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# Race, Gender, and Communications in Natural Disasters

**Darrell M. West and Marion Orr**

*We examine public attitudes toward vulnerability and evacuation in hurricane natural disasters. Using the results of an opinion survey in a coastal, New England state, we find important differences in how men and women, and Whites and minorities perceive natural disasters. Race, gender, and geographic proximity to the coast affect how vulnerable people believe their residence is to a major hurricane, while government officials and media reporting telling people to evacuate influence evacuation decisions. In order to avoid future breakdowns, governments need to understand the different information processing approaches of various groups of people.*

**KEY WORDS:** natural disasters, emergency planning, race, gender, communications, public opinion

The 2005 Katrina hurricane that devastated New Orleans, parts of Mississippi, and the Gulf Coast has led to calls for better emergency planning throughout the United States (Comfort, 2006). As was made painfully clear there by the 13 hundred lost lives (700 in New Orleans alone), destroyed homes, the 144 square miles flooded, and utter devastation of whole communities, many American cities are unprepared for major hurricanes, floods, earthquakes, or other kinds of disasters (Auchmutey, 2006). The wake-up call provided by this category 4 hurricane has spurred city, state, and federal authorities in many places to improve local planning efforts (Stehr, 2006).

Despite the importance of disaster and emergency planning, not enough is known about how citizens see vulnerability and what dictates their willingness to evacuate in cases of hurricane disasters. It is not clear what influences perceptions of vulnerability, how people judge various government and nongovernment information sources, and what role race and gender play in perceptions about hurricane decision making.

In this article, we use a public opinion survey of a coastal New England state to investigate perceptions of disaster vulnerability and evacuation, and how communities can better plan their emergency responses. We find that views about vulnerability are significantly influenced by race and gender. In addition, perceptions about evacuation decisions are affected by media coverage and official evacuation orders. These results demonstrate the complex role of race, gender, and com-



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munications in views about emergency preparedness and the need for government agencies to develop more nuanced plans to deal with natural disasters.

## Models of Disaster Vulnerability and Evacuation

There has been a long series of hurricanes, earthquakes, floods, and other natural disasters over the course of our nation's history (Mileti, 1999). Among the most recent weather storms, Hurricane Ivan came out of the Caribbean and hit Alabama in 2004. With winds of 130 miles per hour, it killed 124 people and caused over $14 billion in property damage. Hurricane Floyd landed ashore in Florida and North Carolina in 1999, and led to the evacuation of three million people along the East Coast. Although it was just a category 3 storm, it generated $3 billion in damage and massive flooding in a number of states. In 1992, Hurricane Andrew became a category 5 storm with wind gusts of up to 165 miles per hour. When this storm hit south Florida, it produced $30 billion in property damage. Hurricane Hugo devastated Charleston, South Carolina in 1989 and caused $7 billion in damage (Historic Hurricanes, n.d.). A devastating series of 1993 floods in the Midwest led to property damage estimated at $15 to 20 billion. The 1994 Southern California earthquake meanwhile destroyed roads and bridges, and cost around $20 billion in property damage (Barnett, 1999).

With the large number of natural disasters that have developed over the past few decades, social scientists have devoted considerable attention deciphering key elements of risk and emergency planning (Drabek, 1969; Quarantelli & Dynes, 1977; Tierney, 1999). Scholars have investigated how citizens perceive hazards, the manner in which factors such as the availability of financial resources and transportation affects hazard perceptions, and what influences decisions about willingness to evacuate (Petak & Atkisson, 1982; Whitehead, Edwards, Van Willigen, Maiolo, & Wilson, 2000; Wolshon, Urbina, Wilmot, & Levitan, 2005).

Each of these dimensions is important because of its centrality to public responses and the ultimate disaster impact in terms of death, injury, and property damage. Hazard perceptions are relevant to how people think about storms, what kind of preparations they undertake, attentiveness to weather forecasts, and how seriously they take government evacuation orders. Proximate factors such as financial resources, access to transportation, and presence of alternative housing possibilities are thought to be important to how residents assess hazards and risks. And there are a range of features, such as information sources, weather forecasts, government recommendations, and life circumstances that have the potential to shape perceptions about willingness to evacuate.

In any natural disaster, citizens must make decisions based on information about the probability of damage. Warnings come from a variety of sources, such as the U.S. Weather Service, media outlets, government officials, friends, and relatives. Not every source has equal credibility, though. Friends and family often are viewed as trustworthy sources, while government agencies and media outlets have seen their credibility drop in recent years. Citizens often do not believe that the government in Washington represents their interests nor cares about ordinary people. At the same

time, people worry about bias, inaccuracy, and unfairness in press coverage. They do not trust media outlets to give the real picture on what is happening or to be reliable in the communication of important information. Women and minorities are less likely to trust established government and media sources than others (West, 2001).

In New Orleans, for example, a variety of factors slowed residents' reactions to the Katrina hurricane (Dreier, 2006). Poor people, women, and minorities lived in the most vulnerable low-lying areas and were devastated when the levees were breeched and the floodwaters came pouring into the city. Information from the mass media and government agencies was late in reaching some people, and a number of individuals either had no way out of the city or voluntarily chose to stay. People's perceptions cost many individuals their lives and accentuated the human and financial cost of that disaster.

Sometimes, perceptions about government and nongovernment information sources are key to personal survival. Which sources influence residents, and which ones do not? At what point do people decide to evacuate, and what factors affect these decisions? To the extent that Gulf citizens believed the storm waters would not be personally threatening or because some were unwilling or unable to evacuate because of poor communications, infirmity, lack of transportation, or confusion over evacuation routes, this made the Gulf Coast disaster even worse than it otherwise would have been.

In thinking about disaster perceptions, scholars have developed several theoretical models which highlight various factors in public thinking. Some researchers focus on *social vulnerability* models positing that factors such as age, race, gender, and family circumstances affect citizen risk assessment and impressions of disaster threats (Dreier, 2006; Enarson, 1998; Fothergill, Maestas, & Darlington, 1999; Morrow, 1999). The idea is that not everyone is at equal risk and not all people see threats in the same way. People who are older, female, or minority are thought to be more vulnerable to natural disasters. They often lack social support systems or community resources that help them cope with these kinds of crises. Sometimes, their access to official information that might help judge risk and threat is limited, which undermines their ability to respond to disaster scenarios.

*Economic vulnerability* models meanwhile look at financial aspects of citizens' lives. Research has shown that having economic resources helps people deal with natural disasters (Morrow, 1999). Those who are poor, lack personal transportation to evacuate, or rent as opposed to own their own homes are more vulnerable and sometimes react more slowly to official advisories to evacuate. The lack of fiscal resources makes it much more difficult for them to draw on needed assistance and act on warning information.

*Geographic vulnerability* models look at physical proximity to disaster outcomes. Arceneaux and Stein (2006) use a city survey to look at attributions of political responsibility in cases of natural disasters. They find proximity to Houston floods is associated with blaming public officials at election time. This project differs from the results of Abney and Hill (1966), who in their study of a New Orleans mayoral election after a major hurricane in 1965, found no relationship between aggregate electoral outcomes in "dry" versus "flooded" precincts. Although these contrasting

research results suggest geographic proximity does not have the same effect in all disasters, it is likely that those who live in low-lying coastal areas face greater hurricane risk than those residing inland, and this may elevate these individuals' perceptions of threat and evacuation. Therefore, we hypothesize that those on the coast will be more likely than others to evacuate when official sources advise them to do so (Cutter, 2001; Rodriguez, Diaz, & Aguirre, 2004).

Government agencies in recent years have put considerable effort into raising people's level of disaster preparedness. The assumption is that *personal and governmental preparedness* is relevant for risk assessment and threat perceptions (Faupel, Kelley, & Petee, 1992; Riad and Norris, n.d.). Officials have encouraged private citizens to prepare emergency kits containing water, food, and medical supplies in case disasters hit and stores are closed. Government bureaus also have developed emergency plans showing evacuation routes in case people need to leave their homes. Based on this reasoning, one can hypothesize that those who have emergency kits or know evacuation routes generally should be more likely to evacuate than those who do not. Having some kind of preparedness means the person has thought about alternative scenarios, knows basic government information concerning disasters, and has a plan for action should a disaster hit their area.

Finally, some scholars have focused on communications as key to disaster reactions. The idea is that information is crucial in how people perceive threat and whether they decide to evacuate (Comfort, 2006; Whitehead et al., 2000). Independent of social, economic, or geographic circumstances or level of preparedness, communications shape how residents respond to disasters (Griswold, Lightle, & Lovelady, 1990; Rodriguez et al., 2004). In cases of natural disaster, citizens get information from the U.S. Weather Service, media outlets, government officials, friends, and family members. Depending on one's experiences, some sources have greater impact than do others. Given this variability in people's use of information, it is important to see who residents listen to and what recommendations affect their perceptions about vulnerability and the way in which they make evacuation decisions.

## Data and Methods

Rhode Island is not as at risk as Florida, Mississippi, or Alabama, but it sits on the coast of the Atlantic Ocean and has experienced major storms. In 1991, hurricane Bob had winds of 105 miles per hour and caused an estimated $115 million in property damage within the state. In 1954, hurricane Carol swept up the East Coast and hit Rhode Island with a 14-foot storm surge. The waters flooded downtown Providence and other low-lying areas along the coast. With gusts of up to 130 miles per hour, the hurricane killed 19 people and caused an estimated $200 million in property damage. In 1938, an unnamed hurricane called the "great storm" devastated the Ocean State and caused 262 deaths and property damage of $100 million (around $1 billion in today's dollars).

As a sign of the state's potential vulnerability, Rhode Island has 420 miles of coastline along the Atlantic Ocean and Narragansett Bay. It is estimated that the state

has insured commercial and residential property totaling $83 billion. Losses from a major hurricane (severe category 3 or a category 4 hurricane) have been estimated at running over $1 billion (South County Advisory, n.d.). Unlike New Orleans, where the poor lived in low-lying vulnerable areas, many of the riskiest coastline locations in Rhode Island are occupied by businesses or upper middle-income people who want nice views of the Bay or the Ocean.

Local press reports have highlighted the low level of hurricane preparedness within Rhode Island (Milkovits, 2006). In a three-part, front-page series entitled "Ready or Not" published in December, 2005 plus another six-part series in July, 2006, the *Providence Journal* outlined how the state is not equipped for a major hurricane. Many cities and towns have not finalized their emergency planning. Communities are required to have official evacuation routes with signs posted at regular intervals, but many jurisdictions have not agreed on what these routes would be. Planning officials complain insufficient money has been earmarked for the development of an evacuation plan (Lord & Milkovits, 2006).

The state's lack of disaster planning is noteworthy because nearly 12 thousand new houses have been built along the Rhode Island coastland in the 50 years since hurricane Carol. More than five hundred acres along Narragansett Bay have been filled and populated with homes, businesses, and boatyards (Lord & Milkovits, 2006). There are around three thousand new acres of open shoreline that has been developed within the state (Lord, 2005). A 1995 government study found that 131 thousand people (13 percent of the state's population) live in low-lying areas along the coast that would be vulnerable to flooding in case of a major hurricane (Milkovits, 2005).

To test alternative models of vulnerability and evacuation in natural disasters, we undertook a statewide public opinion survey of Rhode Island voters. Our statewide telephone survey interviewed 785 adult registered voters 18 years or older between February 4 and 6, 2006 across the state. Interviewers were hired, trained, and supervised at Brown University in accordance with professional norms. Sampling was undertaken through random digit dialing, with up to three callbacks. Overall, the poll had a margin of error of about plus or minus 3.5 percentage points. The response rate for the survey was 60 percent.

The Appendix lists question wording as well as means and standard deviations for resident responses. Our survey generally represented the social, economic, and political diversity of the state. As shown in Table 1, the survey sample slightly overrepresented women, senior citizens, and Whites.

The dependent variables were measures of people's perceptions about vulnerability ("If a major hurricane hit Rhode Island, how vulnerable would your residence be? Very, somewhat, or not very vulnerable") and views regarding the likelihood of evacuation ("If a major hurricane hit Rhode Island and your home was in danger of serious flooding, how likely would you be to evacuate your residence for another location? Very, somewhat, or not very likely").

Our goal in this survey was to investigate the impact of social, economic, and geographic vulnerability, preparedness, and communications on views about disaster vulnerability and evacuation. We measured social vulnerability through gender (male/female), race (White/minority), age, and whether the person had children at

**Table 1.** Survey versus State Population Demographic Characteristics (Percentages)

| | Public Opinion Survey (%) | State Census Population (%) |
|---|---|---|
| Gender | | |
| Male | 42 | 48 |
| Female | 58 | 52 |
| Age | | |
| 18–24 | 4 | 9 |
| 25–34 | 8 | 18 |
| 35–44 | 19 | 23 |
| 45–54 | 24 | 20 |
| 55–64 | 20 | 12 |
| 65+ | 26 | 18 |
| Race | | |
| White | 86 | 82 |
| Minority | 14 | 18 |

*Source:* Rhode Island Public Opinion Survey, February, 2006 and U.S. Census Bureau (RI).

home. Economic vulnerability was studied using family income, whether the person had private transportation to evacuate, and whether the individual owned or rented their residence. Geographic vulnerability was measured by how close the person lived to the coast ("right on the water, within a mile of the bay or coastland, one to five miles away from the bay or coastland, or further than five miles away from the bay or coastland") (see Driscoll & Salwen, 1996). Preparedness was examined by whether the person had an emergency kit, knew where their emergency shelter was, and knew evacuation routes. Communications was measured through frequency of listening to weather forecasts ("how many times during the day do you hear a weather forecast? none, once or twice, three or four times, five or six times, or seven or more times") and views about various information sources ("which of the following would make you likely to obey an evacuation order? the U.S. Weather Service issuing a hurricane warning, a media outlet reporting an evacuation order, a government official telling you to evacuate, or a friend or relative saying you should evacuate").

In this survey, we found a high level of potential hurricane risk within Rhode Island because many people live close to the water. For example, 8 percent say they live right on the water, 19 percent live within a mile of the bay or coastland, 18 percent live one to five miles away, 52 percent reside further than five miles from the coast, and 3 percent are unsure. In addition, a significant number think a major hurricane will strike Rhode Island in the near future. Twenty-five percent feel a hurricane is very likely, 45 percent believe it is somewhat likely, 23 percent think it is not very likely, and 7 percent are unsure.

Despite the fact that significant numbers live near the coast and believe a hurricane is likely, we found that large numbers of state residents are not prepared for a major storm. Only 28 percent say they know the official evacuation route that authorities want them to take in case of an emergency. Thirty-five percent say they have prepared an emergency kit with food and water in case a hurricane strikes

Rhode Island. Forty-two percent claim they know their closest designated emergency shelter. This modest level of preparation is at odds with the fact that weather experts predict there is a "high probability" a major hurricane will land in Rhode Island within the next 15 years (Milkovits & Lord, 2005).

## Gender and Racial Differences

One important aspect of natural disasters is differences in perceptions and life circumstances based on gender and race. As shown in Table 2, women are more likely than men to rent their home or apartment or to have children, and are less likely than men to earn over $100,000. In addition, minorities are less likely than Whites to have someone they say they could stay with if a hurricane hits, own a car, or earn over $100,000, and are more likely to rent their home or apartment, be unmarried, and have children.

These differences have profound consequences for how vulnerable women and minorities feel about natural disasters. Both groups are likely to perceive they are very vulnerable to a major storm, but these perceptions do not make them more likely than men or Whites, respectively, to evacuate. Some of the very conditions that increase disaster vulnerability perceptions limit the willingness or ability to leave in case of a natural disaster. For example, minorities are 14 percentage points less likely than Whites to say they own a car. They also are 9 percentage points more likely than Whites to have children and 25 percentage points more likely to be unmarried. Women are 9 percentage points more likely than men to care for children at home.

In addition, there are interesting contrasts by gender and race in the communications process (Rodriguez et al., 2004). Overall, 77 percent of Rhode Islanders say they would follow the advice of a government official telling them to evacuate, 68 percent think that a media outlet reporting an evacuation order would lead them to evacuate, and 60 percent feel the U.S. Weather Service issuing a hurricane warning would make them obey an evacuation order. However, only 29 percent would obey an evacuation order if a friend or relative told them to leave. These results are comparable to those of Driscoll and Salwen (1996), but are in stark contrast to the findings of Dow and Cutter (1997), who argued that evacuation orders from friends carried more weight than those of public officials.

**Table 2.** Gender and Race Differences in Social Circumstances and Financial Resources, 2006 (Percentages)

| | Men (%) | Women (%) | Whites (%) | Minorities (%) |
|---|---|---|---|---|
| Someone to stay with | 84 | 85 | 85* | 72* |
| Own car | 92 | 91 | 92* | 78* |
| Rent home/apt. | 16* | 22* | 18* | 35* |
| Unmarried | 29 | 32 | 30* | 55* |
| Have children | 36* | 45* | 41* | 64* |
| Income over $100,000 | 28* | 16* | 22* | 10* |

*Source:* Rhode Island Public Opinion Survey, February 4–6, 2006.
*Differences significant at 0.05 level of probability based on chi-square test.

**Table 3.** Gender and Race Differences in Views about Information Sources, 2006 (Percentages)

| | Men (%) | Women (%) | Whites (%) | Minorities (%) |
|---|---|---|---|---|
| Evacuate if weather service issues warning | 65 | 64 | 61* | 88* |
| Evacuate if media report recommended leaving | 66* | 78* | 73* | 85* |
| Evacuate if govt official recommended leaving | 77* | 87* | 83 | 86 |
| Evacuate if friend or relative recommended leaving | 29* | 36* | 33 | 38 |

*Source:* Rhode Island Public Opinion Survey, February 4–6, 2006.
*Differences significant at 0.05 level of probability based on chi-square test.

**Table 4.** Gender/Race Interactions and Differences in Views about Information Sources, 2006 (Percentages)

| | White Males (%) | White Females (%) | Minority Males (%) | Minority Females (%) |
|---|---|---|---|---|
| Evacuate if weather service issues warning | 62** | 61** | 80** | 96** |
| Evacuate if media report recommended leaving | 64*** | 78*** | 74*** | 95*** |
| Evacuate if govt official recommended leaving | 77** | 86** | 78** | 92** |
| Evacuate if friend or relative recommended leaving | 28 | 36 | 39 | 38 |

*Source:* Rhode Island Public Opinion Survey, February 4–6, 2006.
**Differences significant at 0.01 level of probability based on chi-square test.
***Differences significant at 0.001 level of probability based on chi-square test.

However, as shown in Table 3, there are gender and race differences in these reactions. Women are 12 percentage points more likely than men to say a media report would make them evacuate. In addition, women are 10 percentage points more likely than men to say they would obey a government evacuation order and are 7 percentage points more likely to say they would respect a recommendation by a friend or relative. Minorities are 27 percentage points more likely than Whites to say they would evacuate if recommended by the U.S. Weather Service and 12 percentage points more likely to do so if recommended by a media outlet.

Table 4 shows differences in communications based on the interaction of gender and race. It shows contrasts in how White males, White females, minority males, and minority females feel about information sources that would make them more likely to evacuate. The greatest differences appear in regard to media reporting. Minority women are 31 percentage points more likely than White males to say they would evacuate if told to do so by a media report. But there also are differences based on weather service and government recommendations, both in the direction of minority women being more likely than White men to evacuate. The only information source where there were no significant differences was recommendations by friends or relatives.

**Table 5.** Impact of Social, Economic, and Geographic Vulnerability, Preparedness, and Communications on Perceptions about Disaster Vulnerability, 2006

| | |
|---|---|
| Gender | −0.15 (0.07)* |
| Race | −0.37 (0.15)** |
| Age | 0.01 (0.03) |
| Have children at home | 0.12 (0.07) |
| Family income | 0.04 (0.02) |
| Have private transportation to evacuate | 0.16 (0.15) |
| Own or rent home | −0.04 (0.10) |
| Live near coast | 0.27 (0.03)*** |
| Have emergency kit | −0.001 (0.07) |
| Know where emergency shelter is | 0.02 (0.07) |
| Know evacuation route | −0.06 (0.08) |
| Frequency of listening to weather forecasts | −0.04 (0.03) |
| U.S. Weather Service hurricane warning | 0.05 (0.07) |
| Mass media reporting evacuation order | 0.11 (0.08) |
| Government telling you to evacuate | 0.13 (0.09) |
| Friend/relative telling you to evacuate | 0.11 (0.07) |
| Constant | 1.04 (0.49)* |
| *N* | 405 |
| Adjusted $R^2$ | 0.18 |
| *F* value | 6.57*** |

*Note:* The numbers are unstandardized least squares regression coefficients, with standard errors in parentheses. Figures marked with an asterisk are statistically significant.
*Source:* Rhode Island Public Opinion Survey, February 4–6, 2006.
*$p < 0.05$; **$p < 0.01$; ***$p < 0.001$.

## Perceptions about Hazards

Overall, 20 percent of Rhode Island voters feel their residence would be very vulnerable if a major hurricane landed in the state, 42 percent say they would be somewhat vulnerable, 35 percent think they would not be very vulnerable, and 3 percent are unsure. Geographic proximity to storms is a key factor in views about vulnerability. Those living on or near the coast generally are at greatest risk from storms (Driscoll & Salwen, 1996). Furthermore, there are a range of factors from social, economic, and geographic vulnerability to preparedness and communications that are important for perceptions about storm vulnerability.

To determine what explains perceptions of vulnerability, we undertook an ordinary least squares regression of how vulnerable people feel toward a hurricane (very vulnerable, somewhat vulnerable, or not very vulnerable). Table 5 shows the unstandardized regression coefficients for various factors. It reveals that social and geographic vulnerability are the only factors that have a significant impact on perceptions about the risk to one's home during a major hurricane. Communications outlets, frequency of hearing weather forecasts, level of preparedness, and economic circumstances are not associated with feelings of disaster vulnerability.

Comparable to the results of Arceneaux and Stein (2006) in regard to Houston flooding, the strongest predictor of vulnerability is closeness to low-lying areas on

the coast. With 27 percent living on or within a mile of the coast and 45 percent living within five miles of the coast, Rhode Island ranks very high on geographic vulnerability. Those living closest to the water are the ones most likely to feel their residence would be vulnerable in a major hurricane, even after controlling for the other factors.

In addition, as predicted by the social vulnerability model, minorities and women are the ones most likely to feel vulnerable from a major hurricane. This is consistent with the results of work by Fothergill et al. (1999), who looked at past disaster research and found that minority groups perceive risk and react to official warnings differently than Whites. According to this research, some minorities feel "fatalistic" about disasters and fear there is nothing that can be done to protect themselves from floods, earthquakes, or hurricanes. This makes them more fearful about the consequences of disasters for their homes and lives. Minorities are the least likely to have a chance for disaster education, according to past research, which means they sometimes are less prepared than Whites when calamities happen. Blacks, in particular, are suspicious of government and media outlets, and therefore are not likely to take official warnings as seriously. The residue of discrimination makes some minority members reluctant to trust these kinds of information sources (Perry & Mushkatel, 1986).

Enarson (1998) meanwhile focuses on gender differentials in disaster responses. She argues that women are particularly vulnerable to disasters because they lack financial resources, sometimes do not have social support systems, or are unable to avail themselves of government programs designed to provide relief. Women also are less likely to have access to official information that might enable them to assess disaster risks, and this makes it much more difficult for them to respond to disaster scenarios (Morrow, 1999).

Interestingly, communications channels do not matter much in terms of perceptions about disaster vulnerability. We looked at four different information sources that conceivably could influence views about storms: the U.S. Weather Service, media outlets, government officials, and friends or family. Overall, none of these were associated with changes in impressions about disaster vulnerability. It did not affect beliefs if the Weather Service issued hurricane warnings, the media reported an evacuation order, or government officials, friends, or relatives said people should evacuate. Furthermore, there were no ties to how often the person listened to weather forecasts. Listening several times a day to forecasts had no more impact than did listening infrequently.

Most surprisingly, there was no relationship between disaster perceptions and measures of economic vulnerability. We looked at three different indicators of fiscal aspects—family income, having private transportation to evacuate, and renting versus owning a home or apartment. None were statistically associated with how vulnerable people thought their residence would be during a major hurricane. This is unusual because much of the literature demonstrates that economic marginality increases sense of threat, risk, and vulnerability (Miller & Nigg, 1993; Morrow, 1999). However, the Rhode Island situation differs from other locales because if a hurricane hit the state, the well-to-do who live on the water would be most affected, not the poor people as was true in New Orleans. The individuals who feel the most

vulnerable have considerable resources and were able to buy or build million dollar homes near the coast. This relative prosperity, compared to other disasters, may explain why our results differ from disaster research in other geographic areas.

The model based on preparation level had no relationship to opinions concerning disaster vulnerability. It did not matter whether the people had an emergency kit, knew where evacuation routes were, or were aware where their designated emergency shelter was. None of these factors assuaged the sense of risk people felt about natural disasters. Because government agencies have devoted major efforts in recent years to raising preparedness levels, this nonresult is noteworthy because it suggests that improving citizen knowledge about emergency routes or shelters, or improving levels of preparation do not reduce people's sense of vulnerability to major hurricanes.

## Evacuation Intentions

In major storms, some of the greatest loss of life has taken place when people rejected official recommendations to evacuate, and lost their lives in the process. The New Orleans calamity with Katrina certainly bears out the risk of not evacuating. Those who ignored or did not hear government warnings or were unable to leave because of lack of transportation were much more likely to die when the floodwaters breeched the levees.

When asked about decisions to evacuate their residence for another location if a major hurricane hit Rhode Island and their home was in danger of serious flooding, 66 percent said they were very likely, 12 percent were somewhat likely, 18 percent were not very likely to evacuate, and 4 percent were unsure.

Table 6 presents two different ordinary least squares regression models of evacuation (very likely, somewhat likely, or not very likely to evacuate) that make different assumptions about causality. One is based on social, economic, and geographic vulnerability, preparedness, and communications, while the other contains all those factors plus perceptions of disaster vulnerability (measured by how vulnerable would your residence be if a major hurricane hit Rhode Island). We used two models in recognition that causality could run through our five original models or that perceptions of vulnerability might also have an independent effect on evacuation decisions. We wanted to test both alternatives to see whether adding the vulnerability perceptions would affect our results.

In either model, the most interesting finding is that some of the variables that affect perceptions of disaster vulnerability are not relevant for the decision to evacuate. Vulnerability and evacuation appear to be two distinct processes, with differing sets of factors influencing each dimension. For example, gender and race were important for views about how vulnerable their residence was, but not whether someone would evacuate. There were not significant differences between men and women or minorities and Whites in decisions to leave in case of a major storm.

Instead, key determinants included having children, living near the coast, and hearing media reports and government officials telling them to evacuate. The strongest factor was government officials telling people to evacuate. Even in an era of

**Table 6.** Two Models of Citizen Perception Impact on Evacuation Decisions, 2006

| | Evacuation Model Excluding Vulnerability Perceptions | Evacuation Model Including Vulnerability Perceptions |
|---|---|---|
| Perceptions of vulnerability | — | 0.08 (0.06) |
| Gender | −0.13 (0.08) | −0.12 (0.08) |
| Race | 0.15 (0.16) | 0.22 (0.16) |
| Age | 0.06 (0.03) | 0.07 (0.03)* |
| Have children at home | 0.16 (0.08)* | 0.16 (0.08)* |
| Family income | 0.003 (0.03) | 0.00 (0.03) |
| Have private transportation to evacuate | −0.01 (0.17) | 0.00 (0.17) |
| Own or rent home | −0.04 (0.11) | −0.01 (0.11) |
| Live near coast | 0.10 (0.04)** | 0.08 (0.04)* |
| Have emergency kit | −0.09 (0.08) | −0.08 (0.08) |
| Know where emergency shelter is | 0.08 (0.08) | 0.08 (0.08) |
| Know evacuation route | −0.10 (0.09) | −0.12 (0.09) |
| Frequency of listening to weather forecasts | 0.01 (0.04) | 0.01 (0.04) |
| U.S. Weather Service hurricane warning | 0.14 (0.08) | 0.15 (0.08) |
| Mass media reporting evacuation order | 0.17 (0.08)* | 0.17 (0.09)* |
| Government telling you to evacuate | 0.25 (0.10)** | 0.24 (0.10)** |
| Friend/relative telling you to evacuate | −0.05 (0.08) | −0.04 (0.08) |
| Constant | 0.33 (0.53) | 0.09 (0.54) |
| *N* | 410 | 403 |
| Adjusted $R^2$ | 0.08 | 0.09 |
| *F* value | 3.21*** | 3.35*** |

*Note:* The numbers are unstandardized least squares regression coefficients, with standard errors in parentheses. Figures marked with an asterisk are statistically significant.
*Source:* Rhode Island Public Opinion Survey, February 4–6, 2006.
*$p < 0.05$; **$p < 0.01$; ***$p < 0.001$.

citizen cynicism, there remains enough trust in government that when an official evacuation order is released, people take that seriously and it makes them much more likely to evacuate. This demonstrates that timely and well-publicized evacuation orders are important for citizen decision making on whether to stay or go.

The same is true for media outlets reporting an evacuation order. Even though trust and confidence in the American media have dropped in recent decades, press reports about evacuation are credible and make people more likely to leave their residence. Similar to the results of Driscoll and Salwen (1996), our findings demonstrate the crucial role of communications outlets on the evacuation side. In cases of natural disasters, people pay close attention to media reporting and coverage affects their personal decisions to evacuate.

Living near the coast or having children at home furthermore are linked to evacuation choices. People with children and those who reside close to the water are more likely to evacuate than those without children or who live inland, respectively. This shows that geographic vulnerability and social vulnerability are important to evacuation decisions.

In the full model incorporating vulnerability perceptions, the one difference with the more restricted model is that age matters. However, it is not the old but the young who are more likely to evacuate. There are different possibilities here. On the one hand, young people may be less rooted and therefore more mobile than senior

citizens. Alternatively, seniors have lived longer in Rhode Island and survived storms without suffering major damage. This may make them less likely than young people to believe storms are serious threats.

## Conclusion

To summarize, we found in one coastal, New England state that race, gender, and views about information sources affect perceptions about natural disasters. Race, gender, and geographic proximity affect how vulnerable people believe their residence is to a major hurricane, while government officials and media reporting telling people to evacuate, having children, and living close to the water influence evacuation intentions.

While results likely would differ for places such as Florida, Alabama, and Mississippi that experience more severe hurricanes, our findings suggest in a New England context that race, gender, and communications have a complex interaction that is crucial for emergency preparedness (Bolin & Bolton, 1986). It is not the case that women and minorities always act differently from men and Whites in all situations, but rather that they do in particular situations. What makes perceptions of hazard more subject to race and gender effects is the differing role of financial resources, home ownership, owning a car, being married, or having children.

These differences suggest that officials have to understand how race, gender, life circumstances, and communications affect disaster impressions. As shown by Arceneaux and Stein (2006), natural disasters have political consequences for elected officials and beliefs about the efficacy of government. The way in which leaders handle storms and floods can make or break political careers. Voters from various backgrounds process information differently, listen to alternative sources of information, and show differences in how they respond to various communications channels. Disasters are not a situation where a "cookie-cutter" approach with everyone being treated identically is going to be effective. There are significant differences in how much attention people pay to the U.S. Weather Service, government officials, mass media, friends, and relatives. Unless governments build nuances into their emergency planning, they will not be successful with all kinds of people (Riad, Waugh, & Norris, 2001).

Interestingly, disaster perceptions are not very amenable to public information efforts. There were no significant relationships between the recommendations of government or media in how vulnerable people feel from major storms. If citizens do not listen to government or media advisories, it is going to be difficult for officials to convince people to live in less risky areas, take storm warnings seriously, or undertake meaningful levels of pre-storm preparation. In contrast, evacuation decisions are affected by government and media recommendations. Decisions about whether to leave can be influenced through good planning and good communications.

Hurricanes have a major impact on people's lives. Nationally, the Census Bureau estimates that half of the country's 300 million residents reside in coastal areas (Stehr, 2006). Major storms are responsible for death, injury, and major property damage. Studies demonstrate they have considerable health effects, including mental

depression (Ginexi, Simmens, & Hoyt, 2000; Hutton, 2001; Norris, 2005). Although major storms do not hit populated areas very often, they are deadly when they strike. Given the importance of natural disasters for citizen well-being and perceptions about government performance, it behooves us to understand how the public reacts to these types of situations. As shown tragically in New Orleans and the Gulf Coast, failure to understand how various groups process information and react to disaster warnings can lead to a huge loss of life, disruption in people's personal lives, and dramatic political consequences.

**Darrell M. West** is the John Hazen White Professor of Political Science and Public Policy and Director of the Taubman Center for Public Policy at Brown University, Providence, Rhode Island.
**Marion Orr** is the Frederick Lippitt Professor of Political Science, Urban Studies, and Public Policy at Brown University, Providence, Rhode Island.

## Note

The data used in this article can be obtained from Darrell_Westt@brown.edu.

## References

Abney, Glenn, and Larry Hill. 1966. "Natural Disasters as a Political Variable: The Effect of a Hurricane on an Urban Election." *American Political Science Review* 60 (4): 974–81.

Arceneaux, Kevin, and Robert Stein. 2006. "Who is Held Responsible When Disaster Strikes? The Attribution of Responsibility for a Natural Disaster in an Urban Election." *Journal of Urban Affairs* 28 (1): 43–53.

Auchmutey, Jim. 2006. "Katrina's Aftermath Fascinates." *Atlanta Journal-Constitution* February 26: 1.

Barnett, Barry. 1999. "U.S. Government Natural Disaster Assistance: Historical Analysis and a Proposal for the Future." *Disasters* 23 (2): 139–55.

Bolin, Robert, and Patricia Bolton. 1986. *Race, Religion, and Ethnicity in Disaster Recovery*. Boulder, CO: Institute of Behavior Science, University of Colorado.

Comfort, Louise. 2006. "Cities at Risk: Hurricane Katrina and the Drowning of New Orleans." *Urban Affairs Review* 41 (4): 501–16.

Cutter, Susan, ed. 2001. *American Hazardscapes: The Regionalization of Hazards and Disasters*. Washington, DC: Joseph Henry Press.

Dow, Kirstin, and Susan Cutter. 1997. "Crying Wolf: Repeat Responses to Hurricane Evacuation Orders." *Coastal Management* 26: 237–51.

Drabek, Thomas. 1969. "Social Processes in Disaster: Family Evacuation." *Social Problems* 16 (3): 336–49.

Dreier, Peter. 2006. "Katrina and Power in America." *Urban Affairs Review* 41 (4): 528–49.

Driscoll, Paul, and Michael Salwen. 1996. "Riding Out the Storm: Public Evaluations of News Coverage of Hurricane Andrew." *International Journal of Mass Emergencies and Disasters* 14 (3): 293–303.

Enarson, Elaine. 1998. "Through Women's Eyes: A Gendered Research Agenda for Disaster Social Science." *Disasters* 22 (2): 157–73.

Faupel, Charles, Susan Kelley, and Thomas Petee. 1992. "The Impact of Disaster Education of Household Preparedness for Hurricane Hugo." *International Journal of Mass Emergencies and Disasters* 10: 5–24.

Fothergill, Alice, Enrique Maestas, and JoAnne Darlington. 1999. "Race, Ethnicity and Disasters in the United States." *Disasters* 23 (2): 156–73.

Ginexi, Karen Weihs, Samuel Simmens, and Danny Hoyt. 2000. "Natural Disaster and Depression: A Prospective Investigation of Reactions to the 1993 Midwest Floods." *American Journal of Community Psychology* 28 (4): 495–518.

Griswold, Samuel, Ted Lightle, and Jack Lovelady Lovelady. 1990. "Hurricane Hugo: Effect on State Government Communications." *IEEE Communications Magazine*, June, 12–17.

Historic Hurricanes. n.d. "Some of the Most Powerful Storms on Record." Undated document. http://www.hurricaneville.com/historic.html.

Hutton, David. 2001. "Psychosocial Aspects of Disaster Recovery: Integrating Communities into Disaster Planning and Policy Making." Institute for Catastrophic Loss Reduction. Unpublished paper.

Lord, Peter. 2005. "Changes on the Coastline Heighten Storm Danger." *Providence Journal*, December 19, A1.

Lord, Peter, and Amanda Milkovits. 2006. "No Way Out." *Providence Journal*, December 18, A1.

Mileti, Dennis S. 1999. *Disasters by Design: A Reassessment of Natural Hazards in the United States*. Washington, DC: Joseph Henry Press.

Milkovits, Amanda. 2005. "On the Drawing Board." *Providence Journal*, December 20, A1.

———. 2006. "R.I. to Refile Plan to Deal with Disaster." *Providence Journal*, February 6, A1.

Milkovits, Amanda, and Peter Lord. 2005. "R.I. Wrestles with Storm Preparedness." *Providence Journal*, October 13, A1.

Miller, Kristen, and Joanne Nigg. 1993. "Event and Consequence Vulnerability: Effects on the Disaster Recovery Process." Unpublished paper, University of Delaware.

Morrow, Betty. 1999. "Identifying and Mapping Community Vulnerability." *Disasters* 23 (1): 1–18.

Norris, Fran. 2005. "Range, Magnitude, and Duration of the Effects of Disasters on Mental Health." Unpublished paper, Research Education Disaster, Dartmouth College.

Perry, Ronald, and Alvin Mushkatel. 1986. *Minority Citizens in Disasters*. Athens: University of Georgia Press.

Petak, William, and Arthur Atkisson. 1982. *Natural Hazard Risk Assessment and Public Policy*. New York: Springer-Verlag.

Quarantelli, Enrico, and Russell Dynes. 1977. "Response to Social Crisis and Disaster." *Annual Review of Sociology* 3: 23–49.

Riad, Jasmin, and Fran Norris. n.d. "Hurricane Threat and Evacuation Intentions: An Analysis of Risk Perception, Preparedness, Social Influence, and Resources." Unpublished paper, University of Delaware.

Riad, Jasmin, William Waugh, and Fran Norris. 2001. "The Psychology of Evacuation and the Design of Policy." *Public Administration and Public Policy* 93: 309–26.

Rodriguez, Havidan, Walter Diaz, and Benigno Aguirre. 2004. "Communicating Risk and Warnings." University of Delaware Disaster Research Center Preliminary Paper No. 337.

South County Advisory. n.d. "At Risk: What Do We Have to Lose?" Unpublished paper, University of Rhode Island Coastal Resources Center.

Stehr, Steven. 2006. "The Political Economy of Urban Disaster Assistance." *Urban Affairs Review* 41 (4): 492–500.

Tierney, Kathleen. 1999. "Toward a Critical Sociology of Risk." *Sociological Forum* 14 (2): 215–42.

West, Darrell. 2001. *The Rise and Fall of the Media Establishment*. Boston: Bedford/St. Martin's Press.

Whitehead, John, Bob Edwards, Marieke Van Willigen, John Maiolo, and Kenneth Wilson. 2000. "Heading for Higher Ground: Factors Affecting Real and Hypothetical Hurricane Evacuation Behavior." *Global Environmental Change* 2 (4): 133–42.

Wolshon, Brian, Elba Urbina, Chester Wilmot, and Marc Levitan. 2005. "Review of Policies and Practices for Hurricane Evacuation." *Natural Hazards Review* 6 (3): 129–42.

## Appendix: Survey Questions with Means and Standard Deviations

How likely do you think it is that a major hurricane will strike Rhode Island in the near future? 1) very likely 2) somewhat likely 3) not very likely 8) don't know 9) no answer (mean of 1.98 and standard deviation of 0.72) (8 and 9 coded as missing values)

If a major hurricane hit Rhode Island, how vulnerable would your residence be? 1) very vulnerable 2) somewhat vulnerable 3) not very vulnerable 8) don't know 9) no answer (mean of 2.15 and standard deviation of 0.74) (8 and 9 coded as missing values)

If a major hurricane hit Rhode Island and your home was in danger of serious flooding, how likely would you be to evacuate your residence for another location? 1) very likely 2) somewhat likely 3) not very likely 8) don't know 9) no answer (mean of 1.50 and standard deviation of 0.79) (8 and 9 coded as missing values)

If you had to evacuate to another community, do you have someone you could stay with? 1) yes 2) no 8) don't know 9) no answer (mean of 1.16 and standard deviation of 0.36) (8 and 9 coded as missing values)

Would you be most likely to evacuate by: 1) your own car or truck 2) a friend or relative's car or truck 3) bus 4) taxi, 5) train or 6) plane 8) don't know 9) no answer

Have you prepared an emergency kit with food and water in case a hurricane strikes Rhode Island? 1) yes 2) no 8) don't know 9) no answer (mean of 1.64 and standard deviation of 0.48) (8 and 9 coded as missing values)

Do you know the official evacuation route that authorities want you to take in case of an emergency? 1) yes 2) no 8) don't know 9) no answer (mean of 1.71 and standard deviation of 0.46) (8 and 9 coded as missing values)

Do you know where your closest designated emergency shelter is located? 1) yes 2) no 8) don't know 9) no answer (mean of 1.57 and standard deviation of 0.50) (8 and 9 coded as missing values)

How many times during the day do you hear a weather forecast? 0) none 1) once or twice 2) three or four times 3) five or six times 4) seven or more times 8) don't know 9) no answer (mean of 1.94 and standard deviation of 1.04) (8 and 9 coded as missing values)

How confident are you in the ability of the government to help you and your family in case of natural disasters? 1) very confident 2) somewhat confident 3) not very confident 8) don't know 9) no answer (mean of 2.39 and standard deviation of 0.66) (8 and 9 coded as missing values)

Which of the following would make you likely to obey an evacuation order:

a) the U.S. Weather Service issuing a hurricane warning? 1) yes 2) no 8) don't know 9) no answer (mean of 1.36 and standard deviation of 0.48) (8 and 9 coded as missing values)

b) a media outlet reporting an evacuation order? 1) yes 2) no 8) don't know 9) no answer (mean of 1.26 and standard deviation of 0.44) (8 and 9 coded as missing values)

c) a government official telling you to evacuate? 1) yes 2) no 8) don't know 9) no answer (mean of 1.17 and standard deviation of 0.37) (8 and 9 coded as missing values)

d) a friend or relative saying you should evacuate? 1) yes 2) no 8) don't know 9) no answer (mean of 1.66 and standard deviation of 0.47) (8 and 9 coded as missing values)

Which of the following factors would make it difficult for you to comply with an official evacuation order:

a) not having a car—1) yes 2) no 8) don't know 9) no answer (mean of 1.62 and standard deviation of 0.48) (8 and 9 coded as missing values)

b) having to care for someone who would have difficulty leaving—1) yes 2) no 8) don't know 9) no answer (mean of 1.63 and standard deviation of 0.48) (8 and 9 coded as missing values)

c) needing to protect home from theft—1) yes 2) no 8) don't know 9) no answer (mean of 1.79 and standard deviation of 0.41) (8 and 9 coded as missing values)

d) not believing the storm would be very bad in your area—1) yes 2) no 8) don't know 9) no answer (mean of 1.66 and standard deviation of 0.47) (8 and 9 coded as missing values)

e) not trusting government officials—1) yes 2) no 8) don't know 9) no answer (mean of 1.71 and standard deviation of 0.45) (8 and 9 coded as missing values)

f) not trusting media reporting—1) yes 2) no 8) don't know 9) no answer (mean of 1.70 and standard deviation of 0.46) (8 and 9 coded as missing values)

How close do you live either to Narragansett Bay or the Rhode Island coastland? 1) right on the water 2) within a mile of the bay or coastland 3) one to five miles away from the bay or coastland 4) further than five miles away from the bay or coastland 8) don't know 9) no answer (mean of 3.17 and standard deviation of 1.02) (8 and 9 coded as missing values)

How long have you lived in Rhode Island? 1) less than one year 2) one to five years 3) 5 to 10 years 4) 10 to 20 years 5) more than 20 years 8) don't know 9) no answer (mean of 4.71 and standard deviation of 0.73) (8 and 9 coded as missing values)

In terms of your primary residence, do you: 1) own or 2) rent the place where you live? 8) don't know 9) no answer (mean of 1.20 and standard deviation of 0.40) (8 and 9 coded as missing values)

Do you have children who currently live with you? 1) yes 2) no 8) don't know 9) no answer (mean of 1.58 and standard deviation of 0.49) (8 and 9 coded as missing values)

Regardless of how you vote, do you usually think of yourself as a Republican, a Democrat, an Independent, or something else? 1) Republican 2) Independent 3) Democrat 9) no answer (9 coded as missing value)

Are you: 1) white 2) African-American 3) Asian-American 4) Hispanic or Latino or 5) native American? 8) don't know 9) no answer (recoded as 1 white and 2 non-white) (mean of 1.06 and standard deviation of 0.24) (8 and 9 coded as missing values)

Which of the following age group are you in? 1) 18–24 2) 25–34 3) 35–44 4) 45–54 5) 55–64 6) 65 or older 9) no answer (mean of 4.28 and standard deviation of 1.41) (8 and 9 coded as missing values)

Is your family income: 1) 0–20,000 2) 20,001–40,000 3) 40,001–60,000 4) 60,001–80,000 5) 80,001–100,000 6) over 100,000 8) don't know 9) no answer (mean of 3.58 and standard deviation of 1.71) (8 and 9 coded as missing values)

Sex: 1) male 2) female (mean of 1.62 and standard deviation of 0.48)