Hispanic Disaster Preparedness in the United States, 2017: Examining the Association with Residential Characteristics

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Abstract

The number of highly destructive disasters is increasing in regions of the United States where the Hispanic population is growing fastest. Up-to-date studies of disaster preparedness are needed that include housing measures and other factors that may account for differences in disaster preparedness between Hispanics and other racial and ethnic groups. This study fills this gap in the literature by using data from the 2017 American Housing Survey, which includes a topical module on disaster planning along with the core measures of housing and neighborhood characteristics, including housing tenure. The results reveal that Hispanics are generally less prepared than non-Hispanic Whites regarding resource- and action-based measures, with a few exceptions. Hispanics, Blacks, and Asians are significantly more likely than Whites to have at least 3 gallons of water per person, and Hispanics and Blacks are significantly more likely than Whites and Asians to have flood insurance. The findings show that housing and residential characteristics are consistently significant in predicting preparedness—controlling for other relevant variables—although they do not attenuate the disadvantages that Hispanics and Blacks face in their disaster preparedness relative to Whites. Future research would benefit from further exploration of the linkage between racial and ethnic inequalities in housing and neighborhood characteristics and household disaster preparedness.

Introduction

Highly destructive disasters are becoming more common in the United States, particularly in the south, central, and southeastern regions—the same regions in which the Hispanic population is growing fastest (Noe-Bustamante and Flores, 2019; Noe-Bustamante, Lopez, and Krogstad, 2019; Smith, 2020). Between 2010 and 2019, the United States experienced 119 disasters that each totaled at least one billion dollars in damages—an unprecedented number that nearly doubled the 59 disasters of the previous decade (Smith, 2020). In 2020 alone, the damage costs from billion-dollar disasters were close to $50 billion, exceeding the total for all such disasters in 2019 (JCHS, 2020). Geographically, the south, central, and southeast had the greatest number of those disasters and the largest financial impact from them, with Texas experiencing the most (Smith, 2020). Hispanics are particularly exposed to disasters simply because of their geographic concentration in those regions and states, although sociodemographic and housing factors may increase or diminish their vulnerability (Noe-Bustamante and Flores, 2019; Noe-Bustamante, Lopez, and Krogstad, 2019).

Hispanics' disaster preparedness is a topic that needs up-to-date research, especially given their potential exposure to disasters. Much of the literature on racial and ethnic differentials in disaster preparedness, however, relies on data that are about a decade old—from the 2006–2012 Behavioral Risk Factor Surveillance System (BRFSS), the 2008 General Social Survey, the 2010 Health and Retirement Survey, and the 2013 American Housing Survey (AHS; e.g., Al-Rousan, Rubenstein, and Wallace, 2014; Malmin, 2020; Nukpezah and Soujaa, 2018; Smith and Notaro, 2015). Given the significant increase in disasters since 2010, this body of research needs to be updated to examine the preparedness of Hispanics relative to other racial and ethnic groups and especially for the United States as a whole. New datasets from the 2017 U.S. Census Bureau's AHS (U.S. Census Bureau, 2018) and the Federal Emergency Management Agency's (FEMA's) 2017 and 2018 National Household Surveys (FEMA, 2020a) include questions on emergency preparedness for a representative sample of the U.S. population. Only a few publications report analyses of those new data sources (Rivera, 2020; Zamboni and Martin, 2020).

Few studies describe the emergency preparedness of Hispanics in the United States at a multistate or national level using multivariate analyses (Ablah, Konda, and Kelley, 2009; Bethel, Burke, and Britt, 2013; Cox and Kim, 2018; Killian et al., 2017; Malmin, 2020; Murphy et al. 2009; Rivera, 2020; Zamboni and Martin, 2020). Findings from such analyses are mixed as to whether Hispanics are equally or less prepared for disasters than non-Hispanic Whites (hereafter, Whites). Four studies find that Hispanics are similarly likely to be prepared as Whites (Ablah, Konda, and Kelley, 2009; Killian et al., 2017; Malmin, 2020; Murphy et al., 2009). By contrast, using the 2018 NHS, Rivera (2020) finds that Hispanics are less likely than non-Hispanics to have a household emergency plan in place, controlling for other relevant factors. In analyses of BRFSS data from eight states, Bethel, Burke, and Britt (2013) find that controlling for other factors, Hispanics are significantly less likely than other groups to have a 3-day supply of medication, and although Spanish-speaking Hispanics are less likely than Whites to have an emergency evacuation plan, English-speaking Hispanics are more likely than Whites to have such a plan. Zamboni and Martin (2020) and Cox and Kim (2018) find that Hispanics are significantly less likely than non-Hispanic Whites to be prepared for disasters, controlling for other socioeconomic and demographic characteristics.

Housing and its features constitute an additional dimension of disaster preparedness that is rarely measured (except for Murphy et al., 2009; Rivera, 2020). Indeed, very little research has explored the association between disaster preparedness and residential characteristics, such as housing tenure or housing and neighborhood characteristics; of those studies that do, renters are found less likely to be prepared than owners (Burby, Steinberg, and Basolo, 2003; Donahue, Eckel, and Wilson, 2014; Lee and Van Zandt, 2019; Rivera, 2020). Relative to Whites, Hispanics are less likely to be owners and more likely to live in poorer quality housing and neighborhoods, suggesting that housing tenure and housing and residential characteristics may confound the relationship between race, ethnicity, and disaster preparedness (Friedman, Gibbons, and Galvan, 2014; Friedman and Rosenbaum, 2004; McConnell, 2017; U.S. Census Bureau, 2020). Most of the studies that examine racial and ethnic differences in disaster preparedness do not control for differences in residential characteristics, and whether racial and ethnic disparities will persist after accounting for those differences in residential characteristics is unclear (e.g., Cox and Kim, 2018; Zamboni and Martin, 2020).

The main goal of the present study is to examine disaster preparedness among Hispanics relative to other racial and ethnic groups and explore whether any racial and ethnic differential in disaster preparedness remains after accounting for housing tenure, other residential characteristics, and socioeconomic and demographic control variables. A secondary goal is to explore the association between disaster preparedness and a set of residential characteristics, including housing tenure and housing and neighborhood characteristics. This study uses data from the 2017 American Housing Survey, which are ideal because they include a topical module on disaster planning and data on housing tenure and housing and neighborhood characteristics. The article concludes by discussing the implications of those analyses for the preparedness of Hispanics, relative to other racial and ethnic groups, for future climate-related disasters and how their preparedness relates to racial and ethnic stratification in residential attainment.

Background

Disaster Preparedness and Its Significance

In their literature review of studies published on disaster preparedness over a 15-year period, Levac, Toal-Sullivan, and O'Sullivan (2012) define household disaster preparedness as "knowing the risks particular to a community, developing an emergency plan, and having an emergency kit in the home containing food, water, and medical supplies to shelter in place for 72 hours;" it "involves practicing the plan with family members and learning about emergency shelters and community response evacuation plans." In disseminating information to the public about preparedness, FEMA (2014) focuses on four dimensions: (1) be informed, (2) make a plan, (3) build a kit, and (4) get involved. Accordingly, households must have resources in place to prepare themselves in the event of an emergency, but they also must know how to take the appropriate actions should a disastrous event occur (Zamboni and Martin, 2020). In this study, *household disaster preparedness* is defined as a combination of resource- and action-based measures, which are discussed more fully in the data and methods section.

The literature shows that disasters are not experienced equally by all segments of the population; people of color, women, and those with fewer economic resources fare worse in disasters than

Whites, men, and those who are more affluent (Fothergill, Maestas, and DeRouen, 1999; Fussell et al., 2018; Peacock, Morrow, and Gladwin, 1997; Reid, 2013). Having plans in place to evacuate promptly before the onset of a disaster, such as a hurricane, could possibly lessen those impacts. Research on Hurricane Katrina evacuees found significant racial and ethnic differences in those that evacuated before the onset of the storm and those that had emergency evacuation plans in place well before the storm (Spence, Lachlan, and Griffin, 2007). Whereas 85.5 percent of Whites evacuated before the onset of Katrina, 64.5 percent of Blacks and 82.9 percent of other non-Whites evacuated at the same time; well before the hurricane, 49.1 percent of Whites had emergency evacuation plans in place, relative to 31.4 percent of Blacks and 38.6 percent of other non-Whites (Spence Lachlan, and Griffin, 2007).

Studying racial and ethnic differences in preparedness may also be beneficial in terms of health outcomes. Lin and colleagues (2021) find that the combined impact of winter storms and power outages significantly increases hospitalization rates for cardiovascular disease in New York State. Particular groups of Hispanics, such as Puerto Ricans, and Blacks have higher mortality and morbidity from cardiovascular disease than Whites (Daviglus et al., 2012; Pearson-Stuttard et al., 2016). If those households were adequately prepared in terms of owning generators to use in the event of power outages, a widening of racial and ethnic disparities in these health outcomes could be prevented. Such preparedness could depend upon whether households live in owner- or renter-occupied housing, which is also stratified by race and ethnicity; therefore, considering housing characteristics is imperative in examining disaster preparedness.

Individual-Level Factors Related to Hispanic Disaster Preparedness

The literature on disaster preparedness mainly focuses on sociodemographic characteristics of individuals and households as correlates of preparedness. From our reading of the literature, the individual-level correlates of disaster preparedness may be grouped into two categories: those relating to risk of experiencing a disaster and those indicative of social status that influence the extent to which households have resources that allow them to prepare for a disaster.

With respect to the first set of factors, theoretical models—such as the Protective Action Decision model—suggest that the perception of disaster risk and actual disaster experience tend to make individuals more likely to prepare for future disasters (Basolo, Steinberg, and Grant, 2017; Bourque et al., 2012; Cameron and Shah, 2015; Lindell and Perry, 2012; Peacock, Brody, and Highfield, 2005). The empirical findings regarding the association between perceived risk of disaster and preparedness, however, are mixed, with some studies suggesting that self-efficacy to act on risk or fatalism, among other factors, may have a stronger impact than the perception of risk (Basolo, Steinberg, and Grant, 2017; DeYoung and Peters, 2016; Kievik and Gutteling, 2011; Witte and Allen, 2000). Stronger evidence indicates that previous experience with a disaster significantly raises the likelihood of preparedness (Basolo, Steinberg, and Grant, 2017; Bourque et al., 2012; Donahue, Eckel, and Wilson, 2014; Malmin, 2020; Pennings and Grossman, 2008; Rivera, 2020). Because Hispanics and Blacks are more likely than Whites to be at risk of experiencing disasters and be affected by them, Hispanics and Blacks may be more likely than Whites to prepare for disasters (Fothergill, Maestas, and DeRouen, 1999).

Social and human capital and capabilities are the second individual-level category of characteristics that are associated with preparedness and could also affect Hispanic preparedness relative to other racial and ethnic groups. However, the findings regarding those associations are mixed (Donahue, Eckel, and Wilson, 2014; Rivera, 2020). In general, older persons and those with higher levels of education and income are more likely to be prepared (Ablah, Konda, and Kelley, 2009; Cox and Kim, 2018; Malmin, 2020; Murphy et al., 2009; Zamboni and Martin, 2020), but sometimes those factors are found not to be associated with preparedness (Basolo, Steinberg, and Grant, 2017; Killian et al., 2017; Rivera, 2020). The results regarding marital status, the presence of children, nativity status, and disability status are also mixed in the literature, and whether studies include all or some of those variables depends on whether or not they were measured in the survey and, if so, whether the investigator chose to include them in the analysis (Ablah, Konda, and Kelley, 2009; Cox and Kim, 2018; Malmin, 2020; Murphy et al., 2009; Rivera, 2020; Zamboni and Martin, 2020). For example, Zamboni and Martin (2020) find that households with married couples are consistently more prepared for disasters, but those with children and disabled persons are less prepared, but the investigators do not include nativity status in the analysis. On the other hand, Rivera (2020) finds that the presence of children is not associated with preparedness, but marital status, nativity status, and disability status are not included in the model. Given that 59 percent of Hispanic adults have a high school degree or less education and that their poverty rate is above the national average (Noe-Bustamante and Flores, 2019), those factors could make Hispanics less prepared for disasters than Whites, but inconsistencies in model specifications muddy such conclusions.

Residential Characteristics, Place-Based Stratification, and Disaster Preparedness

Less research has focused on how residential characteristics affect household disaster preparedness (Burby, Steinberg, and Basolo, 2003; Lee and Van Zandt, 2019; Murphy et al., 2009; Rivera, 2020). In the case of Hispanics, housing tenure and residential conditions are important to consider. Hispanics have consistently been less likely to own their homes than are non-Hispanic Whites. According to data from the 2019 Housing and Vacancy Survey, the homeownership rate of Hispanics was 47.5 percent, whereas that of non-Hispanic Whites was 73.3 percent; Blacks had the lowest homeownership rates (42.1 percent), and Asians fell in between (57.7 percent) (U.S. Census Bureau, 2020). Those racial and ethnic patterns in homeownership rates have persisted for decades (Acolin, Lin, and Wachter, 2019; U.S. Census Bureau, 2020). In addition to having less access to homeownership, Hispanics have lived in poorer quality housing and neighborhoods than have Whites (Friedman and Rosenbaum, 2004; Friedman, Gibbons, and Galvan, 2014; McConnell, 2017). In 2019, more than two-thirds of low-income Hispanics and Blacks lived in high-poverty neighborhoods, relative to about one-third of low-income Whites and Asians (JCHS, 2020).

People's homes likely affect their preparedness in two ways, through their use and exchange values (Lee and Van Zandt, 2019; Logan and Molotch, 1987). Use values refer to the overall benefits of consumption that are gained from a home. Exchange values refer to the gains made from homes as units for sale within the housing market or through investment. Use values of housing can shape preparedness in several ways. The first relates to housing tenure. Households that own their homes generally have more income than renters, which increases their ability to prepare (Lee and Van Zandt, 2019). Because owners generally stay in their homes longer than renters, owners have

more knowledge about the potential risk of the area for experiencing a disaster, which would make them more likely to be prepared (Burby, Steinberg, and Basolo, 2003; Lee and Van Zandt, 2019). Homeowners also benefit from maintaining and upgrading their homes, which often makes it more hazard resistant—a benefit realized in current use and future exchange value (Iwata and Yamaga, 2008). Because of their longer length of residence in communities, owners generally have more social ties with their neighbors than do renters, and those social networks could prepare them better for disasters than would be the case for renters (Burby, Steinberg, and Basolo, 2003; Lee and Van Zandt, 2019). Indeed, some researchers have suggested that a shared sense of values and willingness to act at the community level, also known as collective efficacy, make households more prepared for disasters (DeYoung and Peters, 2016; McIvor, Paton, and Johnston, 2009). Hispanics and Blacks are less likely than Whites and Asians to be owners, and for all of the aforementioned reasons, we expect that their levels of preparedness will be lower than those of Whites and Asians.

Other residential characteristics relate to the use-value that a household may acquire from their home, including the year the unit was built, the type of building in which the unit is located, and the quality of the housing unit and neighborhood. Older housing stock, which tends to have more structural problems, and housing units with maintenance deficiencies are more likely to be subject to disaster-related damage than newer and better quality housing stock (Lee and Van Zandt, 2019). Evidence also suggests that single-family, detached housing is less susceptible to damage from disasters than mobile homes and multiunit buildings (Peacock et al., 2014). Thus, households living in newer, better quality housing stock and single-family, detached homes are less likely to experience disaster-related housing damage and losses. Households living in poorer quality residential locations, including neighborhoods with high levels of serious crime, also experience lower levels of collective efficacy, increasing their vulnerability to disaster effects (Sampson, 2012). When neighbors have greater collective efficacy, they are more likely to share information, assistance, and resources and provide aid to those with greater needs (Hurlbert, Haines, and Beggs, 2000; Klinenberg, 2002). Households living in older units, in multiunit buildings, and in housing and neighborhoods of lower quality will likely be less prepared for disasters, and, if those characteristics are confounded with racial and ethnic differences in disaster preparedness, the magnitude of the association between race and ethnicity and preparedness will diminish (Friedman and Rosenbaum, 2004; Friedman, Gibbons, and Galvan, 2014; JCHS, 2020).

In addition to the use-values of housing potentially shaping disaster preparedness and, specifically, Hispanic disaster preparedness, the role of exchange values is critical to consider. The social vulnerability of individuals is connected to place-based inequalities, and the exchange values of housing link directly to the larger system of place-based stratification (Cutter, Boruff, and Shirley, 2003; Logan and Molotch, 1987). Exchange values of housing depend upon the location of the housing, and the investment decisions of governments and private investors are influential in privileging some locations over others (Logan and Molotch, 1987). Prominent among the forces contributing to place-based inequalities in exchange values are the institutional actors that have created and perpetuated racial and ethnic residential segregation in America's cities and metropolitan areas (Logan and Molotch, 1987; Massey and Denton, 1993; Rothstein, 2017). The U.S. government's historical participation in redlining and contemporary forms of racial and ethnic discrimination in mortgage lending are just some of the ways in which Hispanics

and other non-White groups have been relegated to living in poorer quality housing and neighborhoods and are less likely to be homeowners than are Whites (Massey and Denton, 1993; Rothstein, 2017; Taylor, 2019).

More recently, Hispanic and Black communities suffered immeasurably from subprime lending and foreclosures that occurred during the Great Recession (Bocian, Li, and Ernst, 2010; Rugh, 2014). According to Bocian and colleagues (2010: 3), "between 2009 and 2012, $194 billion and $177 billion, respectively, will have been drained from African-American and Hispanic communities in indirect 'spillover' losses" from the foreclosure crisis. Hispanic owners seem to have been hit hardest by the second surge of risky lending, known as "alt-A lending," which grew more rapidly after 2004 than subprime lending (Calem, Nakamura, and Wachter, 2011; Rugh, 2014). That wave of risky lending primarily took place in the Sunbelt, including places such as Florida, which also suffer from costly disasters (Kuebler and Rugh, 2013). The burst of the housing bubble in the late 2000s disproportionately affected Hispanics, who had the highest foreclosure rate after 2009 (Rugh, 2014).

These place-based inequalities must be considered in the context of disaster preparedness. From an exchange value perspective, housing tenure is important to consider in household preparedness, particularly related to Hispanic and Black preparedness relative to that of Whites. Because of racial and ethnic residential segregation and the Great Recession, even if Hispanics and Blacks own their homes, they receive lower levels of exchange value from their homes than do Whites and Asians (Friedman, Tsao, and Chen, 2013; JCHS, 2020; Mayock and Malacrida, 2018). Significant racial and ethnic differences exist in household wealth. In 2016, the median wealth values of Hispanic and Black households were $21,400 and $16,300—eight and ten times lower, respectively, than that of White households ($162,800), and Hispanics and Blacks acquired more of their wealth from homeownership—65 percent and 56 percent, respectively—than Whites (38 percent; JCHS, 2018: 15). The glaring racial and ethnic inequalities in wealth are related to those place-based inequalities and no doubt contribute to Hispanic preparedness levels relative to those of other racial and ethnic groups (Maroto, 2016; Mayock and Malacrida, 2018). In addition, with communities of color having lower levels of investment related to a historical legacy of discrimination in housing, Hispanics and Blacks will be less likely to be prepared than Whites and potentially Asians because of fewer resources accessible to those households (Bocian, Li, and Ernst, 2010; JCHS, 2020; Rothstein, 2017). Finally, due to disinvestment in communities of color resulting from persistently high levels of racial and ethnic residential segregation, crime is often higher, and levels of collective efficacy are generally lower, thereby weakening the ability of Hispanics and Blacks to prepare for disasters relative to Whites and Asians (Hurlbert, Haines, and Beggs, 2000; Klinenberg, 2002; Sampson, 2012).

Data and Methods

The analyses for this study are based on data from the 2017 panel of the AHS, a survey based on a biannual, multistage probability sample of more than 80,000 housing units throughout the United States. The 2017 panel includes a topical module on disaster planning, which asks several questions on disaster preparedness, the main focus of our research. In addition, the AHS data

contain many indicators of housing and residential characteristics, such as the housing tenure, the adequacy and age of the unit, the building type within which the unit is located, and whether serious crime occurs in the neighborhood. The analytical dataset is restricted to occupied housing units that received the disaster planning topical module and for which the householder completed the questionnaire. Those housing units have a weight value greater than zero for the topical module (HUD, 2019).

The dependent variables consist of a variety of aspects of disaster preparedness, similar to those used in other research (e.g., Bethel, Burke, and Britt, 2013; Malmin, 2020; Murphy et al., 2009; Zamboni and Martin, 2020). Like Zamboni and Martin's study (2020), this study focuses on resource- and action-based preparedness measures. Concerning the former, this study uses the householder's responses to five questions regarding whether the household has (1) enough nonperishable food for 3 days; (2) at least 3 gallons or 24 bottles of water per person; (3) emergency supplies readily available to take with them if they had to evacuate from their home; (4) financial resources to meet expenses of up to $2,000 if they had to evacuate from their town or city to a safe place at least 50 miles away; and (5) enough reliable vehicles to carry all of their household members and a small amount of supplies, such as clothes and food, if they had to evacuate from their town or city to a safe place at least 50 miles away. For households living in single housing units and multiunit buildings with only two to four units, the study also uses the householder's response to whether they have a generator to provide electricity in the event of a power outage. Households in owner-occupied housing are asked whether they have flood insurance and the reason they purchased it—they (1) have flood insurance because it was required for home purchase or refinance; (2) bought flood insurance for other reasons, including because a neighbor purchased it; or (3) do not have flood insurance. To gauge action-based preparedness, for all households, the householder answers two questions concerning (1) where they would look *first* in the event of a major disaster to find information about what to do; and (2) where they would most likely stay if they had to evacuate from their town or city to a safe place at least 50 miles away for at least 2 weeks.

The key independent variable is the resident's race and ethnicity, with the primary focus being on Hispanic householders.[1] The study compares Hispanics to non-Hispanic Whites (hereafter, Whites), non-Hispanic Blacks (hereafter, Blacks), and Asians. Other races and multiracial and ethnic householders are excluded from this analysis; those latter groups contain too few cases to make any meaningful analysis.

Housing characteristics are examined as they relate to household disaster preparedness. One of the key measures in this regard is housing tenure, gauged by whether the household owns their home. The year that the housing was built is included and is represented by two dummy variables—(1) built between 1970 and 1999; and (2) built in 2000 or later—with units built before 1970 serving as the reference group. The type of unit in which households reside is included as three dummy variables: (1) a single-family, attached unit; (2) a mobile home, trailer, recreational vehicle (RV), or other units; and (3) a building with at least two apartments; single-family, detached units serve as the reference group. The adequacy of the unit is gauged by a dummy variable

[1] This study uses the racial and ethnic terms—such as Hispanic—that are used on the survey to be consistent with the way respondents have identified themselves.

indicating whether the unit is moderately or severely inadequate versus adequate. HUD created this measure of housing adequacy for the AHS (U.S. Census Bureau, 2019). According to their classification, units that are severely inadequate have at least one of the following conditions: (1) lack of plumbing, in terms of water or a full bathroom; (2) significant heating problems; (3) no electricity; (4) considerable electrical wiring problems; or (5) five maintenance problems from among the six following: (a) outside water leaks; (b) inside water leaks; (c) holes in the floors; (d) holes or cracks in the walls or ceilings; (e) large areas of peeling paint or broken plaster; or (e) signs of rats. Moderately inadequate units have at least one of the following: (1) three or four of the six maintenance problems just discussed; or (2) one of the following housing problems: (a) toilet breakdowns; (b) use of "unvented gas, oil, or kerosene heaters" as the main heating equipment; and (c) a lack of adequate kitchen facilities, such as a sink, stove, or working refrigerator (for more details, see U.S. Census Bureau, 2019). Units are adequate if they do not fall into the severely or moderately inadequate categories. Also included is a measure that gauges how much the household pays for either homeowner's or renter's insurance; if they do not pay for that type of insurance, the value is zero. The householder's perception of serious crime in their neighborhood is also included. Specifically, householders respond to the following question: "Do you agree or disagree with the following statement? This neighborhood has a lot of serious crime." A dummy variable is included based upon the responses, with the reference category being in disagreement with this statement. Finally, a dummy variable is included based upon the householder's answer to the question about whether they agree with the statement, "This neighborhood is at high risk for floods or other disasters" (1 = agree; 0 = disagree).

The analysis also includes measures of householder and household socioeconomic and demographic characteristics. One important variable is the number of years that the household has resided in the housing unit, which is used to gauge their knowledge of potential disaster threats. Two measures of socioeconomic status are included: (1) a dummy variable indicating whether the household's income falls at or below the poverty line; and (2) three dummy variables measuring the householder's educational level—(a) high school degree; (b) some college; and (c) at least a college degree—with less than a high school education serving as the reference group. Demographic factors are represented by the householder's age and four dummy variables indicating (1) whether the householder is foreign born; (2) whether the household is headed by a married couple; (3) whether children younger than 18 years old are present; and (4) whether the household contains one person who has a disability. In addition, the following three regional dummy variables are included in this analysis to control for variation in Hispanics' residential location and variation in the location of significant disasters: (1) Midwest; (2) South; and (3) West, with Northeast serving as the reference group.

Many of the dependent variables and a few independent variables are missing data. In a naïve approach such as complete-case-only analysis, one would drop 6.3 percent of cases due to incomplete values. To avoid the adverse impact of such an approach (see, for example, Little and Rubin, 2019), multiple imputation (MI) inference methods are employed, consistent with the survey design. More specifically, a sequential regression multiple imputation algorithm was used, as implemented in SAS PROC MI (with the srmi option), where each survey item subject to missing data is modeled using an appropriate regression model with all the other items and survey

design information included as covariates. This method imputes survey items sequentially or one item at a time using all the other items, whether fully observed or imputed at previous iterations as covariates and preserves associations. Those regression models are used as a basis to sample missing values (i.e., multiple imputations) from the underlying posterior predictive distribution for missing data.

As described extensively in the missing data literature (e.g., Little and Rubin, 2019), multiple imputations obtained under this procedure allows estimation of uncertainty due to missing data on the statistical inferences. This estimation also allows an assessment of whether the imputation procedure worked well by comparing the rates of missing information to the raw missingness rates (Harel and Zhou, 2007). The models are fitted using each of the imputed datasets, and the inferential quantities—such as regression coefficients—are combined, along with their standard errors. This practice, known as combining estimates or multiple imputation inference, allows uncertainty due to the imputation process to be directly gauged. Following a general practice, estimates from 20 multiply imputed datasets were combined. As discussed in Little and Rubin (2019), most applications reveal a minimal gain in the statistical efficiency beyond 20 imputations.

Bivariate and multivariate analyses of those data were conducted. Bivariate analyses are used to examine how Hispanics compare with Whites, Blacks, and Asians in terms of their disaster preparedness and their housing, residential, socioeconomic, and demographic characteristics. Logistic and multinomial logistic regression analyses are used to examine whether any Hispanic disadvantages in disaster preparedness, relative to those for Whites, in the bivariate analyses remain after controlling for housing, residential, socioeconomic, and demographic characteristics. Through those multivariate analyses, the disaster preparedness of Blacks and Asians, relative to Whites, was also examined after controlling for other relevant characteristics. Multiple imputation inference replicates those analyses on each of the imputed datasets, and the estimates (e.g., logistic regression coefficients and standard errors) are then combined using rules defined by Rubin (2004). The level of statistical significance is set to be 0.05.

Results

Descriptive Analyses

How do Hispanics compare with Whites, Blacks, and Asians in terms of their disaster preparedness? Exhibit 1 addresses that question, presenting means for the main dependent variables. Considering multiple indicators of resource-based preparedness, Hispanic households are generally less prepared for disasters than Whites, equally prepared as Asians, and often more prepared than Blacks. Just over 77 percent of Hispanics have enough nonperishable food to last for at least 3 days, relative to 85.39 percent of Whites, 80.61 percent of Blacks, and about 77 percent of Asians. Hispanics are significantly less likely than Whites and Asians to have evacuation funds of up to $2,000 and evacuation vehicles available but are more likely than Blacks to have those funds and vehicles. Hispanic owners, however, are significantly more likely than White and Asian owners to have flood insurance. With respect to having a generator, Hispanics are significantly less likely than Whites but more likely than Blacks and Asians to have that resource.

Exhibit 1

Racial and Ethnic Differences in Disaster Preparedness in the United States, 2017

Characteristic	Percentage of …				Chi-square	Significance
	Hispanics	NH Whites	NH Blacks	Asians		
Household has—						
Enough nonperishable food for at least 3 days	77.24	85.39	80.61	76.65	129.63	***
At least 3 gallons of water per person	66.36	57.42	63.13	63.03	90.48	***
Prepared emergency evacuation supplies	53.76	53.79	58.07	53.10	15.10	**
Evacuation funds of up to $2,000	65.98	83.98	60.94	87.03	712.48	***
Home covered by flood insurance (owners)					78.52	***
Yes, required for home purchase/refinancing	7.40	3.82	7.20	6.71		
Yes, decided to buy after neighbor did	0.64	0.33	0.72	0.62		
Yes, decided to buy for other reasons	9.51	5.86	9.66	6.63		
No	82.45	89.98	82.42	86.04		
Evacuation vehicle(s) available	89.72	95.02	86.34	91.45	198.29	***
Generator[1]	12.93	22.61	11.16	7.68	318.90	***
First source of emergency info during disaster					231.17	***
Family, friends, or neighbors	24.51	17.05	17.02	19.02		
Radio	12.40	14.12	13.20	10.11		
Television	30.29	31.14	40.54	25.19		
Internet	29.38	32.80	24.55	42.60		
Other source	3.42	4.89	4.70	3.08		
Likely place to stay during a 2-week evacuation					500.12	***
With relatives or friends	69.14	65.30	66.57	61.40		
Public shelter	8.39	3.04	7.32	5.97		
Hotel or motel	19.19	24.46	24.01	30.79		
Travel trailer or recreational vehicle	1.11	3.42	.34	.22		
Other	2.16	3.78	1.77	1.62		
N	4,158	16,573	3,740	1,629		

NH = Non-Hispanic.

[1]This variable is asked only for households living in buildings with fewer than five units.

****p<.001. **p<.01. *p<.05.*

Source: Authors' tabulations of the 2017 American Housing Survey

By contrast, non-Whites are more prepared than Whites on two resource-based items. Hispanics, Blacks, and Asians are significantly more likely than Whites to have at least 3 gallons of water per person; likely because of concerns with the local water supply rather than an impending disaster, those groups tend to stock up on water. Blacks were more likely than all other groups to report having emergency supplies readily available to take with them if they have to evacuate from their home.

As far as more action-based items—where groups get their emergency information during a disaster and plan to stay if they are forced to evacuate from their homes for at least 2 weeks—notable differences emerged between Hispanics and the other racial and ethnic groups. For emergency information, Hispanics are significantly more likely than Whites, Blacks, and Asians to rely first on family, friends, or neighbors. Blacks are much more likely than other groups to rely on television for that information. Asians and Whites are more likely than Hispanics and Blacks to rely on the internet. Concerning evacuation destinations, Hispanics are significantly more likely than Whites, Blacks, and Asians to stay with relatives or friends, but they are also more likely than Whites and Asians to stay in a public shelter. Hispanics are the least likely to stay in a hotel or motel, Asians are the most likely, and Whites and Blacks fall in between. Whites are the most likely to plan to stay in a travel trailer or RV. These bivariate racial and ethnic differences in preparedness may be due to confounding with housing and resources.

Racial and ethnic differences in disaster preparedness are likely associated with disparities in residential characteristics and socioeconomic and demographic factors. Exhibit 2 reports the mean differences in those variables between Hispanics and other racial and ethnic groups. Notably, all of the racial and ethnic differences in the characteristics presented in exhibit 2 are statistically significant. The differences in housing tenure are similar in nature to those discussed previously. Just over 48 percent of Hispanics and 45 percent of Blacks own their homes, relative to nearly 73 percent of Whites and just over 60 percent of Asians. Hispanics and Blacks are more likely than Whites and Asians to live in housing stock built before 1970. Just over 26 percent of Asians live in housing built in 2000 or later, relative to 18.59 percent of Hispanics, 18.61 percent of Whites, and 19.48 percent of Blacks. Regarding the type of building in which the home is located, 70.18 percent of Whites live in a single, detached unit, compared with 52.51 percent of Hispanics, 50.48 percent of Blacks, and 55.85 percent of Asians. Non-Whites are more likely than Whites to live in a building with two or more apartments.

Exhibit 2

Racial and Ethnic Differences in Housing, Residential, Householder, and Household Characteristics in the United States, 2017 (1 of 2)

Characteristic	Percentage of… Hispanics	NH Whites	NH Blacks	Asians	Chi-square[a]	Significance
Housing and Residential Characteristics						
Owner	48.15	72.76	45.14	60.38	950.53	***
Year built						
Before 1970	41.58	39.47	42.97	32.16	40.04	***
1970–1999	39.84	41.92	37.55	41.43	16.91	**
2000 or later	18.59	18.61	19.48	26.41	29.42	***
Type of building in which unit is located						
Single-family home, detached	52.51	70.18	50.48	55.85	527.62	***
Single-family home, attached	8.58	6.31	9.94	9.53	52.83	***
Mobile home, trailer, RV, or other	5.86	6.00	3.83	.90	153.13	***
Building with 2+ apartments	33.05	17.52	35.75	33.72	551.71	***
Moderately or severely inadequate housing	6.59	4.21	7.16	2.13	70.98	***
Property insurance amount (mean)	43.62	73.32	44.32	72.61	196.15	***
Agrees that neighborhood has serious crime	9.69	4.26	12.02	4.06	192.68	***
Agrees that neighborhood is at high risk for floods or other disasters	9.53	6.98	9.94	6.29	34.71	***
Household and Householder Characteristics						
Number of years household in the unit (mean)	9.03	13.47	10.78	7.66	202.89	***
Income at or below the poverty line	19.69	10.35	23.67	13.00	297.71	***
Householder education					1152.15	***
Less than high school degree	29.91	6.65	12.19	6.95		
High school degree	26.15	24.19	29.56	14.96		
Some college	25.55	30.32	31.58	17.41		
Bachelor's degree or more	18.39	38.84	26.67	60.68		
Foreign born	52.16	4.22	11.71	77.98	2,876.83	***
Householder age (mean)	46.40	54.08	50.17	46.15	243.84	***
Household is a married-couple family	51.28	51.59	29.23	62.26	472.05	***

Exhibit 2

Racial and Ethnic Differences in Housing, Residential, Householder, and Household Characteristics in the United States, 2017 (2 of 2)

Characteristic	Percentage of...					
	Hispanics	NH Whites	NH Blacks	Asians	Chi-square[a]	Significance
Household and Householder Characteristics						
Household has children	48.19	25.76	32.04	40.76	461.15	***
Household has at least one person age 65+	21.03	32.76	22.55	18.16	356.47	***
At least one person in the home has a disability	18.95	24.09	23.22	10.71	165.38	***
Region					1,558.72	***
Northeast	15.61	19.03	15.18	19.98		
Midwest	9.03	26.69	17.84	13.03		
South	37.83	34.37	59.35	26.41		
West	37.53	19.91	7.62	40.57		

NH = Non-Hispanic. RV = recreational vehicle.

[a]The mean values in the exhibit use the F-statistic from regressing the characteristic on the dummy variables for race/ethnicity.

****p<.001. **p<.01. *p<.05.*

Source: Authors' tabulations of the 2017 American Housing Survey

Racial and ethnic differences exist in the quality of the residential environment and the amount paid in property insurance. More than 6 percent of Hispanics report living in moderately or severely inadequate housing, relative to 4.21 percent of Whites, 7.16 percent of Blacks, and only 2.13 percent of Asians. Whites and Asians pay more for property insurance than Hispanics and Blacks. Around 10 percent of Hispanics agree that serious crime is present in the neighborhoods in which they live. Although not as high as the percentage of Blacks agreeing with that statement (12.02 percent), it is more than double the rate of Whites and Asians. Nearly 10 percent of Hispanics and Blacks agree that their neighborhoods are at high risk of flood or other disasters, relative to 6.98 percent of Whites and 6.29 percent of Asians. Taken together, the residential inequalities faced by Hispanics and Blacks—relative to Whites—will likely be an important component to consider in examining their disaster preparedness.

Exhibit 2 also presents descriptive statistics for racial and ethnic differences in household and householder's socioeconomic and demographic characteristics; for brevity, a few of particular relevance are covered. On average, Hispanics have spent fewer years in their current homes than Whites and Blacks. Not surprising, the percentages of Hispanics and Blacks with income falling at or below the poverty line is at least 1.5 times that of Whites and Asians. Consistent with the variation in income levels, nearly 30 percent of Hispanics and 12.19 percent of Blacks have less than a high school degree, much higher than for White and Asians. Just over a majority, 52.16 percent of Hispanics are foreign born as compared with 4.22 percent of Whites, 11.71 percent of Blacks, and nearly 78 percent of Asians. Nearly 19 percent of Hispanics have at least one disabled person in their household, which is lower than the percentages for Whites and Blacks but higher than for Asians. Clearly, the socioeconomic disadvantages experienced by Hispanics relative to other groups will likely relate to their disaster preparedness relative to other groups.

Notable differences emerge in the regional location of Hispanics relative to other racial and ethnic groups. The shares of Hispanics living in the South and West are each about 38 percent. Although 34.37 percent of Whites live in the South, they are also relatively evenly distributed across the other regions. Blacks, on the other hand, are disproportionately concentrated in the South, with just over 59 percent living there. A significant share of Asians, 40.57 percent, live in the West, and the second largest share, 26.41 percent, can be found in the South. The fact that non-White groups disproportionately reside in the South and West will likely have implications for their disaster preparedness, given that those areas are highly vulnerable to adverse climate events.

Multivariate Analyses: Racial and Ethnic Differences in Disaster Preparedness

How do Hispanics and other racial ethnic groups fare relative to Whites in disaster preparedness outcomes, controlling for housing and residential characteristics and for household and householder socioeconomic and demographic characteristics? Exhibits 3a, 3b, 4, 5, and 6 tackle that question by examining multivariate analyses of all of the dependent variables presented in exhibit 1. The discussion proceeds as follows. First, the results of the coefficients for the racial and ethnic dummy variables are highlighted across all of the models in these exhibits. Then, the association results between our housing/residential variables and disaster preparedness outcomes are summarized. Finally, very brief attention is paid to the results for the rest of the control variables.

Exhibit 3a focuses on the first set of resource-based preparedness outcomes. Column 1 reports that Hispanics, Blacks, and Asians are significantly less likely than Whites to have enough nonperishable food for 3 days, controlling for other factors. By contrast, column 2 shows that Hispanics, Blacks, and Asians are significantly more likely to have available at least 3 gallons of water per person. The odds of Hispanics, Blacks, and Asians having water available are 1.45, 1.39, and 1.26, respectively, times the odds of Whites (exp[.373], exp[.330], exp[.234]). Column 3 reveals that only Blacks are significantly more likely to have emergency supplies readily available to take if they had to evacuate their homes, controlling for other relevant characteristics.

Exhibit 3a

Logistic Regression Coefficients of Disaster Preparedness in the United States, 2017 (1 of 2)

Characteristic	Enough non-perishable food (1)		Enough water per person (2)		Prepared Emerg Evac Supplies (3)	
Race and Ethnicity of Householder (ref. NH White)						
Hispanic	-0.191	**	0.373	***	0.071	
	(0.066)		(0.056)		(0.053)	
NH Black	-0.122	*	0.330	***	0.224	***
	(0.062)		(0.051)		(0.049)	
Asian	-0.233	**	0.234	**	0.046	
	(0.090)		(0.077)		(0.074)	
Housing and Residential Characteristics						
Owner (ref. Renter)	0.210	***	0.213	***	0.034	
	(0.063)		(0.048)		(0.047)	
Year built (ref. Before 1970)						
1970–1999	0.083		0.053		-0.027	
	(0.047)		(0.036)		(0.036)	
2000 or later	0.090		0.070		-0.023	
	(0.060)		(0.047)		(0.046)	
Type of building in which unit is located (ref. Single-family home, detached)						
Single-family home, attached	-0.108		-0.049		-0.075	
	(0.076)		(0.061)		(0.059)	
Mobile home, trailer, RV or other	-0.017		0.009		0.103	
	(0.099)		(0.077)		(0.074)	
Building with 2+ apartments	-0.214	***	-0.226	***	-0.160	***
	(0.061)		(0.049)		(0.048)	
Moderately or severely inadequate housing	-0.394	***	-0.327	***	-0.300	***
(ref. Adequate housing)	(0.084)		(0.073)		(0.072)	
Property insurance amount	0.000		0.000	*	0.001	***
	(0.000)		(0.000)		(0.000)	
Agrees neighborhood has serious crime	-0.174	*	-0.038		-0.100	
(ref. Disagrees)	(0.079)		(0.066)		(0.065)	
Neighborhood at risk for a disaster	-0.063		0.088		0.175	**
(ref. Disagrees)	(0.073)		(0.059)		(0.058)	

Exhibit 3a

Logistic Regression Coefficients of Disaster Preparedness in the United States, 2017 (2 of 2)

Characteristic	Enough non-perishable food (1)		Enough water per person (2)		Prepared Emerg Evac Supplies (3)	
Household and Householder Characteristics						
Number of years household in the unit	0.001		-0.000		-0.002	
	(0.002)		(0.002)		(0.002)	
Income at or below poverty line	0.033		0.098	*	0.039	
	(0.059)		(0.048)		(0.047)	
Householder education (ref. < High school degree)						
High school degree	0.149	*	-0.037		0.105	
	(0.072)		(0.060)		(0.057)	
Some college	0.144	*	-0.106		0.190	***
	(0.071)		(0.060)		(0.057)	
Bachelor's degree or more	0.023		-0.391	***	-0.025	
	(0.072)		(0.060)		(0.058)	
Foreign born (ref. Native born)	-0.374	***	0.243	***	-0.083	
	(0.062)		(0.053)		(0.051)	
Householder age	0.005	**	0.009	***	0.004	*
	(0.002)		(0.002)		(0.002)	
Household is married-couple family	0.216	***	0.003		0.087	*
(ref. other Family/non-family types)	(0.046)		(0.035)		(0.034)	
Household has children	0.055		-0.350	***	-0.098	**
(ref. Does not have children)	(0.050)		(0.039)		(0.038)	
Household has at least one person age 65+	0.066		-0.046		-0.020	
(ref. No one is 65+)	(0.064)		(0.050)		(0.049)	
At least one person in the home is disabled	-0.027		-0.151	***	-0.128	**
(ref. No one is disabled)	(0.052)		(0.040)		(0.039)	
Region (ref. Northeast)						
Midwest	-0.059		-0.177	***	-0.088	
	(0.070)		(0.051)		(0.050)	
South	-0.121		0.036		0.241	***
	(0.063)		(0.048)		(0.047)	
West	-0.187	**	0.095		0.202	***
	(0.066)		(0.051)		(0.050)	
Intercept	1.208	***	-0.023		-0.209	*
	(0.136)		(0.106)		(0.105)	

NH = Non-Hispanic.

****p<.001. **p<.01. *p<.05.*

Source: Authors' tabulations of the 2017 American Housing Survey

Exhibit 3b examines other resource-based disaster preparedness outcomes. According to column 1, Hispanics and Blacks are significantly less likely than Whites to have financial resources to meet expenses of up to $2,000 if they had to evacuate to a place at least 50 miles away, controlling for relevant factors. More specifically, the odds of Hispanics and Blacks having such financial resources are .70 and .53, respectively, times the odds of Whites. Column 2 shows that Hispanics, Blacks, and Asians are significantly less likely to have enough reliable vehicles to carry all household members and a small number of supplies if they had to evacuate to a place at least 50 miles away, controlling for other factors. Column 3 reports results for those living in housing units that are single units or multi-unit buildings with two to four units. Controlling for housing, residential, socioeconomic, and demographic characteristics, Hispanics, Blacks, and Asians are significantly less likely than Whites to have a generator that could provide electricity in the event of a power outage. In terms of the magnitude of those differences, the odds of Hispanics, Blacks, and Asians are .73, .56, and .41, respectively, times the odds of Whites (exp[-.319], exp[-.572], exp[.-.884]).

Exhibit 3b

Logistic Regression Coefficients of Disaster Preparedness in the United States, 2017 (1 of 2)

Characteristic	Has Evacuation Funds (up to $2000) (1)		Evacuation Vehicle Available (2)		Has a Generator (3)	
Race and Ethnicity of Householder (ref. NH White)						
Hispanic	-0.351	***	-0.300	**	-0.319	***
	(0.067)		(0.104)		(0.086)	
NH Black	-0.636	***	-0.565	***	-0.572	***
	(0.059)		(0.083)		(0.087)	
Asian	0.006		-0.478	***	-0.884	***
	(0.112)		(0.141)		(0.164)	
Housing and Residential Characteristics						
Owner (ref. Renter)	0.727	***	0.605	***	0.263	***
	(0.067)		(0.109)		(0.077)	
Year built (ref. Before 1970)						
1970–1999	0.273	***	0.325	***	0.234	***
	(0.049)		(0.074)		(0.052)	
2000 or later	0.557	***	0.340	***	0.086	
	(0.065)		(0.096)		(0.071)	
Type of building in which unit is located (ref. Single-family home, detached)						
Single-family home, attached	-0.011		-0.431	***	-0.843	***
	(0.079)		(0.113)		(0.108)	
Mobile home, trailer, RV or other	-0.650	***	-0.474	**	0.024	
	(0.091)		(0.164)		(0.095)	
Building with 2+ apartments	-0.095		-1.055	***	-0.784	***
	(0.061)		(0.092)		(0.138)	
Moderately or severely inadequate housing (ref. Adequate housing)	-0.546	***	-0.410	***	-0.147	
	(0.088)		(0.108)		(0.124)	
Property insurance amount	0.004	***	0.003	**	0.002	***
	(0.001)		(0.001)		(0.000)	

Exhibit 3b

Logistic Regression Coefficients of Disaster Preparedness in the United States, 2017 (2 of 2)

Characteristic	Has Evacuation Funds (up to $2000) (1)		Evacuation Vehicle Available (2)		Has a Generator (3)	
Housing and Residential Characteristics						
Agrees neighborhood has serious crime	-0.430	***	-0.451	***	0.099	
(ref. Disagrees)	(0.078)		(0.098)		(0.108)	
Agrees neighborhood at risk for a disaster	-0.037		0.058		0.206	*
(ref. Disagrees)	(0.077)		(0.119)		(0.083)	
Household and Householder Characteristics						
Number of years household in the unit	0.005	*	0.001		0.008	***
	(0.002)		(0.003)		(0.002)	
Income at or below poverty line	-0.810	***	-0.821	***	-0.177	*
	(0.053)		(0.067)		(0.084)	
Householder education (ref. < High school degree)						
High school degree	0.544	***	0.245	**	0.029	
	(0.066)		(0.094)		(0.088)	
Some college	0.767	***	0.513	***	0.070	
	(0.068)		(0.101)		(0.088)	
Bachelor's degree or more	1.600	***	0.444	***	-0.394	***
	(0.076)		(0.104)		(0.091)	
Foreign born (ref. Native born)	0.065		-0.235	*	-0.313	***
	(0.067)		(0.095)		(0.091)	
Householder age	0.004		-0.006		0.011	***
	(0.002)		(0.003)		(0.003)	
Household is married-couple family	0.403	***	0.660	***	0.643	***
(ref. Other family/nonfamily types)	(0.049)		(0.077)		(0.051)	
Household has children	-0.298	***	0.353	***	-0.104	
(ref. Does not have children)	(0.052)		(0.082)		(0.058)	
Household has at least one person age 65+	0.316	***	-0.150		-0.334	***
(ref. No one is age 65+)	(0.070)		(0.098)		(0.071)	
At least one person in the home has a disability	-0.679	***	-0.649	***	0.005	
(ref. No one has a disability)	(0.051)		(0.070)		(0.057)	
Region (ref. Northeast)						
Midwest	-0.068		0.580	***	-0.270	***
	(0.073)		(0.095)		(0.072)	
South	-0.321	***	0.812	***	-0.212	**
	(0.068)		(0.086)		(0.068)	
West	-0.018		0.749	***	-0.500	***
	(0.073)		(0.093)		(0.077)	
Intercept	0.047		2.263	***	-2.251	***
	(0.136)		(0.194)		(0.172)	

NH = Non-Hispanic.

****p<.001. **p<.01. *p<.05.*

Source: Authors' tabulations of the 2017 American Housing Survey

Exhibit 4 focuses on multinomial regression coefficients from a model of whether the household purchased flood insurance and the reasons for the purchase—the last resource-based measure of disaster preparedness. In contrast to the previous set of results, the findings in exhibit 4 reveal that Hispanics and Blacks are significantly more likely than Whites to have flood insurance. Column 1 shows that the odds that Hispanics and Blacks have obtained flood insurance because it is required for the purchase of their home or to refinance their mortgage are 1.86 and 1.73 times, respectively, the odds of Whites (exp[.620], exp[.546]) relative to not obtaining flood insurance, and those differences are statistically significant. Column 2 shows that the odds that Hispanics and Blacks have obtained flood insurance for other reasons, including the fact that their neighbors bought it, are 1.71 and 1.59 times, respectively, the odds of Whites (exp[.537], exp[.466]) relative to not obtaining flood insurance, and those differences are statistically significant. Controlling for relevant factors, Asians do not significantly differ from Whites in their purchase or reasons for purchasing flood insurance.

Exhibit 4

Multinomial Logistic Regression Coefficients of Flood Insurance Purchase and Reasons in the United States, 2017 (1 of 2)

Characteristic	Flood Insurance Required for Purchase/Refinance vs. No Flood Insurance (1)		Flood Insurance Bought for Other Reason vs. No Flood Insurance (2)	
Race and Ethnicity of Householder (ref. NH White)				
Hispanic	0.620	***	0.537	***
	(0.160)		(0.134)	
NH Black	0.546	***	0.466	***
	(0.153)		(0.117)	
Asian	0.387		0.084	
	(0.226)		(0.190)	
Housing and Residential Characteristics				
Year built (ref. Before 1970)				
1970–1999	-0.163		-0.061	
	(0.110)		(0.090)	
2000 or later	-0.230		0.050	
	(0.136)		(0.112)	
Type of building in which unit is located (ref. Single-family home, detached)				
Single-family home, attached	0.177		0.248	
	(0.177)		(0.149)	
Mobile home, trailer, RV, or other	-0.777	**	-0.421	*
	(0.254)		(0.190)	
Building with 2+ apartments	-0.289		-0.361	
	(0.231)		(0.212)	
Moderately or severely inadequate housing (ref. Adequate housing)	-0.039		-0.351	
	(0.247)		(0.235)	
Property insurance amount	0.004	***	0.003	***
	(0.000)		(0.000)	
Agrees neighborhood has serious crime (ref. Disagrees)	-0.207		0.184	
	(0.238)		(0.173)	

Exhibit 4

Multinomial Logistic Regression Coefficients of Flood Insurance Purchase and Reasons in the United States, 2017 (2 of 2)

Characteristic	Flood Insurance Required for Purchase/Refinance vs. No Flood Insurance (1)		Flood Insurance Bought for Other Reason vs. No Flood Insurance (2)	
Housing and Residential Characteristics				
Agrees neighborhood at risk for a disaster (ref. Disagrees)	2.109	***	1.218	***
	(0.116)		(0.112)	
Household and Householder Characteristics				
Number of years household in the unit	-0.017	***	-0.007	
	(0.005)		(0.004)	
Income at or below poverty line	0.118		-0.163	
	(0.190)		(0.154)	
Householder education (ref. < High school degree)				
High school degree	0.102		-0.156	
	(0.204)		(0.157)	
Some college	0.140		-0.052	
	(0.200)		(0.155)	
Bachelor's degree or more	-0.122		-0.082	
	(0.201)		(0.154)	
Foreign born (ref. Native born)	0.068		0.164	
	(0.154)		(0.131)	
Householder age	-0.010	*	0.001	
	(0.005)		(0.004)	
Household is married-couple family	0.165		0.111	
(ref. Other family/nonfamily types)	(0.108)		(0.084)	
Household has children	-0.204		-0.035	
(ref. Does not have children)	(0.117)		(0.095)	
Household has at least one person age 65+	0.057		0.175	
(ref. No one is age 65+)	(0.141)		(0.115)	
At least one person in the home has a disability	-0.282	*	0.031	
(ref. No one has a disability)	(0.132)		(0.097)	
Region (ref. Northeast)				
Midwest	-0.108		0.559	***
	(0.194)		(0.145)	
South	0.705	***	0.849	***
	(0.165)		(0.132)	
West	0.039		0.106	
	(0.186)		(0.156)	
Intercept	-3.216	***	-3.546	***
	(0.357)		(0.305)	

NH = Non-Hispanic. RV = recreational vehicle.

****p<.001. **p<.01. *p<.05.*

Note: Flood insurance variable only for owners.

Source: Authors' tabulations of the 2017 American Housing Survey

Exhibit 5 focuses on multinomial regression coefficients from a model for the first source of information households would use in the event of a disaster, an action-based form of preparedness. Controlling for relevant characteristics, columns 1 and 2 of exhibit 5 reveal that Blacks would be significantly more likely than Whites to use the radio or television as the first source of information, relative to relying on family and friends. Column 3 shows that Hispanics and Blacks would be significantly less likely than Whites to use the internet as the first source of information in the event of a disaster, relative to relying on family and friends. Column 4 finds that Hispanics would be significantly less likely than Whites to use a source other than family and friends as the first source of information. Controlling for relevant factors, Asians do not significantly differ from Whites in the types of sources that they would rely first on in the event of a disaster.

Exhibit 5

Multinomial Logistic Regression Coefficients of Disaster Information Source in the United States, 2017 (1 of 2)

Characteristic	Radio vs. Family and Friends (1)	TV vs. Family and Friends (2)	Internet vs. Family and Friends (3)	Other Source vs. Family and Friends (4)
Race and Ethnicity of Householder (ref. NH White)				
Hispanic	-0.093	0.018	-0.280 ***	-0.425 **
	(0.095)	(0.076)	(0.078)	(0.146)
NH Black	0.222 *	0.400 ***	-0.181 *	0.128
	(0.089)	(0.070)	(0.076)	(0.124)
Asian	-0.198	-0.039	-0.031	-0.364
	(0.143)	(0.114)	(0.106)	(0.218)
Housing and Residential Characteristics				
Owner (ref. Renter)	0.296 ***	0.310 ***	0.273 ***	0.252 *
	(0.086)	(0.069)	(0.070)	(0.124)
Year built (ref. Before 1970)				
1970–1999	-0.005	0.124 *	0.102	0.066
	(0.063)	(0.052)	(0.054)	(0.090)
2000 or later	-0.154	0.073	0.008	-0.033
	(0.085)	(0.069)	(0.069)	(0.120)
Type of building in which unit is located (ref. Single-family home, detached)				
Single-family home, attached	0.009	-0.026	0.150	0.052
	(0.107)	(0.087)	(0.086)	(0.153)
Mobile home, trailer, RV, or other	-0.425 **	-0.336 ***	-0.365 ***	-0.036
	(0.133)	(0.099)	(0.110)	(0.171)
Building with 2+ apartments	-0.063	0.108	0.072	0.426 ***
	(0.089)	(0.070)	(0.071)	(0.118)
Moderately or severely inadequate housing (ref. Adequate housing)	-0.003	-0.122	-0.034	0.073
	(0.127)	(0.102)	(0.104)	(0.170)
Property insurance amount	-0.000	0.000	0.001 *	-0.000
	(0.000)	(0.000)	(0.000)	(0.001)
Agrees neighborhood has serious crime (ref. Disagrees)	0.031	0.020	-0.141	0.055
	(0.112)	(0.092)	(0.096)	(0.158)

Exhibit 5

Multinomial Logistic Regression Coefficients of Disaster Information Source in the United States, 2017 (2 of 2)

Characteristic	Radio vs. Family and Friends (1)		TV vs. Family and Friends (2)		Internet vs. Family and Friends (3)		Other Source vs. Family and Friends (4)	
Housing and Residential Characteristics								
Agrees neighborhood at risk for a disaster (ref. Disagrees)	0.280	**	0.056		0.027		0.351	*
	(0.100)		(0.086)		(0.088)		(0.138)	
Household and Householder Characteristics								
Number of years household in the unit	0.002		-0.001		-0.012	***	-0.006	
	(0.003)		(0.002)		(0.003)		(0.004)	
Income at or below poverty line	-0.302	***	-0.184	**	-0.429	***	-0.032	
	(0.085)		(0.062)		(0.070)		(0.107)	
Householder education (ref. < High school degree)								
High school degree	0.156		0.095		0.284	**	-0.045	
	(0.099)		(0.074)		(0.087)		(0.140)	
Some college	0.379	***	0.213	**	0.579	***	0.310	*
	(0.099)		(0.076)		(0.087)		(0.137)	
Bachelor's degree or more	0.520	***	0.270	***	1.086	***	0.370	*
	(0.102)		(0.080)		(0.089)		(0.146)	
Foreign born (ref. Native born)	-0.358	***	-0.154	*	-0.229	**	-0.318	*
	(0.095)		(0.072)		(0.074)		(0.140)	
Householder age	0.013	***	0.022	***	-0.019	***	0.015	***
	(0.003)		(0.002)		(0.002)		(0.004)	
Household is married-couple family (ref. Other family/nonfamily types)	0.430	***	0.313	***	0.324	***	0.358	***
	(0.061)		(0.050)		(0.052)		(0.086)	
Household has children (ref. Does not have children)	-0.020		0.044		-0.008		0.023	
	(0.071)		(0.057)		(0.057)		(0.105)	
Household has at least one person age 65+ (ref. No one is 65+)	-0.305	***	-0.243	***	-0.410	***	-0.194	
	(0.084)		(0.068)		(0.072)		(0.119)	
At least one person in the home has a disability (ref. No one has a disability)	0.048		-0.122	*	-0.050		0.243	**
	(0.068)		(0.055)		(0.060)		(0.094)	
Region (ref. Northeast)								
Midwest	0.390	***	0.219	**	0.104		0.153	
	(0.093)		(0.073)		(0.076)		(0.126)	
South	0.371	***	0.438	***	0.171	*	0.133	
	(0.088)		(0.068)		(0.072)		(0.118)	
West	0.508	***	-0.248	***	0.195	**	0.108	
	(0.090)		(0.074)		(0.075)		(0.127)	
Intercept	-1.839	***	-1.315	***	0.691	***	-2.741	***
	(0.195)		(0.155)		(0.157)		(0.286)	

NH = Non-Hispanic. RV = recreational vehicle.
****p<.001; **p<.01; *p<.05.*
Source: Authors' tabulations of the 2017 American Housing Survey

Exhibit 6 presents the multinomial regression coefficients from a model of where households report that they would most likely stay if they had to evacuate to a place at least 50 miles away for 2 weeks, the other action-based preparedness measure. Column 1 reveals that Hispanics, Blacks, and Asians would be significantly more likely than Whites to report that they would evacuate to a shelter relative to staying with relatives or friends, controlling for other relevant factors. Column 2 shows that Hispanics are significantly less likely than Whites to report they would evacuate to a hotel compared to staying with relatives or friends. Blacks are significantly more likely than Whites to report that they would stay in a hotel relative to staying with relatives or friends. Column 3 reports that Hispanics, Blacks, and Asians are significantly less likely than Whites to report that they would evacuate and stay in an RV compared with staying with relatives and friends. Column 4 shows that Blacks and Asians are significantly less likely than Whites to report that they would evacuate to another place compared with staying with relatives and friends, controlling for relevant factors.

Exhibit 6

Multinomial Logistic Regression Coefficients of Potential Evacuation Location in the United States, 2017 (1 of 2)

Characteristic	Shelter vs. Relatives or Friends (1)	Hotel vs. Relatives or Friends (2)	RV vs. Relatives or Friends (3)	Other Place vs. Relatives or Friends (4)
Race and Ethnicity of Householder (ref. NH White)				
Hispanic	0.304 *	-0.201 **	-0.753 ***	-0.335 *
	(0.120)	(0.067)	(0.226)	(0.164)
NH Black	0.458 ***	0.132 *	-1.695 ***	-0.567 ***
	(0.105)	(0.058)	(0.386)	(0.165)
Asian	0.439 **	0.132	-1.596 ***	-0.563 *
	(0.162)	(0.087)	(0.456)	(0.265)
Housing and Residential Characteristics				
Owner (ref. Renter)	-0.252 *	0.190 ***	0.505 **	-0.032
	(0.116)	(0.057)	(0.186)	(0.141)
Year built (ref. Before 1970)				
1970–1999	-0.347 ***	0.089 *	0.166	-0.194 *
	(0.084)	(0.043)	(0.122)	(0.098)
2000 or later	-0.583 ***	0.152 **	0.303	-0.325 *
	(0.125)	(0.055)	(0.155)	(0.135)
Type of building in which unit is located (ref. Single-family home, detached)				
Single-family home, attached	0.028	-0.069	-0.672 *	0.001
	(0.138)	(0.070)	(0.276)	(0.175)
Mobile home, trailer, RV, or other	0.379 *	-0.256 **	0.078	0.119
	(0.157)	(0.095)	(0.210)	(0.195)
Building with 2+ apartments	0.162	-0.052	-1.117 ***	0.016
	(0.104)	(0.059)	(0.273)	(0.146)
Moderately or severely inadequate housing	0.454 ***	-0.073	-0.290	0.520 **
(ref. Adequate housing)	(0.128)	(0.094)	(0.324)	(0.171)
Property insurance amount	-0.003 **	0.001 *	-0.000	0.001
	(0.001)	(0.000)	(0.001)	(0.001)

Exhibit 6

Multinomial Logistic Regression Coefficients of Potential Evacuation Location in the United States, 2017 (2 of 2)

Characteristic	Shelter vs. Relatives or Friends (1)		Hotel vs. Relatives or Friends (2)		RV vs. Relatives or Friends (3)		Other Place vs. Relatives or Friends (4)	
Housing and Residential Characteristics								
Agrees neighborhood has serious crime	0.591	***	0.097		0.158		0.305	
(ref. Disagrees)	(0.112)		(0.084)		(0.254)		(0.164)	
Neighborhood at risk for a disaster	0.138		-0.015		0.350		0.124	
(ref. Disagrees)	(0.125)		(0.072)		(0.190)		(0.150)	
Household and Householder Characteristics								
Number of years household in the unit	-0.002		-0.000		-0.002		0.001	
	(0.004)		(0.002)		(0.005)		(0.004)	
Income at or below poverty line	0.487	***	-0.336	***	-0.191		0.064	
	(0.085)		(0.064)		(0.207)		(0.133)	
Householder education (ref. < High school degree)								
High school degree	-0.070		0.212	**	0.292		-0.086	
	(0.109)		(0.075)		(0.215)		(0.168)	
Some college	-0.055		0.243	**	0.280		0.167	
	(0.114)		(0.075)		(0.218)		(0.166)	
Bachelor's degree or more	-0.522	***	0.407	***	-0.482	*	0.290	
	(0.132)		(0.074)		(0.23)		(0.172)	
Foreign born (ref. Native born)	0.801	***	0.277	***	-0.937	***	-0.250	
	(0.106)		(0.062)		(0.265)		(0.174)	
Householder age	0.023	***	0.015	***	0.023	***	0.012	**
	(0.004)		(0.002)		(0.006)		(0.004)	
Household is married-couple family	-0.197	*	0.198	***	0.769	***	0.236	*
(ref. Other family/nonfamily types)	(0.084)		(0.042)		(0.126)		(0.098)	
Household has children	-0.068		-0.050		0.096		-0.680	***
(ref. Does not have children)	(0.091)		(0.047)		(0.138)		(0.124)	
Household has at least one person age 65+	-0.269	*	-0.164	**	-0.303		-0.385	**
(ref. no one is age 65+)	(0.118)		(0.059)		(0.173)		(0.138)	
At least one person in the home has a disability	0.398	***	0.058		0.102		0.435	***
(ref. No one has a disability)	(0.085)		(0.048)		(0.128)		(0.104)	
Region (ref. Northeast)								
Midwest	-0.073		0.132	*	0.449	*	0.055	
	(0.126)		(0.062)		(0.191)		(0.136)	
South	0.083		0.251	***	0.095		-0.086	
	(0.111)		(0.057)		(0.191)		(0.129)	
West	0.188		0.306	***	1.012	***	0.408	**
	(0.116)		(0.062)		(0.189)		(0.132)	
Intercept	-3.818	***	-2.564	***	-5.421	***	-3.693	***
	(0.240)		(0.134)		(0.433)		(0.297)	

NH = Non-Hispanic. RV = recreational vehicle.
****p<.001; **p<.01; *p<.05.*
Source: Authors' tabulations of the 2017 American Housing Survey

Multivariate Analyses: Housing and Residential Characteristics and Preparedness

What is the association between housing and residential characteristics and disaster preparedness? For brevity, the most consistently significant findings across the multivariate models in exhibits 3a through 6 are highlighted. On all but one of the resource-based outcomes (having emergency supplies readily available in case of evacuation), owners are significantly more prepared than renters, controlling for relevant characteristics (see exhibits 3a and b).[2] With respect to action-based preparedness, owners are more likely than renters to first turn to the radio, television, internet, or other sources, relative to relying on family and friends as information sources in the event of a disaster (see exhibit 5). In terms of where they would report they would stay if evacuated, owners are more likely than renters to report that they would evacuate to a hotel or use an RV, relative to staying with relatives and friends (exhibit 6). However, they are less likely than renters to report that they would evacuate to a shelter or another place, compared to staying with relatives and friends (exhibit 6).

The results show that the type of building in which the unit is located shows consistent and statistically significant associations with household preparedness. Regarding resource-based preparedness, exhibit 3a reports that households living in units in buildings with at least two apartments are significantly less likely than those living in single, detached units to have enough nonperishable food and water per person and emergency supplies ready in case of an evacuation. Exhibit 3b shows that only those in mobile homes, trailers, RVs, or other types of units are significantly less likely than those in single, detached family units to have evacuation funds up to $2,000 (columns 1 and 2). Column 2 shows that households in single, attached family units, mobile and related homes, and buildings with at least two apartments are significantly less likely than those in single, detached family homes to have reliable vehicles that they could use in the event of an evacuation, controlling for relevant factors. Column 3 indicates that those in single, attached family units and those in buildings with at least two apartments are significantly less likely than those in single, attached family homes to have generators available. Exhibit 4 reveals that only those in mobile homes, trailers, RVs, or other types of units are significantly less likely than those in single, detached family units to have flood insurance (columns 1 and 2). Concerning action-based preparedness, however, exhibits 5 and 6 show that the type of building in which the unit is located has little meaningful impact on the first source of information households would turn to in the event of a disaster or on the nature of the place to which they would evacuate.

With respect to the adequacy of the housing unit, exhibits 3a, 3b, and 4 show that households living in moderately or severely inadequate housing units are significantly less likely than those living in adequate housing to be prepared for disasters on all resource-preparedness outcomes except for having a generator and flood insurance. Exhibits 5 and 6 reveal that housing adequacy affects only one of the action-based preparedness measures, evacuation location plans. Those households living in moderately or severely inadequate housing are significantly more likely than those in adequate housing to report that they would evacuate to a shelter or other place relative to staying with relatives or friends (columns 1 and 4 of exhibit 6).

[2] Just as a reminder to the reader, the analyses in exhibit 4 for flood insurance are only for owners, so no comparison with renters is shown.

Regarding the results examining characteristics gauging the quality of neighborhoods in terms of crime and risk of a disaster, exhibit 3a shows that households that agree their neighborhood has serious crime are significantly less likely than those who disagree with having enough nonperishable food, controlling for other factors (column 1). Households who perceive their neighborhood as at risk of a disaster are significantly more likely than those who do not perceive their neighborhoods at risk to have emergency supplies readily available to take with them in the event of a disaster (column 4). However, perceptions of serious crime and neighborhood risk are not associated with the other resource-based outcomes in exhibit 3a. Exhibit 3b reveals that those who agree that serious crime is present in their neighborhoods are significantly less likely than those who disagree with having evacuation funds or vehicles available, controlling for other factors (columns 1 and 2). Those perceiving the neighborhood at risk of a disaster are more likely than those not perceiving the neighborhood at risk to have a generator (column 3). Exhibit 4 reveals that households with a perception that their neighborhood is at risk of a disaster are significantly more likely to have flood insurance, regardless of reasons, relative to those who do not perceive their neighborhood is at risk of a disaster (columns 1 and 2). Perceptions of serious crime are not significantly associated with the flood insurance indicators. Exhibit 5 shows that perception of crime is not associated with the source of information households would use in a disaster. Those households who believe their neighborhood is at risk of a disaster are significantly more likely than those who do not believe their neighborhood is at risk to get their information about an impending disaster from the radio or other sources relative to relying on family and friends, controlling for other factors (columns 1 and 4). Exhibit 6 shows that those households who agree serious crime is present in their neighborhood are significantly more likely than those who disagree to evacuate to a shelter compared with staying with relatives and friends (column 1); however, neighborhood risk is not associated with potential evacuation location.

Control Variables

With respect to socioeconomic and demographic variables, their associations with disaster preparedness outcomes generally conform to those found in the previous literature, but the results are not always consistent for every outcome. The variables with consistent associations with preparedness are poverty, nativity status, householder age, and disability status. For example, households in poverty are significantly less likely to be prepared in terms of having resources such as evacuation funds, a vehicle, and a generator (except in terms of having an adequate supply of water, an indicator on which they are more prepared), controlling for other factors. A similar pattern is present for households containing at least one person with a disability. Region of residence is associated with disaster preparedness, but the nature of the relationships is not the same across all indicators.

Discussion

The main goal of this study was to examine Hispanic disaster preparedness relative to that of other racial and ethnic groups after accounting for housing tenure, other residential characteristics, and socioeconomic and demographic control variables. A secondary goal was to explore the association between housing and residential characteristics and disaster preparedness. Little research with

recent data has examined Hispanic disaster preparedness or included housing and other residential variables that may explain differences in preparedness between Hispanics and other racial and ethnic groups (Rivera, 2020). These analyses use 2017 American Housing Survey (AHS) data, which includes a topical module on disaster planning, to add to the limited literature on those topics.

The bivariate results revealed that Hispanics are generally less prepared than Whites regarding resource- and action-based measures—with some important exceptions. Blacks exhibit a similar pattern relative to Hispanics on those characteristics, but Asians rate their preparedness similarly to Whites. Specifically, Hispanics and Blacks are less prepared than Whites regarding having enough nonperishable food, evacuation funds up to $2,000, available evacuation vehicles, and a generator. Hispanics, Blacks, and Asians are significantly more likely than Whites to have at least 3 gallons of water per person, and Hispanics and Blacks are significantly more likely than Whites and Asians to have flood insurance. Although Hispanics and Asians are equally as likely as Whites to have emergency supplies readily available to take with them if they have to evacuate from their homes, Blacks are significantly more likely than Whites to have such emergency supplies. The action-based measures reveal some notable differences. In terms of where groups get their emergency information during a disaster, Hispanics and Blacks are significantly less likely to get their information about disasters from the internet than are Whites. Hispanics are significantly more likely than Whites to get their information from their family and friends. Blacks are significantly more likely than Whites to get their information from television. As far as where groups plan to stay if they are forced to evacuate from their homes for at least 2 weeks, Hispanics, Blacks, and Asians are significantly more likely to stay in a shelter and less likely to stay in a hotel or RV relative to Whites.

The results from the multivariate analyses of these disaster-related outcomes that controlled for socioeconomic, demographic, and housing and residential characteristics showed few changes in the nature of those differences. On the other main resource-based outcomes—enough nonperishable food, emergency evacuation funds, an emergency evacuation vehicle, and the presence of a generator—Hispanics and Blacks remained disadvantaged in their preparedness relative to Whites. Hispanics, Blacks, and Asians were significantly more likely than Whites, however, to have an adequate water supply for all of the persons in their households. Hispanics and Blacks were significantly more likely than Whites to have flood insurance. The findings regarding racial and ethnic differences in action-based preparedness—where households get their emergency information during a disaster and where they plan to stay if they are forced to evacuate—were also similar to the descriptive analysis.

With respect to the secondary objective of examining how housing and residential characteristics are associated with the disaster preparedness of households, the findings show that they are consistently significant in predicting preparedness, controlling for other relevant variables. Housing tenure is critical in that regard. Owners are significantly more likely than renters to be prepared on all outcomes except having emergency supplies readily available to take with them if they evacuate from their homes. Households living in buildings with two or more units, in moderately or severely inadequate homes, and who agree that their neighborhoods have serious crime generally are significantly less prepared than households living in single, detached housing units, adequate

homes, and households who disagree that serious crime is present in their neighborhoods, respectively. Households living in neighborhoods at risk of disasters are generally more prepared in terms of resource-based outcomes than those who do not live in neighborhoods at risk.

Overall, while these analyses have demonstrated the importance of considering the housing and residential characteristics of housing units as they are associated with the disaster preparedness of households, those characteristics do not seem to attenuate the disadvantages that Hispanics and Blacks face in their disaster preparedness relative to Whites. Some limitations with this analysis could play a role. Household wealth cannot be controlled for in this analysis, and the significant inequalities in wealth faced by Hispanics and Blacks relative to Whites likely contribute to their lack of disaster preparedness because of the place-based inequalities that cause such wealth disparities (Bocian, Li, and Ernst, 2010; JCHS, 2020; Rothstein, 2017; Rugh, 2014). The AHSs do not contain information about the English proficiency of householders. Other studies have demonstrated the importance of English proficiency in the recovery from disasters, and the results of this study may somewhat overstate the gap in preparedness between Hispanics and Whites, given that researchers cannot control for that variable (Fussell et al., 2018). Also missing from these analyses are measures of the self-efficacy and the collective efficacy of households because those variables are not available in the 2017 AHS data. Racial and ethnic differences in self-efficacy and collective efficacy perceptions could also contribute to the differences between Hispanics and Whites in their disaster preparedness (Basolo, Steinberg, and Grant, 2017; DeYoung and Peters, 2016; McIvor, Paton, and Johnston, 2009). Households likely have different perceptions of the efficacy and collective efficacy of their communities in preparing for disasters, which could explain why they are less likely to prepare for such disasters.

These results clearly demonstrate that much more work needs to be done to link Hispanic disaster preparedness to the underlying racial and ethnic inequalities in housing and residential location (Bocian, Li, and Ernst, 2010; JCHS, 2020; Rothstein, 2017; Rugh, 2014). The housing inequalities that exist for Hispanics and Blacks ultimately make them less prepared for disasters, and future research would profit from including differences in wealth and collective efficacy—two factors that relate to housing and residential place-based disparities in analyses of disaster preparedness. In addition, another direction for future research is to examine whether the disaster preparedness of Hispanics and other racial and ethnic groups differs between owners and renters. In other words, would Hispanic owners be more prepared than their renter counterparts, or does the association between housing tenure and the preparedness of households depend on particular racial and ethnic groups? Finally, future research that links historical data on disasters with the AHS preparedness data would significantly advance research on this topic. Measures of experience with disasters are superior in examining household disaster preparedness than are measures of households' perceptions of the risk of their neighborhoods.

In an era of increasing billion-dollar disasters, these results make clear that Hispanics and Blacks are at a significant disadvantage in terms of their disaster preparedness. The findings also reveal that housing and residential characteristics are an important factor in disaster preparedness, and those households who are owners, with better housing conditions and lower levels of crime, and in units that are single-family, detached housing are at an advantage. This research provides an

important starting point for future research on this topic. Disaster preparedness—particularly in the form of resources, such as generators, and in action plans, such as deciding in advance where to evacuate—could save lives by reducing hospitalizations due to power outages and the potential harm to individuals from major storms, floods, and wildfires. The scientific community must continue to build evidence to tackle the important charge of better preparing American households for the next disaster.

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