficient for use in regression models, as some subscales returned Cronbach's alphas well below recommended cutoffs. Therefore, to develop the outcome variables for the regression models, we combined the accurate beliefs and took the mean to serve as one dependent variable and combined the inaccurate beliefs and took the mean for another dependent variable for each term. The resulting scales for accurate and inaccurate beliefs ranged from fair reliability to reasonably high (alpha = 0.60-0.83). Cronbach's alpha for each scale is provided in Table 2.

Table 2. Cronbach's alphas for accurate and inaccurate belief outcome scales.

Scale	# of items	Alpha
Heat Index Accurate	12	0.83
Heat Index Inaccurate	10	0.60
Relative Humidity Accurate	11	0.76
Relative Humidity Inaccurate	11	0.67
Heat Advisory Accurate	12	0.72
Heat Advisory Inaccurate	11	0.68
Extreme Heat Warning Accurate	12	0.80
Extreme Heat Warning Inaccurate	12	0.65
Mental Health Accurate	5	0.74
Mental Health Inaccurate	3	0.66

Linear Regression

To examine factors associated with participants' beliefs about extreme heat terminology, we conducted a series of linear regression analyses. For each of the four hazard terms (i.e., heat index, relative humidity, heat advisory, extreme heat warning) and for beliefs about the effects of extreme heat on mental health, we estimated two models: one with mean responses to accurate belief items and one with mean responses to inaccurate belief items as the dependent

variable, resulting in a total of 10 models. Predictor variables included geographic location (i.e., NOAA climate region of the state of residence), direct and indirect experience with extreme heat, interest in the weather, exposure to weather forecasts, rurality, gender, age, race, education, and income.

3.2 Survey Descriptive Results

3.2.1 Sources

Table 3 presents the proportion of participants who reported relying on various sources for information about extreme heat events. The most frequently cited sources were local news stations (60.2%) and the NWS (57.7%). Because many sources incorporate data and products from the NWS in their reporting, it is unclear whether the latter figure reflects direct reliance on NWS products or indirect reliance via intermediaries (e.g., a local newscaster stating that "the National Weather Service has issued a heat advisory"). Nearly half of participants also reported relying on their smartphone's default weather app (48.1%). By contrast, relatively few participants relied on community-based sources such as churches (3.8%) or schools (4.3%), or on local health clinics (5.8%), utility providers (9.1%), and local, state, or federal health or emergency management agencies (11.2% and 13.4%, respectively).

Table 3. Sources participants rely on for information about extreme heat events.

Source	Freq.	Percentage
Local news stations	883	60.2%
The National Weather Service	847	57.7%
Smartphone default weather app	705	48.1%
Weather specific sources (The Weather Channel, AccuWeather)	557	38.0%
My personal observations (e.g. how it feels outside)	475	32.4%
Friends, family coworkers, employers or supervisors	440	30.0%
National or cable news stations (e.g. CNN, Fox News, MSNBC)	372	25.4%
Local, State or Federal emergency management agencies	196	13.4%
Local, State or Federal health agencies	164	11.2%
Utility providers	133	9.1%
Local health clinics or primary care providers	85	5.8%
School communications (e.g. people, leaders, alerts or newsletters)	63	4.3%

Churches or other religious organization communicators (e.g. people, leaders, alerts, or newsletters)	56	3.8%
Local or National nonprofits	39	2.7%
Other	39	2.7%

3.2.2 Channels

Table 4 presents the proportion of participants who reported where they usually look for information about extreme heat events. The most frequently selected channels were television (57.1%) and internet websites or search engines (42.9%). Nearly one-third of participants indicated that they use social media (30.0%), while smaller proportions reported relying on AM/FM radio (20.9%), weather radio (19.8%), or newspapers (10.3%). These findings suggest that while traditional mass media such as television remain highly influential, a substantial proportion of the public also turns to digital platforms, including search engines, apps, and social media, for information during extreme heat events.

Table 4. Channels participants rely on to receive information about weather.

Channel	Freq.	Percentage
Television	837	57.1%
Internet websites or search engines (e.g. Google)	629	42.9%
Social media (e.g. Twitter/X, Facebook, TikTok)	440	30.0%
AM/FM Radio	306	20.9%
Weather radio (e.g. NOAA Weather Radio)	291	19.8%
Newspapers	151	10.3%
Other	30	2.0%

Note. The following section shifts to assessing participant beliefs about extreme heat and its terminology. To aid interpretation, results are presented in terms of accurate (green) and inaccurate (red) beliefs.

3.2.3 Vulnerable Populations

Table 5 presents participants' perceptions of which populations are most vulnerable to extreme heat. In many respects, participants' views aligned with public health guidance. Most recognized older adults (83.0%), pregnant people (68.6%), people with chronic health conditions (64.5%), and children under age 4 (56.2%) as vulnerable, which are groups consistently highlighted by public health agencies. Participants also widely identified those who are unhoused (55.7%) and pets (54.2%) as at risk, both of which are included in public health and emergency management guidance.

At the same time, there were notable differences. Far fewer participants identified social or structural vulnerabilities. For example, only a minority pointed to people who are low income (18.4%), socially isolated (20.6%), living alone (19.0%), without a vehicle (21.1%), or non-English speakers (6.9%). These groups are consistently documented in the literature as facing barriers to accessing cooling, healthcare, or timely warnings, yet they were under-recognized by respondents. Similarly, racial and ethnic minorities (9.9%) and rural residents (17.2%)—or groups shown to experience disproportionate impacts due to inequities in housing, healthcare, or infrastructure—were also infrequently selected.

Overall, the findings suggest broad public agreement with CDC on medically and demographically "obvious" vulnerable groups (older adults, young children, pregnant individuals, and those with chronic conditions), but less awareness of the social, economic, and structural factors that public health agencies emphasize as central drivers of heat vulnerability.

Table 5. Vulnerable Population Beliefs

Population	Freq.	Percentage
People over the age of 65	1217	83.0%
People who are pregnant	1006	68.6%
People with a medical condition like obesity, heart disease or mental illness	946	64.5%
Children under the age of 4	825	56.2%
People who are unhoused or without stable housing	817	55.7%
Pets	795	54.2%
People who work indoors without air conditioning	779	53.1%
People who commonly experience extreme heat	678	46.2%
People with a physical disability, for example those using a wheelchair or mobility device	555	37.8%
Athletes	418	28.5%
People without a vehicle	310	21.1%
People who are socially isolated	302	20.6%
People who live alone	278	19.0%
People who are low income	270	18.4%
People who live in rural communities	253	17.2%
People who work inside with air conditioning	165	11.2%
Racial or ethnic minorities	145	9.9%
Non-English speakers or those with limited English proficiency	101	6.9%
People whose ancestors come from hot climates	88	6.0%
People with air conditioning	85	5.8%

3.2.4 Medication and Heat Susceptibility

Table 6 shows participants' responses to the statement that most prescription or over-the-counter medications can increase susceptibility to illness during extreme heat. Public health guidance affirms that many medications, including diuretics, antihypertensives, antidepressants, and antihistamines, can impair the body's ability to regulate heat.

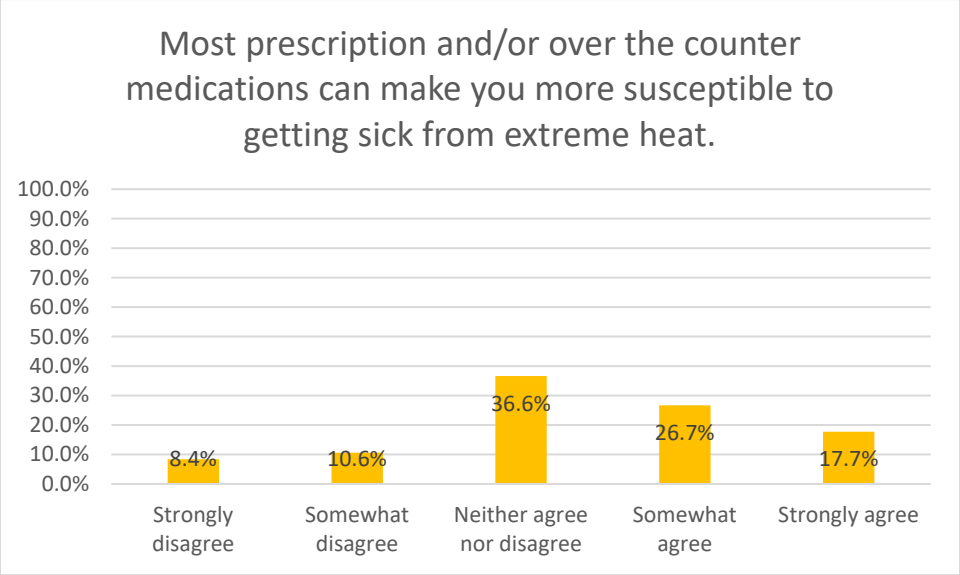
Results indicate mixed awareness of this risk. Just under half of participants (44.4%) somewhat or strongly agreed that medications increase susceptibility, while more than one-third (36.6%) were uncertain (neither agree nor disagree). A smaller proportion disagreed (19.0%).

These findings suggest that while a significant portion of the public recognizes the link between medication use and heat vulnerability, uncertainty is present. Given that older adults and people with chronic conditions are both more likely to take medications and more vulnerable to extreme heat, communication strategies should prioritize clarifying this connection and providing practical guidance (e.g., consulting healthcare providers during heat waves).

Table 6. Frequencies for responses to medication increasing susceptibility to heat.

Most prescription and/or over the counter medications can make you more susceptible to getting sick from extreme heat.	Freq.	Percentage
Strongly disagree	123	8.40%
Somewhat disagree	156	10.60%
Neither agree nor disagree	537	36.60%
Somewhat agree	392	26.70%
Strongly agree	259	17.70%

Figure 4. Frequencies for responses to medication increasing susceptibility to heat.



3.2.5 Checking on Neighbors

Table 7 shows participants' perceptions of what should be considered when checking on neighbors during extreme heat events. Responses largely aligned with public health guidance, which emphasizes looking for signs of heat stroke/exhaustion and ensuring access to cooling and hydration. Most participants indicated that they would check for symptoms of heat illness (75.0%), whether a neighbor's home was too hot (71.2%), and whether they had access to air conditioning (65.5%) or cold water (65.0%). These responses demonstrate strong public recognition of core risk factors.

However, several differences emerged. Checking blood pressure (41.5%) and weight (21.7%) suggest misperceptions about relevant risk indicators. Although high body temperature (65.3%) could be related to heat illness symptoms, public health guidance more commonly recommends focusing on outward signs such as confusion, dizziness, or nausea rather than direct measurement of vitals.

These findings suggest that while the public has a solid grasp of the most critical indicators, such as home cooling and access to water, there is also substantial attention to factors that are irrelevant or stigmatizing. This mix of accurate and inaccurate perceptions highlights an opportunity for clearer public messaging about what to prioritize when checking on neighbors during extreme heat events.

Table 7. Checking on Neighbors Beliefs.

Check Neighbors	Freq.	Percentage
They are showing signs of heat illness such as dizziness, headache, or nausea	1100	75.0%
Their home is too hot	1044	71.2%
They have access to air conditioning	961	65.5%
Their body temperature is high	958	65.3%
They have access to cold water	954	65.0%
They seem coherent	634	43.2%
Their blood pressure is high	609	41.5%
They are overweight	318	21.7%
Their home needs repairs	220	15.0%
They have personal or work stress	181	12.3%
They have good personal hygiene	152	10.4%
Their home is organized	80	5.5%
They have cash available	57	3.9%

Table 8 presents participants' views on how often neighbors should be checked on during extreme heat events. Public health guidance recommends checking on neighbors, including older adults, those with health conditions, or people without air conditioning at least twice a day.

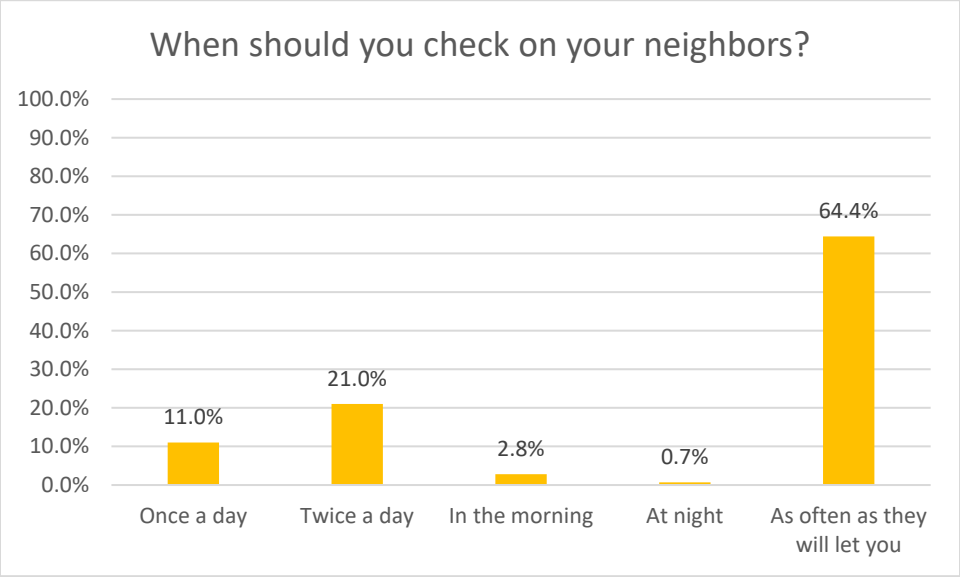
The majority (64.4%) indicated that neighbors should be checked on "as often as they will let you," reflecting a flexible, relationship-driven approach rather than a fixed schedule. Smaller proportions recommended fixed frequencies, such as twice a day (21.0%) or once a day (11.0%). Very few participants endorsed checking only in the morning (2.8%) or only at night (0.7%).

Overall, these results suggest that most participants recognize the importance of regular, ongoing check-ins but prefer to calibrate frequency based on the neighbor's comfort and receptiveness. Although this relational approach aligns with the spirit of public health guidance to "check on your neighbors," the lack of consensus on a specific timeframe may indicate a need for clearer messaging that balances respect for autonomy with the urgency of regular contact during extreme heat events.

Table 8. Frequencies for when you should check on your neighbors.

Frequency Checking on Neighbors	Freq.	Percentage
Once a day	157	11.0%
Twice a day	299	21.0%
In the morning	40	2.8%
At night	10	0.7%
As often as they will let you	916	64.4%

Figure 5. Frequencies for when you should check on your neighbors.



3.2.6 Cooling Centers

Participants were asked to indicate their endorsement of a series of beliefs about cooling centers. Table 9 presents participants' beliefs about who cooling centers are for and under what circumstances they are open.

Most participants correctly recognized that cooling centers can be open during any extreme heat event, depending on local guidelines: 78.6% somewhat or strongly agreed with this statement, aligning with the intended purpose of cooling centers as broadly accessible resources during dangerous heat.

At the same time, more than one in five participants strongly or somewhat agreed that cooling centers are only available for the needy (22.6%) or only for those who are unhoused (22.5%), and an additional 20% were neutral. These results suggest that nearly half of respondents either underestimated or were unsure about the universal eligibility of cooling centers. Similarly, almost one-quarter of participants (26.7%) agreed that cooling centers only open when there is a power outage, while another 23.5% were neutral, which may indicate uncertainty about the conditions under which centers are available.

Participants were more divided on whether cooling centers are open to those who already have air conditioning at home. While 40% somewhat or strongly agreed with this statement, nearly 30% disagreed, and almost one-third (31.8%) were neutral. This diversity in opinion among participants highlights a lack of clarity about whether cooling centers are intended as a universal service or a "last resort" for those without cooling options.

Overall, these findings show that while participants generally understand the core purpose of cooling centers, many hold misconceptions about eligibility and activation. These misunderstandings may discourage people from using cooling centers when needed, particularly those who do not see themselves as “needy” or “unhoused.”

Figure 6. Means for cooling center beliefs.

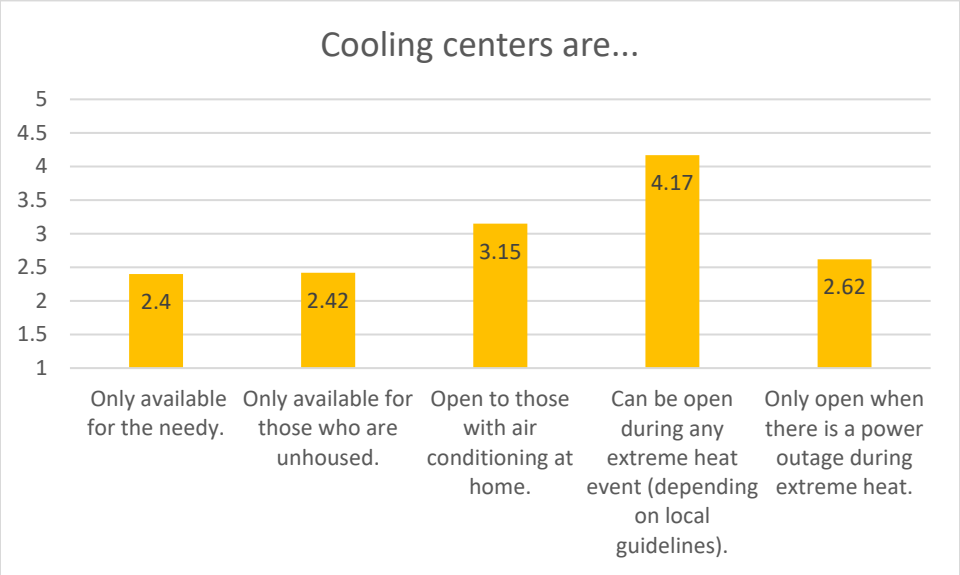


Table 9. Distributions for cooling center beliefs.

Item	Strongly disagree	Some-what Disagree	Neither agree nor disagree	Some-what agree	Strongly agree
Only available for the needy.	34.4%	22.7%	20.3%	13.3%	9.3%
Only available for those who are unhoused.	34.1%	21.5%	21.8%	13.3%	9.2%
Open to those with air conditioning at home.	15.7%	12.4%	31.8%	21.1%	18.9%
Can be open during any extreme heat event (depending on local guidelines).	2.5%	3.3%	15.5%	31.7%	46.9%
Only open when there is a power outage during extreme heat.	28.2%	21.6%	23.5%	13.9%	12.8%

3.2.7 Heat Illness

The National Institute for Occupational Safety and Health (NIOSH, 2024) defines “heat-related illness” as a catch-all term for a spectrum of conditions that occur when the body is unable to

properly cool itself in high temperatures. These illnesses range in severity from relatively mild (i.e., heat rash, heat cramps), moderate (i.e., heat exhaustion) to life-threatening emergencies (i.e., heat stroke).

Table 10 shows participants' perceptions of which conditions count as heat illnesses. Most participants correctly identified heat stroke (85.8%), heat exhaustion (77.0%), heat cramps (71.4%), and heat rash (67.7%). A majority also selected breathing problems such as asthma (58.8%), which, while not formally categorized as a heat illness, can be exacerbated by high heat (American Lung Association, 2022).

However, participants also attributed a wide range of other conditions to heat illness that are not classified as heat illness per NIOSH. For example, over half identified sunburn (51.0%) and one-quarter selected premature aging, sunspots, or skin cancer (25.1%), which are all outcomes of UV radiation rather than heat. Smaller proportions of participants associated kidney failure (16.4%), depression (10.0%), cataracts (6.1%), and weight gain (4.2%) with heat illness. While some of these outcomes (e.g., kidney stress, mental health effects) can be indirectly linked to prolonged heat exposure, they are not formally recognized as heat illnesses in NIOSH guidance.

Taken together, the results suggest that the public has a grasp of the core illnesses emphasized in public health messaging but also tends to conflate heat illness with a broader set of health outcomes. This blending of accurate and inaccurate associations points to a need for clearer communication that distinguishes conditions directly caused by the body's inability to regulate heat from those associated with other hazards, such as sun exposure or chronic health stressors, and to move away from the use of "catch-all" terminology that may blur these distinctions.

Table 10. Heat Illness Beliefs

Heat Illness Symptom	Freq.	Percentage
Heat stroke	1258	85.8%
Heat exhaustion	1130	77.0%
Heat cramps	1047	71.4%
Heat rash	993	67.7%
Breathing problems like asthma	863	58.8%
Sunburn	748	51.0%
Premature aging, sunspots and/or skin cancer	368	25.1%
Kidney failure	241	16.4%
Depression	146	10.0%
Eye cataracts	89	6.1%
Weight gain	62	4.2%

3.2.8 Heat Exhaustion and Heat Stroke Symptoms

The CDC distinguishes *heat exhaustion* as a moderate form of heat-related illness caused by fluid and salt loss through sweating, and *heat stroke* as a life-threatening emergency characterized by extremely high body temperature, hot/dry skin, confusion, and loss of consciousness. Clear differentiation between the two conditions is critical, since heat exhaustion can often be managed with cooling and hydration, whereas heat stroke requires immediate medical attention.

Tables 11 and 12 present participants' perceptions of symptoms associated with heat exhaustion and heat stroke, and Table 13 shows a comparison across the two conditions. Results show both alignment as well as considerable overlaps between the two conditions. For *heat exhaustion*, participants most often identified dizziness (79.8%), headache (71.8%), fainting (71.0%), heavy sweating (66.8%), nausea/vomiting (64.4%), weakness (61.6%), and muscle cramps (47.0%)—or symptoms consistent with medical guidance. Yet they also associated it with indicators of heat stroke, such as confusion (71.2%), extremely high body temperature (70.0%), hot, red skin (55.8%), and loss of consciousness (54.6%).

For *heat stroke*, participants correctly highlighted key symptoms: extremely high body temperature (71.8%), confusion (71.8%), fainting (70.4%), loss of consciousness (56.4%), and hot, red skin (54.6%). However, they also linked heat strokes with symptoms of heat exhaustion, including dizziness (77.4%), headache (66.4%), heavy sweating (63.6%), nausea/vomiting (61.0%), weakness (59.4%), and muscle cramps (42.8%).

This side-by-side pattern reveals a core finding: participants tended to perceive both conditions as largely overlapping. Dizziness, confusion, fainting, headache, nausea, weakness, and sweating were frequently reported for *both* heat exhaustion and heat stroke, which often blurs the distinction emphasized by public health. In addition, some participants selected symptoms not defined as part of either condition, such as high blood pressure (32.2% for exhaustion; 38.0% for stroke), dry eyes (17.4% vs. 16.0%), and insomnia (10.6% vs. 7.4%).

Overall, these results suggest that the public recognizes many of the most important indicators of "heat illness" but does not consistently differentiate between heat exhaustion and heat stroke. This conflation has significant implications for risk communication: messages may need to focus more on clearly distinguishing these conditions and stressing that heat stroke is a medical emergency requiring immediate intervention.

Table 11. Heat Exhaustion Symptoms.

Heat Exhaustion Symptom	Freq.	Percentage
Dizziness	585	79.8%
Headache	527	71.8%
Confusion	522	71.2%
Fainting	521	71.0%

Extremely high body temperature	514	70.0%
Heavy sweating	490	66.8%
Nausea or vomiting	472	64.4%
Weakness	452	61.6%
Hot, red skin	409	55.8%
Loss of consciousness	400	54.6%
Rapid heartbeat/pulse	401	54.6%
Rapid, shallow breathing	369	50.4%
Muscle cramps	345	47.0%
Shaking	292	39.8%
High blood pressure	236	32.2%
Cool, moist skin	162	22.0%
Dry eyes	128	17.4%
Insomnia	78	10.6%

Table 12. Heat Stroke Symptoms.

Heat Stroke Symptom	Freq.	Percentage
Dizziness	568	77.4%
Confusion	526	71.8%
Extremely high body temperature	527	71.8%
Fainting	516	70.4%
Headache	487	66.4%
Heavy sweating	466	63.6%
Nausea or vomiting	447	61.0%
Weakness	435	59.4%
Loss of consciousness	414	56.4%
Rapid heartbeat/pulse	407	55.4%
Hot, red skin	401	54.6%
Rapid, shallow breathing	378	51.6%
Muscle cramps	314	42.8%
Shaking	308	42.0%
High blood pressure	278	38.0%
Cool, moist skin	161	22.0%
Dry eyes	118	16.0%
Insomnia	55	7.4%

Table 13. Heat exhaustion vs. Heat stroke Symptoms.

Symptom	Heat Exhaustion (%)	Heat Stroke (%)
Dizziness	79.8	77.4
Headache	71.8	66.4
Confusion	71.2	71.8

Fainting	71	70.4
Extremely high body temperature	70	71.8
Heavy sweating	66.8	63.6
Nausea or vomiting	64.4	61
Weakness	61.6	59.4
Hot, red skin	55.8	54.6
Loss of consciousness	54.6	56.4
Rapid heartbeat/pulse	54.6	55.4
Rapid, shallow breathing	50.4	51.6
Muscle cramps	47	42.8
Shaking	39.8	42
High blood pressure	32.2	38
Cool, moist skin	22	22
Dry eyes	17.4	16
Insomnia	10.6	7.4

3.2.9 Heat Exhaustion and Heat Stroke Beliefs

Tables 14 and 15 and Figures 7, 8, and 9 present participants' beliefs about heat exhaustion and heat stroke.

For heat exhaustion, most participants recognized that it could happen to anyone regardless of health, that it can occur without over-exertion, and that it is not life threatening. The majority also endorsed that heat exhaustion occurs when body temperature rises above a certain point. However, misconceptions were also evident: 39.4% agreed that heat exhaustion is the same thing as heat illness, with 28.9% being neutral (i.e., neither agreed nor disagreed).

For heat stroke, participants again showed strong alignment with public health guidance. For example, 95.2% agreed that heat stroke can happen to anyone regardless of health and that it can occur without over-exertion (88.5%). Almost nine in ten (or 86.3%) agreed that heat stroke involves body temperature rising above a certain point. Importantly, most participants rejected the statement that heat stroke is not life-threatening, thereby indicating recognition of its severity. Nonetheless, misconceptions persisted: over half of participants either agreed or neither agreed nor disagreed that heat stroke is the same thing as heat illness, and a small minority agreed that it is not life-threatening.

The results suggest that while the public broadly understands that both heat exhaustion and heat stroke can affect anyone and are not limited to over-exertion. Yet, distinctions between the two conditions remain blurred. For example, participants thought both terms were the same as the catch-all label of "heat illness." By contrast, recognition of the life-threatening nature of heat stroke was stronger, but not universal. These findings support earlier patterns in

symptom recognition, whereby participants tended to see heat exhaustion and heat stroke as overlapping rather than distinct conditions.

Figure 7. Heat Exhaustion Beliefs

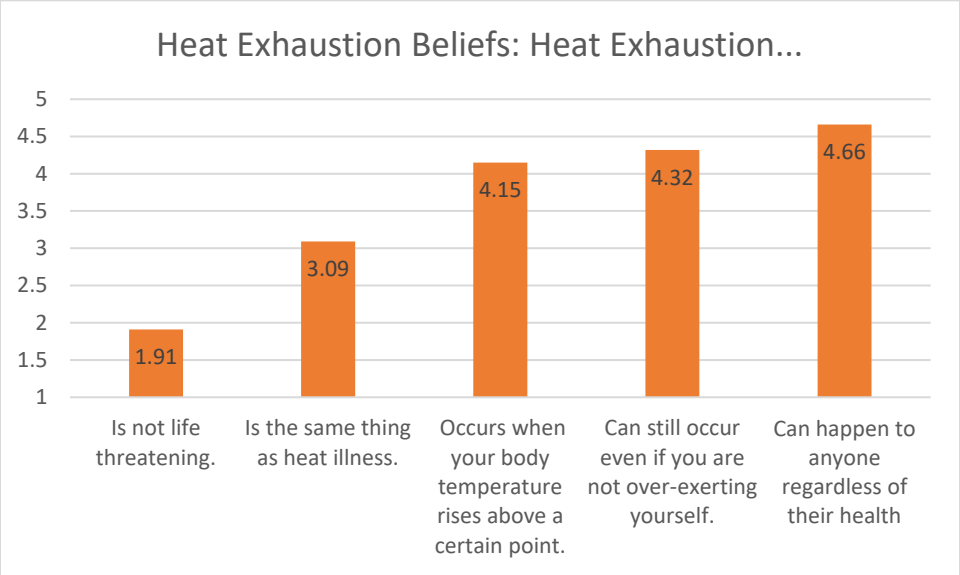


Figure 8. Heat Stroke Beliefs.

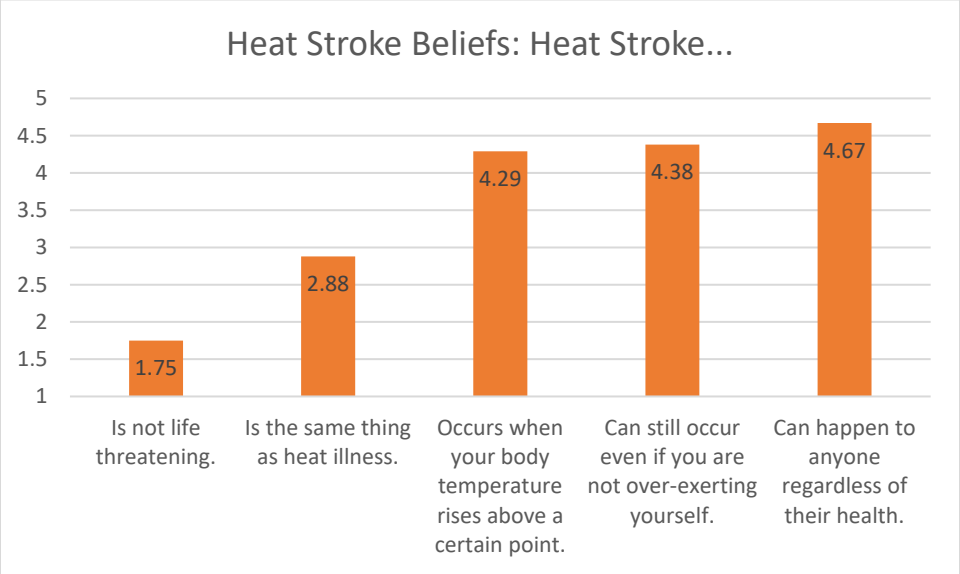


Figure 9. Heat Exhaustion vs. Heat Stroke Beliefs.

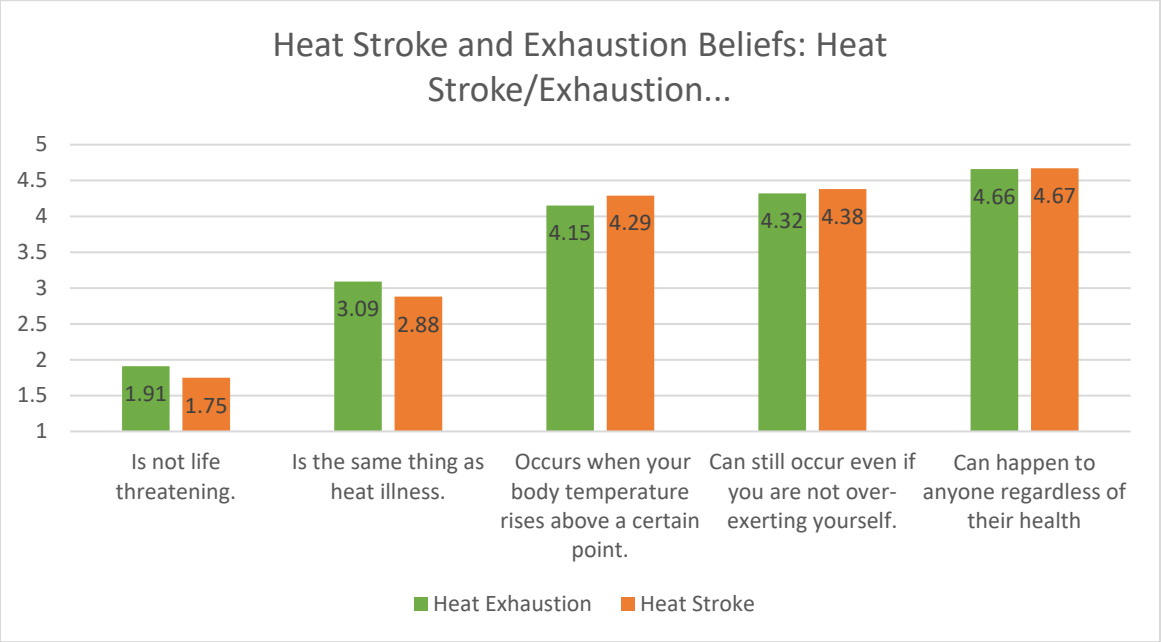


Table 14. Heat Exhaustion Beliefs

Item	Strongly disagree	Some-what Disagree	Neither agree nor disagree	Some-what agree	Strongly agree
Is not life threatening.	52.5%	24.5%	8.8%	8.1%	6.1%
Is the same thing as heat illness.	10.9%	20.7%	28.9%	27.0%	12.4%
Occurs when your body temperature rises above a certain point.	2.0%	2.7%	10.8%	46.6%	37.8%
Can still occur even if you are not over-exerting yourself.	1.3%	2.0%	9.2%	38.1%	49.4%
Can happen to anyone regardless of their health	0.4%	0.5%	3.6%	23.6%	71.8%

Table 15. Heat Stroke Beliefs

Item	Strongly disagree	Some-what Disagree	Neither agree nor disagree	Some-what agree	Strongly agree

Is not life threatening.	64.8%	15.6%	5.9%	6.8%	6.9%
Is the same thing as heat illness.	17.8%	22.7%	26.4%	19.9%	13.1%
Occurs when your body temperature rises above a certain point.	1.5%	2.8%	9.4%	38.0%	48.3%
Can still occur even if you are not over-exerting yourself.	1.5%	2.2%	7.7%	33.7%	54.8%
Can happen to anyone regardless of their health	0.7%	0.8%	3.3%	21.3%	73.9%

3.2.10 Heat Exhaustion and Heat Stroke Protective Actions

Heat Stroke Protective Actions

Table 16 shows participants' responses to the question about the *first action* that should be taken if someone is experiencing heat stroke. Participants could only select one response. The two most frequently selected answers were of moving the person to a cooler place (35.4%) and the "correct" action of calling 911 or emergency services (33.4%). It is recommended that people first call 911 if they suspect someone has heat stroke and *then* move someone to a cooler place while waiting for emergency services.

Inaccurate responses were fewer, such applying wet cloths (10.2%) and making the person drink water (10.1%); Both of which may seem intuitive but are insufficient as a first action given the severity of heat stroke. The remaining options, such as calling a doctor (4.1%), removing clothing (3.6%), or making the person rest (2.1%), were less frequently endorsed, and very few participants suggested highly inappropriate actions such as using an AED (0.6%) or making the person eat (0.6%).

Overall, most participants able to identify either the medically correct or an acceptable initial action. However, approximately 64% of participants did not prioritize emergency medical services, which underscores the need for clearer communication that heat stroke is a life-threatening emergency requiring immediate medical care, not just basic first aid.

Table 16. Participants responses for the first action that should be taken if someone has heat stroke.

FIRST Action Taken	Freq.	Percentage
Move them to a cooler place (e.g. somewhere with air conditioning or shade)	257	35.40%
Call 911/Emergency services	242	33.40%
Apply wet, cool cloths to their head and/or body	74	10.20%

Make them drink water	73	10.10%
Call their doctor	30	4.10%
Remove or loosen tight or heavy clothing	26	3.60%
Make them rest	15	2.10%
Use an automated external defibrillator (AED)	4	0.60%
Make them eat	4	0.60%

Heat Exhaustion Protective Actions

Table 17 shows participants' selections for actions they would take if someone were experiencing heat exhaustion. Unlike the heat stroke question, participants could select multiple responses.

Most respondents identified the key recommended protective actions: moving the person to a cooler place (87.2%), making them drink water (81.4%), applying wet cloths (81.0%), removing tight or heavy clothing (74.8%), and ensuring they rest (70.0%). These results align closely with medical guidance for treating heat exhaustion, suggesting strong public awareness of the most effective strategies.

However, more than half of participants (58.4%) also endorsed calling 911, and just over half (51.6%) selected calling a doctor. These steps are not typically necessary unless symptoms progress to heat stroke. This indicates that while the public is largely familiar with appropriate actions for heat exhaustion, there may be some confusion between exhaustion and stroke in terms of when emergency medical care is warranted. A small minority of participants selected clearly irrelevant or unnecessary responses, such as using an AED (6.8%) or making the person eat (6.6%).

Overall, the findings suggest that participants broadly recognize the correct suite of protective actions for heat exhaustion, but public health messaging may need to better emphasize the distinction between (a) responses for heat exhaustion and the (b) the medical emergency response required for heat stroke.

Table 17. Heat Exhaustion Projective Action.

Heat Exhaustion Protective Action	Freq.	Percentage
Move them to a cooler place (e.g. somewhere with air conditioning or shade)	640	87.2%
Make them drink water	597	81.4%
Apply wet, cool cloths to their head and/or body	594	81.0%
Remove or loosen tight or heavy clothing	549	74.8%
Make them rest	513	70.0%
Call 911/Emergency services	428	58.4%
Call their doctor	378	51.6%

Use an automated external defibrillator (AED)	50	6.8%
Make them eat	48	6.6%

3.3 Survey Regression Results

To examine factors associated with public understanding of extreme heat terminology, we conducted a series of linear regression analyses predicting accurate and inaccurate belief scores for each focal term. These models allow us to move beyond descriptive patterns and identify which geographic, experiential, and demographic factors are associated with greater accuracy or greater misunderstanding.

For each hazard term and for beliefs about the effects of extreme heat on mental health, two models were estimated: one predicting mean accurate belief scores and one predicting mean inaccurate belief scores. Predictor variables included NOAA climate region, direct and indirect experience with extreme heat, interest in weather, exposure to weather forecasts, rurality, gender, age, race/ethnicity, education, and income.

Descriptive distributions for all belief items are provided in Appendix B. Full model estimations, including all coefficients, standard errors, and model fit statistics, are reported in Appendix C. The results presented below focus on statistically significant predictors and patterns with clear implications for communication strategy and message targeting.

3.3.1 Heat Index

For accurate beliefs, several predictors were significant. Indirect experience with extreme heat (B = 0.245, $p < .001$) and direct experience (B = 0.068, $p = .067$, marginal) were positively associated with accurate beliefs. Greater interest in the weather (B = 0.111, $p = .005$) and higher exposure to weather forecasts (B = 0.120, $p = .003$) also predicted more accurate beliefs. Older age was associated with more accurate beliefs (B = 0.109, $p = .007$). By contrast, non-Hispanic Black (B = –0.110, $p = .003$) and non-Hispanic "other" race respondents (B = –0.107, $p = .002$) reported fewer accurate beliefs compared to non-Hispanic White respondents.

For inaccurate beliefs, different patterns emerged. Direct experience was associated with fewer inaccurate beliefs (B = –0.081, $p = .031$), while greater interest in the weather was associated with more inaccurate beliefs (B = 0.256, $p < .001$). Age was negatively associated with inaccurate beliefs (B = –0.212, $p < .001$), suggesting older adults were less likely to endorse misconceptions. Urban residents reported more inaccurate beliefs than suburban residents (B = 0.094, $p = .018$). Non-Hispanic Black respondents (B = 0.093, $p = .013$) also reported more inaccurate beliefs relative to non-Hispanic White respondents.

Finally, we see no significant effects of geographical location for the endorsement of either accurate or inaccurate beliefs.

Taken together, the models suggest that experience with heat, interest in weather, and age are important predictors of accuracy, while racial identity may shape patterns of both accurate and inaccurate beliefs. Notably, interest in the weather and forecast exposure improves accuracy but do not necessarily reduce susceptibility to misconceptions, highlighting the persistence of mixed understanding even among engaged audiences.

3.3.2 Relative Humidity

Several consistent predictors emerged across models.

For accurate beliefs, indirect experience with extreme heat was a strong positive predictor (B = 0.251, $p < .001$), while direct experience also increased accuracy (B = 0.110, $p = .003$). Older age was associated with more accurate beliefs (B = 0.100, $p = .013$), whereas men reported fewer accurate beliefs than women and non-binary participants (B = –0.112, $p = .002$). Effects of weather engagement were marginal: interest in the weather (B = 0.074, $p = .059$) and exposure to weather forecasts (B = 0.077, $p = .059$) trended positive but did not reach conventional significance levels. By race/ethnicity, non-Hispanic other respondents reported fewer accurate beliefs (B = –0.073, $p = .035$). Several regions showed modestly higher accurate beliefs compared to the Southwest, particularly the Northeast (B = 0.127, $p = .030$).

For inaccurate beliefs, different patterns emerged. Indirect experience (B = 0.102, $p = .011$) and interest in the weather (B = 0.147, $p < .001$) were associated with *more* inaccurate beliefs, while direct experience reduced inaccuracies (B = –0.110, $p = .004$). Age again predicted fewer inaccuracies (B = –0.153, $p < .001$). Urban residents reported significantly more inaccurate beliefs than suburban residents (B = 0.218, $p < .001$). Racial differences also appeared: non-Hispanic Black respondents reported more inaccurate beliefs (B = 0.078, $p = .037$).

Regional patterns were pronounced: compared to the Southwest, residents in the Northeast (B = 0.226, $p < .001$), Upper Midwest (B = 0.140, $p = .006$), Ohio Valley (B = 0.155, $p = .018$), Southeast (B = 0.186, $p = .002$), and Northwest (B = 0.131, $p = .004$) all reported significantly higher inaccurate beliefs about relative humidity.

Taken together, these findings reinforce themes from the overall models: direct experience with heat improves accuracy and reduces inaccuracies, while age is also a significant predictor. At the same time, interest in the weather marginally increases accurate beliefs and significantly increases inaccurate beliefs, suggesting deeper engagement does not necessarily buffer people from misconceptions. Regional patterns are particularly strong for relative humidity, with residents outside the Southwest more likely to endorse inaccurate beliefs, highlighting the role of climate context in shaping public understanding of this term.

3.3.3 Heat Advisory

For accurate beliefs, predictors largely mirrored patterns observed for other terminology. Indirect experience with extreme heat was positively associated with accuracy (B = 0.154, $p <$

.001), and direct experience was marginally positive (B = 0.070, p = .066). Interest in the weather (B = 0.106, p = .009) and exposure to weather forecasts (B = 0.124, p = .005) also predicted more accurate beliefs. Men reported fewer accurate beliefs than other genders (B = –0.123, p = .001). Geographic differences were minimal; no region showed significantly higher accuracy compared to the Southwest.

For inaccurate beliefs, a different set of predictors emerged. Direct experience reduced inaccuracies (B = –0.134, p < .001), while interest in the weather increased them (B = 0.175, p < .001). Older age predicted fewer inaccuracies (B = –0.179, p < .001). Urban residents reported more inaccurate beliefs than suburban residents (B = 0.139, p < .001). Regional differences were also evident; compared to the Southwest, residents in the Northeast (B = 0.119, p = .048), Upper Midwest (B = 0.114, p = .026), and Northwest (B = 0.140, p = .003) expressed more inaccurate beliefs. Racial differences emerged as well: non-Hispanic Black respondents (B = 0.094, p = .015) and marginally, non-Hispanic Asian respondents (B = 0.070, p = .053), reported more inaccurate beliefs than non-Hispanic White respondents.

Taken together, these findings reinforce patterns observed with other terms: experience and age improve accuracy and reduce misconceptions, while interest in the weather increases both accuracy and inaccuracy. Geographic patterns were especially pronounced for heat advisory, with residents outside the Southwest being more likely to endorse inaccurate beliefs.

3.3.4 Extreme Heat Warning

For accurate beliefs, several predictors were significant. Indirect experience with extreme heat (B = 0.215, p < .001) and direct experience (B = 0.115, p = .002) were positively associated with accuracy. Interest in the weather trended positively (B = 0.075, p = .058), and exposure to weather forecasts predicted greater accuracy (B = 0.103, p = .011). Older age was also associated with more accurate beliefs (B = 0.147, p < .001). Men reported fewer accurate beliefs than women (B = –0.144, p < .001). Income was positively associated with accuracy (B = 0.088, p = .041). By region, residents in the Upper Midwest (B = 0.103, p = .041), Southern region (B = 0.156, p = .004), and Western region (B = 0.157, p = .007) reported more accurate beliefs compared to those in the Southwest.

For inaccurate beliefs, a different set of predictors emerged. Interest in the weather predicted more inaccuracies (B = 0.193, p < .001), whereas older age reduced inaccuracies (B = –0.121, p = .005). Urban residents reported more inaccurate beliefs than suburban residents (B = 0.163, p < .001). Men were marginally more likely than women to endorse inaccurate beliefs (B = 0.070, p = .068). Regional patterns were weaker, with no region significantly different from the Southwest at conventional levels, although the Northwest trended higher (B = 0.081, p = .084).

These findings suggest that both direct and indirect experience, age, weather engagement, and socioeconomic factors (gender, income) play a role in shaping accurate beliefs about extreme heat warnings. However, like other terminology, interest in the weather appears to be a

double-edged sword: while it increases accuracy, it also predicts greater endorsement of misconceptions.

3.3.5 Synthesis of Regression Results Across Hazard Terms

For accurate beliefs, regional variation was evident. Compared to the Southwest, residents in the Northeast endorsed more accurate beliefs about relative humidity, while residents in the Upper Midwest, South, and West endorsed more accurate beliefs about extreme heat warnings. These patterns likely reflect differences in local climate and communication practices: humidity is more salient in the Northeast than in the arid Southwest, while regions that issue heat warnings more frequently (even if not the hottest on an absolute scale) may build stronger familiarity with that terminology.

Experience emerged as one of the most consistent predictors. Direct experience with extreme heat was associated with greater endorsement of accurate beliefs about relative humidity and extreme heat warnings. Indirect experience, such as having previously been under a heat advisory or warning, was even more robust as being positively associated with accurate beliefs across all four terms. Weather engagement also mattered: greater interest in the science of weather predicted more accurate beliefs about heat index and heat advisory, while exposure to weather forecasts predicted more accuracy for heat index, heat advisory, and extreme heat warning. Importantly, even for terms that did not reach conventional levels of significance, associations trended positive, suggesting that both interest and exposure contribute to accuracy.

Demographic effects also appeared. Men consistently endorsed fewer accurate beliefs about relative humidity, heat advisories, and extreme heat warnings compared to other genders. Older participants endorsed more accurate beliefs about heat index, relative humidity, and extreme heat warnings. Urban residents reported more accurate beliefs about heat advisories, potentially reflecting the frequency of such advisories in urban heat island settings. Higher income was positively associated with accurate beliefs about extreme heat warnings. By race/ethnicity, non-Hispanic Black participants endorsed fewer accurate beliefs about heat index, while multiracial and “other” non-Hispanic respondents endorsed fewer accurate beliefs about multiple terms (heat index, relative humidity, heat advisories, and mental health impacts).

For inaccurate beliefs, regional differences were more extensive. Compared to the Southwest, the Northwest endorsed more inaccurate beliefs about heat index; the Northeast, Upper Midwest, Ohio Valley, Southeast, and Northwest endorsed more inaccurate beliefs about relative humidity; and the Northeast, Upper Midwest, and Northwest endorsed more inaccurate beliefs about heat advisories. These findings may reflect both differences in climatology and differences in familiarity with terminology.
Direct and indirect experiences had divergent effects. Direct experience was linked to more inaccurate beliefs about heat index, relative humidity, and heat advisory. Indirect experience, however, was linked to greater endorsement of inaccurate beliefs about relative humidity. This

may suggest a form of overconfidence: individuals exposed indirectly may feel more knowledgeable and endorse a wider range of beliefs, whether accurate or not. Similarly, greater interest in the science of weather was associated with more inaccurate beliefs across all five terms, reinforcing the pattern that deeper engagement boosts confidence but not necessarily accuracy. In contrast, forecast exposure increased accuracy without significantly affecting inaccuracy, suggesting that repeated exposure to operational weather language may better support accurate interpretation compared to interest alone.

Demographics again played a central role. Age was strongly protective, with older participants endorsing more accurate beliefs and fewer inaccurate beliefs across most terms. Urban residents endorsed more inaccurate beliefs about all terms. This pattern may reflect the complexity of urban information environments, where multiple channels and local advisory practices create both opportunities and confusion. Education and income showed few consistent effects. Finally, racial differences emerged, with non-Hispanic Black participants endorsing more inaccurate beliefs about heat index, relative humidity, and advisories than non-Hispanic White participants.

Taken together, these results highlight a few overarching themes. Experience and age strengthen accurate schemas and reduce susceptibility to inaccuracies, while indirect experience and interest in weather increase confidence but do not shield against misconceptions. Regional context shapes both accuracy and inaccuracy, likely reflecting climatological realities and exposure to particular terminology. Finally, personal characteristics like gender, race, and urbanicity influence how people interpret heat-related terms.

3.3.6 Mental Health

For accurate beliefs, several predictors emerged. Direct experience with extreme heat was positively associated with endorsing accurate beliefs (B = 0.137, $p < .001$), as was indirect experience (B = 0.117, $p < .001$). Greater interest in weather (B = 0.069, $p = .018$) also predicted accuracy, while forecast exposure trended positively (B = 0.057, $p = .063$). Men were less likely to endorse accurate beliefs than other genders (B = –0.085, $p = .002$), and non-Hispanic “other” respondents also endorsed fewer accurate beliefs (B = –0.056, $p = .031$).

For inaccurate beliefs, different patterns appeared. Direct experience was protective, associated with fewer inaccuracies (B = –0.156, $p < .001$), while age predicted more inaccuracies (B = 0.080, $p = .005$). Urban residents reported significantly fewer inaccurate beliefs than suburban residents (B = –0.208, $p < .001$), contrasting with the pattern observed for other hazard terms. Education was positively associated with inaccuracies (B = 0.081, $p = .008$), suggesting that higher educational attainment did not shield respondents from endorsing misconceptions in this domain.

Regional differences were limited: the only significant effect was that residents of the Northwest reported more inaccurate beliefs than those in the Southwest (B = 0.109, $p = .001$).

These findings indicate that both direct and indirect experiences with heat increase recognition of its mental health impacts, while demographic effects differ from those observed for other terminology. Notably, older adults and more educated respondents were more likely to endorse inaccurate beliefs, while urban residents were less likely to do so. This divergence suggests that beliefs about the mental health impacts of heat may be shaped less by climatological familiarity and more by cultural framing and generational differences in how mental health is understood.

Chapter 4: Conclusion and Recommendations

We find that public understanding of heat terminology remains uneven. Across both the focus groups and the national survey, participants demonstrated baseline awareness of core heat concepts, but interpretations were often incomplete, inconsistent, or shaped more by intuitive word cues than by formal definitions.

Several consistent patterns emerged. First, participants preferred plain, intuitive language over technical terminology. Terms such as “heat index” and especially “apparent temperature” were interpreted inconsistently, while “feels-like temperature” was widely viewed as clearer and more relatable. When multiple terms appeared to describe similar concepts, participants expressed frustration and confusion.

Second, participants relied heavily on word modifiers to infer severity. The term “extreme” reliably signaled greater danger than “advisory,” even when participants did not know the formal differences between products. In the absence of numerical thresholds or duration information, individuals used language cues as heuristics for risk assessment. This pattern suggests that word choice alone can meaningfully shape perceived urgency and behavioral intent.

Third, although medically vulnerable groups such as older adults and individuals with chronic conditions were widely recognized, social and structural vulnerabilities were substantially under-identified. Factors such as low income, social isolation, language barriers, and lack of transportation were rarely selected as risk drivers, despite strong evidence that they shape heat exposure and adaptive capacity. This gap highlights an opportunity for communication that broadens public understanding of vulnerability beyond individual health status.

Fourth, participants demonstrated strong recognition of core heat-related illnesses but frequently conflated related conditions. In both qualitative and survey findings, heat exhaustion and heat stroke were perceived as largely overlapping conditions. Similarly, “heat illness” was treated as a catch-all term encompassing both medically defined conditions and broader outcomes associated with sun exposure or general discomfort. This blending of concepts may reduce clarity as to when emergency action is required.

Fifth, findings related to cooling centers, medication susceptibility, and checking on neighbors revealed uncertainty. Although many participants understood the general purpose of cooling centers and neighbor check-ins, misconceptions about eligibility, activation criteria, and appropriate risk indicators were common. These misunderstandings may inadvertently reduce protective behavior.

Importantly, the survey results demonstrate that these patterns are not isolated to specific regions or demographic groups. While experience with extreme heat and interest in weather were associated with greater belief accuracy in some models, misunderstanding was broadly

distributed. This suggests that communication challenges are structural rather than confined to particular audiences.

Taken together, the findings underscore a central principle: scientific accuracy alone does not guarantee public understanding. Terminology that is technically correct may still be interpreted in unintended ways. When individuals rely on intuitive meaning, prior experience, and word cues to fill gaps in knowledge, small differences in phrasing can produce meaningful differences in perceived risk and response.

For the National Weather Service and its partners, these results point toward several communication priorities:

- Favor plain, intuitive language when possible or pair technical terms with clear explanation.
- Provide numerical thresholds, duration, and contextual detail alongside categorical labels.
- Clarify distinctions between related conditions, particularly heat exhaustion and heat stroke.
- Broaden public understanding of vulnerability to include social and structural factors.
- Support core partners by reducing ambiguity around eligibility and activation of protective resources such as cooling centers.

As the frequency and intensity of extreme heat events increases, effective communication will remain a central component of public health and safety. This report demonstrates that the public is attentive and motivated, but clarity, consistency, and specificity are essential to translate meteorological information into protective action. By aligning terminology with how people interpret risk in practice, agencies can strengthen both understanding and response during extreme heat events nationwide.

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A1. Appendix A: Extreme Heat Survey

Start of Block: Intro

[Introduction]: Thank you for your interest in participating in our study. Before beginning the survey, please review the information below: This research study is about perceptions of extreme heat information. It is being conducted by Dr. Micki Olson along with other researchers at the University at Albany. The survey, which will take about 15 minutes of your time, will ask questions about your perceptions about extreme heat information. Participation in this study is completely voluntary, and you are free to decline to answer any survey question, to decline to participate entirely, or to stop participating at any time. However, if you do not complete the survey, you may not receive compensation for the amount you agreed upon before you entered the survey. Your identity and your responses will remain confidential to the extent permitted by law and only research staff at the University at Albany will have access to the data. The results of this study will be reported in the aggregate: no individual's responses will be identifiable. None of our staff have any financial interest in the results of this study. These data are being collected to inform the development of hazard warning messages and will not be sold to a third party. Nor will these data be used at a later date to sell you something. If you have questions about your rights as a research participant, you may contact the University at Albany Institutional Review Board at (518) 437-3850 or irb@albany.edu. For any other questions about the study, contact Dr. Micki Olson at mkolson@albany.edu. We appreciate your time and effort for this research study.

[Consent]: Now that you have this information, are you willing to participate in this study?

- ○ Yes (1)
- ○ No (2)

Skip To: End of Block If Consent = No

Page Break

[State Residence]: In which US State do you currently reside?

▼ Alabama (1) ... Wyoming (56)

[Zipcode]: What is your zipcode?

_____

[Rurality]: What type of area do you currently live in?

- ○ Urban location in a densely population area (1)
- ○ Suburban location in a neighborhood that's near a densely populated area (2)
- ○ Rural location in a sparsely populated area (3)

Page Break

*

[Age]: What is your current age?

_____

Skip To: End of Block If Condition: What is your current age? Is Less Than 18. Skip To: End of Block.

[Gender]: With which gender do you most identify?

- ○ Man (1)
- ○ Woman (2)
- ○ Non-binary (3)
- ○ Prefer to self describe (4) _____

End of Block: Intro

Start of Block: Hazard Experience

[Transition]: To begin, we would like to know about your recent experiences with extreme heat or very hot weather.

Page Break

[Direct Experience]: During the past year, have you or a member of your household experienced any of the following **that you suspect were caused by extreme heat or very hot weather**? Please select all that apply.

- Nausea or vomiting
- Headache
- Heavy sweating during intense exercise
- Fainting
- Rapid Heartbeat
- Confusion
- Dizziness
- Muscle pain or cramps
- Cold, pale, and clammy skin
- Felt too hot while indoors at home
- Felt too hot while indoors away from home
- Felt too hot while outdoors
- Had decreased productivity while working
- Experienced difficulty falling asleep due to the temperature
- Had problems concentrating
- Felt agitated or angry
- None of the above

Page Break

[Indirect Experience]: Please indicate your level of agreement with the following statements. During the past year, I have...

	Strongly disagree (1)	Somewhat disagree (2)	Neither agree or disagree (3)	Somewhat agree (4)	Strongly agree (5)
Been under a heat warning.	○	○	○	○	○
Received a heat warning (not as a test).	○	○	○	○	○
Heard or watched live news coverage an extreme heat event as it was happening.	○	○	○	○	○
Seen news coverage about the aftermath of an extreme heat event.	○	○	○	○	○

Page Break

[Protective Action Experience]: Thinking about the worst heat conditions you have ever experienced, did you take actions to protect yourself?

- ○ Yes
- ○ No

Display this question:
If Protective Action Experience = Yes

[Protective Action Experience – Open Ended]: What actions did you do to protect yourself?

_____
_____
_____
_____
_____

Page Break

[Weather Interest]: How would you describe your interest in the science of weather?

- ○ Very low (1)
- ○ Low (2)
- ○ Moderate (3)
- ○ High (4)
- ○ Very high (5)

[Weather Information Exposure]: How often do you typically watch, hear, or read a weather forecast?

- ○ Never (1)
- ○ Multiple times per month (2)
- ○ Multiple times per week, but not daily (3)
- ○ Once per day (4)
- ○ Multiple times per day (5)

End of Block: Hazard Experience

Start of Block: Sources and Channels

[Transition]: Next, we would like to know about how you receive heat information.

Page Break

[Sources]: Which sources do you usually rely on for information about extreme heat events? (Select all that apply)

- Friends, family, co-workers, employers or supervisors
- The National Weather Service
- Local news stations
- National or cable news stations (e.g., CNN, Fox News, MSNBC)
- Weather specific sources (e.g., The Weather Channel, AccuWeather)
- Smartphone default weather app
- My personal observations (e.g., how it feels outside)
- Local, state, or federal health agencies
- Local, state, or federal emergency management agencies
- School communications (e.g., people, leaders, alerts, or newsletters)
- Churches or other religious organization communicators (e.g., e.g., people, leaders, alerts, or newsletters)
- Utility providers
- Local health clinics or primary care providers
- Local or national nonprofits (e.g, the American Red Cross)
- Other_____

Page Break

[Channels]: Where do you usually look for information about extreme heat events? (Select all that apply)

- Social media (e.g., Twitter/X, Facebook, TikTok)
- Television
- Internet websites or search engines (e.g., Google)
- Weather radio (e.g., NOAA Weather Radio)
- AM/FM radio
- Newspapers (print or digital editions)
- Smart phone apps and/or push notifications
- Text messages or email alerts from organizations
- Other_____

End of Block: Sources and Channels

Start of Block: Hazard Information Transition

[Transition]: The following questions will ask you about heat hazards. **This is not intended to be a test or exam.** We are interested in learning about your honest perceptions of the meaning of terms that are used by weather officials and communicators. *Your answers will help us to improve communication about extreme heat.* Please answer based on your current knowledge and/or opinions. We ask that you do not search for answers online or consult external sources.

End of Block: Hazard Information Transition

Start of Block: Heat Index

[Heat Index – Hazard]: Please indicate your level of agreement with the following statements.

Heat index...

	Strongly disagree (1)	Somewhat disagree (2)	Neither agree nor disagree (3)	Somewhat agree (4)	Strongly agree (5)
Is what the air outside feels like on my body.	○	○	○	○	○
Is the opposite of wind chill.	○	○	○	○	○
Is the same as air temperature.	○	○	○	○	○
Increases when it is sunny out.	○	○	○	○	○
Is lower when it is windy.	○	○	○	○	○
Includes humidity.	○	○	○	○	○

Page Break

[Heat Index - Susceptibility/Impacts]: Please indicate your level of agreement with the following statements.

High **heat index**....

	Strongly disagree (1)	Somewhat disagree (2)	Neither agree nor disagree (3)	Somewhat agree (4)	Strongly agree (5)
Can make you sick.	○	○	○	○	○
Can make it harder for you to breathe.	○	○	○	○	○
Can make it harder for sweat to cool you off.	○	○	○	○	○
Only impacts people who are outside or without air conditioning.	○	○	○	○	○
Can affect people during the day and night.	○	○	○	○	○
Only impacts older adults.	○	○	○	○	○

Page Break

[Heat Index Protective Actions]: Please indicate the extent to which you agree with the following statements regarding their effectiveness in protecting you from heat. When **heat index** is high, you should…

	Strongly disagree (1)	Somewhat disagree (2)	Neither agree nor disagree (3)	Somewhat agree (4)	Strongly agree (5)
Stay in air-conditioned spaces.	○	○	○	○	○
Stay indoors even if you don't have air conditioning.	○	○	○	○	○
Use fans if you don't have air conditioning.	○	○	○	○	○
Take cold showers.	○	○	○	○	○
Drink alcohol to hydrate.	○	○	○	○	○
Drink more water than usual.	○	○	○	○	○
Stay out of the sun.	○	○	○	○	○
Reschedule outdoor activities to cooler parts of the day, like morning and/or night.	○	○	○	○	○
Wear light, loose clothing if outside.	○	○	○	○	○
Eat spicy food to cool off.	○	○	○	○	○

End of Block: Heat Index

Start of Block: Relative Humidity

[Relative Humidity – Hazard]: Please indicate your level of agreement with the following statements.

Relative humidity...

	Strongly disagree (13)	Somewhat disagree (14)	Neither agree nor disagree (15)	Somewhat agree (16)	Strongly agree (17)
Tells you how much moisture is in the air.	○	○	○	○	○
Is a measure only used in the summer.	○	○	○	○	○
Is the amount of water vapor in the air compared to how much the air can hold at that temperature.	○	○	○	○	○
Tells you how comfortable or uncomfortable it will be outside.	○	○	○	○	○
Decreases as air temperature increases, if the amount of moisture stays the same.	○	○	○	○	○
Increases with altitude because the cooler temperatures at higher elevations can hold more moisture in the air.	○	○	○	○	○

Page Break

[Relative Humidity – Susceptibility/Impacts]: Please indicate your level of agreement with the following statements.

High **relative humidity**...

	Strongly disagree (1)	Somewhat disagree (2)	Neither agree nor disagree (3)	Somewhat agree (4)	Strongly agree (5)
Can make you sick.	○	○	○	○	○
Can make it harder for you to breathe.	○	○	○	○	○
Can make it harder for sweat to cool you off.	○	○	○	○	○
Only impacts people who are outside or without air conditioning.	○	○	○	○	○
Can affect people during the day and night.	○	○	○	○	○
Only impacts older adults.	○	○	○	○	○

Page Break

[Relative Humidity - Protective Actions]: Please indicate the extent to which you agree with the following statements regarding their effectiveness in protecting you from humidity.

When **relative humidity** is high, you should...

	Strongly disagree (1)	Somewhat disagree (2)	Neither agree nor disagree (3)	Somewhat agree (4)	Strongly agree (5)
Stay in air-conditioned spaces.	○	○	○	○	○
Stay indoors even if you don't have air conditioning.	○	○	○	○	○
Use fans if you don't have air conditioning.	○	○	○	○	○
Take cold showers.	○	○	○	○	○
Drink alcohol to hydrate.	○	○	○	○	○
Drink more water than usual.	○	○	○	○	○
Stay out of the sun.	○	○	○	○	○
Reschedule outdoor activities to cooler parts of the day, like morning and/or night.	○	○	○	○	○
Wear light, loose clothing if outside.	○	○	○	○	○
Eat spicy food to cool off.	○	○	○	○	○

End of Block: Relative Humidity

Start of Block: Heat vs. Humidity

[Heat vs. Humidity]: Heat combined with humidity is more dangerous than heat alone

- ○ True
- ○ False

Page Break

Display this question:
If HeatVsHumidity = True

[Heat vs Humidity Open Ended = True]: In your own words, why is heat combined with humidity more dangerous?

_____
_____
_____
_____
_____

Display this question:
If HeatVsHumidity = False

HeatVsHumidityOpenFa In your own words, why is heat more dangerous than heat combined with humidity?

_____
_____
_____
_____
_____

End of Block: Heat vs. Humidity

Start of Block: Product Information Transition

[Transition]: The following questions are about types of heat information from the National Weather Service. **This is not intended to be a test or exam.** We are interested in learning about your honest perceptions of the meaning of terms that are used by weather officials and communicators. *Your answers will help us to improve communication about extreme heat.* Please answer based on your current knowledge and/or opinions. We ask that you do not search for answers online or consult external sources.

End of Block: Product Information Transition

Start of Block: Heat Advisory

[Heat Advisory – Hazard]: Please indicate your level of agreement with the following statements. A **Heat Advisory**....

	Strongly disagree (1)	Somewhat disagree (2)	Neither agree nor disagree (3)	Somewhat agree (4)	Strongly agree (5)
Means record breaking heat will occur. (1)	○	○	○	○	○
Means it will be hotter than normal. (2)	○	○	○	○	○
Happens anytime it is hot outside. (3)	○	○	○	○	○
Is different from an extreme heat warning. (5)	○	○	○	○	○
Can happen in both cities and rural areas. (11)	○	○	○	○	○
Only happens during the day. (12)	○	○	○	○	○
Has no impact on air quality. (14)	○	○	○	○	○

Page Break

[Heat Advisory– Susceptibility/Impacts]: Please indicate your level of agreement with the following statements. A **Heat Advisory** means...

	Strongly disagree (1)	Somewhat disagree (2)	Neither agree nor disagree (3)	Somewhat agree (4)	Strongly agree (5)
The heat will make it hard to breathe. (1)	○	○	○	○	○
It can become life-threatening for everyone. (2)	○	○	○	○	○
It can be dangerous to your health to not have air conditioning. (3)	○	○	○	○	○
Heat can be dangerous at any time of day, including at night. (4)	○	○	○	○	○
Heat can be dangerous both outdoors and indoors. (5)	○	○	○	○	○
Only those with health issues, like heart problems, need to be aware. (6)	○	○	○	○	○

Page Break

[Heat Advisory - Protective Actions]: Please indicate your level of agreement with the following statements. If a **Heat Advisory** is forecasted or in effect, you should...

	Strongly disagree (1)	Somewhat disagree (2)	Neither agree nor disagree (3)	Somewhat agree (4)	Strongly agree (5)
Stay in air-conditioned spaces. (1)	○	○	○	○	○
Stay indoors even if you don't have air conditioning. (9)	○	○	○	○	○
Use fans if you don't have air conditioning. (2)	○	○	○	○	○
Take cold showers. (3)	○	○	○	○	○
Drink alcohol to hydrate. (4)	○	○	○	○	○
Drink more water than usual. (5)	○	○	○	○	○
Stay out of the sun. (6)	○	○	○	○	○
Reschedule your outdoor activities to cooler parts of the day, like morning and/or night. (7)	○	○	○	○	○
Wear light, loose clothing if outside. (8)	○	○	○	○	○
Eat spicy food to cool off. (10)	○	○	○	○	○

End of Block: Heat Advisory

Start of Block: Extreme Heat Warning

[Extreme Heat Warning – Hazard]: Please indicate your level of agreement with the following statements. An **Extreme Heat Warning**...

	Strongly disagree (1)	Somewhat disagree (2)	Neither agree nor disagree (3)	Somewhat agree (4)	Strongly agree (5)
Means record breaking heat will occur. (1)	○	○	○	○	○
Means it will be hotter than normal. (2)	○	○	○	○	○
Happens anytime it is hot outside. (3)	○	○	○	○	○
Is different from a heat advisory. (5)	○	○	○	○	○
Can happen in both cities and rural areas. (11)	○	○	○	○	○
Only happens during the day. (12)	○	○	○	○	○
Has no impact on air quality. (14)	○	○	○	○	○
Is hotter than an excessive heat warning. (17)	○	○	○	○	○

Page Break

[Extreme Heat Warning – Susceptibility/Impacts]: Please indicate your level of agreement with the following statements. An **Extreme Heat Warning** means...

	Strongly disagree (1)	Somewhat disagree (2)	Neither agree nor disagree (3)	Somewhat agree (4)	Strongly agree (5)
The heat will make it hard to breathe. (1)	○	○	○	○	○
It can become life-threatening to everyone. (2)	○	○	○	○	○
It can be dangerous to your health to not have air conditioning. (3)	○	○	○	○	○
Heat can be dangerous at any time of day, including at night. (4)	○	○	○	○	○
Heat can be dangerous both outdoors and indoors. (5)	○	○	○	○	○
Only those with health issues, like heart problems, need to be aware. (6)	○	○	○	○	○

Page Break

[Extreme Heat Warning - Protective Actions]: Please indicate your level of agreement with the following statements. When an **Extreme Heat Warning** is forecasted or in effect, you should...

	Strongly disagree (1)	Somewhat disagree (2)	Neither agree nor disagree (3)	Somewhat agree (4)	Strongly agree (5)
Stay in air-conditioned spaces. (1)	○	○	○	○	○
Stay indoors even if you don't have air conditioning. (2)	○	○	○	○	○
Use fans if you don't have air conditioning. (9)	○	○	○	○	○
Take cold showers. (3)	○	○	○	○	○
Drink alcohol to hydrate (4)	○	○	○	○	○
Drink more water than usual. (5)	○	○	○	○	○
Stay out of the sun. (6)	○	○	○	○	○
Reschedule your outdoor activities to cooler parts of the day, like morning and/or night. (7)	○	○	○	○	○
Wear light, loose clothing if outside. (8)	○	○	○	○	○
Eat spicy food to cool off. (10)	○	○	○	○	○

End of Block: Extreme Heat Warning

Start of Block: Impacts Transition and Illness

Instructions The following questions are about heat impacts. **This is not intended to be a test or exam.** We are interested in learning about your honest perceptions of the meaning of terms

that are used by weather officials. *Your answers will help us to improve communication about extreme heat.* Please answer based on your current knowledge and/or opinions. Please do not search for answers online or consult external sources.

Page Break

[Heat Illness - Hazard]: Which of the following are symptoms of **heat illness**? Select all that apply.

- ☐ Sunburn (1)
- ☐ Heat rash (2)
- ☐ Eye cataracts (3)
- ☐ Heat cramps (4)
- ☐ Depression (5)
- ☐ Kidney failure (6)
- ☐ Breathing problems like asthma (7)
- ☐ Heat stroke (8)
- ☐ Weight gain (9)
- ☐ Premature aging, sunspots, and/or skin cancer (10)
- ☐ Heat exhaustion (11)

End of Block: Impacts Transition and Illness

Start of Block: Heat Exhaustion

[Heat Exhaustion – Hazard]: Please indicate your level of agreement with the following statements. **Heat exhaustion**...

	Strongly disagree (1)	Somewhat disagree (2)	Neither agree nor disagree (3)	Somewhat agree (4)	Strongly agree (5)
Is not life threatening. (1)	○	○	○	○	○
Is the same thing as heat illness. (2)	○	○	○	○	○
Occurs when your body temperature rises above a certain point. (3)	○	○	○	○	○
Can still occur even if you are not over-exerting yourself. (4)	○	○	○	○	○

Page Break

[Heat Exhaustion – Hazard 2]: Which of the following are symptoms of **heat exhaustion**? Select all that apply.

- [ ] Confusion (2)
- [ ] Cool, moist skin (3)
- [ ] Dizziness (4)
- [ ] Dry eyes (5)
- [ ] Extremely high body temperature (6)
- [ ] Fainting (7)
- [ ] Headache (8)
- [ ] Heavy sweating (9)
- [ ] High blood pressure (10)
- [ ] Hot, red skin (11)
- [ ] Insomnia (13)
- [ ] Loss of consciousness (14)
- [ ] Nausea or vomiting (15)
- [ ] Rapid heartbeat/pulse (16)
- [ ] Rapid, shallow breathing (17)
- [ ] Shaking (19)
- [ ] Weakness (20)
- [ ] Muscle cramps (21)

Page Break

[Heat Exhaustion – Susceptibility/Impacts]: **Heat exhaustion** can happen to anyone regardless of their health.

- ○ Strongly disagree (1)
- ○ Somewhat disagree (2)
- ○ Neither agree nor disagree (3)
- ○ Somewhat agree (4)
- ○ Strongly agree (5)

Page Break

[Heat Exhaustion - Protective Actions]:If you suspect someone has **heat exhaustion,** you should: (select all that apply)

- ☐ Move them to a cooler place (e.g. somewhere with air conditioning or shade) (1)
- ☐ Make them drink water (2)
- ☐ Make them rest (3)
- ☐ Remove or loosen tight or heavy clothing (5)
- ☐ Call their doctor (6)
- ☐ Use an automated external defibrillator (AED) (7)
- ☐ Apply wet, cool cloths to their head and/or body (8)
- ☐ Make them eat (9)
- ☐ Call 911/Emergency services (10)

End of Block: Heat Exhaustion

Start of Block: Heat Stroke

[Heat Stroke – Hazard]: Please indicate your level of agreement with the following statement. **Heat stroke**...

	Strongly disagree (1)	Somewhat disagree (2)	Neither agree nor disagree (3)	Somewhat agree (4)	Strongly agree (5)
Is not life threatening. (1)	○	○	○	○	○
Is the same thing as heat illness. (2)	○	○	○	○	○
Occurs when your body temperature rises above a certain point. (3)	○	○	○	○	○
Can still occur even if you are not over-exerting yourself. (5)	○	○	○	○	○

Page Break

[Heat Stroke – Hazard 2]: Which of the following are symptoms of **heat stroke**? Select all that apply.

- [ ] Confusion (2)
- [ ] Cool, moist skin (3)
- [ ] Dizziness (4)
- [ ] Dry eyes (5)
- [ ] Extremely high body temperature (6)
- [ ] Fainting (7)
- [ ] Headache (8)
- [ ] Heavy sweating (9)
- [ ] High blood pressure (10)
- [ ] Hot, red skin (11)
- [ ] Insomnia (13)
- [ ] Loss of consciousness (14)
- [ ] Nausea or vomiting (15)
- [ ] Rapid heartbeat/pulse (16)
- [ ] Rapid, shallow breathing (17)
- [ ] Shaking (19)
- [ ] Weakness (20)
- [ ] Muscle cramps (21)

Page Break

[Heat Stroke – Susceptibility/Impacts]: Heat stroke can happen to anyone regardless of their health.

- ○ Strongly disagree (1)
- ○ Somewhat disagree (2)
- ○ Neither agree nor disagree (3)
- ○ Somewhat agree (4)
- ○ Strongly agree (5)

Page Break

[Heat Stroke - Protective Actions]: If you suspect someone has **heat stroke**, the FIRST thing you should do is:

- ○ Move them to a cooler place (e.g. somewhere with air conditioning or shade) (1)
- ○ Make them drink water (2)
- ○ Make them rest (3)
- ○ Remove or loosen tight or heavy clothing (5)
- ○ Call their doctor (6)
- ○ Use an automated external defibrillator (AED) (7)
- ○ Apply wet, cool cloths to their head and/or body (8)
- ○ Make them eat (9)
- ○ Call 911/Emergency services (10)

End of Block: Heat Stroke

Start of Block: Vulnerable Groups

Instructions The following questions are about heat vulnerable groups. **This is not intended to be a test or exam.** We are interested in learning about your honest perceptions of the meaning of terms that are used by weather officials. *Your answers will help us to improve communication*

about extreme heat. Please answer based on your current knowledge and/or opinions. Please do not search for answers online or consult external sources.

Page Break

[Vulnerable Groups]: Which of the following groups are at an increased risk of getting sick on hot days? Please select all that apply:

- ☐ People who work inside with air conditioning (1)
- ☐ People over the age of 65 (2)
- ☐ People who are pregnant (4)
- ☐ People who are low income. (5)
- ☐ Children under the age of 4 (7)
- ☐ People with air conditioning (9)
- ☐ Pets (11)
- ☐ People who work indoors without air conditioning (13)
- ☐ People who live in rural communities (14)
- ☐ People with a medical condition like obesity, heart disease, or mental illness (15)
- ☐ People who commonly experience extreme heat (17)
- ☐ People who are unhoused or without stable housing (18)
- ☐ Racial or ethnic minorities (19)
- ☐ People whose ancestors come from hot climates (20)
- ☐ Non-English speakers or those with limited English proficiency (21)
- ☐ People with a physical disability. For example, those using a wheelchair or mobility device (22)
- ☐ People without a vehicle (23)
- ☐ Athletes (24)
- ☐ People who live alone (25)
- ☐ People who are socially isolated (28)

Page Break

[Medication]: Most prescription and/or over the counter medications can make you more susceptible to getting sick from extreme heat.

- ○ Strongly disagree (1)
- ○ Somewhat disagree (2)
- ○ Neither agree nor disagree (3)
- ○ Somewhat agree (4)
- ○ Strongly agree (5)

Page Break

[Mental Health]: Please indicate your level of agreement with the following statements. Hot temperatures...

	Strongly disagree (1)	Somewhat disagree (2)	Neither agree nor disagree (3)	Somewhat agree (4)	Strongly agree (5)
Make people irritable. (1)	○	○	○	○	○
Make it hard to concentrate. (2)	○	○	○	○	○
Help relieve stress. (4)	○	○	○	○	○
Make people behave more impulsively. (5)	○	○	○	○	○
Do not impact a person's mental health. (6)	○	○	○	○	○
Make it hard for you to sleep. (7)	○	○	○	○	○
Make people less social. (9)	○	○	○	○	○
Make people sleep more. (10)	○	○	○	○	○

End of Block: Vulnerable Groups

Start of Block: Protective Actions

Instructions The following questions are about heat protective actions. **This is not intended to be a test or exam.** We are interested in learning about your honest perceptions of the meaning of terms that are used by weather officials. *Your answers will help us to improve communication about extreme heat.* Please answer based on your current knowledge and/or opinions. Please do not search for answers online or consult external sources.

Page Break

[Cooling Centers] Please indicate your level of agreement with the following statements. **Cooling centers** are...

	Strongly disagree (1)	Somewhat disagree (2)	Neither agree nor disagree (3)	Somewhat agree (4)	Strongly agree (5)
Only available for the needy. (2)	○	○	○	○	○
Only available for those who are unhoused. (3)	○	○	○	○	○
Open to those with air conditioning at home. (7)	○	○	○	○	○
Can be open during any extreme heat event (depending on local guidelines). (6)	○	○	○	○	○
Only open when there is a power outage during extreme heat. (9)	○	○	○	○	○

Page Break

[Check Neighbors Beliefs]: If you are told to "**check on your neighbors**" during a heat event, you should check if...(select all that apply)

- [ ] They have access air conditioning. (1)
- [ ] They have access to cold water. (2)
- [ ] They are overweight. (3)
- [ ] They are hydrated. (4)
- [ ] They have good personal hygiene. (5)
- [ ] Their home is too hot. (6)
- [ ] Their home needs repairs. (7)
- [ ] They are showing signs of heat illness such as dizziness, headache, or nausea. (8)
- [ ] They have personal or work stress. (9)
- [ ] They seem coherent. (10)
- [ ] Their home is organized. (11)
- [ ] They have cash available. (12)
- [ ] Their blood pressure is high. (13)
- [ ] Their body temperature is high. (14)

[Check Neighbors Frequency]: How often should you check on someone during an extreme heat event?

- ○ Once a day (1)
- ○ Twice a day (2)
- ○ In the morning (3)
- ○ At night (4)
- ○ As often as they will let you (5)

End of Block: Protective Actions

Start of Block: Demographics

[Race/Ethnicity]: What is your racial or ethnic identity? Select all that apply

- ☐ African-American/Black (1)
- ☐ East Asian (2)
- ☐ Hispanic/Latinx (3)
- ☐ Middle Eastern (4)
- ☐ American Indian/Alaskan Native (5)
- ☐ Pacific Islander (6)
- ☐ South Asian (7)
- ☐ Southeast Asian (8)
- ☐ White (9)
- ☐ Other (please specify) (10)

_____

[Education]: What is the highest level of education you have completed?

- ○ Less than high school degree (1)
- ○ High school degree or equivalent (e.g. GED) (2)
- ○ Some college but no degree (3)
- ○ Associate's Degree (4)
- ○ Bachelor's Degree (5)
- ○ Master's, Doctoral, or Professional Degree (6)

[Income]: What was your total household income before taxes during the past 12 months?

- ○ Less than $20,000 (1)
- ○ $20,000 - $39,000 (2)
- ○ $40,000 - $59,000 (3)
- ○ $60,000 - $99,000 (4)
- ○ $100,000 - $149,000 (5)
- ○ $150,000 - $199,000 (6)
- ○ $200,000 and above (7)

Page Break

SurveyOpenResponse If you have any additional comments or feedback you'd like to share, please feel free to provide them below.

_____
_____
_____
_____
_____

End of Block: Demographics

B1. Appendix B: Beliefs Descriptives

Table 18. Heat Index Item Frequency.

Statement	Strongly Disagree	Somewhat Disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
Is what the air outside fells like on my body	3.9%	7.1%	16.0%	38.3%	34.7%
Is the opposite of wind chill	7.1%	10.4%	18.8%	34.2%	29.6%
Is the same as air temperature	25.7%	25.9%	18.9%	17.5%	12.0%
Increases when it is sunny out	1.8%	3.5%	16.0%	40.4%	38.3%
Is lower when it is windy	4.6%	12.7%	28.3%	39.0%	15.5%
Includes humidity	2.9%	4.3%	18.5%	35.9%	38.4%
Can make you sick	2.0%	2.1%	7.9%	34.0%	54.1%
Can make it harder for you to breathe	1.7%	2.8%	8.0%	36.5%	51.0%
Can make it harder for sweat to cool you off	2.2%	3.5%	15.6%	33.6%	45.1%
Only impacts people who are outside or without air conditioning	15.7%	25.9%	17.5%	23.5%	17.5%
Can affect people during the day and night	0.8%	2.5%	11.1%	34.4%	51.2%
Only impacts older adults	46.6%	22.8%	10.3%	9.4%	10.9%
Stay in air-conditioned spaces	1.3%	1.7%	5.3%	32.2%	59.6%
Stay indoors even if you don't have air conditioning	5.8%	11.2%	25.6%	34.7%	22.7%
Use fans if you don't have air conditioning	1.4%	2.2%	5.5%	32.2%	58.7%
Take cold showers	1.5%	6.1%	16.0%	37.1%	39.3%
Drink alcohol to hydrate	68.1%	11.7%	6.4%	6.4%	7.5%
Drink more water than usual	0.4%	1.4%	6.0%	25.9%	66.2%
Stay out of the sun	1.4%	2.8%	5.4%	23.3%	67.1%
Reschedule outdoor activities to cooler parts of the day, like morning and/or night	0.7%	2.1%	6.4%	29.5%	61.3%
Wear light, loose clothing if outside	0.4%	1.8%	5.0%	28.1%	64.7%
Eat spicy food to cool off	54.2%	16.4%	15.3%	7.9%	6.1%

Table 19. Relative Humidity Item Frequency

Statement	Strongly Disagree	Somewhat Disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
Tells you how much moisture is in the air	2.7%	3.2%	10.9%	41.2%	41.9%
Is a measure only used in the summer	30.5%	23.6%	19.8%	17.7%	8.5%
Is the amount of water vapor in the air compared to how much the air can hold at that temperature	1.9%	3.9%	26.4%	40.4%	27.4%
Tells you how comfortable or uncomfortable it will be outside	2.0%	4.9%	16.1%	42.7%	34.3%
Decreases as air temperature increases, if the amount of moisture stays the same	8.8%	13.7%	37.7%	24.5%	15.2%
Increases with altitude because the cooler temperatures at higher elevations can hold more moisture in the air	8.6%	12.2%	35.9%	25.7%	17.5%
Can make you sick	3.0%	5.1%	17.6%	42.6%	31.8%
Can make it harder for you to breathe	1.9%	3.6%	12.4%	40.0%	42.0%
Can make it harder for sweat to cool you off	2.6%	6.3%	17.3%	34.8%	39.0%
Only impacts people who are outside or without air conditioning	20.6%	21.4%	18.0%	23.0%	17.0%
Can affect people during the day and night	1.1%	1.3%	10.1%	35.8%	51.7%
Only impacts older adults	46.3%	20.8%	11.7%	11.2%	10.0%
Stay in air-conditioned spaces	1.8%	1.9%	10.5%	38.7%	47.1%
Stay indoors even if you don't have air conditioning	7.4%	16.6%	28.2%	26.0%	21.7%

Use fans if you don't have air conditioning	1.3%	1.9%	6.5%	37.5%	52.8%
Take cold showers	1.5%	4.6%	20.6%	39.8%	33.5%
Drink alcohol to hydrate	67.0%	9.8%	7.3%	8.9%	7.0%
Drink more water than usual	1.0%	2.0%	7.1%	29.2%	60.7%
Stay out of the sun	2.2%	1.6%	8.4%	29.3%	58.5%
Reschedule outdoor activities to cooler parts of the day, like morning and/or night	0.8%	1.4%	10.1%	30.0%	57.7%
Wear light, loose clothing if outside	1.1%	1.5%	6.5%	30.0%	61.0%
Eat spicy food to cool off	53.1%	17.9%	12.9%	8.8%	7.3%

Table 20. Heat Advisory Item Frequency.

Statement	Strongly Disagree	Somewhat Disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
Means record breaking heat will occur	4.9%	14.4%	18.7%	31.1%	30.9%
Means it will be hotter than normal	1.0%	2.5%	8.2%	37.6%	50.7%
Happens anytime it is hot outside	18.4%	24.9%	19.9%	19.3%	17.5%
Is different from an extreme heat warning	3.2%	7.0%	21.6%	36.1%	32.1%
Can happen in both cities and rural areas	0.8%	1.1%	7.7%	25.8%	64.6%
Only happens during the day	28.2%	29.0%	16.4%	16.8%	9.5%
Has no impact on air quality	36.3%	26.4%	18.4%	12.4%	6.6%
The heat will make it hard to breathe	1.6%	4.5%	14.4%	45.1%	34.3%
It can become life-threatening for everyone	1.8%	7.0%	13.2%	37.3%	40.8%
It can be dangerous to your health to not have air conditioning	1.4%	6.2%	15.6%	40.1%	36.7%
Heat can be dangerous at any time of day, including at night	1.0%	2.9%	8.8%	38.0%	49.4%
Heat can be dangerous both outdoors and indoors	1.0%	2.3%	8.5%	36.0%	52.3%
Only those with health issues, like heart problems, need to be aware	42.2%	20.9%	8.9%	13.9%	14.1%
Stay in air-conditioned spaces	1.0%	1.5%	6.0%	40.1%	51.4%
Stay indoors even if you don't have air conditioning	6.4%	11.4%	24.8%	31.4%	26.0%
Use fans if you don't have air conditioning	0.8%	1.2%	6.7%	35.9%	55.3%
Take cold showers	2.2%	6.5%	18.2%	37.4%	35.7%
Drink alcohol to hydrate	69.6%	10.0%	6.8%	6.8%	6.7%
Drink more water than usual	0.6%	1.8%	5.0%	27.9%	64.8%
Stay out of the sun	1.4%	1.5%	5.6%	27.9%	63.6%

Reschedule your outdoor activities to cooler parts of the day, like morning and/or night	0.4%	1.8%	7.0%	31.5%	59.3%
Wear light, loose clothing if outside	0.5%	1.1%	5.5%	27.8%	65.1%
Eat spicy food to cool off	58.8%	13.7%	11.9%	9.2%	6.4%

Table 21. Extreme Heat Warning Item Frequency.

Statement	Strongly Disagree	Somewhat Disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
Means record breaking heat will occur	4.1%	6.8%	13.0%	35.0%	41.1%
Means it will be hotter than normal	1.4%	1.0%	5.7%	26.9%	65.0%
Happens anytime it is hot outside	21.3%	21.9%	19.1%	18.5%	19.2%
Is different from a heat advisory	4.0%	5.2%	17.7%	38.7%	34.4%
Can happen in both cities and rural areas	1.1%	2.1%	6.0%	24.1%	66.7%
Only happens during the day	26.9%	25.2%	17.7%	18.1%	12.0%
Has no impact on air quality	35.1%	29.3%	14.7%	11.7%	9.1%
Is hotter than an excessive heat warning	3.5%	4.2%	21.7%	33.2%	37.4%
The heat will make it hard to breathe	1.8%	3.0%	11.5%	36.7%	47.1%
It can become life-threatening to everyone	1.8%	2.5%	8.6%	32.1%	55.1%
It can be dangerous to your health to not have air conditioning	1.9%	4.0%	13.8%	33.9%	46.4%
Heat can be dangerous at any time of day, including at night	2.0%	3.3%	6.8%	31.2%	56.7%
Heat can be dangerous both outdoors and indoors	1.5%	2.9%	8.1%	32.0%	55.6%
Only those with health issues, like heart problems, need to be aware	45.3%	17.6%	8.2%	11.8%	17.1%
Stay in air-conditioned spaces	0.7%	1.9%	6.2%	28.8%	62.5%
Stay indoors even if you don't have air conditioning	6.0%	10.7%	25.2%	30.1%	28.0%
Use fans if you don't have air conditioning	1.0%	1.1%	6.7%	29.5%	61.8%
Take cold showers	1.2%	3.6%	18.4%	32.7%	44.1%
Drink alcohol to hydrate	69.8%	10.0%	6.3%	6.7%	7.3%
Drink more water than usual	1.2%	1.1%	5.4%	22.4%	69.9%
Stay out of the sun	1.5%	1.4%	5.6%	21.0%	70.5%

Reschedule your outdoor activities to cooler parts of the day, like morning and/or night	0.5%	1.8%	6.7%	25.5%	65.5%
Wear light, loose clothing if outside	0.8%	1.6%	5.5%	25.0%	67.1%
Eat spicy food to cool off	58.5%	13.4%	13.4%	9.0%	5.7%

Table 22. Mental Health Item Frequency.

Statement	Strongly Disagree	Somewhat Disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
Make people irritable	0.8%	2.6%	8.3%	39.8%	48.5%
Make it hard to concentrate	0.6%	2.0%	10.4%	42.5%	44.5%
Help relieve stress	51.9%	22.3%	10.5%	8.4%	7.0%
Make people behave more impulsively	4.7%	6.1%	30.8%	33.5%	24.8%
Do not impact a person's mental health	36.5%	28.4%	16.8%	10.7%	7.5%
Make it hard for you to sleep	1.7%	2.9%	7.5%	35.7%	52.1%
Make people less social	3.5%	5.4%	25.9%	36.3%	28.9%
Make people sleep more	18.1%	17.7%	32.4%	18.1%	13.7%

C1. Appendix C: Regression Models

Table 23. Regression results for accurate and inaccurate beliefs about heat index.

	Accurate		Inaccurate	
	B	p	B	p
Northeastern (vs. Southwest)	-0.008	0.892	0.076	0.194
Upper Midwestern (vs. Southwest)	0.065	0.187	0.034	0.494
Ohio Valley (vs. Southwest)	-0.018	0.765	-0.022	0.724
Southeastern (vs. Southwest)	0.058	0.333	0.018	0.764
Northern Rockies/ Plains (vs. Southwest)	0.048	0.212	-0.037	0.340
Southern (vs. Southwest)	0.055	0.306	-0.004	0.943
Northwestern (vs. Southwest)	-0.023	0.604	**0.120**	**0.008**
Western (vs. Southwest)	-0.024	0.666	-0.008	0.889
Direct Experience	0.068	0.067	**-0.081**	**0.031**
Indirect Experience	**0.245**	**<0.001**	0.055	0.165
Interest in Weather	**0.111**	**0.005**	**0.256**	**<0.001**
Weather Forecast Exposure	**0.120**	**0.003**	-0.058	0.160
Male (vs. Female and Non-Binary)	-0.048	0.192	0.034	0.365
Age	**0.109**	**0.007**	**-0.212**	**<0.001**
Urban (vs. Suburban)	0.005	0.893	**0.094**	**0.018**
Rural (vs. Suburban)	0.036	0.347	-0.012	0.755
Non-Hispanic Black (vs. Non-Hispanic White)	**-0.110**	**0.003**	**0.093**	**0.013**
Non-Hispanic Asian (vs. Non-Hispanic White)	-0.038	0.278	0.020	0.572
Hispanic (vs. Non-Hispanic White)	-0.019	0.603	-0.008	0.823
Non-Hispanic Other (vs. Non-Hispanic White)	**-0.107**	**0.002**	-0.012	0.745
Income	0.068	0.112	0.000	0.997
Education	-0.066	0.107	0.061	0.142

Table 24. Regression results for accurate and inaccurate beliefs about relative humidity.

	Accurate		Inaccurate	
	B	p	B	p
Northeastern (vs. Southwest)	**0.127**	**0.030**	**0.226**	**<0.001**
Upper Midwestern (vs. Southwest)	0.083	0.097	**0.140**	**0.006**
Ohio Valley (vs. Southwest)	0.103	0.107	**0.155**	**0.018**
Southeastern (vs. Southwest)	0.097	0.102	**0.186**	**0.002**
Northern Rockies/ Plains (vs. Southwest)	0.033	0.386	0.042	0.281
Southern (vs. Southwest)	0.042	0.440	0.043	0.444
Northwestern (vs. Southwest)	0.054	0.232	**0.131**	**0.004**
Western (vs. Southwest)	0.035	0.560	0.065	0.291
Direct Experience	**0.110**	**0.003**	**-0.110**	**0.004**
Indirect Experience	**0.251**	**<0.001**	**0.102**	**0.011**
Interest in Weather	0.074	0.059	**0.147**	**<0.001**
Weather Forecast Exposure	0.077	0.059	0.015	0.721
Male (vs. Female and Non-Binary)	**-0.112**	**0.002**	0.005	0.900
Age	**0.100**	**0.013**	**-0.153**	**<0.001**
Urban (vs. Suburban)	0.055	0.141	**0.218**	**<0.001**
Rural (vs. Suburban)	0.039	0.283	0.017	0.657
Non-Hispanic Black (vs. Non-Hispanic White)	0.009	0.809	**0.078**	**0.037**
Non-Hispanic Asian (vs. Non-Hispanic White)	-0.066	0.060	0.007	0.843
Hispanic (vs. Non-Hispanic White)	-0.006	0.859	0.010	0.784
Non-Hispanic Other (vs. Non-Hispanic White)	**-0.073**	**0.035**	0.024	0.493
Income	0.046	0.263	0.045	0.281
Education	0.009	0.820	0.016	0.705

Table 25. Regression results for accurate and inaccurate beliefs about heat advisory.

	Accurate		Inaccurate	
	B	p	B	p
Northeastern (vs. Southwest)	-0.054	0.373	**0.119**	**0.048**
Upper Midwestern (vs. Southwest)	0.022	0.675	**0.114**	**0.026**
Ohio Valley (vs. Southwest)	-0.044	0.482	0.083	0.186
Southeastern (vs. Southwest)	0.001	0.981	0.073	0.227
Northern Rockies/ Plains (vs. Southwest)	0.051	0.206	-0.004	0.926
Southern (vs. Southwest)	0.007	0.901	0.018	0.753
Northwestern (vs. Southwest)	0.032	0.495	**0.140**	**0.003**
Western (vs. Southwest)	-0.071	0.239	0.048	0.424
Direct Experience	0.070	0.066	**-0.134**	**<0.001**
Indirect Experience	**0.154**	**<0.001**	0.075	0.071
Interest in Weather	**0.106**	**0.009**	**0.175**	**<0.001**
Weather Forecast Exposure	**0.124**	**0.005**	0.041	0.341
Male (vs. Female and Non-Binary)	**-0.123**	**0.001**	-0.052	0.165
Age	0.069	0.100	**-0.179**	**<0.001**
Urban (vs. Suburban)	**0.098**	**0.015**	**0.139**	**<0.001**
Rural (vs. Suburban)	0.025	0.528	-0.002	0.949
Non-Hispanic Black (vs. Non-Hispanic White)	0.039	0.316	**0.094**	**0.015**
Non-Hispanic Asian (vs. Non-Hispanic White)	-0.041	0.269	0.070	0.053
Hispanic (vs. Non-Hispanic White)	0.010	0.802	0.041	0.273
Non-Hispanic Other (vs. Non-Hispanic White)	**-0.085**	**0.022**	0.010	0.794
Income	0.041	0.342	-0.028	0.506
Education	-0.032	0.447	-0.004	0.921

Table 26. Regression results for accurate and inaccurate beliefs about extreme heat warning.

	Accurate		Inaccurate	
	B	p	B	p
Northeastern (vs. Southwest)	0.095	0.102	0.079	0.192
Upper Midwestern (vs. Southwest)	**0.103**	**0.041**	0.019	0.715
Ohio Valley (vs. Southwest)	0.098	0.132	0.013	0.854
Southeastern (vs. Southwest)	0.115	0.060	0.085	0.182
Northern Rockies/ Plains (vs. Southwest)	0.056	0.147	-0.012	0.774
Southern (vs. Southwest)	**0.156**	**0.004**	0.037	0.519
Northwestern (vs. Southwest)	0.054	0.231	0.081	0.084
Western (vs. Southwest)	**0.157**	**0.007**	0.060	0.326
Direct Experience	**0.115**	**0.002**	-0.036	0.368
Indirect Experience	**0.215**	**<0.001**	0.031	0.446
Interest in Weather	0.075	0.058	**0.193**	**<0.001**
Weather Forecast Exposure	**0.103**	**0.011**	0.009	0.822
Male (vs. Female and Non-Binary)	**-0.144**	**<0.001**	0.070	0.068
Age	**0.147**	**<0.001**	**-0.121**	**0.005**
Urban (vs. Suburban)	0.008	0.839	**0.163**	**<0.001**
Rural (vs. Suburban)	0.027	0.480	-0.008	0.843
Non-Hispanic Black (vs. Non-Hispanic White)	-0.021	0.575	0.050	0.200
Non-Hispanic Asian (vs. Non-Hispanic White)	-0.039	0.271	-0.010	0.781
Hispanic (vs. Non-Hispanic White)	-0.047	0.192	-0.037	0.323
Non-Hispanic Other (vs. Non-Hispanic White)	-0.045	0.201	-0.002	0.959
Income	**0.088**	**0.041**	0.013	0.773
Education	-0.028	0.508	-0.002	0.966

Table 27. Results of linear regressions for accurate beliefs (all terms).

	Heat Index		Relative Humidity		Heat advisory		Extreme Heat Warning	
	B	p	B	p	B	p	B	p
Northeastern (vs. Southwest)	-0.008	0.892	**0.127**	**0.030**	-0.054	0.373	0.095	0.102
Upper Midwestern (vs. Southwest)	0.065	0.187	0.083	0.097	0.022	0.675	**0.103**	**0.041**
Ohio Valley (vs. Southwest)	-0.018	0.765	0.103	0.107	-0.044	0.482	0.098	0.132
Southeastern (vs. Southwest)	0.058	0.333	0.097	0.102	0.001	0.981	0.115	0.060
Northern Rockies/ Plains (vs. Southwest)	0.048	0.212	0.033	0.386	0.051	0.206	0.056	0.147
Southern (vs. Southwest)	0.055	0.306	0.042	0.440	0.007	0.901	**0.156**	**0.004**
Northwestern (vs. Southwest)	-0.023	0.604	0.054	0.232	0.032	0.495	0.054	0.231
Western (vs. Southwest)	-0.024	0.666	0.035	0.560	-0.071	0.239	**0.157**	**0.007**
Direct Experience	0.068	0.067	**0.110**	**0.003**	0.070	0.066	**0.115**	**0.002**
Indirect Experience	**0.245**	**<0.001**	**0.251**	**<0.001**	**0.154**	**<0.001**	**0.215**	**<0.001**
Interest in Weather	**0.111**	**0.005**	0.074	0.059	**0.106**	**0.009**	0.075	0.058
Weather Forecast Exposure	**0.120**	**0.003**	0.077	0.059	**0.124**	**0.005**	**0.103**	**0.011**
Male (vs. Female and Non-Binary)	-0.048	0.192	**-0.112**	**0.002**	**-0.123**	**0.001**	**-0.144**	**<0.001**
Age	**0.109**	**0.007**	**0.100**	**0.013**	0.069	0.100	**0.147**	**<0.001**
Urban (vs. Suburban)	0.005	0.893	0.055	0.141	**0.098**	**0.015**	0.008	0.839
Rural (vs. Suburban)	0.036	0.347	0.039	0.283	0.025	0.528	0.027	0.480
Non-Hispanic Black (vs. Non-Hispanic White)	**-0.110**	**0.003**	0.009	0.809	0.039	0.316	-0.021	0.575
Non-Hispanic Asian (vs. Non-Hispanic White)	-0.038	0.278	-0.066	0.060	-0.041	0.269	-0.039	0.271
Hispanic (vs. Non-Hispanic White)	-0.019	0.603	-0.006	0.859	0.010	0.802	-0.047	0.192
Non-Hispanic Other (vs. Non-Hispanic White)	**-0.107**	**0.002**	**-0.073**	**0.035**	**-0.085**	**0.022**	-0.045	0.201
Income	0.068	0.112	0.046	0.263	0.041	0.342	**0.088**	**0.041**

Education	-0.066	0.107	0.009	0.820	-0.032	0.447	-0.028	0.508

Table 28. Results of linear regressions for inaccurate beliefs (all terms).

	Heat Index		Relative Humidity		Heat advisory		Extreme Heat Warning	
	B	p	B	p	B	p	B	p
Northeastern (vs. Southwest)	0.076	0.194	**0.226**	**<0.001**	**0.119**	**0.048**	0.079	0.192
Upper Midwestern (vs. Southwest)	0.034	0.494	**0.140**	**0.006**	**0.114**	**0.026**	0.019	0.715
Ohio Valley (vs. Southwest)	-0.022	0.724	**0.155**	**0.018**	0.083	0.186	0.013	0.854
Southeastern (vs. Southwest)	0.018	0.764	**0.186**	**0.002**	0.073	0.227	0.085	0.182
Northern Rockies/ Plains (vs. Southwest)	-0.037	0.340	0.042	0.281	-0.004	0.926	-0.012	0.774
Southern (vs. Southwest)	-0.004	0.943	0.043	0.444	0.018	0.753	0.037	0.519
Northwestern (vs. Southwest)	**0.120**	**0.008**	**0.131**	**0.004**	**0.140**	**0.003**	0.081	0.084
Western (vs. Southwest)	-0.008	0.889	0.065	0.291	0.048	0.424	0.060	0.326
Direct Experience	**-0.081**	**0.031**	**-0.110**	**0.004**	**-0.134**	**<0.001**	-0.036	0.368
Indirect Experience	0.055	0.165	**0.102**	**0.011**	0.075	0.071	0.031	0.446
Interest in Weather	**0.256**	**<0.001**	**0.147**	**<0.001**	**0.175**	**<0.001**	**0.193**	**<0.001**
Weather Forecast Exposure	-0.058	0.160	0.015	0.721	0.041	0.341	0.009	0.822
Male (vs. Female and Non-Binary)	0.034	0.365	0.005	0.900	-0.052	0.165	0.070	0.068
Age	**-0.212**	**<0.001**	**-0.153**	**<0.001**	**-0.179**	**<0.001**	**-0.121**	**0.005**
Urban (vs. Suburban)	**0.094**	**0.018**	**0.218**	**<0.001**	**0.139**	**<0.001**	**0.163**	**<0.001**
Rural (vs. Suburban)	-0.012	0.755	0.017	0.657	-0.002	0.949	-0.008	0.843
Non-Hispanic Black (vs. Non-Hispanic White)	**0.093**	**0.013**	**0.078**	**0.037**	**0.094**	**0.015**	0.050	0.200
Non-Hispanic Asian (vs. Non-Hispanic White)	0.020	0.572	0.007	0.843	0.070	0.053	-0.010	0.781
Hispanic (vs. Non-Hispanic White)	-0.008	0.823	0.010	0.784	0.041	0.273	-0.037	0.323
Non-Hispanic Other (vs. Non-Hispanic White)	-0.012	0.745	0.024	0.493	0.010	0.794	-0.002	0.959
Income	0.000	0.997	0.045	0.281	-0.028	0.506	0.013	0.773

Education	0.061	0.142	0.016	0.705	-0.004	0.921	-0.002	0.966

Table 29. Regression Results for effects of extreme heat on mental health.

	Accurate		Inaccurate	
	B	p	B	p
Northeastern (vs. Southwest)	0.020	0.647	0.057	0.182
Upper Midwestern (vs. Southwest)	-0.043	0.255	0.015	0.685
Ohio Valley (vs. Southwest)	0.008	0.873	0.018	0.694
Southeastern (vs. Southwest)	0.042	0.353	-0.031	0.482
Northern Rockies/ Plains (vs. Southwest)	0.014	0.639	-0.001	0.978
Southern (vs. Southwest)	0.040	0.330	-0.052	0.203
Northwestern (vs. Southwest)	0.031	0.353	**0.109**	**0.001**
Western (vs. Southwest)	-0.014	0.742	0.006	0.894
Direct Experience	**0.137**	**<0.001**	**-0.156**	**<0.001**
Indirect Experience	**0.117**	**<0.001**	-0.006	0.846
Interest in Weather	**0.069**	**0.018**	**0.087**	**0.003**
Weather Forecast Exposure	0.057	0.063	-0.029	0.343
Male (vs. Female and Non-Binary)	**-0.085**	**0.002**	0.017	0.529
Age	-0.002	0.937	**0.080**	**0.005**
Urban (vs. Suburban)	-0.033	0.272	**-0.208**	**<0.001**
Rural (vs. Suburban)	-0.003	0.924	-0.010	0.712
Non-Hispanic Black (vs. Non-Hispanic White)	-0.024	0.383	0.040	0.144
Non-Hispanic Asian (vs. Non-Hispanic White)	0.001	0.959	-0.008	0.767
Hispanic (vs. Non-Hispanic White)	0.007	0.789	-0.009	0.747
Non-Hispanic Other (vs. Non-Hispanic White)	**-0.056**	**0.031**	0.037	0.155
Income	0.024	0.435	-0.001	0.975
Education	-0.023	0.449	**0.081**	**0.008**