# Hurricane Evacuation Research: A Systematic Review

By

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**Abstract**

    Public health agencies play a large role in research initiatives to gain a better

understanding of human response during hurricanes.  This research is critical to allow

public health agencies and their partners in emergency management to develop and

implement educational initiatives, communications plans and evacuation strategies to

safeguard human life in times of natural disaster.  While research has identified several

primary factors that impact one's decision to evacuate there is still a gap in understanding

exactly how social factors impact evacuation decisions.  A systematic review of the

literature was carried out  to gain better understanding of the level of knowledge about

how and which social factors influence evacuation decisions. All of the research presented

in this literature review was specifically designed to examine evacuation behavior,

however in all studies, understanding the impact of social capital was secondary. This

review indicates that three things should be considered when developing evacuation

planning and intervention; these are:  a set of specific major themes, social factors and

research limitations and knowledge gaps. While much progress has been made in this area,

additional targeted research is needed to truly understand how social factors coupled with

known factors such as perception of risk, source of information, personal evacuation plans,

prior hurricane experience, length of residence, lack of transportation, and sense of place

interact to form the basis of one's decision to evacuate during a hurricane.  Having this

greater understanding may allow agencies and officials to design and implement education

and intervention strategies based on specific demographic, social, and physical attributes of

the population and their surroundings that will improve evacuation efficiency and overall outcomes, including a reduction in death and injuries, improved household planning and preparation and higher evacuation rates during these critical emergency situations.

**Introduction**

The National Hurricane center defines a hurricane as "an intense tropical weather system of strong thunderstorms with a well-defined surface circulation and maximum sustained winds of 74 mph (64 kt) or higher". Each year approximately 6 storms reach hurricane status and threaten the United States coastline, however, during a typical 3 year period, only 5 storms make landfall in the US (National Hurricane Center, 2012). While occurrence seems low, with every storm there is an opportunity for severe devastation and avoidable injury and death.  Public health agencies may play an integral part in reducing casualties through research initiatives and public health preparedness interventions to increase public awareness and improve evacuation education and outcomes. One critical area of research involves understanding the factors that impact the decision making process for residents faced with potential severe weather. Learning from ongoing research is critical in informing educational initiatives, communication strategies and evacuation plans to reduce the risks to residents in harm's way.

**Factors to be Considered**

This paper will define some of the primary factors that inform the decision to evacuate during a hurricane and discuss how social interactions may impact these factors. The factors that will be discussed include perception of risk, source of information, personal evacuation plans, prior hurricane experience, length of residence, lack of transportation, sense of place, and social capital including religious and ethnic affiliations. It is also necessary to discuss how a combination of various factors may affect the decision process in order to clearly understand how to address these from a public health perspective.

Perception of risk may involve understanding the severity of the storm and its

attributes such as expected sustained winds, wind gust, and storm surge and how these

may affect personal safety and property during and after the storm. This perception may be

impacted by various other factors including length of residence, previous storm experience,

sources of information and the social networks that affect daily life.

Trusting the source of information may involve having evacuation messages delivered

in a specific language, from a source that is considered credible by the population and that

is not perceived as unreliable based on previous experience. These informational sources

may include television, radio or print media, state and federal government officials, or

members of the social network including friends, family, religious or ethnic affiliations.

Trust may be deeply rooted in previous experience, race relations, and language barriers or

even related to legal issues such as immigration status.

Having an evacuation plan or knowing where to go or when to leave during an

evacuation involves either having a plan in place prior to an emergency situation or

receiving important information about available public shelters, evacuation routes and

timelines to inform a decision about evacuating. Factors affecting evacuation plans may be

dependent upon social networks such as friends, family or religious or ethnic affiliations as

well as length of residence and previous hurricane experience.

Prior hurricane experience may involve being directly affected by many hurricanes or

may involve a number of near misses, when hurricanes did not make landfall in the

location or at the strength they were forecast. While people who have been directly

impacted by previous hurricanes may be expected to evacuate in higher numbers, research

indicates that this is not always the case.  Baker states that there is no empirical research to

link a relationship between experience and evacuation which may in part be due to difficulty in defining and measuring experience (Baker, 1991).

Length of residence may impact a decision in several ways. First of all, living in the same location for many years will likely come with extended experience with dealing with environmental dangers that are prevalent to the area such as hurricanes, flooding, and high winds.  In addition, it may lead to a false sense of security when previous storms have changed course or been less impactful as previously forecasted. In addition, having a strong community connection, knowing one's neighbors may serve to inform a decision to evacuate simply because everyone else is evacuating, or it may conversely affect evacuation because of lack of trust of those who are staying behind or invoke fear of looting based on community distrust.

Lack of transportation may include having no personal form of transportation, no one to rely on for transportation needs, no form of public transportation or no means to purchase transportation. This may involve timing of the storm towards the end of a pay period making it impossible to purchase gas, train or bus tickets (Elder, 2007).

Sense of place is defined as a social, emotional and psychological connection to their neighborhoods (Chamlee-Wright, 2009). While the literature on this subject continues to be somewhat unclear about how this phenomenon manifests itself in evacuation situations, it seems clear that these bonds are an important factor in decision about evacuation and in returning home. Hay suggests that sense of place "can provide feelings of security, belonging and stability" (Hay, 1998). Sense of place may also be strongly connected to social capital as it relates to the connection to the community through ethnic or religious affiliations, civic organizations, friends and family.

Social capital, is defined as "social networks, the reciprocities that arise from them, and the value of these for achieving certain goals" (Schuller, 2000) or "the trust, mutual understanding, and shared values and behaviors that bind the members of human networks and communities and make cooperative action possible" (Cohen, 2001) and "facilitate a flow of information providing a basis for action and assisting in individual and community goal attainment" (Ritchie, 2007)  This concept may play a critical role in decisions about evacuation from a hurricane (Airriess, 2008). Social capital binds people together through various connections to either increase or decrease the likelihood of evacuation.  While some social connections create a stronger argument for one to act in an emergency situation, others seem to support a decision not to act. This is difficult to understand because the variables are tightly coupled and more research is needed to better understand how these interactions impact one's actions based on the demographic variables that come into play.

This paper will discuss major findings of the recent hurricane evacuation research as well as the underlying social factors that contribute to decisions about hurricane evacuation. There will also be a discussion of how various factors come together to impact a decision about evacuation or to contribute to evacuation failure. In addition, the limitations in the presented research will also be outlined in an effort to improve the design of future research initiatives.  Improved research design may allow for a better understanding of the decision making process during impending weather and lead to improved communication strategies, educational initiatives and interventions by public health agencies in preparation for future hurricane evacuations.

**Methods**

A systematic review of the literature was performed to identify research that looked at the potential impact of different factors on evacuation decision making. The published research primarily focused on analyzing data collected after hurricanes made landfall in a specific area and sought to understand the factors that contributed to a decision to evacuate during impending severe weather. The initial review included 219 articles published between 1991 and 2010 and was performed using a keyword search for "hurricanes" and "evacuation" using PubMed, PsychInfo, and the Sociological Abstract Database. The initial 219 articles were comprised of 77 publications from the Sociological Abstract Database, 95 publications from PubMed and 47 publications from PsychInfo. These articles were reviewed and only those that offered insight into the impact of the factors identified above were included in the review. A total of 26 articles were selected for inclusion in this review based on the factors of interest relating to evacuation and included perception of risk, source of information, personal evacuation plans, prior hurricane experience, length of residence, lack of transportation, sense of place, and social capital.

Upon initial review it also became clear that there were limitations in the research that may be important in understanding how social factors might impact the decision making process. This paper will offer a discussion of these limitations including social response and cognitive biases, interpretation of emergency communication, and sample size or distribution that does not accurately reflect the population as a way to improve future research initiatives.

**Findings**

***Perception of Risk***

Table 1 identifies the findings of this review and indicates that of the 26 publications, 11 offer a discussion of perception of risk. Overall, perception of risk findings indicate that in general, when residents feel unsafe to stay in their homes during the storm, they evacuate and those who feel safe tend to stay (Baker, 1991). This perception may be altered by many factors including community, ethnic or religious affiliations, interpretation of media messages or simply a misinterpretation of the possible severity of the storm.  In the Adeola study, evacuees from the Earnest Morial Convention Center, the Austin City Convention Center and the Red Cross Convention Center were interviewed along with property owners returning to New Orleans after hurricane Katrina. The study utilized both quantitative and qualitative methods and included an open-ended questionnaire, interviews and participant observation. For residents returning to New Orleans after the hurricane, a face to face questionnaire was administered to 700 victims. This questionnaire was administered by 70 upper and lower level undergraduate sociology students who were provided orientation to the project, instructions about the population and training on how to conduct the field work. Of the 700 questionnaires, 598 were completed and returned (response rate = 85%).  Most of the respondents indicated that they underestimated the impact of the storm and never anticipated a 15 ft. storm surge and breeches to the levees. In this case, the inaccuracy of the perception of risk put large numbers of residents at danger unnecessarily and led to avoidable death (Adeola, 2009).

*Trust the Source of Information*

Of 26 articles included in the literature review, 11 included a discussion of the importance of how residents perceived the source of information. During impending severe weather, residents may receive information about the storm from various resources including state and local government officials, news media, and their community contacts including neighbors, civic organizations, and religious affiliations. When residents trust the source of the information they are more likely to evacuate and having multiple channels of information may improve evacuation decisions (Spence, 2007).

Media credibility was explored in one study following hurricane Katrina in which participants who evacuated to Columbia South Carolina were identified by the American Red Cross Disaster Relief Operations Control for Columbia, SC. Participants attended weekly town hall meetings and focus group sessions that involved filling out a consent form, completing a demographic questionnaire and participating in a face to face interview conducted by facilitators who were trained in qualitative research and who had experience in conducting focus groups. The participants consisted of 53 African Americans, most of which (92.5%), did not evacuate prior to the storm but who evacuated to Columbia, SC in the aftermath of hurricane Katrina.  Participants of this focus group indicated that they trusted television media reporting of the size and strength of the hurricane because they could see it. "It was right there in front of your eyes showing where it is coming and how fast it's coming" (Elder, 2007). In this study it is noted that the majority of the participants (69.92%) were low income men with a high school education or less and may not completely represent the overall general African American population who did not evacuate from New Orleans prior to landfall of hurricane Katrina (Elder, 2007).

In another study, following hurricane Andrew, researchers identified that language problems were found in the way that the Federal Emergency Management Authority (FEMA) responded and noted that immigrants and migrants workers were not able to fill out forms (Cherry, 1997, Morrow 2000). This study also revealed that this population has a strong distrust for government officials and generally sought out evacuation information from friends and family due to this mistrust (Peguero, 2006).

Residents may have issues of trust regarding state and local officials or even the media. This distrust is largely based on previous experience and may be amplified when evacuation for previous storms are proven unnecessary (Baker, 1991). Several reasons for distrust of state and local government officials were discussed including language barriers, socio-economic status, and minority preference for a particular information source (Peguero, 2006, Spence 2007). This distrust may be a barrier to evacuation and lead to higher numbers of casualties and injuries. Baker's analysis of 15 studies that included hurricanes Carla, Camille, Eloise, Frederic, David, Allen, Alicia, Diana, Elena, Gloria, and Hugo indicated that residents who did evacuate, at the warning of public officials, did so because the information provided to them, convinced them of the danger or they wanted to be compliant or obedient (Baker, 1991).

### *Personal Evacuation Plan*

Having an evacuation plan or knowing where and when to go during an evacuation is critical in making evacuation decisions. Of the 26 publications reviewed, 13 included a discussion of the importance of an evacuation plan. Residents are much more likely to evacuate than when they have evacuation plans in place or when information is provided to them about when to leave their homes, evacuation routes, and places to go during an

evacuation (Adeola, 2009, Baker, 1991, Bourque 2006, Brezina, 2008, Burnside, 2007, Eisenman, 2007, Elliott, 2006, Goodwin, 2010, Litt, 2008, Vu, 2009, West, 2007).

In a vulnerability study in Ruskin, Florida of mobile 75 mobile home residents, 83 % indicated that they would evacuate during a hurricane of these however, 17.3 % stated that they would not evacuate or were unsure, 25.3% reported uncertain or unsafe evacuation destinations, 32% had made no personal evacuation plans or preparation for evacuation and 31% had not made arrangements for evacuation for the family pets (Kusenbach, 2010). The 75 households interviewed were from an approximate pool of occupied homes during the summer months of 207 (response rate = 36%) (Kusenbach, 2010). This study, by design, created an over-representation of senior citizens but is representative of the overall population of people living in Gulf Coast Florida mobile home parks (Kusenbach, 2010).

Another study, of hypothetical evacuation response, included a telephone survey of 1207 residents of the greater New Orleans region which was administered between March 30, 2004 and May 16, 2004 and was designed to answer the question "If public officials in the greater New Orleans area recommended an evacuation because of the threat of a hurricane this year, what would you most likely do: definitely evacuate, probably evacuate, probably not evacuate, or definitely not evacuate?" The survey also collected information regarding individual variables including questions about source of information, perceived risk, evacuation plan and prior evacuation experience. The results of this survey suggest that residents are 22.4% more likely to evacuation if they have a definite evacuation plan in place (Burnside, 2011).

In addition, having friends or relatives to stay with also greatly improves the decision to evacuate and having no place to go greatly increases the risk of evacuation failure (Smith,

2009). This was evident in multiple studies including a study of Hurricane Gilbert in Cancun in September 1988 where 24% of the local respondents evacuated. Of this population, 63.9% evacuated to the homes of friends, family or neighbors and those who stayed away from their home for extended periods of time, remained with friends and family (Aguirre BE, 1991). Research following hurricane Isabel in North Carolina indicated that having an evacuation plan was important in hurricane evacuation and suggested that residents with a plan were 15% more likely to evacuate than those without a plan (Horney, 2010).

### *Length of Residence and Prior Hurricane Experience*

When studied separately, factors such as age, length of residence and previous hurricane experience appear less significant; however, understanding how these factors impact each other is important. The literature seems to suggest that these factors are strengthened or weekend in the presence or absence of each other and consideration should be given to such factors when planning communication strategies, educational initiatives and emergency evacuation plans.

Length of residence and prior hurricane experience were prominent in multiple studies including Elder and Adeola's research following hurricane Katrina and Bourque's research following hurricane Floyd in North Carolina. In all studies, prior hurricane experience led to inaccurate risk perception and optimism based on prior experience with riding out the storm and put more residents in danger when they decided not to evacuate( Adeola, 2009, Elder, 2007, and Bourque, 2006). Horney explains in post hurricane research following hurricane Isabel in North Carolina in September 2003, that older residents had a lower perception of risk that led to their failure to evacuate because the last major hurricane to

effect their region was Hurricane Hazel in 1954 (Horney, 2010). In this example age, coupled with length of residence and prior hurricane experience led to inaccurate assessment of risk which put people in danger when they did not evacuate.

### Lack of Transportation

Lack of transportation also played a key role in decisions about evacuation and was strongly associated with failure to evacuate in areas of poverty in New Orleans during hurricane Katrina. This issue included a pure lack of transportation as well as lack of financial resources to afford gas for the car (Baker, 1991, Bourque, 2006, Brezina, 2008, Eisenman, 2007, Elder, 2007, Elliott, 2010, Spence, 2007, West, 2007). It is also noted that in areas of extreme poverty in New Orleans no provisions were made for the poor and thus left many people stranded with no way out during hurricane Katrina and is attributed to higher risk of injury and death (Brezina, 2008, West, 2007). In this study, professional interviewers administered face to face interviews with 394 participants who evacuated after hurricane Katrina made landfall in New Orleans and 247 evacuees who left prior to the storm (Brezina, 2008). This sample was drawn from a pool of greater than 8000 residents who were housed in shelters following the storm (Brezina, 2008). Of the 394 study participants who evacuated after the storm, 298 participated in post storm, government assisted evacuation. Of these 38 stated that they did not have transportation to leave and 45 stated that looking back, they would not have been able to find a way to leave (Brezina, 2008).

### Sense of Place

Sense of place also played a strong role in evacuation decision as residents planned their strategies in a way that would allow them to relocate to a similar environment. For

example, evacuees seek out refuge in an area with similar ethnic, cultural and religious background where they might find acceptance and resources to help them during this time of displacement (Chamlee-Wright, 2009, Vu, 2010). In addition, communities tried to stay in touch and made plans to return to their homes and rebuild their communities as soon as possible following the storm.

Sense of place was discussed at length specifically related to the Vietnamese-American community in New Orleans during hurricane Katrina in which 78% of this population evacuated to Houston during hurricane Katrina with the primary decision based on the fact that Houston has the second largest Vietnamese-American population in the United States (Vu, 2010). For this research, interviewers conducted face to face interviews in the Summer of 2005 with 128 Vietnamese (response rate = 73%) (Vu, 2010). A follow-up study was conducted in August-September of 2006 in which 82 of the original 128 participants were re-interviewed (Vu, 2010). The follow-up interviews one year after hurricane Katrina, indicated that approximately two thirds of this population had returned to their homes to rebuild which is a significantly higher rate of return than the rest of the city (Vu, 2010).

### Social Capital

Finally, social capital was discussed in all 26 articles and was the defining factor in the inclusion criteria for the literature review. The underlying implications of strong social interactions are variable and the research suggests that social factors may have both positive and negative impacts on evacuation decisions. Examples of social capital may include religious or ethnic affiliations, community connections such as civic organizations, community involvement, participation in school functions or interactions with friends and family. These social connections may play a significant role in informing decisions during

evacuation situations and should be considered when designing research to inform future public health initiatives.

Membership in religious or ethnic groups is one example of social capital and may play a significant role in affecting decisions about evacuation. These memberships may help to inform a decision by providing targeted information in a native language or to provide resources such as information about where, when and how other's within the affiliation are evacuating. They may also provide transportation, financial, or spiritual support during times of need and facilitate communication that allows families or affiliation members to stay in touch during this time of need. In particular, these networks seem to improve trust level among members and there is generally an informal communication channel by which information and resources flow to assure that all within the community are taken care of (Litt, 2008). These lines of communication are often critical and very efficient in situations of emergency and can greatly influence evacuation decisions (Airriess, 2007, Chamlee-Wright, 2009, Eisenman, 2007).

**Figure 1.  Summary of Findings from Literature Review**

| Author | Title/citation | Setting | Findings | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Perception of risk | Trust the source of information | Know when /where to go in an evacuation | Prior hurricane experience | Length of Residence | Lack of transportation | Sense of Place | Social Capital |
| Adeola, Francis O. | Adeola, F. O. (2009). Katrina cataclysm: Does duration of residency and prior experience affect impacts, evacuation, and adaptation behavior among survivors? *Environment and Behavior, 41*(4), 459-489. | Post Hurricane Katrina | √ | √ | √ | √ | √ | √ | | √ |
| Adeola, Francis O. | Adeola, F. O. (2009). Mental health & psychosocial distress sequelae of Katrina: An empirical study of survivors. *Human Ecology Review, 16*(2), 195-210. | Post Hurricane Katrina | | | | | | | | √ |
| Aquirre B.E. | Aguirre, B. E. (1991). Evacuation in Cancun during hurricane Gilbert. *International Journal of Mass Emergencies and Disasters, 9*(1), 31-45. | Post Hurricane Gilbert | | | √ | | | | | √ |
| Airries, Christopher A. | Airriess, C. A., Li, W., Leong, K. J., Chen, A. C., & Keith, V. M. (2008). Church-based social capital, networks and geographical scale: Katrina evacuation, relocation, and recovery in a New Orleans Vietnamese American | Post Hurricane Katrina | | | | | | | | √ |

| Author | Citation | Description | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | community. *Geoforum, 39*(3), 1333-1346. | | | | | | | | | |
| Baker, Earl J. | Baker, E. J. (1991). Hurricane evacuation behavior. *International Journal of Mass Emergencies and Disasters, 9*(2), 287-310. | A review of research covering 12 hurricanes from 1961-1989. | √ | √ | √ | | | √ | | √ |
| Bourque Linda B. | Bourque, L. B., Siegel, J. M., Kano, M., & Wood, M. M. (2006). Weathering the storm: The impact of hurricanes on physical and mental health. *The Annals of the American Academy of Political and Social Science, 604*, 129-151. | Review of US hurricanes prior to Hurricane Katrina | √ | √ | √ | √ | √ | √ | | √ |
| Brezina, Timothy | Brezina, T. (2008). What went wrong in New Orleans? An examination of the welfare dependency explanation. *Social Problems, 55*(1), 23-42. | Post Hurricane Katrina | √ | | √ | | | √ | | √ |
| Burnside, Randolph | Burnside, R., Miller, D. S., & Rivera, J. D. (2007). The impact of information and risk perception on the hurricane evacuation decision-making of greater New Orleans residents. *Sociological Spectrum, 27*(6), 727-740. | Post Hurricane Katrina | √ | √ | √ | | | | | √ |
| Chamlee-Wright, Emily | Chamlee-Wright, E., & Storr, V. H. (2009). "There's no place like New Orleans": Sense of place and community recovery in the ninth ward after hurricane Katrina. *Journal of Urban Affairs, 31*(5), 615-634. | Post Hurricane Katrina | | | | | | | √ | √ |
| Eisenman, D.P. | Eisenman, D. P., Cordasco, K. M., Asch, S., Golden, J. F., & Glik, D. (2007). Disaster planning and risk communication with vulnerable | Post Hurricane Katrina | √ | √ | √ | | | √ | | √ |

| Author | Citation | Event | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | communities: Lessons from hurricane Katrina. *American Journal of Public Health, 97 Suppl 1*, S109-115. | | | | | | | | | | |
| Elder, K.B. | Elder, K., Xirasagar, S., Miller, N., Bowen, S. A., Glover, S., & Piper, C. (2007). African Americans' decisions not to evacuate New Orleans before hurricane Katrina: A qualitative study. *American Journal of Public Health, 97 Suppl 1*, S124-129. | Post Hurricane Katrina | | √ | | √ | √ | √ | | | √ |
| Elliott, James R. | Elliott, J. R., Haney, T. J., & Sams-Abiodun, P. (2010). Limits to social capital: Comparing network assistance in two New Orleans neighborhoods devastated by hurricane Katrina. *Sociological Quarterly, 51*(4), 624-648. | Post Hurricane Katrina | | | | | | | √ | | √ |
| Elliott, James R. | Elliott, J. R., & Pais, J. (2006). Race, class, and hurricane Katrina: Social differences in human responses to disaster. *Social Science Research, 35*(2), 295-321. | Post Hurricane Katrina | √ | | √ | | | | | | √ |
| Goodwin, BA | Goodwin Jr., B. S., & Donaho, J. C. (2010). Tropical storm and hurricane recovery and preparedness strategies. *ILAR Journal / National Research Council, Institute of Laboratory Animal Resources, 51*(2), 104-119. | Post Tropical Storm Allison<br><br>Hurricane Ike | | | √ | | | | | | √ |
| Horney, J.A. | Horney, J. A., MacDonald, P. D. M., Van Willigen, M., Berke, P. R., & Kaufman, J. S. (2010). Factors associated with evacuation from hurricane Isabel in North Carolina, 2003. *International Journal of Mass Emergencies and Disasters, 28*(1), 33-58. | Post Hurricane Isabel | √ | | √ | | √ | | | | √ |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Jacob, B. | Jacob, B., Mawson, A. R., Payton, M., & Guignard, J. C. (2008). Disaster mythology and fact: Hurricane Katrina and social attachment. *Public Health Reports, 123*(5), 555-566. | Post Hurricane Katrina | | | | | | | | |
| Kusenbach, Margarethe | Kusenbach, M., Simms, J. L., & Tobin, G. A. (2010). Disaster vulnerability and evacuation readiness: Coastal mobile home residents in Florida. *Natural Hazards, 52*(1), 79-95. | Post Hurricanes Charley, Frances, Ivan and Wilma | | | √ | | | | | √ |
| Litt, Jacquelyn | Litt, J. (2008). Getting out or staying put: An African American women's network in evacuation from Katrina. *NWSA Journal, 20*(3), 32-48. | Post Hurricane Katrina | √ | | √ | | | | | √ |
| Pequero, Anthony A. | Peguero, A. A. (2006). Latino disaster vulnerability: The dissemination of hurricane mitigation information among Florida's homeowners. *Hispanic Journal of Behavioral Sciences, 28*(1), 5-22. | | | √ | | | | | | √ |
| Smith, Stanley K. | Smith, S. K., & McCarty, C. (2009). Fleeing the storm(s): An examination of evacuation behavior during Florida's 2004 hurricane season. *Demography, 46*(1), 127-145. | Post Hurricanes Charley, Frances, Ivan and Wilma | √ | | | | √ | | | √ |
| Spence, Patrick R. | Spence, P. R., Lachlan, K. A., & Griffin, D. R. (2007). Crisis communication, race, and natural disasters. *Journal of Black Studies, 37*(4), 539-554. | Post Hurricane Katrina | | √ | | | | | √ | √ |
| Stein, Robert | Stein, R. M., Dueñas-Osorio, L., & Subramanian, D. (2010). Who evacuates when hurricanes approach? The role of risk, information, and location. *Social Science Quarterly, 91*(3), 816-834. | Post Hurricane Katrina | | | | | | | | √ |

| Author | Citation | Disaster | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Taylor, Jonathan G. | Taylor, J. G., Gillette, S. C., Hodgson, R. W., Downing, J. L., Burns, M. R., Chavez, D. J., & Hogan, J. T. (2007). Informing the network: Improving communication with interface communities during wildland fire. *Human Ecology Review, 14*(2), 198-211. | Post Southern California Wildfire | | √ | | | | | | | |
| Vu, Lung | Vu, L., VanLandingham, M. J., Do, M., & Bankston III, C. L. (2009). Evacuation and return of Vietnamese New Orleanais affected by hurricane Katrina. *Organization and Environment, 22*(4), 422-436. | Post Hurricane Katrina | | √ | √ | | | | | √ | √ |
| West, Darrell M. | West, D. M., & Orr, M. (2007). Race, gender, and communications in natural disasters. *Policy Studies Journal, 35*(4), 569-586. | | √ | | √ | | | | √ | | √ |
| Zottarelli, Lisa K., | Zottarelli, L. K. (2010). Broken bond: An exploration of human factors associated with companion animal loss during hurricane katrina1. *Sociological Forum, 25*(1), 110-122. | Post Hurricane Katrina | | | | | | | | | √ |

**Survey Methodology**

A summary of study design and knowledge and research gaps can be found in Figure 2 below. The study design summary provides information about how each study was conducted and outlines knowledge and research application gaps noted by each author upon completion of their research. Most of the study designs involved a survey sampling/questionnaire approach, including various interview strategies. Of the 26 publications included in this review 12 study designs included face to face interviews, 9 utilized telephone interviews, 4 were literature reviews and one was a focus group meeting. One study involved both face to face interviews and focus group meetings. In addition, all of the face to face and telephone surveys were dependent upon self reported hurricane experience, some of which relied on immediate recall of events and some of which relied on recall of past experience as well as current events. Some notable knowledge and research gaps include biases due to misrepresentation of demographic factors such as race, age, sex or socioeconomic status of the population and recall biases such as dissonance due to the timing of the research and the self reported aspect of data collection. While some studies noted bias by design as a way of capturing information about a specific demographic, it is important to weigh these issues when using data to generalize across the larger population. Although overall research design gaps have been noted and are summarized in Figure 2; a detailed analysis of the strengths and weaknesses of the specific survey sampling methodology used is not presented here, since it is beyond the scope of this paper.

**Knowledge and Research Application Gaps:**

   In all research there are lessons to learn about how future studies can be improved or
designed to gather better or more comprehensive information. While reviewing the
publications for this literature review, it became clear that the lessons learned are critical
in truly understanding the impact of social factors on evacuation and emergency
management planning. Some of the important potential research limitations noted in this
literature review include social response and cognitive biases and sample size or
distribution that does not accurately reflect the population.  It is important to understand
how these factors affect the accuracy of information that is reported and to think about
ways to reduce these issues to improve research initiatives and evacuation outcomes.

   Social response and cognitive biases may appear when survey respondents have
difficulty accurately recalling or articulating responses to survey questions or when they
provide answers that are inaccurate because of dissonance (Eisenman, 2007, Elder, 2007).
Dissonance may occur in research such as in Elder's study of African American's evacuated
after Katrina to Columbia, SC in which the respondents self-reported the event before and
after the storm (Elder 2007). Bias may also occur when respondents answer surveys in a
way that they feel will please the surveyor. These biases may be reduced when surveys are
conducted immediately after the event, leaving less time for the respondent to contemplate
their decision or to think about the results of their actions (Spence, 2007). Specifically in
the Spence research following hurricane Katrina, the data was collected over an extended
period of time allowing some respondents to provide response hours after the event while
other information was gathered weeks after the event due to the time consuming nature of
finding and interviewing hurricane evacuees. By collecting data at a single time point as

close to the event as possible, recall accuracy should be improved and bias reduced (Spence, 2007).

Communication strategies are critical in emergency management planning and interpretation of media messages may be more important than the number of messages heard (Aguirre, 1991). It is important to understand how demographic data coupled with variances in social capital may affect how emergency media messages are interpreted (Aguirre, 1991). Horney points out that decision to evacuate may be positively or negatively affected by social capital, social cohesion or social control and provides an example that a variable that leads to a decision to evacuate for a family with children under the age of 18 may also lead to a decision not to evacuate for a family without children. In addition, these factors could account for such inconsistencies in the research (Horney, 2012). Having a strong understanding of the populations' socio-economic status, race/ethnicity, and age along with social networks such as church attendance, organizational membership, or racial or ethnic community concentrations may allow emergency management planners to create targeted messaging to improve understanding and trust of the population (Vu, 2009, Airress, 2007). By improving this level of trust within diverse subgroups of the population, evacuation compliance will likely improve the overall outcome of the interventions involving evacuation communication strategies.

It is also critical to understand the population represented in this research. Often post-hurricane survey respondents are not representative of the entire population. (Elder, 2007). In some situations, the poor are unable to evacuate due to issues with lack of transportation or financial resources to allow them to travel away from their homes.  In other situations, when post disaster surveys are completed immediately following a

hurricane, only the people with the most resources have returned to their homes because those with less financial resources may be unable to make repair to their property to allow them a safe place to live. These discrepancies may lead to a small sample size with racial or economic bias due to an under-representation of the poor (Elliott, 2006). In one particular study, Elliott notes the opposite effect which he contributes to the source of population data. This sample includes 1510 participants randomly selected from the American Red Cross database of 460,000 survivors seeking assistance following hurricane Katrina. Even after taking steps to ensure appropriate representation, the sample set indicated an over representation of women by 5% and of black, non senior citizens, and non-homeowners by approximately 15%. In addition, the represented population indicated an average income level that was approximately 14% lower than the most recent census information of 2000. These misrepresentations led to the assumption that while there are inherent biases in the data, there is sufficient diversity to estimate the basic social difference in response to the storm (Elliott, 2006). It is important however to understand and note these potential biases in the research.

In a study of hurricane Gilbert in Cancun, 431 interviews were conducted of residents of Cancun one year following the hurricane to understand experiences of residents during and following the storm. The sample was derived by identifying 18 sampling cells and randomly interviewing at least 25 people residing within those cells. The strata for each sampling cell were determined based on socioeconomic status, age and gender and utilized recently updated city maps to identify 112 city squares for inclusion. The model identified that the most impoverished residents of Cancun were underrepresented in the sample. Due to this underrepresentation, the estimated impact of

the hazards of the study was conservative (Aguirre, 1991).  While this study accounted for the misrepresentation of an important sub-population, it is important in any research to document any discrepancies in the population base and adjust analysis to take into consideration biases that may affect the accuracy of the data or design follow up surveys to capture data from a more representative sample.

**Figure 2. Summary of Study Design and Knowledge and Research Application Gaps**

| Author/Citation | Study Design | Comments Regarding Knowledge and Research Application Gaps |
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| Adeola, Francis O.<br><br>Adeola, F. O. (2009). Katrina Cataclysm: Does duration of residency and prior experience affect impacts, evacuation, and adaptation behavior among survivors? *Environment and Behavior, 41*(4), 459-489. | • Face to face interviews<br>• Interviews conducted by 70 upper and lower level undergraduate sociology student volunteers who underwent training prior to conducting surveys<br>• 25 people out of several thousands of victims stranded at the Earnest Morial Convention Center in New Orleans were interviewed from August 31 to September 2, 2005.<br>• More than 20 evacuees were interviewed at the Austin City Convention Center<br>• About 10 evacuees were interviewed at the Red Cross Evacuation Center in Lawrenceville, Georgia.<br>• 700 face to face interviews were conducted among property owners returning to New Orleans between October 5, 2005 and January 2006 yielding 598 completed questionnaires. | • The cross sectional design of the study relying on respondents' recall of previous experience of hurricane or flood may not reveal as much information as a longitudinal study of victims of such events. Unfortunately, a longitudinal approach is beyond the scope of the present endeavor. Future research along this line of inquiry is strongly encouraged. |
| Adeola, Francis O.<br><br>Adeola, F. O. (2009). Mental health & psychosocial distress sequelae of Katrina: An empirical study of survivors. *Human Ecology Review, 16*(2), 195-210. | • Telephone interviews<br>• Interviews conducted by Gallup<br>• The first survey was conducted between September 30 and October 9, 2005 during the immediate post-impact phase of the disaster.<br>• Follow-up survey of the same subjects was carried out from August 3 to 17, 2006.<br>• Both data sets were based | • This research may contain bias due to over-representation of the poor, black-non senior citizen- non home owners is thought to be negligible but worthy of noting. |

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| | on a random sample of 1,510 subjects aged 18 and above drawn from a sampling frame of approximately 460,000 Hurricane Katrina survivors. | |
| Aquirre B.E.<br><br>Aguirre, B. E. (1991). Evacuation in Cancun during hurricane Gilbert. *International Journal of Mass Emergencies and Disasters, 9*(1), 31-45. | • Face to face interviews<br>• Initial Interviews conducted by a 4 person team supported by the Committee on Natural Disasters, National Academy of Sciences and National Academy of Engineering<br>• Follow-up interviews conducted by Grupo Asesor en Mercadotecnia y Metodologia Aplicada, SC (GAMMA)<br>• The information was collected during a post-disaster visit conducted one week after impact of hurricane Gilbert (September 13, 1988) and as part of a survey a year later that was completed in October 1989.<br>• Consisted of a random sample of 431 persons 18 years old and older who resided in Cancun at the time of the disaster from 18 identified sample cells; sample was generated from a random start | • The respondents in the most impoverished parts of Cancun, those who suffered the most devastation in the homes and possessions, are underrepresented in the sample<br>• The sample is on average, much older than the general populations of the city |
| Airries, Christopher A.<br><br>Airriess, C. A., Li, W., Leong, K. J., Chen, A. C., & Keith, V. M. (2008). Church-based social capital, networks and geographical scale: Katrina evacuation, relocation, and recovery in a New Orleans Vietnamese American community. *Geoforum,* | • Face to Face interviews<br>• Self- reported survey completed in preferred language<br>• Interviews by journalist<br>• Focus groups<br>• Research consisted of quantitative and qualitative researcher<br>• Survey that was administered to 104 | • We understand relying on the *Tet* Festival participants as the primary source of information biases the sample in favor of those who had already returned to the community or those with transport to attend the festival. |

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| *39*(3), 1333-1346. | respondents, most of whom were attending a community Tet or New Year Festival in early February 2006 the remaining were among those who had not returned to New Orleans who were attending a community function in Houston TX in March 2006. | |
| Baker, Earl J.<br><br>Baker, E. J. (1991). Hurricane evacuation behavior. *International Journal of Mass Emergencies and Disasters, 9*(2), 287-310. | • Literature review<br>• Literature Review of sample surveys of at least 12 hurricanes requiring evacuation from 1961 through 1989. | • None note |
| Bourque Linda B.<br><br>Bourque, L. B., Siegel, J. M., Kano, M., & Wood, M. M. (2006). Weathering the storm: The impact of hurricanes on physical and mental health. *The Annals of the American Academy of Political and Social Science, 604*, 129-151. | • Literature review<br>• "Literature review of deaths, injuries and diseases attributed to hurricanes that made landfall in the United States prior to Hurricane Katrina; recent hurricane evacuations and studies and the potential for reducing death, injury and disease; information available to date about mortality, injury and disease attributed to Hurricane Katrina; and psychological distress attributed to hurricanes, including hurricane Katrina." | • None note |
| Brezina, Timothy<br><br>Brezina, T. (2008). What went wrong in New Orleans? An examination of the welfare dependency explanation. *Social Problems, 55*(1), 23-42. | • Face to face interviews<br>• Interviews conducted by professional interviewers<br>• Survey conducted 2 weeks after hurricane Katrina<br>• 680 random subjects over the age of 18 who evacuated to Houston from the Gulf Coast after hurricane Katrina made | • None noted |

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| | landfall- from a population of more than 8000<br>• 90% response rate | |
| Burnside, Randolph<br><br>Burnside, R., Miller, D. S., & Rivera, J. D. (2007). The impact of information and risk perception on the hurricane evacuation decision-making of greater New Orleans residents. *Sociological Spectrum, 27*(6), 727-740. | • Telephone survey<br>• Interviews conducted by University of New Orleans Survey Research Center in collaboration with the Center for Hazards Assessment, Response, and Technology<br>• This study uses data collected from a random digit dialing telephone survey of 1,207 residents of the greater New Orleans region, which includes Orleans, Jefferson, and St. Bernard parishes.<br>• The survey was administered between March 30, 2004 and May 16, 2004 | • None noted |
| Chamlee-Wright, Emily<br><br>Chamlee-Wright, E., & Storr, V. H. (2009). "There's no place like New Orleans": Sense of place and community recovery in the ninth ward after hurricane Katrina. *Journal of Urban Affairs, 31*(5), 615-634. | • Face to face interviews<br>• The analysis is based on qualitative interview data collected in the spring of 2007 from residents and other stakeholders engaged in the rebuilding process following hurricane Katrina.<br>• The research team has conducted and recorded 285 interviews in Orleans and St. Bernard Parishes, Louisiana.<br>• A mixed methods field study in Houston, Texas was also performed in August 2008.<br>• The research team administered a 14-question survey to 82 subjects and conducted in-depth interviews with 38 of these respondents.<br>• The research team also conducted in-depth | • None noted |

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| | interviews with an additional 21 subjects, for a total of 103 survey and/or interview subjects. | |
| Eisenman, D.P.<br><br>Eisenman, D. P., Cordasco, K. M., Asch, S., Golden, J. F., & Glik, D. (2007). Disaster planning and risk communication with vulnerable communities: Lessons from hurricane Katrina. *American Journal of Public Health, 97 Suppl 1*, S109-115. | • Face to face Interviews<br>• Qualitative interviews were conducted with persons living in Houston's 3 major evacuation centers: the Reliant Center, Reliant Astrodome, and George Brown Convention Center<br>• On September 9, 2005 8623 persons were residing in these shelters.15 study participants>18 years old were randomly selected from inside and outside the centers from 9:00 AM to 9:00 PM | • Response bias or cognitive dissonance may have influenced recall of evacuation decisions.<br>• The peculiarities of the large-scale evacuation from impoverished sections of New Orleans provided a skewed population for study, which was further compounded by the rapidly changing occupancy of the shelters.<br>• The sample was older, poorer, less well educated, and disproportionately African American compared with New Orleans residents before Hurricane Katrina. |
| Elder, K.B.<br><br>Elder, K., Xirasagar, S., Miller, N., Bowen, S. A., Glover, S., & Piper, C. (2007). African Americans' decisions not to evacuate New Orleans before hurricane Katrina: A qualitative study. *American Journal of Public Health, 97 Suppl 1*, S124-129. | • Focus Groups<br>• African American women trained in qualitative research (masters and doctoral level) with experience in conducting focus groups conducted the groups.<br>• Focus groups were conducted between October 3 and October 14, 2005.<br>• Convenience sampling based on easy availability and accessibility included 53 participants | • The majority of our sample participants consisted of low income men with a high school education or less, and thus, our findings may not fully generalize to the total African American community<br>• In addition, the respondents self-reported the events before and after Hurricane Katrina, and the accuracy of the reporting may have been compromised. |
| Elliott, James R.<br><br>Elliott, J. R., Haney, T. J., & Sams-Abiodun, P. (2010). Limits to social capital: Comparing network assistance in two New Orleans neighborhoods devastated by hurricane Katrina. *Sociological Quarterly, 51*(4), 624-648. | • Telephone interviews<br>• 179 completed Interviews<br>• Interviews conducted between May and December 2006<br>• Interviews began approximately 9 months after hurricane Katrina made landfall in New Orleans | • None noted |

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| Elliott, James R.<br><br>Elliott, J. R., & Pais, J. (2006). Race, class, and hurricane Katrina: Social differences in human responses to disaster. *Social Science Research, 35*(2), 295-321. | • Telephone Survey<br>• Gallup teamed with the American Red Cross to conduct a telephone survey<br>• 1510 randomly selected hurricane Katrina survivors, ages 18 and over drawn from a database of over 460,000 hurricane Katrina survivors.<br>• Interviews conducted between September 30-October 9, 2005<br>• Response rate 90% | • Because the population was derived from the Red Cross database of people registering for assistance, the population not be representative of the entire population affected by hurricane Katrina, specifically the population may contain respondents of lower economic status than the general population. |
| Goodwin, BA<br><br>Goodwin Jr., B. S., & Donaho, J. C. (2010). Tropical storm and hurricane recovery and preparedness strategies. *ILAR Journal / National Research Council, Institute of Laboratory Animal Resources, 51*(2), 104-119. | • Review of emergency evacuation actions following Tropical Storm Allison and hurricane Ike<br>• Review of emergency management plans | • None noted |
| Horney, J.A.<br><br>Horney, J. A., MacDonald, P. D. M., Van Willigen, M., Berke, P. R., & Kaufman, J. S. (2010). Factors associated with evacuation from hurricane Isabel in North Carolina, 2003. *International Journal of Mass Emergencies and Disasters, 28*(1), 33-58. | • Face to face interviews<br>• Interviews conducted by Trimble Recon Field Data Collectors<br>• 570 interviews conducted between March 15, 2008 and August 23, 2008 5 years after hurricane Isabel made landfall<br>• 86.8% response rate | • If those who are at highest risk for evacuation failure were also more likely to be missed in this survey, there is potential for response bias.<br>• Renters, those living in poverty, and other underserved groups may be more likely to move to different addresses or stay with friends or family members for a period of time and therefore would have been ineligible to participate.<br>• Since Hurricane Isabel made landfall nearly 5 years prior to the survey, recall bias could have been a factor in this study. |
| Jacob, B.<br><br>Jacob, B., Mawson, A. R., Payton, M., & Guignard, J. C. (2008). Disaster mythology and fact: Hurricane Katrina and social attachment. | • Literature Review | • None noted |

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| *Public Health Reports, 123*(5), 555-566. | | |
| Kusenbach, Margarethe<br><br>Kusenbach, M., Simms, J. L., & Tobin, G. A. (2010). Disaster vulnerability and evacuation readiness: Coastal mobile home residents in Florida. *Natural Hazards, 52*(1), 79-95. | • Face to face interviews<br>• Interviews conducted by Team of faculty, graduate, and undergraduate students<br>• 75 households residing in seven Ruskin mobile home parks that ranged in size from 32 to 159 homes<br>• Overall 60% response rate<br>• A questionnaire survey was conducted with mobile home park residents between June and September 2007 | • These data are based on self reports by participants who may not have an accurate technical understanding of what "hurricane shutters," 'hurricane proof windows" and "tie downs" really are; thus, the actual number of under prepared residents might be even more alarming than those reported here. |
| Litt, Jacquelyn<br><br>Litt, J. (2008). Getting out or staying put: An African American women's network in evacuation from Katrina. *NWSA Journal, 20*(3), 32-48. | • Face to face interviews<br>• Interviews conducted by Jacqueline Litt, author<br>• Focus Group meetings<br>• Group consisted of a total of 100 evacuees and social service personnel, faith-based volunteers, and community members involved in assisting evacuees | • None noted |
| Pequero, Anthony A.<br><br>Peguero, A. A. (2006). Latino disaster vulnerability: The dissemination of hurricane mitigation information among Florida's homeowners. *Hispanic Journal of Behavioral Sciences, 28*(1), 5-22. | • Telephone survey<br>• Interviews conducted by The International Hurricane Center (IHRC) and the Institute of Public Opinion Research (IPOR)<br>• random digit-dialing telephone survey of an actual sample of 1,533 single-family homeowners throughout Florida during the summer of 1999 | • The SMS sample included an oversample of 300 households in Miami-Dade County<br>• Because of that oversample, the data were weighted so a statewide analysis reflects Florida single-family owners<br>• The target population of single family homeowners reflects the perspectives of only homeowners |
| Smith, Stanley K.<br><br>Smith, S. K., & McCarty, C. (2009). Fleeing the storm(s): An examination of evacuation behavior during Florida's 2004 hurricane season. | • Telephone interview<br>• 1881 completed interviews; 500 at the state level and 11,559 at the local level<br>• The sample was reduced to 9,045 surveys to make the sample representative of | • Post-hurricane surveys themselves are subject to imperfect recall on the part of respondents and miss people who leave the area following a hurricane and do not return. |

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| *Demography, 46*(1), 127-145. | each regions population for a margin of error of less than 3% at the state level and less than 5% at the regional level. | |
| Spence, Patrick R.<br><br>Spence, P. R., Lachlan, K. A., & Griffin, D. R. (2007). Crisis communication, race, and natural disasters. *Journal of Black Studies, 37*(4), 539-554. | • Survey's were collected from Katrina victims from relief centers in Cape Cod, MA; Lansing, MI; The Houston Astrodome; and several aid centers in Texas<br>• Surveys were captured during the course of 5 weeks immediately following the evacuation<br>• 964 surveys were completed and 935 of these were usable<br>• The study was designed to examine the differences in crisis preparation, information seeking and media use based on race. | • Data was collected over an uneven time frame with data collected hours, days and weeks after evacuation leading to likely hindsight bias and memory distortion |
| Stein, Robert<br><br>Stein, R. M., Dueñas-Osorio, L., & Subramanian, D. (2010). Who evacuates when hurricanes approach? The role of risk, information, and location. *Social Science Quarterly, 91*(3), 816-834. | • Telephone Interview<br>• Survey conducted less than 3 weeks after hurricane Katrina<br>• A random-digit sample of area phone numbers was drawn from which interviews were conducted with 651 persons in eight counties between September 29 and October 3, 2005<br>• The error rate for the sample was 3.95 percent.<br>• The response rate for the survey was 24 percent<br>• The survey queried respondents about their evacuation experiences and the risks they perceived from Hurricane Rita | • None noted |
| Taylor, Jonathan G.<br><br>Taylor, J. G., Gillette, S. C., Hodgson, R. W., Downing, J. L., Burns, M. R., Chavez, D. | • Face to face interviews<br>• The Fire Communication Research team members conducted interviews<br>• A "snowballing" method | • None noted |

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| J., & Hogan, J. T. (2007). Informing the network: Improving communication with interface communities during wildland fire. *Human Ecology Review, 14*(2), 198-211. | was used to identify key personnel and residents to interview | |
| Vu, Lung<br><br>Vu, L., VanLandingham, M. J., Do, M., & Bankston III, C. L. (2009). Evacuation and return of Vietnamese New Orleanais affected by hurricane Katrina. *Organization and Environment, 22*(4), 422-436. | • Face to face interviews<br>• Interviews conducted with the assistance of the Vietnamese Initiatives in Economic Training (VIET)<br>• Interviews conducted in the Summer of 2005 and the Fall of 2006<br>• Our sample size for the original, summer 2005 wave of the survey was 128. We had forty-six refusals, yielding a response rate of 73 percent.<br>• During August and September 2006, we successfully located and re-interviewed 82 of the original 128 respondents from 2005; 79 of these had returned to the New Orleans area by this time. Only two from the original cohort refused to be re-interviewed for the second wave.<br>• We attempted to contact the remaining 46 in a number of ways: by visiting their former addresses; by asking neighbors about their whereabouts; by attempting to contact them by telephone; and by asking a wide range of community leaders about their whereabouts. These remaining 46 individuals could not be located in the New Orleans area by fall 2006, are considered to | • Our multivariate analysis is severely hampered by our small sample |

| | have been living elsewhere | |
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| West, Darrell M.<br><br>West, D. M., & Orr, M. (2007). Race, gender, and communications in natural disasters. *Policy Studies Journal, 35*(4), 569-586. | • Telephone survey<br>• Interviews conducted by interviewers that were hired, trained, and supervised at Brown University in accordance with professional norms<br>• 785 adult registered voters 18 years or older between February 4 and 6, 2006 across the state<br>• Overall, the poll had a margin of error of about plus or minus 3.5 percentage points.<br>• The response rate for the survey was 60 percent. | • None noted |
| Zottarelli, Lisa K.<br><br>Zottarelli, L. K. (2010). Broken bond: An exploration of human factors associated with companion animal loss during hurricane katrina1. *Sociological Forum, 25*(1), 110-122. | • Telephone survey<br>• Interviews were conducted by Gallup<br>• A sample of 1,510 respondents was selected randomly from a database of over 460,000 people who sought any form of assistance from the American Red Cross and affiliated organizations as a result of Hurricane Katrina<br>• Nine attempts were made at contact over 10 days The interviews were conducted by landline and cell phone, with a final response rate of 90% | • None noted |

**Conclusion**

In conclusion, the literature suggests that there are many important factors for public health and emergency management officials to consider when designing and implementing evacuation planning. This paper suggests that three things should be considered when developing evacuation planning and interventions; these are: a set of specific major themes, social factors and research limitations and knowledge gaps. The major themes include the perception of risk, source of information, personal evacuation plans, prior hurricane experience, length of residence, lack of transportation, and sense of place. While understanding the major themes is important it is also critical to understand how social factors, such as church membership, community organization participation and ethnic or racial concentrations affect the decision making processes and these are also essential in designing effective evacuation strategies. In reviewing the literature to plan future research or interventions research limitations such as biases are also important to consider including recall bias and dissonance, which may be minimized through techniques such as conducting surveys as soon as possible after the disaster and reducing the timeframe for collecting data, understanding the population to inform survey questions and training of interview staff, and creating an environment of trust to reduce respondent concerns about how their responses will be perceived by the interviewer. Additional, targeted research plans that take all three of these factors into consideration will likely yield better data and inform evacuation planning that is specific to various populations and thus yield improved outcomes including higher evacuation rates, improved household planning and preparation and a decrease in deaths and injuries during hurricanes.

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