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Characterizing Household Perceived Evacuation Behaviors in the United States During the COVID-19 Pandemic: 2020-2021

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Abstract

Objective: Evacuation can reduce morbidity and mortality by ensuring households are safely out of the path of, and ensuing impacts from, a disaster. Our goal was to characterize potential evacuation behaviors among a nationally representative sample.

Methods: We added 10 questions to the existing Porter Novelli's (PN) ConsumerStyles surveys in Fall 2020, Spring 2021, and Fall 2021.We conducted a weighted analysis using SAS 9.4 to examine distributions and estimate associations of potential evacuation behaviors of each survey separately.

Results: When asked about barriers to evacuation if public authorities announced a mandatory evacuation because of a large-scale disaster, ~7% reported nothing would prevent them from evacuating. Over half of respondents across the 3 surveys (51.1%-52.4%) had no preparedness plans, and almost two-thirds of respondents (63.7%-66.2%) did not have an emergency supply kit.

Conclusions: Knowing potential evacuation behaviors can help frame messages and provide a starting point for interventions to improve disaster preparedness and response. Overall, data show that there is much work to be done regarding evacuation behaviors and overall preparedness in the United States. These data can be used to tailor public messaging and work with partners to increase knowledge about evacuation.

Many kinds of emergencies can lead to a necessary evacuation. In some cases, people may have a day or 2 to prepare while other situations may call for an immediate evacuation.[1] Planning is essential to making sure that households can evacuate quickly and safely no matter what the circumstances.[1] Encouraging residents in areas with higher risk of hurricanes to evacuate before a storm makes landfall, for instance, is one way to reduce hurricane-related morbidity and mortality. However, many factors have been shown to discourage a household's decision to evacuate. According to recent surveys by the Centers for Disease Control and Prevention (CDC), when respondents were surveyed for evacuation barriers, the primary reasons they were unable to evacuate were because of pet concerns, cost, and if community COVID-19 levels in their area were high.[2] In light of this problem, it is important for public health interventions to increase evacuation rates, especially among groups at increased risk for negative outcomes (e.g., older adults, persons with mobility challenges, persons who are experiencing homelessness).[3]

Previous research has shown that those who experienced a past hurricane without major harm, those who believe their home is not in a community placed at increased risk for hurricane damage, and those that think the storm is not severe enough to warrant evacuation, are less likely to evacuate.[3] Most residents who feel unsafe staying where they are during a storm tend to leave, and those who feel safe tend to stay.[3] When Hurricane Ida hit New York City in 2021, flooding occurred rapidly in basement apartments during the night—when decedents were home—with little time to evacuate.[4] Records indicate how quickly flooding overtook people and, in several cases, decedents were actively trying to evacuate and could not escape. In at least 1 case, the decedent was sleeping and deaths occurred before the state of emergency declaration, which also lacked basement-specific safety messaging; many decedents spoke limited English.[4] The circumstances of these Ida-related deaths illustrate the importance of issuing early weather and basement-specific warnings in multiple languages, as well as installing basement flood alarms to mitigate risk for residents who are sleeping or have not yet noticed signs of flooding (if any).[4]

Literature shows that people expected to evacuate often do not end up doing so and those who should not evacuate often do.[5] People do not always respond to risk warnings as

authorities hope, primarily because they feel as if their overall options are limited.[5] Once an evacuation order is put into place, people decide on whether to evacuate or not based on previous experiences and available information at hand.[5] Research showed that some of the most important factors that influence decision-making in the face of disaster include socioeconomic variables such as the presence of children or family members; demographic indicators such as gender, race, and ethnicity; personal experiences with previous disaster; property ownership; and social ties with friends and family.[5] Continued research on evacuation behaviors is needed overall, particularly on how timing affects evacuation. A better understanding may help to reduce barriers and improve evacuation compliance. Planning and preparing communities for hurricanes and other natural disasters can be stressful and complex, more so during the COVID-19 pandemic.[6] To understand how the COVID-19 pandemic may affect preparedness during disasters, in June 2020 the CDC surveyed a sample of 500 adults from across the country. The survey asked respondents how the pandemic may affect their plans to shelter for disasters, including hurricanes, tornadoes, and wildfires.[6] Respondents mentioned that concerns about getting COVID-19 could keep them from going to a shelter during an extreme weather incident, and that they would not be able to frequently wash their hands. CDC explored these concerns further with an online survey of 3000 adults in 8 states along the Atlantic and Gulf Coasts in October 2020. Respondents said they had changed their emergency response plans because of the COVID-19 pandemic and listed fears about going to a shelter, such as other people not wearing masks, being unable to keep distance from those outside their households, and concern about older family members getting COVID-19.[6] These data show how the current climate can affect preparedness and response behaviors among households. To further expand understanding and increase overall knowledge of evacuation behaviors, the goal of this manuscript is to characterize the potential natural disaster evacuation behaviors amidst the COVID-19 pandemic among a nationally representative sample.

Methods

To understand potential evacuation behaviors during the COVID-19 pandemic, data were collected and analyzed through Porter Novelli's (PN) *ConsumerStyles* surveys. PN *ConsumerStyles* are cross-sectional market surveys of a random sample of non-institutionalized adults (aged 18 years or older) from Ipsos' KnowledgePanel®. To address self-selection bias, panel members must be invited to join through random recruitment by mail using probability-based sampling by address to reach respondents regardless of whether they have landline phones or Internet access. Approximately 5 weeks after the initial mailing, telephone refusal-conversation calls are made to nonresponding households for which a telephone number is matched. If needed, households are provided with a laptop or tablet and a mobile data plan for Internet access as all surveys are online only.

In 2020, *FallStyles* was sent to a sample (n = 4548) of panelists, fielded from September 14, /2020 to October 10, 2020, who answered the 2020 *SpringStyles* survey, fielded from March 19, 2020 to April 9, 2020. In 2021, *SpringStyles*, was sent to 10 919 panelists between March 23, 2021 and April 13, 2021 with 6455 adults (59.1%) completing the survey. For the 2020 *FallStyles* survey, reminders were sent to non-responders on days 3, 7, and 13, and those who completed the survey received 5000 cash-equivalent reward points and were eligible for a sweepstakes. For 2021 *SpringStyles*, email reminders were sent to all non-responders on day 3, 6, 9 of the field period. Three additional reminders were sent on days 13, 16, and 19 in order to maximize response rates. Those who completed the survey also received 5000 cash-equivalent reward points (worth approximately $5).

The Fall 2021 wave, *FallStyles*, was fielded from September 24, 2021 to October 7, 2021. The survey was sent to a sample of 4510 panelists who answered the *SpringStyles* 2021 survey. Email reminders were sent to non-responders on days 3, 7, and 11 of the field periods. Survey completion time was approximately 37 minutes (median). Respondents were not required to answer any of the questions and could exit the survey at any time. Those who completed the survey received 10 000 cash-equivalent reward points (worth approximately $10). Respondents who did not answer at least half of the questions or completed the survey in 10 minutes or less were removed from the data as incomplete (n = 31). A total of 3553 adults completed the survey for a response rate of 78.8%. While sampled from the same KnowledgePanel® pool, the 2020 *FallStyles*, 2021 *SpringStyles*, and 2021 *FallStyles* are separate samples; there is no way of knowing if any respondents participated in all surveys.

While the specific questions related to evacuation remained the same in all surveys, there were changes to some demographic variables between Fall 2020 and Fall 2021. All modifications were accounted for by creating matching variables between 2020 *FallStyles*, 2021 *SpringStyles*, and 2021 *FallStyles*, except for employment which could not be aligned and is noted as such in the tables. In addition, the 2020 *FallStyles* survey included an additional question on potential barriers to going to a shelter during COVID-19 not included in *SpringStyles or FallStyles 2021.* We conducted weighted analysis of the data using SAS version 9.4 to examine distributions and estimate associations of potential evacuation behaviors of each survey separately. *FallStyles 2020 and 2021* weights are based off the previous *SpringStyles* and adjusted according to the US Current Population Survey (CPS) proportions, while *SpringStyles* data were weighted using the 2019 Census' American Community Survey (ACS) proportions.

Descriptive analysis, using means and frequencies, were used to examine distributions of demographic characteristics and potential evacuation behaviors. Missing data were minimal in all surveys for all variables (< 5%). Chi-square tests were used to examine the association between evacuation behaviors and demographics, disaster experience, perceptions of preparedness, emergency supply kits, and disaster risk. Because *FallStyles* and *SpringStyles* data were similar in terms of descriptive statistics and significant associations, multivariable logistic regression was run on *FallStyles 2021* only to help explain the relationship between key variables (e.g., race, ethnicity, income, education) and evacuation behaviors.

Multivariable logistic regression, using the backward stepwise elimination procedures, were used beginning with all variables in the model (either all demographic factors, all disaster experience variables, or all beliefs) and eliminating those that did not statistically predict ($P < 0.05$) the dependent variable (evacuation behaviors) one by one. Only the final model is presented in the text. All data presented within this report, including the tables, are weighted. Data are presented with Fall 2020 first, followed by Spring 2021, and then Fall 2021 unless otherwise noted. However, data are presented as one value if they were the same for the 3 surveys. If the 3 data points had less than 1% difference, they are reported as one value with an approximate (~) sign.

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Results

Descriptive Results

Overall, the weighted demographics were comparable across the 3 surveys (Table 1). Slightly more than half of respondents (51.6%) were female. Roughly 63% self-identified as White with ∼11% Black, ∼16% Hispanic, and less than 2% mixed-raced (Table 1). Most live in single-family homes (73.1%, 71.7%, 72.2%), with ∼15% in apartment homes, ∼8% in townhomes or duplexes, and ∼4% in mobile homes, RVs, boats, or vans (Table 1). The majority (73.7%, 72.5%, 72.7%) own their homes with a quarter (24.4%, 25.6%, 25.7%) renting and ∼2% living in their home without payment (Table 1). The South had the most representation of respondents with ∼38%, followed by the West (24%), Midwest (∼21%), and Northeast (∼17%), with the majority living in metro areas (86.6%) compared to non-metro (13.4%). Less than 15% live alone (Table 1).

Most respondents (69.0%, 63.5%, 55.5%) have experienced a disaster, with severe weather with power outages being the most common (55.1%, 50.3%, 40.9%) followed by a tropical storm or hurricane (29.2%, 23.4%, 22.9%) (Table 2). Respondents also indicated experiencing the following disasters: a tornado (15.7%, 13.8%, 10.2%); earthquake, mudslide, or landslide (15.5%, 14.2%, 10.9%); or flood (14.2%, 12.2%, 11.7%) (Table 2). Respondents (16.4%, 19%, 16.1%) reported that they, or somebody in their household, worked, volunteered, or trained in disaster response or recovery (Table 2).

When asked about barriers to evacuation if public authorities announced a mandatory evacuation because of a large-scale disaster, ∼57% reported there would be nothing that would prevent them from evacuating (Table 2). However, (20.6%, 19.7%, 21.0%) reported a concern of leaving pets, (21.9%, 19.0%, 20.3%) were concerned about leaving their property, and roughly 12% to 15% said they had nowhere to go (Table 2). Few (5.5%, 5.3%, 5.6%) cited health problems or a lack of transportation (3.8%, 3.8%, 4.3%) as a barrier (Table 2).

Overall, less than 3% had all 5 FEMA preparedness plans (Table 2). Throughout all 3 surveys, 56%-57% responded that they felt confident they knew how to prepare for a disaster (Table 3). Evacuation was highest among those with a bachelor's degree and those 75+ years and older (Table 4). When looking at evacuation behaviors by preparedness, disaster experience and beliefs were considered, among those who had an emergency supply kit (ESK), (58.8%, 61.3%, 59.1%) evacuated. When considering

Table 1. Weighted demographics of respondents

	Fall 2020 (*N* = 3625)		Spring 2021 (*N* = 6455)		Fall 2021 (*N* = 3553)	
	Frequency	Percent	Frequency	Percent	Frequency	Percent
Age						
18–34 years	1035.4	28.6	1819.9	28.2	1016.4	28.6
35–54 years	1200.3	33.1	2146.4	33.3	1174.5	33.1
55–74 years	1138.2	31.4	2046.1	31.7	1121.4	31.6
75+ years	251.1	6.9	442.7	6.9	240.8	6.8
Sex						
Male	1756.1	48.4	3121.6	48.4	1720.8	48.4
Female	1868.9	51.6	3333.4	51.6	1832.2	51.6
Education						
Less than high school	365.2	10.1	688.0	10.7	392.1	11.0
High school	1022.7	28.2	1768.8	27.4	971.9	27.4
Some college	1010.5	27.9	1948.4	30.2	1067.6	30.1
Bachelor's or higher	1226.6	33.8	2049.8	31.8	1121.4	31.6
Race/ethnicity						
White, non-Hispanic	2316.1	63.9	4099.9	63.5	2246.8	63.2
Black, non-Hispanic	414.4	11.4	747.2	11.6	412.8	11.6
Hispanic	582.2	16.1	1049.2	16.3	581.6	16.4
Mixed-race	52.9	1.5	119.4	1.9	65.0	1.8
Other	259.4	7.2	439.4	6.8	246.7	6.9
Housing structure						
Single family home	2650.1	73.1	4626.0	71.7	2564.8	72.2
Townhome/duplex	300.4	8.3	575.9	8.9	313.7	8.8
Apartment	529.9	14.6	990.1	15.3	536.3	15.1
Mobile home, boat, RV, van	144.6	4.0	263.1	4.1	138.2	3.9

(*Continued*)

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Table 1. (*Continued*)

	Fall 2020 (*N* = 3625)		Spring 2021 (*N* = 6455)		Fall 2021 (*N* = 3553)	
	Frequency	Percent	Frequency	Percent	Frequency	Percent
Ownership status						
Owns	2671.5	73.7	4681.1	72.5	2581.7	72.7
Rents	883.3	24.4	1654.6	25.6	913.1	25.7
Occupy w/o payment	70.3	1.9	119.3	1.9	58.2	1.6
Region						
South	1361.64	37.7	2447.6	37.9	1343.8	37.8
West	868.4	24.1	1547.2	24.0	851.6	24.0
Midwest	747.4	20.7	1344.3	20.8	738.9	20.8
Northeast	633.1	17.5	1115.9	17.3	618.7	17.4
Urbanicity						
Metro	3137.6	86.6	5592.9	86.6	3079.5	86.7
Non-metro	487.4	13.4	862.1	13.4	473.5	13.3
Household size						
Lives alone	522.1	14.7	911.5	14.1	496.2	14.0
Lives with others	3091.9	85.3	5543.5	85.8	3056.8	86.0
Marital status						
Married/with partner	2306.4	63.6	3665.4	56.8	2029.3	57.1
Single	1318.6	36.4	2789.6	43.2	1523.7	42.9
Children						
Household has kids	1155.0	31.9	2136.3	33.1	1146.9	32.3
No kids in home	2470.0	68.1	4318.7	66.9	2406.1	67.7
Household income						
< $25 000	485.4	13.4	796.9	12.4	437.5	12.3
$25 000 < $50 000	646.0	17.8	1128.2	17.5	623.6	17.6
$50 000 < $75 000	602.8	16.6	1119.2	17.3	617.2	17.4
$75 000 < $100 000	508.0	14.0	908.8	14.1	500.3	14.1
$100 000 < $150 000	639.9	17.7	1207.7	18.7	663.9	18.7
$150 000 or more	742.9	20.5	1294.2	20.1	710.6	20.0
Employment status*						
Employed	2324.0	64.1	2805.2	43.5	1624.8	45.7
Unemployed/retired	1118.7	30.9	2522.1	39.1	1447.6	40.7
Other	182.4	5.0	1127.8	17.5	480.6	13.5

*Fall 2020 "Employed" includes all currently employed persons, and "Other" includes those who are temporarily out of work; Spring 2021 and Fall 2021 "Employed" is employed full-time only, and "Other" are those who are employed part-time. Therefore, these are separate categories and should not be compared.

preparedness plans, (67.7%, 64.6%, 61.9%) of those who had all plans evacuated. Among those that experienced a previous disaster (severe weather with outages, hurricane/storm, tornado, earthquake/landslide, flood, and wildfires) 56.3%, 56.4%, 54.6% evacuated. When looking at individuals who were confident on how to prepare for a disaster, 59.4%, 60.4%, and 58.1% of them evacuated (Table 5). In the chi-square analysis for all 3 cycles, there is a significant association found between evacuation behavior and age, education, race/ethnicity, housing structure, housing status, urbanicity, marital status, and household income (Table 4). In addition, there is a statistically significant association between evacuation behavior and preparedness levels as well as emergency supply kit cost (Table 5).

Multivariable Regression Results

Age, education level, race/ethnicity, housing structure, region, and household income all remained significant predictors of preparedness in the final adjusted model (Table 6). Those aged 75+ years had an increased odds (OR 2.6; 95% CI 1.9, 3.5) of evacuation, followed by those aged 55-75 years (OR, 1.7; 95% CI 1.5, 2.1) and 35-54 years (OR, 1.3; 95% CI 1.1, 1.6) compared to the reference age group of

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Table 2. Weighted preparedness levels and disaster experience

	Fall 2020 (*N* = 3625)		Spring 2021 (*N* = 6455)		Fall 2021 (*N* = 3553)	
	Frequency	Percent	Frequency	Percent	Frequency	Percent
Experienced previous disaster						
Yes	2491.5	69.0	4089.5	63.5	1971.4	55.5
No	1119.4	31.0	2346.1	36.5	1577.8	44.5
Type of disaster experienced						
Severe weather with power outages	1988.4	55.1	3235.2	50.3	1450.4	40.9
Tropical storm or hurricane	1054.1	29.2	1504.1	23.4	814.3	22.9
Tornado	567.4	15.7	888.6	13.8	361.4	10.2
Earthquake, mudslide, or landslide	559.1	15.5	913.9	14.2	387.3	10.9
Flood	513.9	14.2	785.8	12.2	416.1	11.7
Wildfire	205.1	5.7	347.5	5.4	166.5	4.7
Work/volunteer/train in disaster response/recovery						
Yes	593.3	16.4	1220.5	19.0	569.7	16.1
No	3018.6	83.6	5212.0	81.0	2974.6	83.9
Type of response/recovery employment						
Volunteered for disaster response	212.2	5.9	481.9	7.5	188.0	5.3
Work in disaster response or recovery	160.0	4.4	293.2	4.6	128.5	3.6
Taken CERT training	159.9	4.4	353.0	5.5	154.0	4.3
Work in emergency management	110.1	3.1	203.7	3.2	113.7	3.2
Volunteer with American Red Cross	102.3	2.8	180.0	2.8	90.9	2.6
Other	143.1	4.0	285.8	4.4	115.1	3.3
Barriers to evacuation						
Nothing, I would evacuate	2065.9	57.2	3724.0	57.9	2006.1	56.7
Concern about leaving pets	745.3	20.6	1264.6	19.7	742.8	21.0
Concern about leaving property	791.7	21.9	1222.6	19.0	717.1	20.3
Nowhere to go	528.9	14.6	740.0	11.5	491.6	14.0
Health problems	200.3	5.5	341.7	5.3	196.2	5.6
Lack of transportation	138.1	3.8	246.4	3.8	151.0	4.3
Other	162.0	4.5	305.7	4.8	131.5	3.7
Has the following preparedness plans/items						
Stored copies of important documents	1247.6	34.6	2080.5	32.4	1173.0	33.1
Designated meeting place outside the home	672.2	18.6	1237.7	19.3	676.4	19.1
Multiple evacuation routes away from home	640.1	17.7	816.7	12.7	431.6	12.2
Emergency communication plan	485.0	13.4	987.0	15.4	552.6	15.6
Meeting place outside the neighborhood	342.5	9.5	463.4	7.2	268.1	7.6
Preparedness level						
No plans	1845.2	51.1	3366.2	52.4	1846.7	52.2
Some plans	1659.0	46.0	2898.5	45.2	1604.7	45.3
All 5 FEMA-recommended plans	106.3	2.9	155.0	2.4	89.0	2.5
Emergency supply kit						
Has an emergency supply kit	1160.1	33.8	2201.3	36.3	1223.0	36.4
Does not have an emergency supply kit	2276.0	66.2	3864.1	63.7	2136.0	63.6

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Table 3. Weighted beliefs about disasters and preparedness

	Fall 2020 (*N* = 3625)			Spring 2021 (*N* = 6455)			Fall 2021 (*N* = 3553)		
	Agree	Neutral	Disagree	Agree	Neutral	Disagree	Agree	Neutral	Disagree
How much do you agree with the following…									
Supply kit will improve chance of surviving a disaster	2823.6 (78.1)	633.0 (17.5)	160.0 (4.4)	4700.1 (73.0)	1471.1 (22.8)	270.0 (4.2)	2811.1 (79.2)	617.1 (17.4)	120.3 (3.4)
I feel confident that I know how to prepare for disasters	2026.2 (56.0)	977.0 (27.0)	612.4 (16.9)	3681.9 (57.1)	1769.4 (27.5)	992.4 (15.4)	1981.2 (55.8)	1020.4 (28.8)	547.9 (15.4)
Risk of household being affected by an infectious disease is greater than that of a disaster	1602.4 (44.3)	1396.1 (38.6)	616.9 (17.1)	2662.9 (41.4)	2502.1 (38.9)	1274.2 (19.8)	1435.3 (40.5)	1461.7 (41.2)	647.9 (18.3)
An emergency supply kit costs a lot of money	843.4 (23.3)	980.0 (27.1)	1793.0 (49.6)	1406.3 (21.8)	1961.7 (30.4)	3078.6 (47.8)	884.7 (24.9)	971.4 (27.4)	1693.4 (47.7)

those aged 18-34 years. Non-Hispanic Blacks and Hispanics had increased odds of reporting they would evacuate (OR 1.8; 95% CI 1.4, 2.2 and OR 1.2; 95% CI 1.0, 1.5, respectively) compared to non-Hispanic Whites. Although not statistically significant, mixed-race respondents had a decreased odds of evacuation (OR, 0.7; 95% CI 0.4, 1.1). Having an income of $50,000 or higher was associated with a significantly higher odds of evacuating when compared to those with an income of less than $25,000. Those in the Midwest (OR 1.2; 95% CI 1.0, 1.5) or West (OR 1.3; 95% CI 1.1, 1.6) were significantly more likely to evacuate than those in the South (Table 6).

Discussion

Assessing the preparedness levels of communities can help public health and other agencies plan for disasters or emergencies and tailor messaging to increase community preparedness. This can include determining if households have emergency plans; supply kits with adequate food, water, and medicine; preferred and trusted communication sources; and, intended evacuation (or non-evacuation) plans.[7] Knowledge of such potential evacuation plans and behaviors is a key aspect to understand for preparedness for any disaster or emergency. By understanding the potential evacuation behaviors of the community, local jurisdictions can tailor messages and communication campaigns to the community regarding evacuation, including developing interventions to improve disaster preparedness and response behaviors.

Based on these data, only about 60% of people across the nation would evacuate if told to do so. Messaging on the importance of evacuation is essential to help people safely navigate through the impacts of disasters. Understanding the hesitancies of the remaining 40% allows for overall barriers to be addressed on a local as well as national level. Top concerns of those reporting they would not evacuate were leaving pets and property. This is comparable with data from several Community Assessments for Public Health Emergency Response (CASPERs) conducted prior to the COVID-19 pandemic and is important to recognize as a consistent barrier to safe evacuation behaviors.[7–10] One potential explanation could be a lack of awareness of shelter locations, safety measures, and/or the availability of pet-friendly shelters. It is important to work with representatives on a local and national level to increase communications on overall access to shelters in various communities.

On top of these more traditional barriers, the Fall 2020 data also demonstrated specific pandemic-related concerns about evacuation during an incident such as concerns about getting COVID-19, lack of social distancing, inadequate sanitizing, and medical care access. This is similar to other survey data from the pandemic.[11] Although there is no longer a disaster declaration for COVID-19, people may still have hesitancies about the spread of infectious diseases in shelters, hotels, or other congregate settings, which supports the need for continued messaging about safety precautions being taken. In addition, infectious diseases are an important consideration that public health and emergency management should continue to address when planning evacuation shelters.

Importantly, almost 15% of respondents reported nowhere to go as a barrier, despite shelters being available for free and often accounting for concerns such as pets by providing a safe location at or nearby the shelter for pets. In addition, while lack of transportation was cited by less than 5% of respondents, this is an important issue to address, especially when understanding overall barriers during evacuation. Overall, transportation is an important factor during evacuation to ensure communities can evacuate in a timely manner. It is essential for public health to work with emergency management to ensure that all those who want to evacuate can safely do so, whether it is through better communication about the availability of safe sheltering, providing transportation to those in need, or developing creative solutions for those who are concerned about leaving their property behind.

Several individual factors (e.g., age group, race/ethnicity, perceptions and beliefs, previous disaster experience) indicate the importance of messaging to be specifically directed to how people can prepare emergency plans prior to a disaster occurring. It may be possible that they do not have the resources or information at hand before a disaster occurs to prepare accordingly. Our data show significant relationships between evacuation and age, education, ethnicity, housing structure, household status, region, urbanicity, marital status, household income, and employment status. This has implications in preparedness and messaging, and future efforts should tailor interventions to specific demographic groups in hopes to increase preparedness and evacuation. Tailored messaging and engaging with the local communities are essential for communities

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Table 4. Evacuation behavior by demographic characteristics

	Fall 2020				Spring 2021				Fall 2021			
	Evacuate (*N* = 2066)	Not evacuate (*N* = 1547)	Total (*N* = 3613)	*P* value	Evacuate (*N* = 3724)	Not evacuate (*N* = 2704)	Total (N = 6428)	*P* value	Evacuate (*N* = 2106)	Not evacuate (*N* = 1434)	Total (*N* = 3540)	*P* value
Age												
18–34 years	521.8 (50.5)	510.7 (49.5)	1032.4 (28.6)	< 0.001	981.5 (54.2)	829.6 (45.8)	1811.0 (28.2)	0.0003	493.8 (48.8)	518.5 (51.2)	1012.3 (28.6)	< 0.0001
35–54 years	722.2 (60.4)	473.2 (39.6)	1195.4 (33.1)		1234.6 (57.8)	900.3 (42.2)	2134.8 (33.2)		665.2 (56.9)	503.3 (43.1)	1168.5 (33.0)	
55–74 years	651.2 (57.4)	482.4 (42.6)	1133.6 (31.4)		1232.0 (60.4)	807.2 (39.6)	2039.2 (31.7)		682.6 (61.1)	434.6 (38.9)	1117.2 (31.6)	
75+ years	170.7 (68.0)	80.3 (32.0)	251.1 (7.0)		276.0 (62.4)	166.6 (37.6)	442.7 (6.9)		164.5 (68.8)	74.6 (31.2)	239.1 (6.8)	
Sex												
Male	1007.0 (57.5)	743.8 (42.5)	1750.8 (48.5)	0.6982	1791.6 (57.7)	1315.2 (42.3)	3106.7 (48.3)	0.6713	1003.4 (58.6)	709.1 (41.4)	1712.5 (48.4)	0.0291
Female	1058.9 (56.9)	802.8 (43.1)	1861.7 (51.5)		1932.5 (58.2)	1388.5 (41.8)	3321.0 (51.7)		1002.7 (55.0)	821.9 (45.0)	1824.5 (51.6)	
Education												
Less than high school	177.3 (49.0)	184.8 (51.0)	362.1 (10.0)	< 0.001	320.7 (47.1)	359.9 (52.9)	680.5 (10.6)	< 0.0001	182.4 (46.5)	209.7 (53.5)	392.1 (11.1)	< 0.0001
High school	557.9 (54.7)	461.5 (45.3)	1019.4 (28.2)		966.2 (55.0)	791.7 (45.0)	1758.0 (27.4)		495.7 (51.5)	466.4 (48.5)	962.0 (27.2)	
Some college	547.6 (54.4)	459.0 (45.6)	1006.6 (27.9)		1095.2 (56.3)	849.4 (43.7)	1944.5 (30.3)		597.4 (56.2)	466.0 (43.8)	1063.41 (30.1)	
Bachelor's or higher	783.1 (64.0)	441.3 (36.0)	1224.4 (33.9)		1342.0 (65.6)	702.6 (34.4)	2044.6 (31.8)		730.6 (65.3)	388.8 (34.7)	1119.5 (31.7)	
Race/ethnicity												
White, non-Hispanic	1308.8 (56.6)	1003.5 (43.4)	2312.2 (64.0)	0.0230	2305.1 (56.5)	1772.0 (43.5)	4077.1 (63.4)	< .0001	1239.4 (55.4)	999.9 (44.7)	2239.3 (63.3)	0.0014
Black, non-Hispanic	260.5 (63.5)	149.9 (36.5)	410.4 (11.4)		503.0 (67.5)	241.9 (32.5)	744.8 (11.6)		260.8 (63.8)	148.2 (36.2)	409.0 (11.6)	
Hispanic	311.5 (53.9)	266.6 (46.1)	578.1 (16.0)		589.1 (56.2)	458.5 (43.8)	1047.5 (16.3)		323.9 (56.0)	254.1 (44.0)	578.0 (16.3)	
Mixed-race	34.7 (66.2)	17.7 (33.8)	52.5 (1.5)		55.1 (46.1)	64.3 (53.9)	119.4 (1.9)		28.6 (43.9)	36.5 (56.1)	65.0 (1.8)	
Other	150.5 (58.0)	108.9 (42.0)	259.4 (7.2)		271.8 (62.0)	167.0 (38.1)	438.8 (6.8)		153.4 (62.4)	92.3 (37.6)	245.7 (7.0)	
Housing structure												
Single family home	1530.6 (57.9)	1111.8 (42.1)	2642.4 (73.2)	0.0178	2671.2 (58.0)	1934.5 (42.0)	4605.7 (71.7)	< 0.0001	1438.5 (56.4)	1111.93 (43.6)	2550.5 (72.1)	0.0015
Townhome/duplex	181.4 (60.4)	119.0 (39.6)	300.4 (8.3)		376.9 (65.7)	197.1 (34.3)	573.9 (8.9)		206.0 (65.8)	107.0 (34.2)	313.0 (8.9)	
Apartment	286.7 (54.6)	238.4 (45.4)	525.1 (14.5)		570.9 (58.0)	415.1 (41.1)	985.9 (15.3)		295.2 (55.1)	240.2 (44.9)	535.4 (15.1)	
Mobile home, boat, RV, etc.	67.2 (46.4)	77.5 (53.6)	144.6 (4.0)		157.0 (60.0)	105.1 (40.10)	262.1 (4.1)		66.4 (48.0)	71.8 (52.0)	138.2 (3.9)	
Household status												
Owns	1587.7 (59.6)	1077.9 (40.4)	2665.5 (73.8)	< 0.0001	2731.8 (58.6)	1929.1 (41.39)	4660.8 (72.5)	0.0379	1490.3 (58.0)	1081.2 (42.0)	2571.5 (72.7)	0.0396
Rents	439.9 (50.2)	436.8 (49.8)	876.7 (24.3)		935.4 (56.7)	713.1 (43.3)	1648.5 (25.7)		482.6 (53.1)	425.9 (46.9)	908.5 (25.7)	
Occupy w/o payment	38.3 (54.5)	32.0 (45.5)	70.3 (1.9)		56.9 (48.1)	61.4 (51.9)	118.3 (1.8)		33.2 (58.2)	23.9 (41.8)	57.1 (1.6)	

(*Continued*)

Table 4. (*Continued*)

	Fall 2020				Spring 2021				Fall 2021			
	Evacuate (*N* = 2066)	Not evacuate (*N* = 1547)	Total (*N* = 3613)	*P* value	Evacuate (*N* = 3724)	Not evacuate (*N* = 2704)	Total (N = 6428)	*P* value	Evacuate (*N* = 2106)	Not evacuate (*N* = 1434)	Total (*N* = 3540)	*P* value
Region												
South	767.6 (56.3)	597.1 (43.8)	1364.7 (37.8)	0.4460	1377.9 (56.5)	1059.4 (43.5)	2437.3 (37.9)	0.0131	727.3 (54.3)	611.7 (45.7)	1339.0 (37.9)	0.0095
West	514.7 (59.3)	353.1 (40.7)	867.7 (24.0)		934.7 (60.6)	606.7 (39.4)	1541.3 (24.0)		516.4 (61.1)	329.1 (38.9)	845.6 (23.9)	
Midwest	430.4 (57.6)	316.4 (42.4)	746.8 (20.7)		797.4 (59.5)	543.5 (40.5)	1340.9 (20.9)		425.4 (58.0)	308.4 (42.0)	733.8 (20.8)	
Northeast	353.2 (55.8)	280.1 (44.2)	633.3 (17.5)		614.1 (55.4)	494.0 (44.6)	1108.2 (17.2)		336.9 (54.5)	281.8 (45.5)	618.7 (17.5)	
Urbanicity												
Metro	1814.3 (58.0)	1315.5 (42.0)	3129.7 (86.6)	0.0156	3254.8 (58.4)	2313.9 (41.6)	5567.6 (86.6)	0.0375	1771.1 (57.8)	1294.9 (42.2)	3066.0 (86.7)	0.0013
Non-metro	251.6 (52.1)	231.2 (47.9)	482.8 (13.4)		470.3 (54.7)	389.8 (45.3)	860.1 (13.4)		235.0 (50.0)	236.1 (50.1)	471.1 (13.3)	
Household size												
Lives alone	302.4 (56.7)	230.5 (43.3)	532.9 (14.8)	0.8230	549.0 (60.7)	356.2 (39.4)	905.2 (14.1)	0.0749	291.1 (58.7)	205.1 (41.3)	496.2 (14.0)	0.3441
Lives with others	1763.5 (57.3)	1316.1 (42.7)	3079.6 (85.3)		3175.1 (57.5)	2347.4 (42.5)	5522.5 (85.9)		1715 (56.4)	1325.9 (43.6)	3040.9 (86.0)	
Marital status												
Married	1359.9 (59.1)	942.4 (40.9)	2302.3 (63.7)	0.0025	2204.5 (60.4)	1447.8 (39.6)	3652.3 (56.8)	< 0.0001	1203.4 (59.7)	813.4 (40.3)	2016.8 (57.0)	< 0.0001
Not married	706.0 (53.9)	604.2 (46.1)	1310.2 (36.3)		1520.5 (54.8)	1255.9 (45.3)	2775.4 (43.2)		802.7 (52.8)	717.5 (47.2)	1520.3 (43.0)	
Children												
Household has kids	678.0 (58.8)	475.3 (41.2)	1153.3 (31.9)	0.1827	1255.6 (59.1)	868.4 (40.9)	2124.1 (33.1)	0.1797	642.9 (56.4)	496.3 (43.6)	1139.2 (32.2)	0.8152
No kids in home	1387.9 (56.4)	1071.4 (43.6)	2459.3 (68.1)		2468.4 (57.4)	1835.2 (42.6)	4303.6 (67.0)		1363.2 (56.9)	1034.7 (43.2)	2397.9 (67.8)	
Household income												
< $25 000	200.7 (41.6)	281.3 (58.4)	482.0 (13.3)	< 0.0001	377.2 (47.8)	412.6 (52.2)	789.9 (12.3)	< 0.0001	191.8 (44.2)	242.0 (55.8)	433.8 (12.3)	< 0.0001
$25 000 < $50 000	335.4 (52.4)	304.4 (47.6)	639.8 (17.7)		628.4 (56.0)	493.4 (44.0)	1121.9 (17.5)		318.4 (51.3)	301.8 (48.7)	620.2 (17.5)	
$50 000 < $75 000	356.1 (59.1)	246.6 (40.9)	602.7 (16.7)		616.9 (55.2)	500.9 (44.8)	1117.8 (17.4)		375.9 (61.0)	240.2 (39.0)	616.1 (17.4)	
$75 000 < $100 000	313.1 (61.7)	194.4 (38.3)	507.5 (14.1)		525.8 (58.1)	379.2 (41.9)	905.0 (14.1)		281.2 (56.6)	215.4 (43.4)	496.6 (14.0)	
$100 000 < $150 000	388.4 (60.8)	250.4 (39.2)	638.9 (17.7)		730.4 (60.6)	475.4 (39.4)	1205.9 (18.8)		372.6 (56.1)	291.2 (43.9)	663.9 (18.8)	
$150 000 or more	472.1 (63.7)	269.5 (36.3)	741.5 (20.5)		845.2 (65.7)	442.0 (34.4)	1287.3 (20.0)		466.2 (66.0)	240.2 (34.0)	706.5 (20.0)	
Employment status*												
Employed	1320.8 (57.0)	997.2 (43.0)	2317.9 (64.2)	0.0004	1642.6 (58.8)	1150.2 (41.2)	2792.8 (43.5)	0.0248	934.1 (57.8)	683.0 (42.2)	1617.1 (45.7)	0.4932
Unemployed/retired	665.1 (59.8)	448.1 (40.3)	1113.2 (30.8)		1403.8 (55.9)	1105.8 (44.1)	2509.6 (39.0)		807.5 (56.0)	633.9 (44.0)	1441.4 (40.8)	
Other	80.0 (44.1)	101.4 (55.9)	181.4 (5.0)		677.6 (60.2)	447.7 (39.8)	1125.3 (17.5)		264.5 (55.3)	214.0 (44.7)	478.5 (13.5)	

*Fall 2020 "Employed" includes all currently employed persons, and "Other" includes those who are temporarily out of work; Spring 2021 and Fall 2021 "Employed" is employed full-time only, and "Other" are those who are employed part-time. Therefore, these are separate categories and should not be compared.

Table 5. Evacuation behaviors by preparedness, disaster experience and beliefs

	Fall 2020				Spring 2021				Fall 2021			
	Evacuate (*N* = 2066)	Not evacuate (*N* = 1547)	Total (*N* = 3613)	*P* value	Evacuate (*N* = 3724)	Not evacuate (*N* = 2704)	Total (*N* = 6428)	*P* value	Evacuate (*N* = 2106)	Not Evacuate (*N* = 1434)	Total (*N* = 3540)	*P* value
Emergency Supply Kit (ESK)												
Has an ESK	681.5 (58.8)	476.6 (41.2)	1158.1 (33.8)	0.3797	1346.0 (61.3)	850.9 (38.7)	2196.9 (36.3)	0.0089	719.1 (59.1)	497.2 (40.9)	1216.2 (36.3)	0.2032
Does not have an ESK	1299.6 (57.3)	969.4 (42.7)	2269.0 (66.2)		2227.3 (57.8)	1624.2 (42.2)	3851.5 (63.7)		1210.9 (56.9)	918.6 (43.1)	2129.5 (63.7)	
Has the following preparedness plans/items												
Copies of important docs	756.0 (60.8)	488.3 (39.2)	1244.3 (34.6)	0.0020	1260.3 (60.7)	814.8 (39.3)	2075.1 (32.4)	0.0017	701.3 (60.0)	468.6 (40.1)	1169.8 (33.2)	0.0051
Easy to get to ESK	590.3 (59.8)	396.4 (40.2)	986.6 (27.4)	0.0547	1070.6 (61.5)	670.5 (38.5)	1741.1 (27.2)	0.0004	617.5 (56.8)	469.0 (43.2)	1086.5 (30.8)	0.8702
Meeting place outside home	408.1 (61.0)	260.9 (39.0)	669.0 (18.6)	0.0296	777.4 (62.9)	458.4 (37.1)	1235.7 (19.3)	<.0001	406.6 (60.2)	269.0 (39.8)	675.7 (19.2)	0.0383
Multiple evacuation routes	373.8 (58.8)	262.1 (41.2)	635.9 (17.7)	0.3891	497.5 (61.1)	316.6 (38.9)	814.1 (12.7)	0.0505	263.7 (61.1)	168.0 (38.9)	431.6 (12.2)	0.0456
Emergency comms plan	305.0 (63.3)	177.0 (36.7)	482.0 (13.4)	0.0040	605.3 (61.5)	378.6 (38.5)	983.8 (15.4)	0.0134	355.1 (64.4)	196.0 (35.6)	551.1 (15.6)	< 0.0001
Meeting place outside of the neighborhood	206.2 (60.2)	136.1 (39.8)	342.3 (9.5)	0.2395	270.7 (58.7)	190.6 (41.3)	461.4 (7.2)	0.7411	174.5 (65.3)	92.9 (34.8)	267.4 (7.6)	0.0031
None of the above	908.9 (54.6)	755.8 (45.4)	1664.6 (46.2)	0.0029	1627.2 (55.9)	1283.8 (44.1)	2911.1 (45.5)	0.0024	850.1 (54.4)	711.5 (45.6)	1561.6 (44.3)	0.0190
Preparedness level												
No plans	1016.7 (55.2)	823.9 (44.8)	1840.6 (51.1)	0.0089	1888.7 (56.4)	1460.7 (43.6)	3349.4 (52.4)	0.0134	993.6 (54.1)	843.5 (45.9)	1837.1 (52.1)	0.0056
Some plans	973.3 (58.8)	681.6 (41.2)	1654.8 (46.0)		1717.3 (59.4)	1174.3 (40.6)	2891.5 (45.2)		947.7 (59.3)	651.5 (40.7)	1599.2 (45.4)	
All plans	72.0 (67.7)	34.3 (32.3)	106.3 (3.0)		100.2 (64.6)	54.9 (35.4)	155.0 (2.4)		55.1 (61.9)	33.9 (38.1)	89.0 (2.5)	
Experienced previous disaster												
Yes	1395.6 (56.3)	1084.9 (43.7)	2480.4 (68.9)	0.0993	2298.7 (56.4)	1780.8 (43.7)	4079.5 (63.6)	0.0006	1072.3 (54.6)	893.1 (45.4)	1965.4 (55.6)	0.0032
No	661.9 (59.2)	456.1 (40.8)	1118.0 (31.1)		1415.6 (60.7)	915.6 (39.3)	2331.2 (36.4)		932.9 (59.5)	634.9 (40.5)	1567.8 (44.4)	
Type of disaster experienced												
Severe weather w/outages	1110.0 (56.1)	867.5 (43.9)	1977.5 (55.0)	0.1623	1840.7 (57.0)	1388.5 (43.0)	3229.1 (50.4)	0.1258	799.0 (55.2)	647.6 (44.8)	1446.6 (41.0)	0.1297
Hurricane/storm	582.7 (55.7)	463.6 (44.3)	1046.2 (29.1)	0.2493	798.3 (53.3)	700.0 (46.7)	1498.4 (23.4)	< 0.0001	425.7 (52.3)	387.6 (47.7)	813.3 (23.0)	0.0038
Tornado	313.9 (55.5)	251.8 (44.5)	565.7 (15.7)	0.3768	480.2 (54.2)	405.6 (45.8)	885.9 (13.8)	0.0154	196.9 (54.7)	162.9 (45.3)	359.8 (10.2)	0.4133
Earthquake/landslide	324.0 (58.3)	231.7 (41.7)	555.7 (15.4)	0.5604	517.7 (56.8)	394.0 (43.2)	911.7 (14.2)	0.4443	218.6 (56.8)	166.4 (43.2)	385.0 (10.9)	0.9922
Flood	279.6 (54.6)	232.6 (45.4)	512.2 (14.2)	0.2024	395.2 (50.4)	388.9 (49.6)	784.1 (12.2)	< 0.0001	213.6 (51.5)	201.5 (48.5)	415.2 (11.8)	0.0204
Wildfire	125.8 (61.6)	78.4 (38.4)	204.1 (5.7)	0.1883	189.9 (54.8)	156.6 (45.2)	346.5 (5.4)	0.2257	90.2 (55.0)	74.0 (45.1)	164.2 (4.7)	0.6323
Employment/volunteer in disaster response/recovery												
Yes	320.2 (54.2)	270.4 (45.8)	590.6 (16.4)	0.1008	690.0 (56.8)	524.4 (43.2)	1214.4 (19.0)	0.3900	328.5 (57.8)	240.1 (42.2)	568.6 (16.1)	0.5621
No	1741.1 (57.9)	1267.7 (42.1)	3008.8 (83.6)		3020.9 (58.2)	2127.3 (41.8)	5192.3 (81.1)		1671.0 (56.5)	1288.8 (43.5)	2959.8 (83.9)	

(*Continued*)

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Table 5. (*Continued*)

	Fall 2020				Spring 2021				Fall 2021			
	Evacuate (*N* = 2066)	Not evacuate (*N* = 1547)	Total (*N* = 3613)	*P* value	Evacuate (*N* = 3724)	Not evacuate (*N* = 2704)	Total (*N* = 6428)	*P* value	Evacuate (*N* = 2106)	Not Evacuate (*N* = 1434)	Total (*N* = 3540)	*P* value
Confident know how to prepare for a disaster												
Agree	1202.2 (59.4)	820.3 (40.6)	2022.5 (56.1)	0.0046	2220.1 (60.4)	1453.6 (39.6)	3673.7 (57.3)	< 0.0001	1145.5 (58.1)	827.9 (42.0)	1973.3 (55.8)	0.2132
Neutral	533.8 (55.1)	435.9 (45.0)	969.7 (26.9)		961.1 (54.8)	790.7 (45.1)	1751.8 (27.3)		557.0 (54.9)	457.3 (45.1)	1014.2 (28.7)	
Disagree	322.7 (52.8)	288.2 (47.2)	610.9 (17.0)		539.3 (54.4)	452.6 (45.6)	991.9 (15.5)		303.1 (55.5)	242.9 (44.5)	546.0 (15.5)	
ESK will improve chance of surviving a disaster												
Agree	1670.5 (59.3)	1145.2 (40.7)	2815.7 (78.1)	< 0.0001	2798.9 (59.7)	1890.3 (40.3)	4689.2 (73.1)	< 0.0001	1590.3 (56.8)	1209.0 (43.2)	2799.2 (79.2)	0.2079
Neutral	309.4 (49.2)	319.0 (50.8)	628.4 (17.4)		766.5 (52.6)	690.7 (47.4)	1457.2 (22.7)		337.9 (55.1)	275.2 (44.9)	613.0 (17.4)	
Disagree	79.8 (49.9)	80.2 (50.1)	160.0 (4.4)		148.8 (55.4)	119.6 (44.6)	268.3 (4.2)		76.8 (63.9)	43.5 (36.2)	120.3 (3.4)	
ESK costs a lot of money												
Agree	403.8 (48.0)	438.0 (52.0)	841.8 (23.4)	< 0.0001	682.2 (48.6)	720.2 (51.4)	1402.4 (21.8)	< 0.0001	400.0 (45.4)	481.6 (54.6)	881.6 (25.0)	< 0.0001
Neutral	520.6 (53.6)	450.5 (46.4)	971.1 (26.9)		1068.7 (54.8)	882.9 (45.2)	1951.7 (30.4)		541.3 (56.2)	422.6 (43.8)	963.9 (27.3)	
Disagree	1134.7 (63.4)	656.4 (36.7)	1791.1 (49.7)		1969.8 (64.2)	1096.5 (35.8)	3066.3 (47.8)		1064.3 (63.0)	623.9 (37.0)	1688.1 (47.8)	
Risk of my household being affected by an infectious disease is greater than that of a disaster												
Agree	954.2 (59.7)	644.4 (40.3)	1598.6 (44.4)	0.0115	1613.4 (60.8)	1040.7 (39.2)	2654.1 (41.4)	0.0003	813.3 (56.9)	617.0 (43.1)	1430.3 (40.5)	0.0950
Neutral	754.0 (54.3)	634.9 (45.7)	1388.9 (38.6)		1404.5 (56.5)	1082.6 (43.5)	2487.2 (38.8)		849.9 (58.4)	605.5 (41.6)	1455.4 (41.2)	
Disagree	348.5 (56.6)	267.0 (43.4)	615.5 (17.1)		696.3 (54.8)	575.3 (45.2)	1271.6 (19.8)		342.9 (53.3)	300.3 (46.7)	643.2 (18.2)	

Table 6. Weighted logistic regression analysis of evacuation behavior by demographics factors, Fall 2021

	Adjusted OR	95% CI	*P* value
Age			
18–34 years	1		
35–54 years	1.3	[1.1, 1.6]	0.0014
55–74 years	1.7	[1.5, 2.1]	< 0.0001
75+ years	2.6	[1.9, 3.5]	< 0.0001
Education			
Less than high school	1		
High school	1.1	[0.9, 1.4]	0.4753
Some college	1.3	[1.0, 1.6]	0.0669
Bachelor's or higher	1.8	[1.4, 2.3]	< 0.001
Ethnicity			
White, non-Hispanic	1		
Black, non-Hispanic	1.8	[1.4, 2.2]	< 0.0001
Mixed-race	0.7	[0.4, 1.1]	0.1106
Hispanic	1.2	[1.0, 1.5]	0.0489
Other, non-Hispanic	1.1	[0.9, 1.5]	0.3791
Housing structure			
Single family, detached	1		
Single family, attached	1.5	[1.2, 2.0]	0.0012
Apartment	1.1	[0.9, 1.4]	0.3019
Other	1.1	[0.7, 1.5]	0.7886
Income			
Less than $25 000	1		
$25 000-$49 999	1.2	[0.9, 1.6]	0.1479
$50 000-$74 999	1.8	[1.4, 2.4]	< 0.0001
$75 000-$99 999	1.5	[1.1, 1.9]	0.0095
$100 000-$149 999	1.4	[1.0, 1.8]	0.0215
$150 000+	2.0	[1.5, 2.6]	< 0.0001
Region			
South	1		
Midwest	1.2	[1.0, 1.5]	0.0489
Northeast	0.9	[0.8, 1.1]	0.4740
West	1.3	[1.1, 1.6]	0.0080

to have a plan in the time of emergency. It allows for those in disaster-prone areas to evacuate in a timely manner prior to a disaster occurring.

When looking at the preparedness levels overall, many respondents would have benefited if there were an increase of preparedness plans overall, along with an increase in confidence on how to prepare for a disaster to be able to safely navigate through and prevent burden from these disasters. While studies have shown that local media communication is a critical source of information regarding disasters, and thus emergency preparedness, changes in messaging may be necessary overall.[12] These data serve to highlight this need on a national scale, but they would also be helpful in assisting with the customization and tailoring of certain initiatives at the local level. Agencies and organizations at all levels—federal, state, local, tribal, and territorial (STLT), community—can comprehend the gaps and set the right priorities for their population of focus by doing so. Because disasters happen locally, preparatory measures also need to be locally developed and implemented. The skills and relationships of local trusted leaders (e.g., religious leaders, local personalities, popular business owners, community organizers) and community members should be leveraged to focus on specific groups. These trusted individuals can help change social norms and understanding about preparedness and encourage planning.[13] The first step in closing the household preparedness gap is recognizing the variations in a community's beliefs, potential risks, and demographics.[13]

Survey findings indicate that perceived risk and confidence were significant factors in readiness. There was a lower likelihood of preparedness among those who felt that the risk of contracting an infectious disease outweighed the risk of a disaster. In terms of focusing messages and communication efforts to homes, this is crucial to understand. If someone is confident in their disaster preparedness or does not believe that a disaster will affect their home, they may not follow the communication guidance provided to them. This has also been observed with pandemic flu when the public is informed of the risks; subjective risk assessment affects the level of preparedness, and therefore, education strategies must take into account expectations, social context, and the influence and trust of the health agency. This is also consistent with theories suggesting that communication must be adapted to different stages of thinking/belief and overall disaster preparedness.[13] Disasters can, and do, happen everywhere and to anybody. The benefits of avoiding the threat, and factors influencing the decision to act, can support changes in perception that help advance behavior changes for increased preparedness.[13]

Limitations

These data are not without limitations. *ConsumerStyles* surveys are cross-sectional and limited to only those within the panel. Therefore, while there are 3 surveys, they are only 3 snapshots in time and do not represent a longitudinal analysis. Also, even though KnowledgePanel® works to ensure representativeness of the respondents on several key aspects, there are some potential differences in areas that have traditionally mattered in disaster preparedness and response, such as household structure, home ownership, and persons within the home (e.g., marital status, living with others, having kids). Further, the panel only represents those within the 50 US states and does not include panel members from US territories. The US territories are prone to disasters and should be included in all disaster research. As far as the survey questions, the demographic categories changed between Fall 2020, Spring 2021, and Fall 2021, making it impossible to compare employment and limiting the analysis of household type by combining mobile homes with boats, RVs, and vans. A final limitation noted is that the overall response regarding evacuation is hypothetical—whether the respondent thinks they would evacuate or not—rather than actual evacuation. Additionally, because all questions were closed-ended, any reasoning for certain responses (e.g., "other") had to be inferred. While this research is integral in acquiring knowledge of evacuation behaviors, a needed step is to explore in detail with more granular data. Overall, developing policies that help raise awareness of the

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need and opportunity for preparedness actions and plans at the household-level would help increase preparedness on a broader scope. Efforts must continue to be made at the local level to inform and address preparedness. In addition, these data can be valuable for informing community outreach and engagement and the tailoring of sometimes limited resources. These data can also help inform response planning and the updating of communication resources such as websites, fact sheets, and other materials to reach a wide audience.[13] In addition, understanding how evacuation can decrease morbidity and mortality should be studied further.

Conclusion

Overall, these data show that there is much work to be done in terms of evacuation behaviors and overall preparedness in the United States. These data are an essential starting point in determining evacuation behaviors to help tailor public messaging, work with partners to increase knowledge in evacuation, and guide future research. Therefore, efforts must continue to be made at the local level to both inform and address evacuation preparedness. These include focused communication strategies to address barriers, including those related to preparedness and planning. It is important to understand how the data can be implemented for various audiences and specifically depending on the environment in which they live.

Disclaimer. The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.

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References

1. **Evacuation**. *Ready.gov*. Accessed April 7, 2023. https://www.ready.gov/evacuation
2. **Centers for Disease Control and Prevention**. *Evacuating during hurricanes*. Atlanta, GA: Centers for Disease Control and Prevention. Published August 25, 2023. https://www.cdc.gov/environmental-health-studies/php/about/index.html?CDC_AAref_Val=https://www.cdc.gov/nceh/hsb/disaster/evacuating-during_hurricanes.html
3. **Ricchetti-Masterson, K.**, **Horney, J.** Social factors as modifiers of Hurricane Irene evacuation behavior in Beaufort County, NC. *PLoS Curr*. 2013. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3682762/
4. **Yuan A**, **Spira-Cohen A**, **Olson C**, et al. Immediate injury deaths related to the remnants from Hurricane Ida in New York City, September 1-2, 2021. *Disaster Med Public Health Prep*. 2024;**18**:e55. doi:10.1017/dmp.2024.49
5. **Bartolucci A**, **Lüders A.** Alone in the disaster? The independent nature of behavioural instructions for evacuation. *J Community Psychol*. 2022 Jul;**50**(5): 2072–2089. doi: 10.1002/jcop.22755. Epub 2021 Nov 26. PMID: 34825385
6. **Centers for Disease Control and Prevention.** *Sheltering during the COVID-19 pandemic*. Atlanta, GA: Centers for Disease Control and Prevention. Published November 10, 2021. Accessed April 7, 2023. https://www.cdc.gov/nceh/hsb/disaster/sheltering-covid19-pandemic.html
7. **Schnall AH**, **Wolkin AF**, **Roth JJ**, et al. Community Assessments for Public Health Emergency Response (CASPERs) – US Virgin Islands, 2017-2018. *Am J Public Health*. 2019;**109**:S303–8. doi: 10.2105/AJPH.2019.305161
8. **Community Assessment for Public Health Emergency Response (CASPER)** after the Gulf Coast Oil Spill: Mississippi 2011. October 2011 [Unpublished Report].
9. **Community Assessment for Public Health Emergency Response (CASPER)** assessing the response and recovery needs of communities affected by flooding – West Virginia, August 2012. September 2012 [Unpublished Report].
10. **Community Assessment for Public Health Emergency Response (CASPER)** after Laurel County Tornado – Kentucky, March 20-22, 2012. April 2012 [Unpublished Report].
11. **Centers for Disease Control and Prevention**. *Sheltering during the COVID-19 pandemic*. Atlanta, GA: Centers for Disease Control and Prevention. Published November 10, 2021. Accessed April 7, 2023. https://www.cdc.gov/nceh/hsb/disaster/sheltering-covid19-pandemic.html
12. **Centers for Disease Control and Prevention**. *Public health emergency preparedness (PHEP) cooperative agreement*. Atlanta, GA: Centers for Disease Control and Prevention. Published December 15, 2023. https://www.cdc.gov/orr/readiness/phep/index.htm
13. **Schnall AH**, **Kieszak S**, **Heiman HJ**, et al. Characterizing household emergency preparedness levels for natural disasters during the COVID-19 pandemic: United States, 2020-2021. *J Emerg Manag*. 2023;**21**(7):51–69. https://doi.org/10.5055/jem.0737

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