

# Extreme Heat Impacts and Household Preparedness in the Western United States

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## Issue Brief

### Background

As a result of climate change, extreme heat events worldwide are becoming more frequent, intense, and severe. While there is no single definition for extreme heat, it can be defined as a period of sustained and uncomfortable hot weather, with temperatures higher than normal for that area and season, lasting between 1-5 days (1).

Extreme heat can impact human health and wellbeing in a variety of ways. Research has shown worsened health outcomes and higher mortality rates, especially for people with chronic conditions (1-3), pregnant individuals (1), and among certain additional populations, including children, older adults, and individuals with low socioeconomic status (1,4). The negative impacts of extreme heat on mental health have also been documented (5).

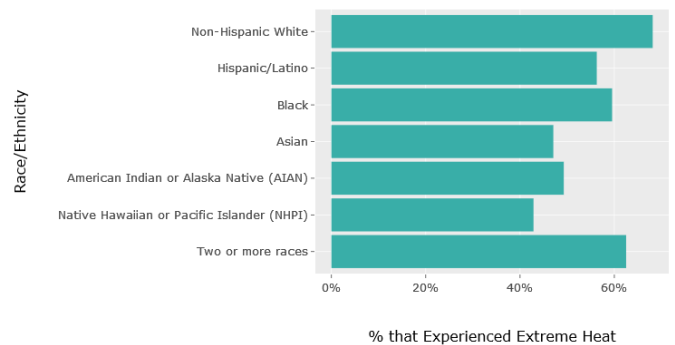
We aimed to explore the experiences with, impact of, and preparedness for extreme heat events among residents of the Western United States (U.S.) using data collected through an online survey of 1,740 adults living in Alaska, Arizona, California, Colorado, Idaho, Montana, Nevada, North Dakota, Oregon, South Dakota, Utah, Washington, and Wyoming. This data can help identify unmet needs among this population, as well as fill in gaps in our understanding of to how to best guide individuals as the risks of extreme heat exposures are likely to increase in the coming years.

## Findings

### Impacts of Extreme Heat

The survey found that 62% of adults living in the Western U.S. reported experiencing an extreme heat event since 2020. The likelihood of experiencing extreme heat differed across sociodemographic groups (Figure 1). Individuals that self-reported as female (65%, compared to male), Non-Hispanic White (67%, compared to other race/ethnicity groups), and aged 65 years or older (73%, compared to adults younger than 65 years of age) were more likely to report having experienced an extreme heat event (all  $p < 0.05$ ). Additionally, individuals with incomes below \$35,000 (56%, compared to all other income groups) and those identifying as politically independent (54%, compared to those identifying as Democrats or Republicans) were less likely to report having experienced extreme heat.

**Figure 1: % of Adults who Reported Experiencing Extreme Heat in Past 3 Years**



Among adults who had experienced extreme heat, 62% rated the degree of overall impact on their lives as

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a score of 6 or higher on a 10-point scale (“increased impact”). Significantly higher proportions of younger people (ages 18-29) reported increased impacts from extreme heat, compared to older age groups. We found no differences in the impact of extreme heat across other sociodemographic characteristics.

The survey also asked those respondents who had experienced extreme heat to rate how it affected specific dimensions of their life, with scores of 6 or higher on a 10-point scale denoting “increased impact”. Almost three quarters of the population noted increased impacts on the temperature outdoors (71%), and almost half reported increased impacts with respect to exercise and physical activity (45%) and temperatures indoors (42%). Increased impacts were also reported with respect to mood and wellbeing (37%), physical health (29%), financial impact (29%), ability to work (23%), impact to children (21%), transportation (20%), and access to food or medications (17%).

## Preparedness for Extreme Heat

Overall, the degree of self-rated preparedness for extreme heat events among our sample averaged 7.0 (standard deviation: 0.08) on a 10-point scale, with lower scores reported among people of color (including individuals identifying as Hispanic, African American, Asian, American Indian/Alaska Native, Native Hawaiian/Pacific Islander, or two/more races), compared to individuals who identified as Non-Hispanic White only (6.6 vs 7.4,  $p < 0.01$ ).

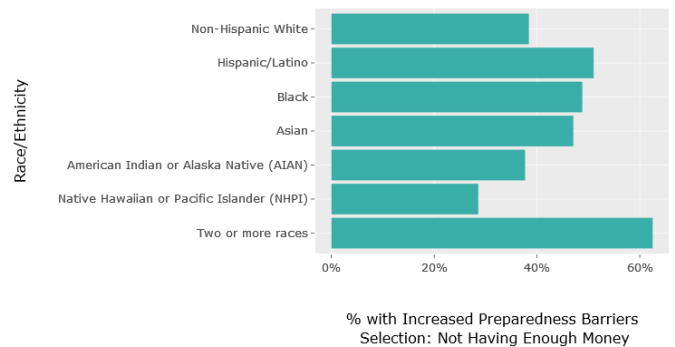
Additionally, we found that people of color were more likely to report experiencing increased barriers (scores 6+ on a 10-point scale) to preparedness for extreme heat, compared to Non-Hispanic Whites, in relation to their inability to modify their home (58.4% vs. 41.6%,  $p < 0.01$ ), transportation barriers (58.9% vs. 41.1%,  $p < 0.01$ ), lack of prioritization (58.8% vs. 41.2%,  $p < 0.01$ ), finances (59.1% vs. 40.9%,  $p < 0.01$ ), and not having enough information (56.7% vs. 43.3%,  $p < 0.01$ ). Figure 2 shows these differences across race/ethnicity groups.

We wanted to explore whether a respondents’ previous preparedness to extreme heat could influence their current level of preparedness. We found a significantly positive relationship between past and current preparedness, with each one-point score increase in past preparedness for extreme heat being associated with a 0.75 increase in current preparedness scores ( $p < 0.01$ ). This means that respondents who were prepared for an extreme heat event in the past are more likely to be currently prepared for extreme heat and suggests that supporting current preparedness behaviors may increase preparedness for future events.

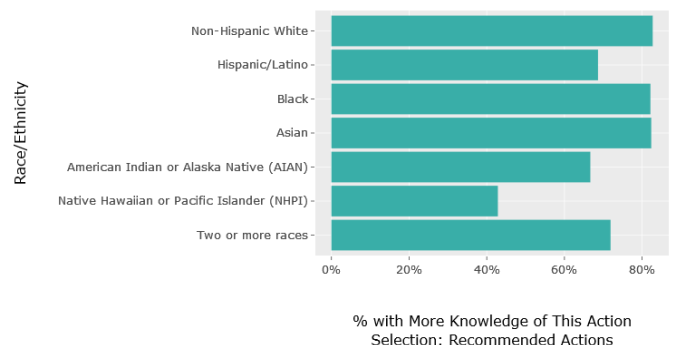
## Knowledge of Extreme Heat Mitigation Actions

Lastly, we assessed knowledge about extreme heat, and actions to take during extreme heat events that would help prevent or mitigate negative health effects. We found significant differences across racial and ethnic groups in the percentage of respondents with knowledge scores of 6 or higher on a 10-point scale (“more knowledgeable”) for specific topics associated with extreme heat (Figure 3). The percentage of people reporting being more knowledgeable was lower among people of color compared

**Figure 2: % of Adults Reporting Having Increased Barriers to Preparedness for Extreme Heat**



**Figure 3: % of Adults Reporting Knowledge Scores 6 or Higher for Extreme Heat Mitigation Actions**



to Non-Hispanic Whites with respect to knowing where to find information about when extreme heat will occur (45.5% vs. 54.5%,  $p < 0.01$ ); where to find information about recommended actions during extreme heat (46.6% vs. 56.6%,  $p < 0.01$ ); how to keep their home cool (46.6% vs. 53.4%,  $p < 0.01$ ); how to recognize the symptoms of heat related illness (46.7% vs. 53.3%,  $p < 0.01$ ); basic first aid for heat related illness (44.2% vs. 55.8%,  $p < 0.01$ ); and where to go if their home becomes too hot (46.8% vs. 53.2%,  $p < 0.01$ ).

## Conclusions

Insights into disparities associated with the impacts of extreme heat and preparedness among Western state residents are an important first step to identifying and addressing gaps in readiness for climate-related incidents that are relatively frequent. Our survey found that over two-thirds of the population residing in the Western U.S. have experienced extreme heat since 2020. Two thirds of respondents also stated that extreme heat had an increased impact on their lives overall, with the greatest impacts reported on physical activity as well as both indoor and outdoor temperatures.

While overall self-rated preparedness for extreme heat was high on average, statistically-significant differences emerged by race/ethnicity, with lower preparedness and higher reported barriers among non-White respondents. Similarly, knowledge about actions to take to mitigate the health effects of extreme heat was lower among people of color. These actions have been suggested by government agencies and health organizations as the best strategies for effectively decreasing the impacts of extreme heat, and lack of knowledge about these actions raises concerns about individuals' ability to implement mitigation strategies that can be protective for themselves and their families from the health consequences of extreme heat.

The results of this study highlight the need for public health interventions focused on education and preparedness support for minority populations. Furthermore, given some of the logistical barriers identified by people of color, providing instrumental and financial support to these communities could most effectively support their preparedness needs. Future work should explore preparedness patterns and gaps among sensitive populations (such as pregnant people and young children) as well as the cultural preferences and linguistic needs in communities of color to design interventions that are effective and responsive to these groups.

## Technical Notes

### Methods

We conducted an online panel survey of adults residing in the Western U.S. to assess preparedness for extreme heat (defined as a temperature of 90 degrees Fahrenheit for 3+ days) in the general population. Respondents included residents of Alaska, Arizona, California, Colorado, Idaho, Montana, Nevada, North Dakota, Oregon, South Dakota, Utah, Washington, and Wyoming. Post-sampling weights were implemented to ensure that the sample was representative of the sociodemographic characteristics of these states. The survey was conducted in May 2023, with a total of 1,740 survey responses meeting the data quality criteria.

Descriptive statistics were used to explore the distribution of variables in our survey associated with respondents' experience with extreme heat; t-tests, chi square tests, and Wilcoxon rank sums were used to compare differences in responses by sociodemographic characteristics. In particular, we examined participants' experience with extreme heat since 2020; the impact of extreme heat in their lives overall and in specific ways among those who previously experienced extreme heat; their preparedness for extreme heat events; and their knowledge of issues surrounding extreme heat. Answer choices ranged from 1-10, with higher scores denoting a stronger impact, being more prepared, or higher level of knowledge.

## Limitations

Some limitations should be noted in our research. While the definition used in this survey is based on a definition used by many government agencies, including the Federal Emergency Management Agency (FEMA) and the U.S. Department of Homeland Security (6,7), there is not a single agreed upon definition for extreme heat. Therefore, it is possible that using a slightly different definition could have elicited different responses in participants. Our data is based on self-reported responses, so we cannot confirm the actual temperatures experienced by respondents, nor can we standardize individual experiences of extreme heat across all respondents. Our survey was conducted online and in English, so individuals without access to the internet and those who do not speak English are not represented in our sample.

## Acknowledgements

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