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Title

Sociodemographic Factors and Vulnerability to Multiple Extreme Weather Events: A National Study in the U.S.

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ABSTRACT

Background:
Millions of U.S. residents experience increasingly more prevalent weather events due to climate change, however, there is limited research exploring the vulnerability to multiple extreme weather events using a national U.S. sample.

Aims:
Identify patterns in exposures to climate events, and examine sociodemographic factors associated with increased climate event vulnerability.

Method:
Data was retrieved from the May 2022 American Trends Panel, a nationally representative sample of 10,282 United States adults. We performed a latent class analysis to group respondents by patterns in five climate event experiences (heatwave, intense storm, wildfire, drought, and sea level rise), and analyzed variables associated with vulnerability to climate events using weighted multinomial logistic regression.

Results:
Respondents were categorized into four latent classes based on exposures to heatwave (42.5%), intense storm (43.2%), wildfire (21.3%), drought (30.8%) and sea level rise (15.8%): high (9.8%), heat-storm (22.2%), heat-drought (13.4%), and low (54.6%) climate event vulnerability. Relative risk for high climate event vulnerability was lower for older adults (relative risk ratio [RRR]=0.39, $p<0.001$), but higher for females (RRR=1.42, $p=0.01$) and residents in the South (RRR=2.05, $p=0.003$) and West (RRR=9.31, $p<0.001$) geographic regions. Relative risk for heat-drought was higher for Hispanic adults (RRR=1.51, $p=0.03$), but lower for high school graduates (RRR=0.40, $p=0.01$) compared to those who did not complete high school.

Conclusions:
We identified several underlying climate event exposure subpopulations, ranging from low to high vulnerability. As climate-related events become more frequent, our results provide critical insights for stakeholders to identify high-risk individuals and prioritize resources for disaster management.

Keywords: Climate Change, Extreme Weather, Flood, Heat, Storm, Wildfire

Impact Statement:
This study provides insights into the vulnerability of U.S. residents to multiple climate-related events, highlighting the sociodemographic groups most at risk. The findings are expected to guide policymakers in developing targeted disaster preparedness and resource allocation strategies, thus minimizing the adverse effects of extreme weather events on vulnerable communities.

1 INTRODUCTION

As the global climate continues to change, the frequency and intensity of extreme weather events such as heatwaves, severe storms, wildfires, droughts, and sea level rise are escalating. These events significantly impact human health, economic stability, and ecosystems, with vulnerable populations often bearing the brunt of these effects [1]. In the United States (U.S.), the impact of extreme weather events is also profound. For instance, reports from the National Oceanic and Atmospheric Administration (NOAA) indicate that in 2020, the U.S. suffered economic losses exceeding $95 billion due to extreme climate events, setting a new annual record for hurricane-related costs [2]. Additionally, according to the U.S. Centers for Disease Control and Prevention (CDC), extreme heat is a significant health hazard, with an average of 700 heat-related deaths per year in the U.S. between 2004 and 2018, though this number is likely an underestimate due to indirect effects not being fully captured [3].

Climate change disproportionately affects vulnerable groups, including low-income communities, older adults, and people of color. For example, older individuals and children have higher mortality rates during heatwaves, illustrating the unequal burden that climate change imposes on these populations [4]. Numerous studies have highlighted that low-income households are less able to afford the costs associated with climate adaptation, such as home cooling systems or flood insurance, making them more susceptible to extreme heat and flooding [5]. Similarly, racial disparities in climate vulnerability have been documented, with Black and Hispanic communities in the U.S. being more likely to live in areas prone to heatwaves and poor air quality, which increases their susceptibility to heat-related illnesses and other climate risks [6]. Gender also plays a critical role, with women—particularly in developing nations—often bearing a greater burden during and after climate disasters due to social roles and caregiving responsibilities [7]. These studies underscore the complex and multifaceted nature of climate vulnerability, emphasizing the need for targeted interventions that address these inequities.

Some previous systematic reviews have highlighted the broader and more severe impacts of climate events beyond those reported by direct data sources. A review by Ebi et al. (2021) [8] highlights that these events not only increase immediate morbidity and mortality but also place a sustained burden on public health infrastructure and resources. The study suggests that building climate-resilient health systems and implementing proactive adaptation measures are crucial to mitigating the ongoing health and economic impacts of climate change. This comprehensive perspective is necessary for developing effective strategies to mitigate the multifaceted consequences of climate change. Many studies have been conducted on the effects of individual climate events such as heatwaves [9] and hurricanes [10]. However, these studies, while foundational, primarily address isolated events and are often confined to specific geographical areas. Recent research on individual climate events continues to advance our understanding of their isolated impacts. For example, studies have detailed the physiological and environmental consequences of heatwaves, noting increased mortality rates during prolonged high-temperature periods. For example, Lee et al. (2016) [11] found that in Seoul, Korea, the cumulative risk of mortality rises substantially after four consecutive days of extreme heat, demonstrating the added effects of prolonged heat exposure. Similarly, research has explored the localized economic disruptions caused by severe storms, highlighting their acute impacts on infrastructure and community resources [5].

Although there is research investigating factors associated with exposure to climate events, there is limited research that has performed an analysis using a nationally representative U.S. sample, which may limit the generalizability of prior findings. In addition, there is a lack of

research examining multiple exposures to climate events. Therefore, our present study has two objectives: (1) Identify subpopulations of U.S. residents based on patterns in exposure to five climate events (heatwave, severe weather, wildfire, drought, and sea level rise) and (2) Examine sociodemographic factors associated with increased vulnerability to climate events.

Unlike prior studies, which often focus on single climate events or region-specific data, we utilize data from a nationally representative sample of U.S. adults, to provide a more holistic view of climate risk. We employed latent class analysis (LCA) to identify distinct subpopulations based on their exposure to multiple climate events, offering a nuanced understanding that has been largely overlooked in previous research. While recent studies have considered demographic factors, they often lack a detailed exploration of how these interact with geographic vulnerabilities [5, 12]. Our study delves deeper into the compound effects of climate events and their modulation by sociodemographic factors, providing a more comprehensive understanding of climate vulnerability. Additionally, to further explore the factors influencing vulnerability, we applied weighted multinomial logistic regression, a method that allows for a detailed analysis of how sociodemographic factors such as age, gender, race, and region, independently contribute to varying levels of climate event vulnerability. This combination of advanced statistical techniques not only enhances the generalizability of our findings but also provides a comprehensive framework for understanding the compounded impacts of climate events on diverse U.S. populations, offering crucial insights for targeted policy interventions and disaster management strategies.

2 MATERIALS AND METHODS

2.1 Data Source

Data were retrieved from Wave 108 of the American Trends Panel (ATP), a nationally representative (including states of Alaska and Hawaii) panel of non-institutionalized U.S. adults aged 18 or older who were randomly selected to complete a self-administered online survey from May 2-8, 2022. Responses were completed in both English and Spanish, and alternative technology options were provided for individuals without home internet. There was a response rate of 88%, resulting in a sample size of 10,282 individuals.

2.2 Climate Event Variables

Five climate events were available in our data set: heatwave, intense storms, wildfire, drought, and sea level rise. Respondents were asked to provide a binary response (yes or no) to the header question, “In the past 12 months, has your local community experienced the following?” Heatwave was asked as, “Long periods of unusually hot weather.” Intense storms was asked as, “Severe weather, like floods or intense storms.” Wildfire was asked as, “Major wildfires.” Drought was asked as, “Droughts or water shortages.” Sea level rise was asked as, “Rising sea levels that erode beaches and shorelines.”

2.3 Sociodemographic Variables

Sociodemographic variables included age group (18-29, 30-49, 50-64, or 65+), race and ethnicity (non-Hispanic White [hereafter, White], non-Hispanic Black [hereafter, Black], Hispanic, non-Hispanic Asian [hereafter, Asian], or Other), education level (less than high school, high school, some college, undergraduate, or postgraduate), gender (male, female, or

other), income tier (lower, middle, or upper), marital status (married or not married), and U.S. citizenship. Income tier was an ATP-calculated variable, which they adjusted for differences in purchasing power by geographic region and for household size. In general, lower income families had less than $38.9k, middle income ranged from $38.9k to $116.8k, and higher income was greater than $116.8k. Geographic-related variables included metropolitan area residence and U.S. census region (Northeast, Midwest, South, or West).

2.4 Data Analysis

We used latent class analysis (LCA) to create subgroups of respondents categorized by their exposures to the five climate events (heatwave, intense storm, wildfire, drought, and sea level rise) for our first research question. There were no a priori assumptions on the number of classes. Thus, we began with a one-class model and sequentially added more classes until the model could no longer converge, which was our five-class model. We selected the best fitting model using the lowest values for Akaike's information criterion (AIC) and Bayesian information criterion (BIC).

For our second research question, we utilized multinomial logistic regression to regress climate event vulnerability group membership by the sociodemographic variables. Missing data were fairly minimal, in which 7.1% of the sample was lost in the fully-adjusted regression model. Most of the missingness was from income tier (5.2%), race and ethnicity (1.5%), and marital status (0.7%). The average variance inflation factor (VIF) was 1.12, indicating no multicollinearity. We also applied the ATP survey sampling weights to the descriptive and regression analyses to enable the results to be more generalizable to the whole U.S. population. All analyses were conducted using Stata 18 with two-tailed tests at a 0.05 significance level.

3 RESULTS

3.1 Latent Classes

Using the five climate event indicators (heatwave, intense storm, wildfire, drought, and sea level rise), the four-class model had the best fit (AIC=54477 , BIC=54643) compared to the three-class (AIC=54701, BIC=54824), two-class (AIC=55558, BIC=55637), and one-class (AIC=59841, BIC=59877) models. All four groups are displayed visually in Figure 1 and their exposure to each climate event are listed in Table 1. The largest group was termed “low vulnerability” (54.6%, N=5,621), which had low probabilities (≤10%) of all climate events except for exposure to intense storms (23.4%). There were two subgroups for moderate vulnerability to climate events, in which we termed the larger group “heat-storm” (22.2%, N=2,296) because these respondents had elevated exposures to heatwaves (77.4%) and intense storms (94.7%). The smaller group was termed “heat-drought” (13.4%, N=1,398) because these individuals had elevated exposures to heatwaves (75.8%) and droughts (89.5%). The smallest of all the four groups was termed “high vulnerability”, which generally had elevated exposures of at least 85% for all climate events except sea level rise (67.5%).

[Figure 1]

3.2 Sample Characteristics

Table 1 provides a summary of the overall sociodemographic characteristics of the sample, highlighting key factors that may influence respondents' exposure to climate events and their ability to respond to these risks. The age distribution shows that most respondents were between the ages of 30 and 49 (34.7%), followed by those aged 50-64 (25.9%), and those aged 65 and older (21.6%). Younger adults (aged 18-29) accounted for 17.9% of the sample. This distribution suggests that a substantial proportion of the sample consists of middle-aged to older adults, which could have important implications for vulnerability to climate events. In terms of race and ethnicity, the sample was predominantly non-Hispanic White (64.2%), with Hispanic (15.8%), non-Hispanic Black (11.6%), and non-Hispanic Asian (5.8%) respondents making up smaller portions of the population. Regarding education, 30.9% of respondents had some college education, while 28.5% had completed high school. A smaller proportion (18.0%) held an undergraduate degree, and 14.3% had postgraduate education. The income distribution shows that almost half (49.8%) of the sample were classified as middle-income, with 32.7% categorized as lower-income and 17.5% as upper-income. The gender distribution was fairly balanced, with females comprising 52.3% of the sample, and males making up 47.1%. Geographically, the majority of respondents (86.6%) lived in metropolitan areas. Regionally, the largest share of respondents resided in the South (38.2%), followed by the West (23.7%), Midwest (20.9%), and Northeast (17.2%).

[Table 1]

3.3 Sociodemographic Factors

Table 2 presents the results from the multinomial logistic regression, which examines the sociodemographic factors associated with membership in the different climate vulnerability groups relative to the low vulnerability group.

Older adults (65+) show significantly lower likelihood of being in the heat-storm (RRR = 0.66, $p = 0.01$) and high vulnerability groups (RRR = 0.39, $p < 0.001$), compared to younger adults (18-29). For race and ethnicity, Hispanic respondents had an increased likelihood of being in the heat-drought group (RRR = 1.51, $p = 0.03$), compared to non-Hispanic White respondents. Higher education levels were associated with a lower risk of climate vulnerability. High school graduates were significantly less likely to be in the heat-drought group (RRR = 0.40, $p = 0.01$), and similar protective trends were observed for some college and undergraduate education, though these associations are not statistically significant. Females showed an increased likelihood of belonging to the heat-drought (RRR = 1.30, $p = 0.04$) and high vulnerability groups (RRR = 1.42, $p = 0.01$).

For geographic-related factors, residing in a metropolitan area was not significantly associated with any of the climate vulnerability groups. However, the South and West regions stand out as significant predictors of climate event vulnerability. Residents of the South were more likely to be in the heat-drought (RRR = 2.13, $p = 0.01$) and high vulnerability (RRR = 2.05, $p = 0.003$) groups, while the West showed an even more pronounced effect, with residents in this region being dramatically more likely to be in the heat-drought (RRR = 27.70, $p < 0.001$) and high vulnerability (RRR = 9.31, $p < 0.001$) groups compared to those in the Northeast.

[Table 2]

4 DISCUSSION

This study provides significant insights into the patterns of exposure to climate events and the associated sociodemographic factors that influence vulnerability in the United States. Through latent class analysis, we identified four distinct subpopulations with varying levels of vulnerability: low vulnerability, heat-storm, heat-drought, and high vulnerability. Each of these subpopulations exhibits unique characteristics that highlight the complex interplay between climate exposure and underlying sociodemographic factors.

4.1 High Vulnerability Group

The "high vulnerability" group, which makes up about 9.8% of our sample, includes individuals who have high exposure levels to multiple climate events such as heatwaves, intense storms, wildfires, and droughts, with exposure rates over 85% for most events except sea level rise (67.5%), which was still substantially higher than the sample average of 15.8%. The elevated risk for this group is likely due to the cumulative and overlapping impacts of multiple climate events, which can amplify health risks, disrupt infrastructure, and overburden emergency services. This is consistent with previous studies that have highlighted the compounded effects of multiple simultaneous climate risks on vulnerable populations, resulting in more severe health and socio-economic outcomes than single-event exposures [13, 14].

Interestingly, our analysis identified that older adults (aged 65 and above), who made up 21.6% (N=2,207) of our sample, are less likely to be in this high vulnerability group, with a relative risk ratio (RRR) of 0.39 ($p<0.001$). This finding diverges from some earlier studies that have indicated older adults as a highly vulnerable group due to physical frailty and potential social isolation [15, 16]. However, our results align with recent studies suggesting that older adults may have developed better adaptive strategies, such as access to more stable housing, social networks, or community support systems that can provide resilience during extreme climate events [17, 18] .

In contrast, females and residents of the South and West census regions are significantly more likely to be in the high vulnerability group, with RRRs of 1.42 ($p=0.01$) for females and 9.31 ($p<0.001$) for residents in the West. These results are consistent with previous research that underscores gender disparities and geographic differences in climate vulnerability. Studies have indicated that women often face higher climate risks due to socio-economic factors, caregiving roles, and limited access to resources. For instance, Eastin (2018) [7] found that in developing states, women are more vulnerable to climate change impacts because of unequal access to resources, reduced economic opportunities, and societal norms that prioritize male participation in decision-making processes. Moreover, geographic differences further exacerbate vulnerabilities, as seen in Mnimbo et al. (2016) [19], who highlighted that women smallholder farmers in Tanzania face distinct challenges due to regional climatic variations, resource ownership imbalances, and increased burden of productive tasks. Additionally, geographic disparities, particularly in the Western U.S., could be attributed to the region's unique climate patterns and socio-economic dynamics, which may exacerbate vulnerability [20].

While Hispanic populations were not significantly associated with the high vulnerability class, their increased vulnerability to heat and drought events observed in the heat-drought class echoes findings from earlier research that documented heightened climate-related health risks among Hispanic communities [21, 22]. This alignment with previous literature further strengthens the validity of our results, suggesting that targeted interventions for specific demographics and regions are essential for mitigating climate vulnerability effectively.

4.2 Heat-Storm and Heat-Drought Groups

The identification of the heat-storm and heat-drought groups, which comprise 22.2% and 13.4% of the sample, respectively, underscores the importance of considering regional climate patterns when assessing vulnerability. The heat-storm group, characterized by elevated exposure to both heatwave (77.4%) and intense storms (94.7%), is predominantly located in the South (53.2%) and Northeast (20.5%) This group's vulnerability may be exacerbated by the combination of high temperatures and severe storms, which can compound health risks, damage infrastructure, and lead to significant economic losses. Recent studies have confirmed that such overlapping climate events can lead to a "multiplier effect," where the combined impacts are greater than the sum of individual events [23]. Similarly, the heat-drought group, with high exposure to heatwaves (75.8%) and droughts (89.5%), is more prevalent in Western regions, where prolonged periods of high temperatures and water scarcity present severe challenges for both urban and rural communities. The South (17.6%) also faces considerable exposure to the heat-drought combination, further stressing the region's climate vulnerabilities.

Sociodemographic factors significantly shape climate event vulnerability by influencing exposure levels and access to adaptive resources. For example, Hispanic adults are more likely to be part of the heat-drought group, with an RRR of 1.51 ($p=0.03$). This increased likelihood may be linked to the socioeconomic and occupational characteristics of this population, particularly in regions like the West and South where agricultural livelihoods are prevalent, making them more susceptible to prolonged droughts and associated economic hardships. Hispanic communities often face unique climate vulnerabilities due to their work in labor-intensive sectors and their geographic concentration in areas prone to heatwaves and droughts. These vulnerabilities are exacerbated by systemic inequalities, such as reduced access to health care, lower income levels, and limited political representation, which collectively limit their adaptive capacities [24, 25]. Additionally, lower educational attainment is another critical factor influencing climate vulnerability. Individuals who did not complete high school face heightened risks during climate events. The protective effect of higher educational attainment, reflected in the lower RRR for high school graduates (0.40, $p=0.01$), is associated with better access to information, social capital, and resources that enhance their ability to adapt to and recover from climate impacts. Recent studies emphasize that education is vital in building climate resilience by fostering awareness and facilitating access to resources and decision-making processes that reduce vulnerability [26, 27].

4.3 Implications for Practice and Policy

The findings of our study provide critical insights that can inform both practice and policy. The identification of distinct subpopulations with varying levels of climate vulnerability underscores the need for tailored interventions that address specific demographic and geographic risks. Public health agencies and policymakers should prioritize resources for those identified as high-vulnerability groups, such as residents in the Southern and Western U.S. regions, where compounded climate risks are more prevalent. In practice, this could include expanding access to cooling centers during heatwaves, increasing outreach and education efforts in vulnerable communities, and enhancing emergency preparedness infrastructure in regions prone to extreme weather events [14]. Moreover, policy initiatives that address systemic inequities—such as improving access to affordable housing and healthcare—can play a pivotal role in mitigating the disproportionate impact of climate events on marginalized populations [1]. Recent studies show that disaster preparedness and public health initiatives, including early warning systems and

community engagement, are essential for reducing the health impacts of climate change [28]. By incorporating climate vulnerability assessments into public health strategies, stakeholders can better allocate resources and support resilience-building efforts in at-risk communities [29].

4.4 Limitations and Future Research

We believe our present study provides a robust analysis identifying patterns in exposures to a wide variety of climate events, especially using a large nationally representative U.S. sample. Despite the robustness of our findings, some limitations should also be acknowledged. The reliance on self-reported data introduces potential recall bias, which may affect the accuracy of reported experiences. Respondents may have underreported or overreported their exposure to climate events due to memory limitations or personal biases. Additionally, the absence of data on the intensity and duration of climate events limits our ability to fully assess the extent of exposure and its impact on vulnerability. Understanding the severity and frequency of exposure would allow for a more nuanced analysis of climate vulnerability. While this study focuses on sociodemographic correlates, other factors such as healthcare access, community support systems, and local policy interventions, which were not included in this analysis, may also significantly influence climate vulnerability. Recent research [30, 31] emphasizes that local governance, healthcare infrastructure, and community preparedness are critical in determining resilience against climate events, suggesting this data should be included in future studies. Furthermore, although nearly all sociodemographic variables analyzed in this study are relatively immutable (e.g., race, gender), there is the potential for changes in variables such as income tier and census region over time. Variations in these variables could affect the vulnerability patterns identified in this study. Future research should consider longitudinal data to examine how changes in these variables influence vulnerability over time.

5 CONCLUSIONS

This study sheds light on the complexity of sociodemographic factors influencing climate event vulnerability in the U.S. Through the identification of four distinct subpopulations, we reveal that vulnerability to climate events is not uniformly distributed and is shaped by a variety of intersecting factors. The high vulnerability group, with females and residents in the South and West regions experiencing increased exposure, underscores the compounded risks these populations face. Additionally, the findings highlight the need for targeted interventions, especially for groups disproportionately affected by specific climate events like heatwaves and droughts. Addressing these vulnerabilities through tailored policies and practices, such as improving access to healthcare and emergency preparedness, is crucial for enhancing resilience in the most at-risk communities. Future research should focus on incorporating more detailed climate event data and exploring longitudinal patterns to provide a more comprehensive understanding of climate vulnerability over time.

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Author Contributions

R.W. conceived the study and conducted the analysis. L.Z. and K.Z. critically contributed to data interpretation. All authors drafted the manuscript and approved the final submitted version.

Data Availability

This study uses public American Trends Panel data, which may be obtained through the Pew Research Center website: https://www.pewresearch.org/the-american-trends-panel/.

Ethics Approval and Consent to Participate

This study uses public data and was deemed exempt by the SUNY Upstate Institutional Review Board for the Protection of Human Subjects (#2229888-1).

Conflict of Interest

None.

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Figure 1. Probability of Climate Events Stratified by Climate Event Vulnerability Group

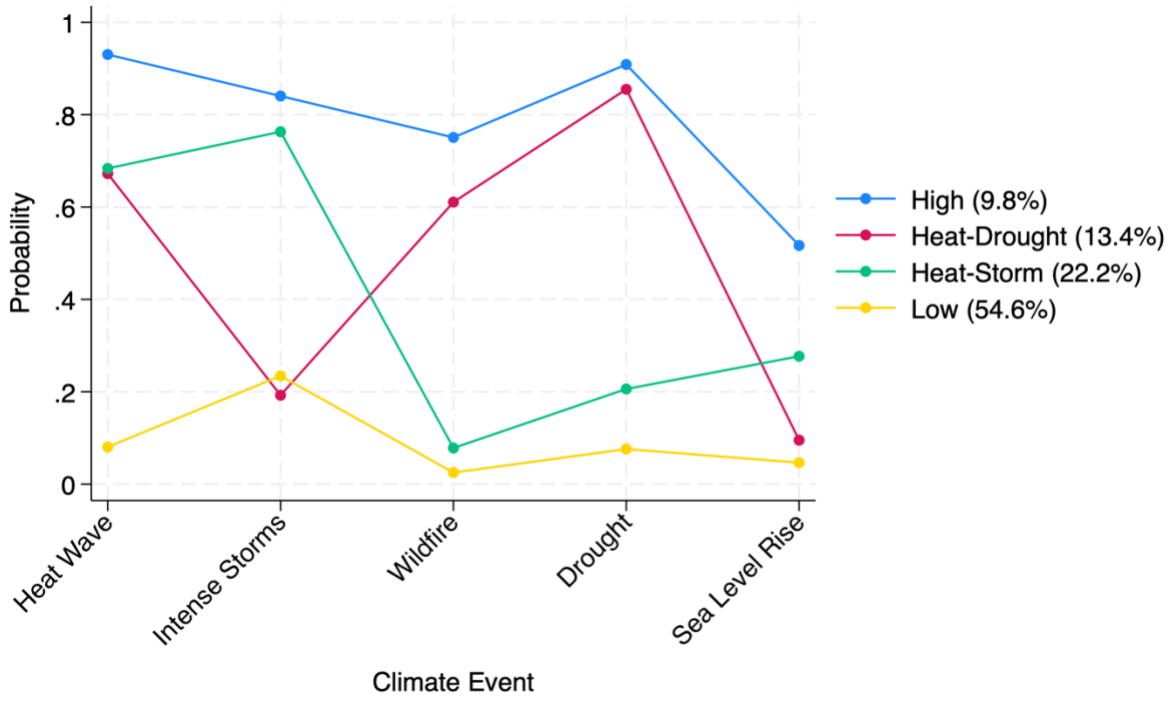

Table 1. Weighted Sample Characteristics Stratified by Climate Event Vulnerability Group

	Climate Event Vulnerability Group				
	Low N=5,621 (54.6%)	Heat-Storm N=2,296 (22.2%)	Heat-Drought N=1,398 (13.4%)	High N=967 (9.8%)	Total N=10,282 (100.0%)
Climate Event					
Heat wave	570 (10.2%)	1,764 (77.4%)	1,030 (75.8%)	975 (96.7%)	4,340 (42.5%)
Intense storm	1,304 (23.4%)	2,157 (94.7%)	66 (4.9%)	894 (88.6%)	4,422 (43.2%)
Wildfire	142 (2.5%)	256 (11.3%)	913 (67.0%)	863 (85.6%)	2,175 (21.3%)
Drought	408 (7.3%)	578 (25.4%)	1,226 (89.5%)	935 (92.9%)	3,147 (30.8%)
Sea level rise	163 (2.9%)	641 (28.3%)	130 (9.6%)	677 (67.6%)	1,612 (15.8%)
Age Group					
18-29	853 (15.3%)	457 (20.1%)	251 (18.3%)	271 (26.8%)	1,832 (17.9%)
30-49	1,881 (33.7%)	833 (36.6%)	456 (33.3%)	384 (38.1%)	3,554 (34.7%)
50-64	1,563 (28.0%)	548 (24.0%)	316 (23.1%)	220 (21.9%)	2,647 (25.9%)
65+	1,287 (23.1%)	440 (19.3%)	345 (25.3%)	134 (13.2%)	2,207 (21.6%)
Race and Ethnicity					
White, non-Hispanic	3,672 (66.7%)	1,474 (65.2%)	791 (58.5%)	551 (55.4%)	6,487 (64.2%)
Black, non-Hispanic	693 (12.6%)	266 (11.8%)	93 (6.9%)	116 (11.7%)	1,168 (11.6%)
Hispanic	714 (13.0%)	351 (15.5%)	320 (23.7%)	213 (21.4%)	1,597 (15.8%)
Asian, non-Hispanic	291 (5.3%)	102 (4.5%)	109 (8.1%)	83 (8.4%)	585 (5.8%)
Other	136 (2.5%)	68 (3.0%)	39 (2.9%)	32 (3.2%)	274 (2.7%)
Education Level					
<High School	415 (7.4%)	204 (9.0%)	140 (10.2%)	94 (9.4%)	854 (8.3%)
High School	1,820 (32.5%)	539 (23.6%)	329 (24.1%)	231 (22.9%)	2,918 (28.5%)
Some College	1,661 (29.7%)	729 (31.9%)	454 (33.2%)	322 (32.0%)	3,166 (30.9%)
Undergraduate	980 (17.5%)	426 (18.6%)	250 (18.3%)	195 (19.4%)	1,851 (18.0%)
Postgraduate	723 (12.9%)	385 (16.9%)	195 (14.2%)	164 (16.3%)	1,467 (14.3%)
Gender					
Male	2,756 (49.3%)	1,035 (45.5%)	614 (44.9%)	422 (41.8%)	4,826 (47.1%)
Female	2,815 (50.4%)	1,228 (54.0%)	749 (54.8%)	566 (56.0%)	5,359 (52.3%)
Other	20 (0.4%)	14 (0.6%)	5 (0.4%)	21 (2.1%)	60 (0.6%)
Income Tier					
Lower	1,685 (32.0%)	703 (32.3%)	423 (32.6%)	372 (38.0%)	3,183 (32.7%)
Middle	2,633 (49.9%)	1,089 (50.0%)	662 (51.0%)	460 (47.0%)	4,843 (49.8%)
Upper	954 (18.1%)	387 (17.8%)	213 (16.4%)	147 (15.0%)	1,701 (17.5%)
Married	3,037 (54.5%)	1,124 (49.5%)	759 (55.6%)	423 (42.2%)	5,344 (52.3%)
U.S. Citizen	5,262 (94.0%)	2,133 (93.5%)	1,241 (91.1%)	933 (92.5%)	9,570 (93.4%)
Metropolitan Area	4,784 (85.2%)	2,008 (87.8%)	1,201 (87.5%)	914 (90.6%)	8,907 (86.6%)
Census Region					
Northeast	1,162 (20.7%)	468 (20.5%)	56 (4.1%)	86 (8.6%)	1,773 (17.2%)

Midwest	1,576 (28.1%)	395 (17.3%)	84 (6.1%)	90 (8.9%)	2,145 (20.9%)
South	2,141 (38.1%)	1,216 (53.2%)	242 (17.6%)	329 (32.6%)	3,927 (38.2%)
West	735 (13.1%)	207 (9.1%)	991 (72.2%)	504 (50.0%)	2,438 (23.7%)

Table 2. Weighted Multinomial Logistic Regression Examining Sociodemographic Correlates of Climate Event Vulnerability

	Climate Event Vulnerability Group (Reference Group: Low)		
	Heat-Storm	Heat-Drought	High
	Relative Risk Ratio (95% CI), p	Relative Risk Ratio (95% CI), p	Relative Risk Ratio (95% CI), p
Age Group			
18-29	Reference	Reference	Reference
30-49	0.84 (0.62-1.13), 0.25	0.83 (0.51-1.34), 0.44	0.72 (0.47-1.09), 0.12
50-64	0.71 (0.52-0.97), 0.03	0.73 (0.44-1.21), 0.22	0.55 (0.36-0.85), 0.01
65+	0.66 (0.48-0.91), 0.01	0.86 (0.53-1.41), 0.55	0.39 (0.25-0.60), <0.001
Race and Ethnicity			
White, non-Hispanic	Reference	Reference	Reference
Black, non-Hispanic	0.77 (0.58-1.02), 0.07	1.05 (0.62-1.77), 0.86	1.10 (0.71-1.69), 0.67
Hispanic	1.02 (0.74-1.40), 0.91	1.51 (1.03-2.22), 0.03	1.27 (0.82-1.96), 0.29
Asian, non-Hispanic	0.74 (0.46-1.17), 0.20	0.94 (0.57-1.55), 0.80	1.11 (0.62-1.98), 0.72
Other	1.06 (0.67-1.66), 0.82	0.93 (0.54-1.59), 0.79	1.10 (0.50-2.43), 0.81
Education Level			
<High School	Reference	Reference	Reference
High School	0.58 (0.37-0.91), 0.02	0.40 (0.21-0.78), 0.01	0.60 (0.30-1.19), 0.14
Some College	0.84 (0.55-1.28), 0.42	0.61 (0.32-1.16), 0.13	0.82 (0.42-1.58), 0.55
Undergraduate	0.85 (0.55-1.31), 0.47	0.53 (0.28-1.02), 0.06	0.90 (0.46-1.73), 0.74
Postgraduate	1.06 (0.68-1.64), 0.80	0.56 (0.30-1.07), 0.08	1.20 (0.61-2.36), 0.59
Gender			
Male	Reference	Reference	Reference
Female	1.14 (0.96-1.36), 0.13	1.30 (1.02-1.66), 0.04	1.42 (1.10-1.85), 0.01
Other	1.34 (0.45-4.06), 0.60	1.22 (0.24-6.12), 0.81	7.12 (2.22-22.79), 0.001
Income Tier			
Lower	Reference	Reference	Reference
Middle	1.06 (0.84-1.34), 0.61	1.21 (0.87-1.67), 0.26	0.89 (0.65-1.23), 0.48
Upper	1.01 (0.76-1.34), 0.94	1.13 (0.77-1.66), 0.54	0.82 (0.56-1.20), 0.32
Married	0.87 (0.72-1.04), 0.13	1.18 (0.92-1.52), 0.20	0.81 (0.62-1.05), 0.12
U.S. Citizen	0.99 (0.62-1.57), 0.96	0.87 (0.50-1.53), 0.63	1.24 (0.65-2.38), 0.51
Metropolitan Area	1.16 (0.89-1.52), 0.26	0.90 (0.61-1.32), 0.59	1.38 (0.88-2.15), 0.16
Census Region			
Northeast	Reference	Reference	Reference
Midwest	0.65 (0.51-0.84), 0.001	1.03 (0.57-1.88), 0.92	0.84 (0.49-1.44), 0.53
South	1.45 (1.16-1.82), 0.001	2.13 (1.26-3.61), 0.01	2.05 (1.28-3.31), 0.003
West	0.73 (0.52-1.01), 0.06	27.70 (16.68-45.97), <0.001	9.31 (5.77-15.02), <0.001