

# Hurricane Jeanne Behavioral Analysis

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# HURRICANE JEANNE BEHAVIORAL ANALYSIS

## Introduction

### Scope of the Survey

This survey of Florida residents following hurricane Jeanne is part of a post-storm assessment funded by the Federal Emergency Management Agency and the U.S. Army Corps of Engineers, with support from the Florida Division of Emergency Management. It deals mainly with issues related to evacuation, but also addresses information needs, mitigation, and economic impacts.

### The Threat Posed by Jeanne

In late September Jeanne affected most of the same parts of Florida that hurricane Frances had threatened and struck during the first week of September. Landfall eventually occurred in the almost exactly the same location as Frances, then Jeanne followed a path across the state similar to that of Frances.

Jeanne first approached the southeast coast of the United States as a tropical storm forecast to pass through the Bahamas on a course that would take it near Savannah, Georgia. The track shifted more to the east and Jeanne headed northward, east of the Bahamas. On September 18<sup>th</sup>, Jeanne began to slow down and began a 270° loop to the east, then south, then west that put it on a heading toward the east coast of Florida, as a 90 MPH hurricane. Forecasts initially indicated that Jeanne would approach the east coast of Florida around the latitude of Lake Okeechobee, but turn northward and make landfall near the Cape Kennedy in about 72 hours. A hurricane watch was posted for most of the east coast of Florida at 5 AM on September 24<sup>th</sup>. At the time Jeanne had winds of 100 MPH, and landfall was predicted in northeast Florida in approximately 60 hours, with winds of 110 MPH. At 5 PM the same day a hurricane warning replaced the hurricane watch from St. Augustine southward to Florida City (south of Miami). The area north of St. Augustine into Georgia was put under a hurricane watch. When the warning was issued Jeanne's winds were 100 MPH, but they were predicted to be 115 MPH at landfall near the Indian River County / St. Lucie County line in less than 36 hours. The storm's strength grew, and by 11 AM on the following day, September 25<sup>th</sup>, winds had reached 115 MPH and were forecast to reach 125 MPH before crossing the coast. Landfall occurred on the southern part of Hutchinson Island, east of Stuart in Martin County, the same location where Frances had struck just three weeks earlier. Winds were between 115 MPH and 120 MPH.

Jeanne moved inland toward the northwest with hurricane-force winds as it moved over the central part of the state, and dropped to tropical storm force north of Tampa. Before entering the Gulf of Mexico Jeanne turned northward and moved parallel to the shoreline and into Georgia. According to FEMA all of Martin, St. Lucie, and Indian River Counties received wind gusts over 100 MPH and parts of those counties received gusts between 110 MPH and 120 MPH, the same as in Frances. Portions of Palm Beach and Brevard Counties and most of Okeechobee County experienced gusts over 100 MPH.

For another portion of the FEMA-Corps post-storm assessment of Jeanne, interviews were conducted with state and county emergency management officials to document their actions concerning evacuation notices to the public: what and when they advised or ordered, how they disseminated the notices, and how they arrived at their decisions. There was substantial variation among counties with respect to evacuation actions. Some coastal counties issued notices for

areas expected to flood in a category 4 or 5 hurricane, whereas other notices applied only to barrier islands and mobile homes. Some counties made their evacuation mandatory, and others made theirs voluntary. Gulf coast evacuation notices mostly applied to mobile homes and low-lying areas, the latter sometimes including category 1 evacuation zones. Non-coastal counties typically told mobile home residents and people living in low-lying areas to move to safer housing or to higher ground.

## Survey Methods

Representatives from FEMA, the Corps of Engineers, and the state of Florida specified 31 counties where interviews were to be conducted to document public response in Jeanne and certain additional subjects. The list included all counties known at the time to have at least recommended evacuation for portions of their residents. The counties in which interviews were conducted are shown in Figure 1. The counties were aggregated into groups for sample allocation and reporting of results. There were five aggregations of coastal counties (Northeast, East Central, Treasure Coast, Southeast, and Tampa Bay/Big Bend) and two aggregations of inland or non-coastal counties (Central, and Southern). Aggregations of coastal counties were guided primarily by groupings used for hurricane evacuation planning studies in Florida. Treasure Coast is the name used in Florida for the planning region including Indian River through Palm Beach Counties. The Tampa Bay/Big Bend area included Citrus, Hernando, Levy, and Dixie Counties in addition to the counties comprising the Tampa Bay planning region. In most of the report's tables and graphics, the area is simply labeled Gulf Coast to economize on space. Sampling was proportional to population, so the Tampa Bay counties accounted for the bulk of interviews in the cluster. The Federal and state agency representatives composed a list of questions to be asked in the interviews, resulting in the questionnaire.

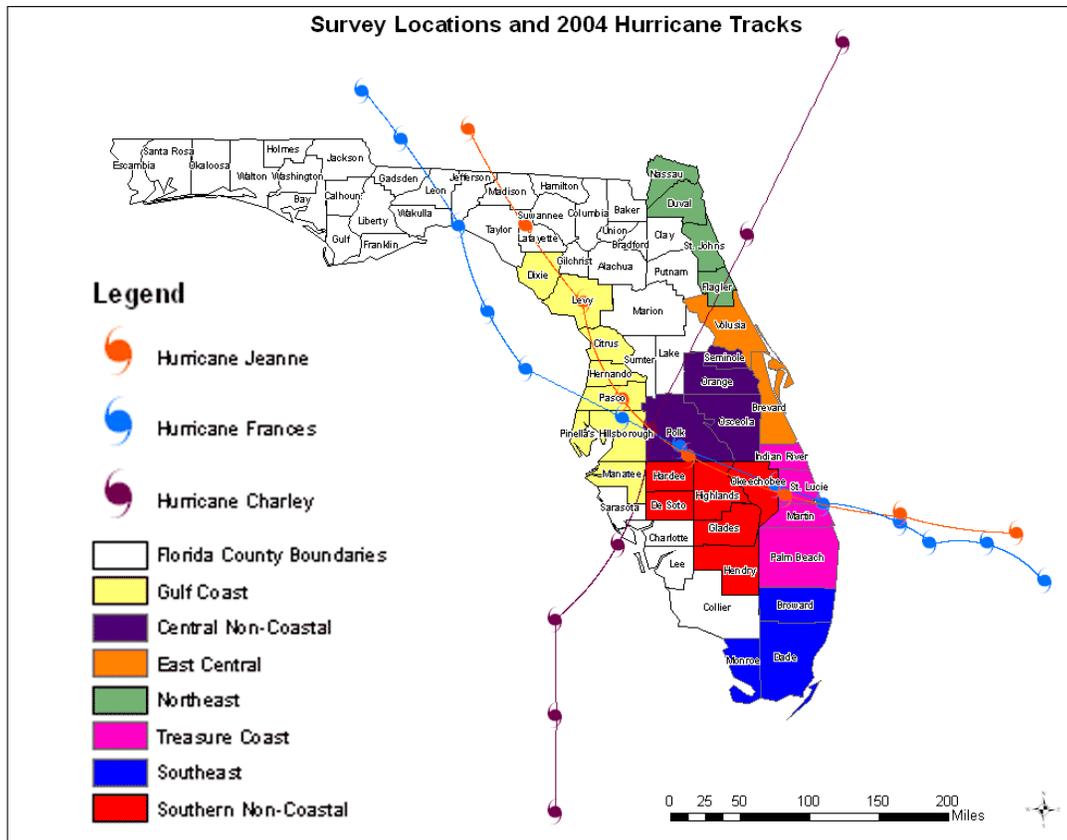


Fig. 1

A total of 1700 interviews were to be conducted. The interviews were allocated among the seven aggregations of counties in consultation with the agency representatives. In coastal counties the sample was stratified to ensure a targeted number of responses in three specific risk zones: 1) areas that would normally be evacuated in a category 1 hurricane; 2) that would normally be evacuated in a category 3 hurricane (East Central, Treasure Coast, and Southeast only); and 3) areas inland of the category 3 evacuation zone. In non-coastal counties there was no stratification based on risk. Evacuation in those areas was mainly based on wind and localized flooding. Some of the southern inland counties could experience wind-driven flooding from Lake Okeechobee.

Table 1 indicates the number of completed interviews in each location. An earlier survey was conducted to document evacuation and other behaviors related to hurricane Frances in many of the same counties. The questionnaires were too lengthy to ask all respondents all the questions about both storms, but the Jeanne respondents were asked a few of the most important questions about Frances as well as Jeanne. The combined sample sizes for questions asked in both surveys are shown in Table 2.

Table 1. Sample sizes by area and risk zone for primary Jeanne survey

	Northeast	East Central	Treasure Coast	Southeast	Gulf Coast	Southern Noncoastal	Central Noncoastal
Cat 1	102	102	207	99	100		
Cat 3		102	81	106			
Nonsurge	102	100	121	94	94	150	159

Table 2. Sample sizes by area and risk zone for Frances/Jeanne combined questions

	Northeast	East Central	Treasure Coast	Southeast	Gulf Coast	Southern Noncoastal	Central Noncoastal
Cat 1	140	159	405	199	148		
Cat 3		102	281	210			
Nonsurge	152	150	331	194	188	282	310

In coastal counties streets in each evacuation zone were identified using GIS software, and phone numbers at corresponding addresses were looked up in a commercial cross-reference directory. Within aggregations of counties interviews were allocated among counties proportional to their respective risk-zone populations.

Samples are subject to statistical error due to the fact that not everyone in the population is included in the sample. Appendix A contains a discussion about sample reliabilities in a fair amount of detail and includes a table for confidence intervals for samples of various sizes. The most important thing to remember is that smaller samples are generally less reliable than larger ones. Differences of a few percentage points among survey locations don't necessarily mean differences in the entire populations from which the samples were drawn. The sample sizes shown in Tables 1 and 2 are reduced in many cases because not everyone in the sample was asked all questions. Only people who evacuated were asked where they went, for example. When samples are large enough results are presented for each group shown in Tables 1 and 2, particularly if there is reason to expect that results might vary by risk zone as well as county

aggregation. In some cases, however, results are shown just for the multi-county group, and in a few instances just for the sample as a whole or for other aggregations necessary to obtain reasonably useful sample sizes. In tables where formatting is suitable, sample sizes are displayed as a part of graphics. In many tables, however, sample sizes vary with each cell in the data table. In those instances sample sizes are not displayed the tables or graphic.

All interviews were conducted by telephone. Interviewing was conducted during May and June of 2005.

## Evacuation Participation Rates

Respondents were asked whether they left their homes to go someplace safer in response to the threat presented by Jeanne. In all east coast counties evacuation notices were issued for category 1 evacuation zones. Not all counties issued notices for category 3 zones. Only in the category 1 risk zone of the Treasure Coast region did a majority evacuate (Figure 2). In the counties with the highest strike probabilities (Martin, St. Lucie, and Indian River) 62% left from category 1 evacuation zones. Response was notably low in the category 1 evacuation zones in the Northeast and Southeast areas.

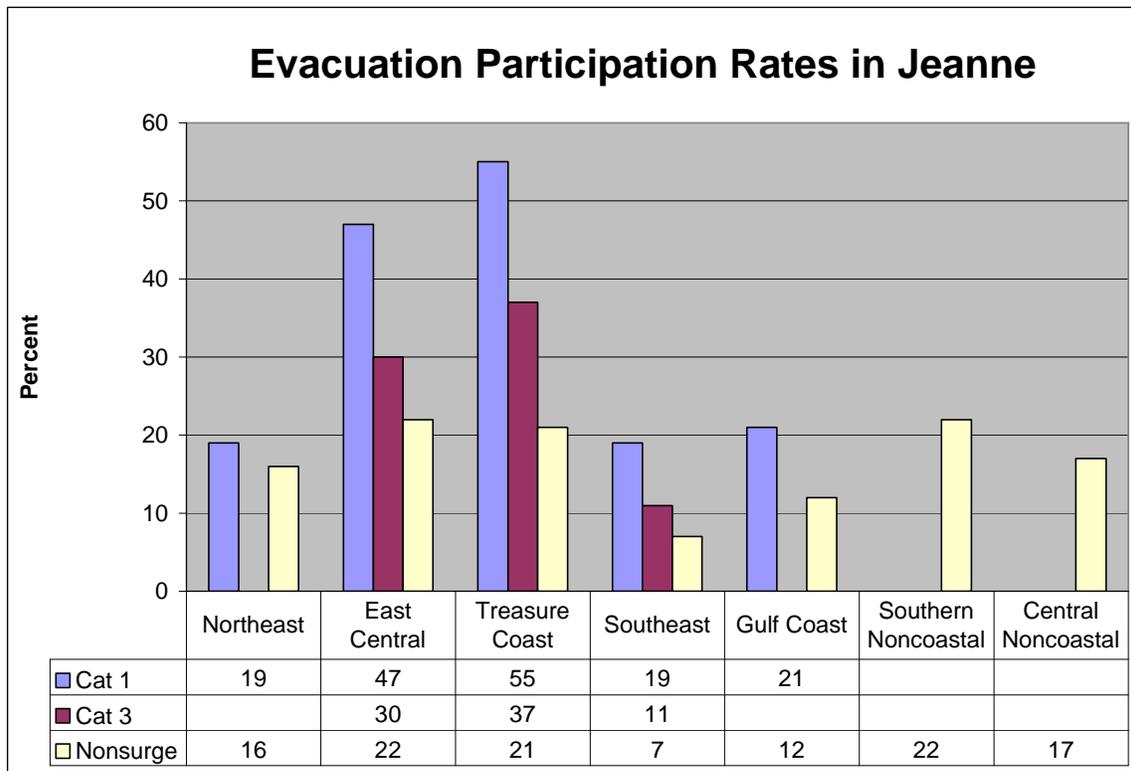


Fig. 2

### Reasons Given for Leaving or Staying

#### Leaving

Evacuees were asked what made them decide to go someplace safer, and the most frequent responses are shown in Figure 3. People could give more than one reason for leaving, and the data in Figure 3 reflect the percent of respondents who gave each response. The total percentages for a location can exceed 100%. Evacuation notices from public safety officials were cited most frequently in all but the southern non-coastal area. Severity of the storm was other most common response. Storm severity includes concerns about the location or construction of one's home, the perceived adequacy of which is related to storm severity. The "other" category

includes a variety of answers (e.g., “wife wanted to leave,” “live in a mobile home,” “felt safer with others,”). Living in a mobile home, a special case of concerns about storm severity, was a frequent motivation in the non-coastal areas but not in coastal areas.

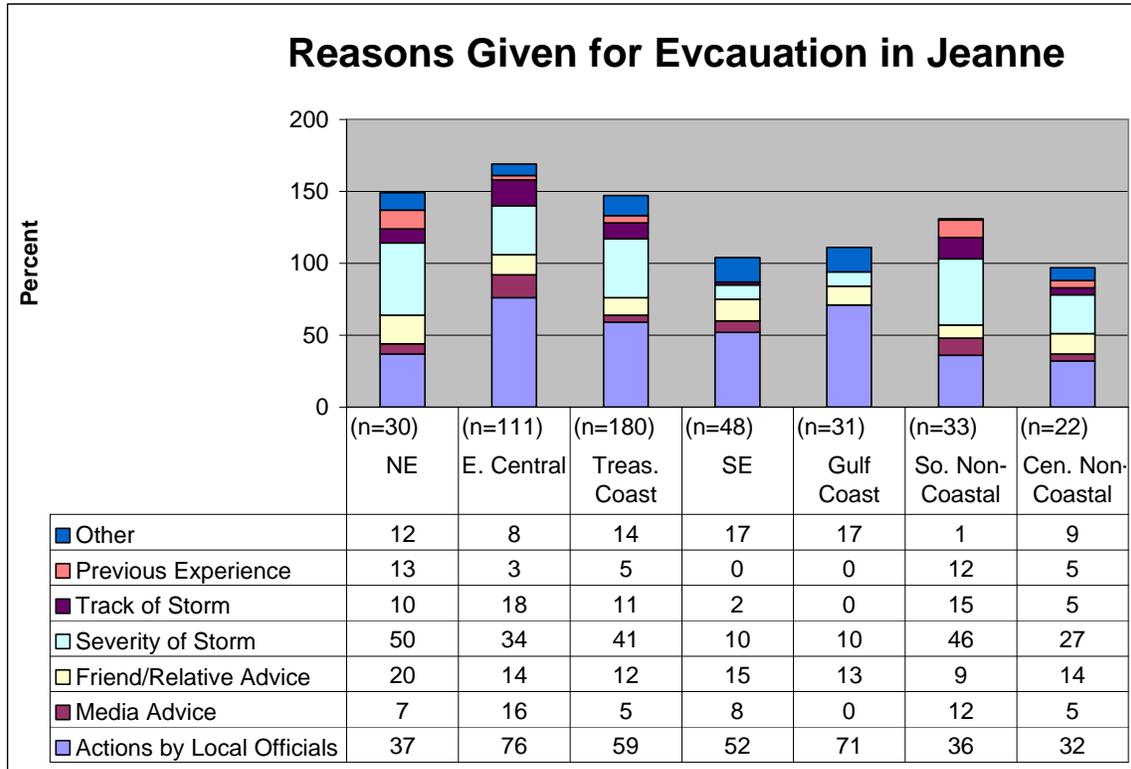


Fig. 3

### Staying

Those who did not evacuate were asked why they didn't leave, and their most frequent reasons are shown in Figure 4. The great majority of responses concerned factors dealing with risk assessment. That is, people felt safe staying where they were. The most frequent responses indicated that the storm was not severe enough to pose a danger, given the storm characteristics and the strength or location or construction of the person's home. "Constraints" refer to lack transportation, shelter, or a place to take pets, having to work, or having an immobile person in the household. The category labeled "other" includes concern about looters, protecting property from the storm, and having evacuated unnecessarily in the past.

Experiences in Frances and Charley were mentioned explicitly by relatively few respondents. Among those who did mention prior 2004 storm experiences as a reason for not leaving in Jeanne, the most frequent explanations had to do with the fact the respondents' homes experienced little damage in the other storms. Some said they were as safe at home as anyplace else. Some said they needed to be present to prevent further damage to their homes caused by earlier storms and some cited difficulties experienced returning home after evacuating for an earlier storm. Only one person explicitly mentioned being tired of evacuating after having left in earlier storms.

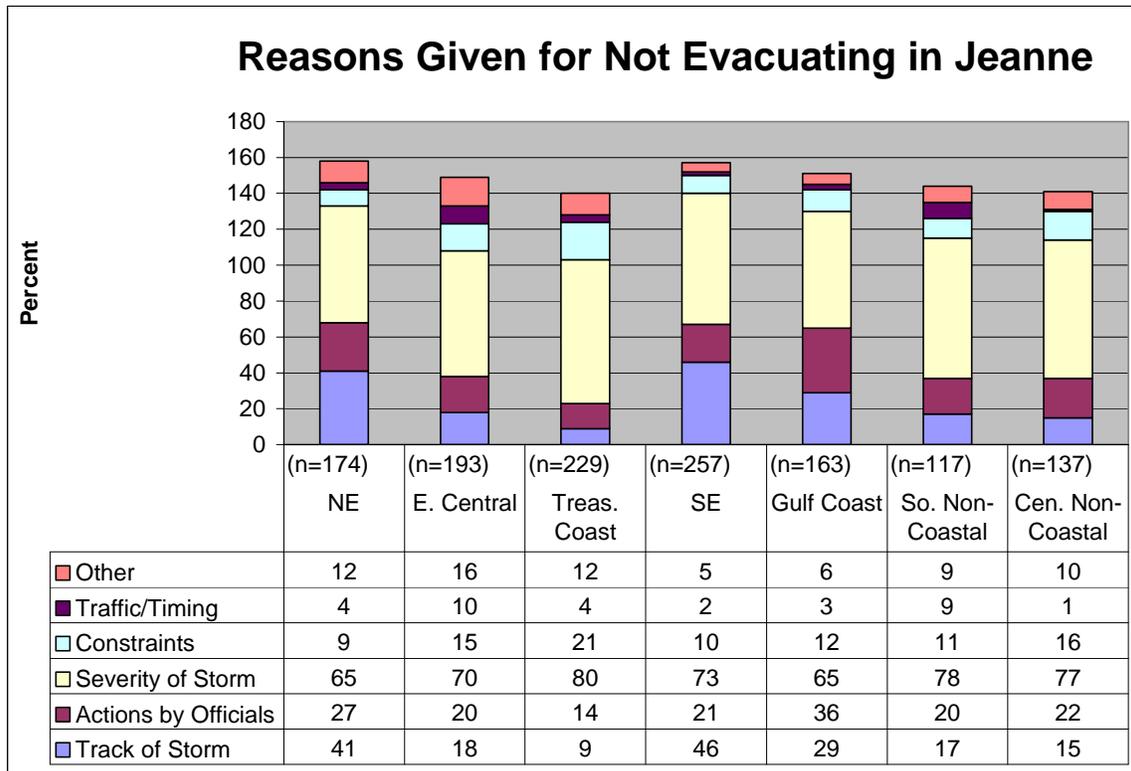


Fig. 4

#### Threat Information

The two previous questions were open-ended: interviewers recorded whatever reasons for evacuating or staying that respondents mentioned. In another series of questions people were given a list of factors and asked how important each was in their decision whether to evacuate or not. All were threat-related variables, and respondents could indicate that the factor was not important, somewhat important, or very important. Questions in this format tend to inflate the actual importance of factors. The questions were asked of both evacuees and those who didn't evacuate. Results are shown for the coastal areas in Figures 5 – 9, and for the non-coastal areas in Figure 10. In every location media information and NHC watches and warnings were said to be very important by the largest number of people. Hurricane winds were the third most important factor. Tornadoes were cited more often than fresh water flooding by a surprisingly high number of people. Each of the factors was said by evacuees to be very important more often than by nonevacuees.

Another risk factor, storm surge and waves, was inadvertently left out of the interview due to a programming error. It was included in surveys in most of the same locations regarding Frances, however, and in those interviews storm surge and waves were said to be very important by 40% in the cat1 area, 28% in the cat 3 area, and 16% inland of the cat 3 area in coastal counties. For the other risk factors, responses were essentially the same for Frances and Jeanne (varying between 0% to 4% for the aggregate samples), so it seems reasonable to infer that the stated importance of storm surge and waves in Jeanne would be essentially the same as those in Frances also.

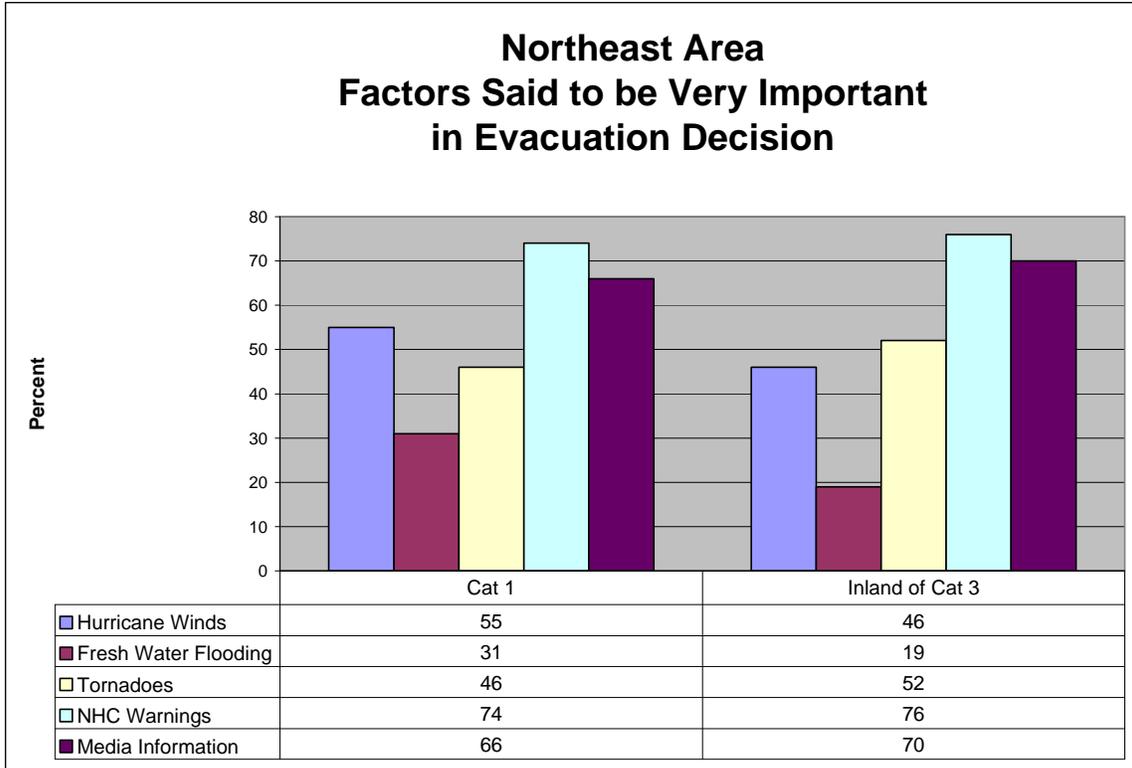


Fig. 5

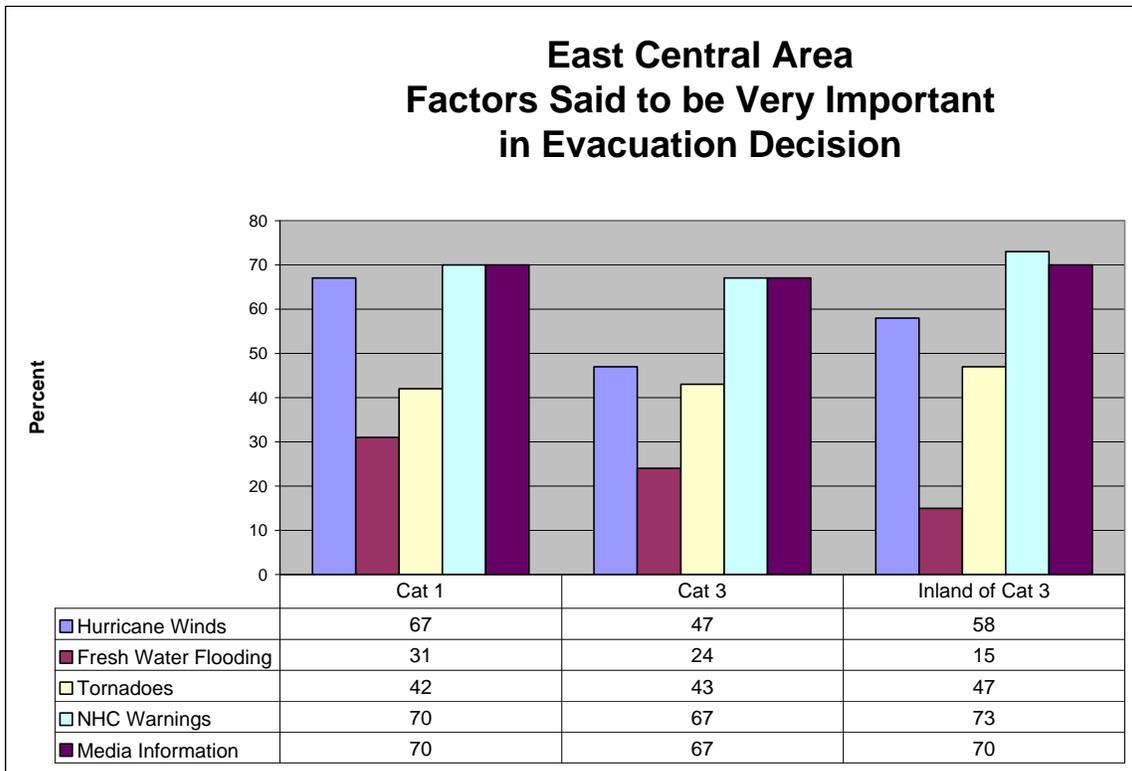


Fig. 6

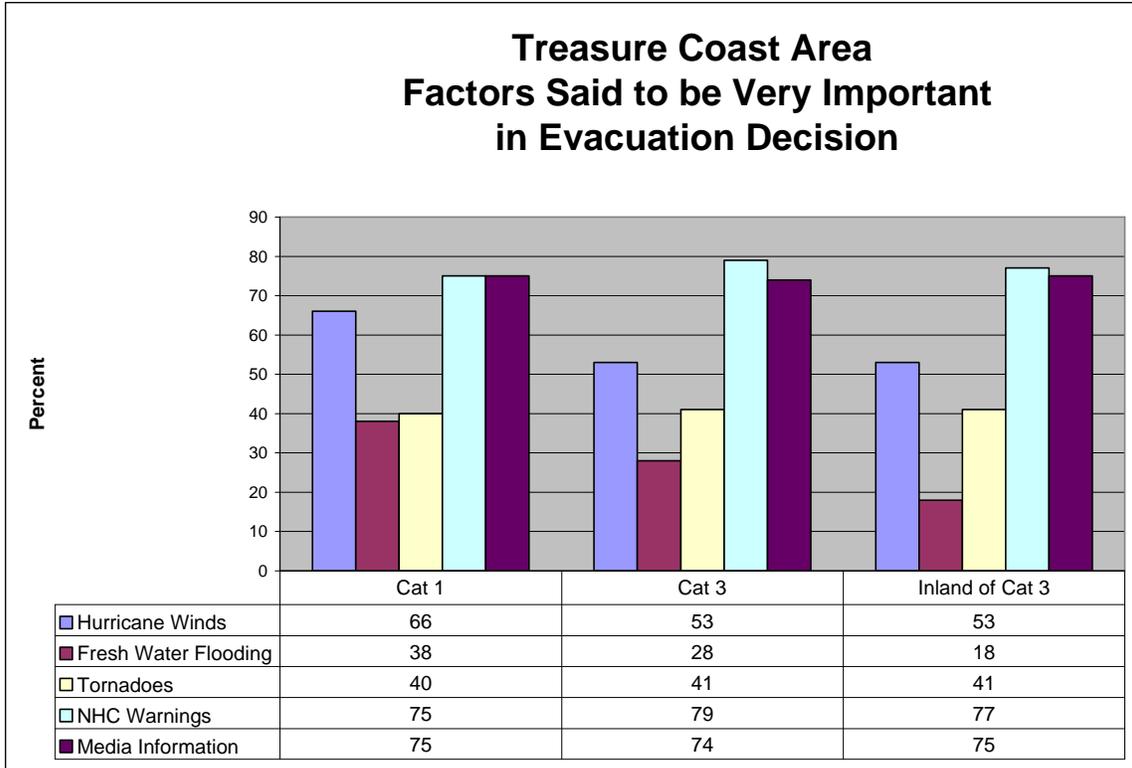


Fig. 7

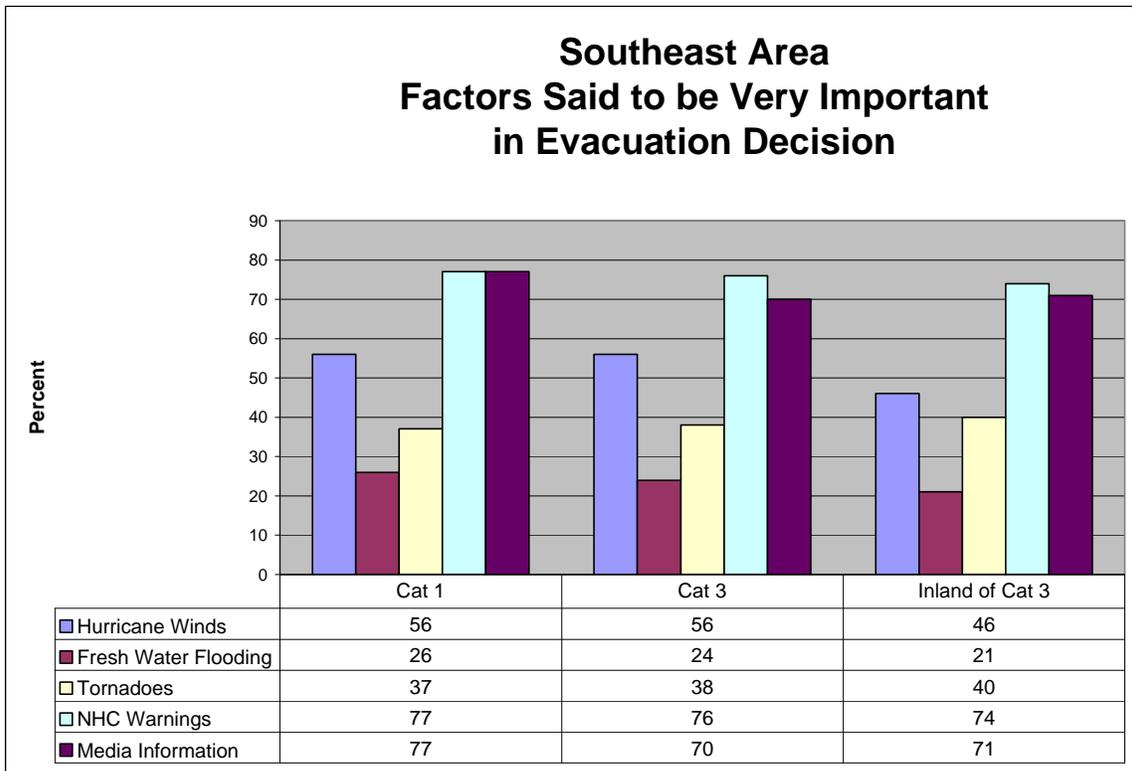


Fig. 8

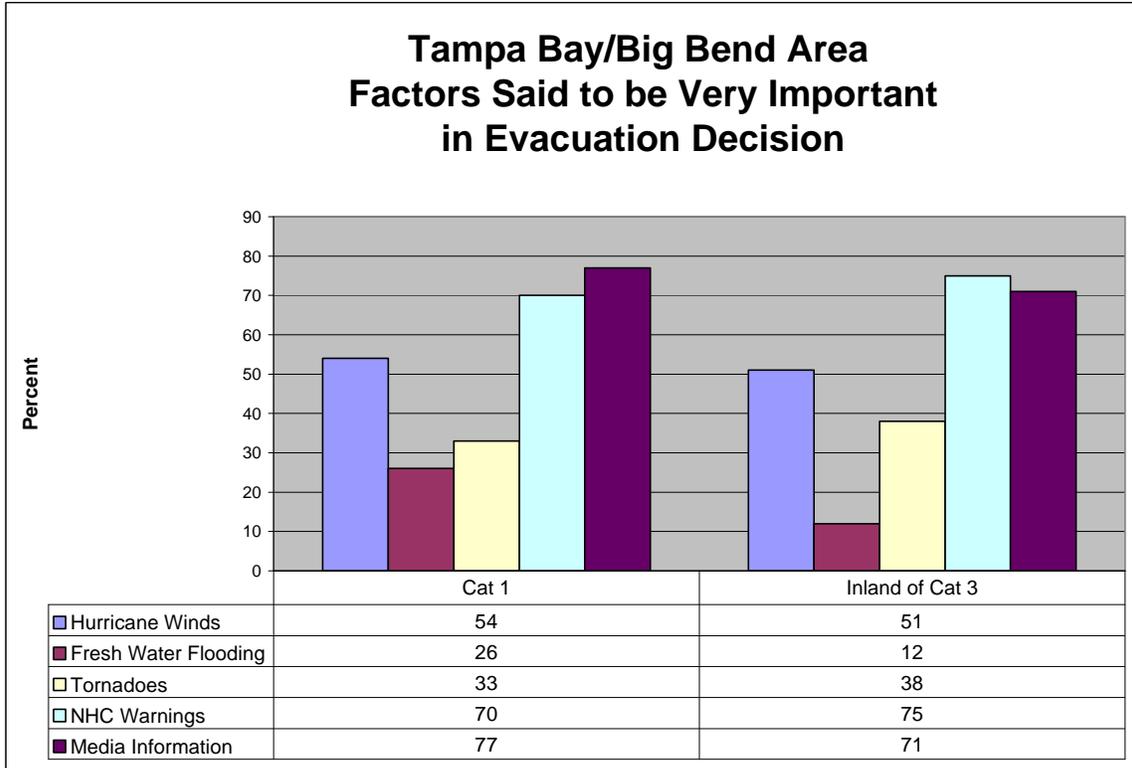


Fig. 9

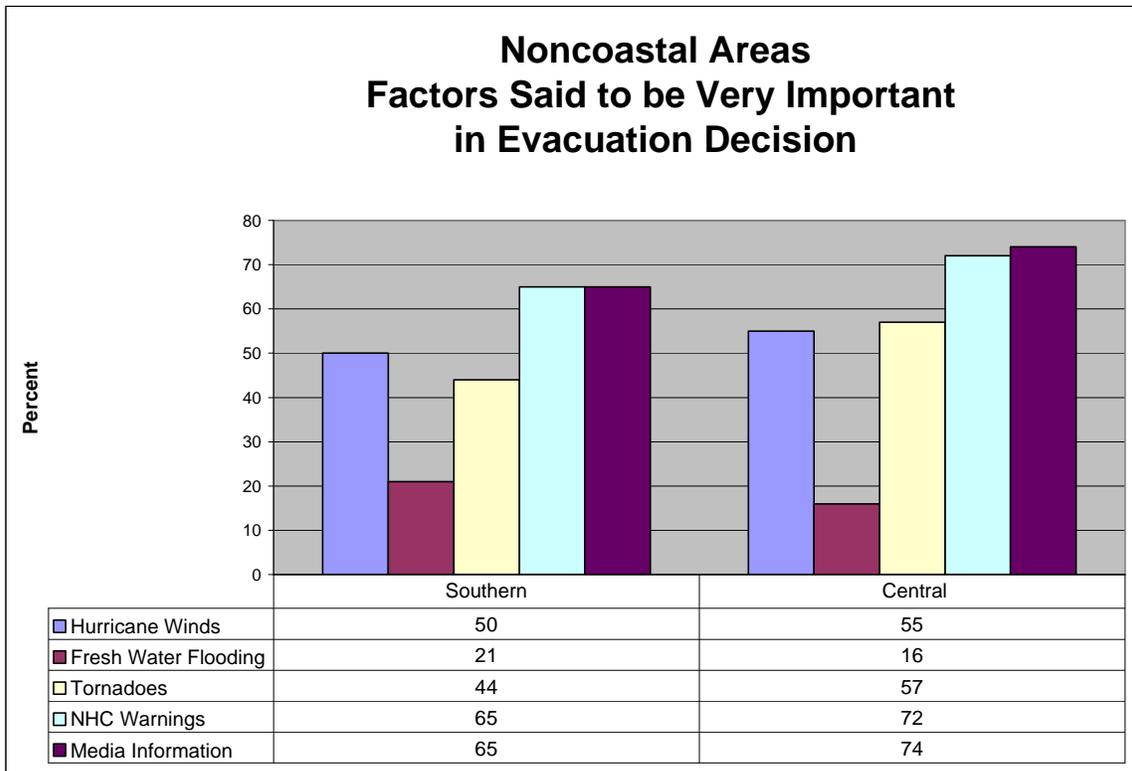


Fig. 10

## Preparations by Those Who Didn't Evacuate

### Would Have Left

Respondents who didn't evacuate were asked whether they would have left had it appeared that Jeanne was going to hit their location directly (Figure 11). Most people in category 1 areas of coastal counties, except in the Treasure Coast area (where the storm made landfall) said they would have left (54% to 79%). For parts of the Treasure Coast area the track was about as dangerous as possible, so it didn't make sense for many respondents to say a worse track would have caused them to evacuate.

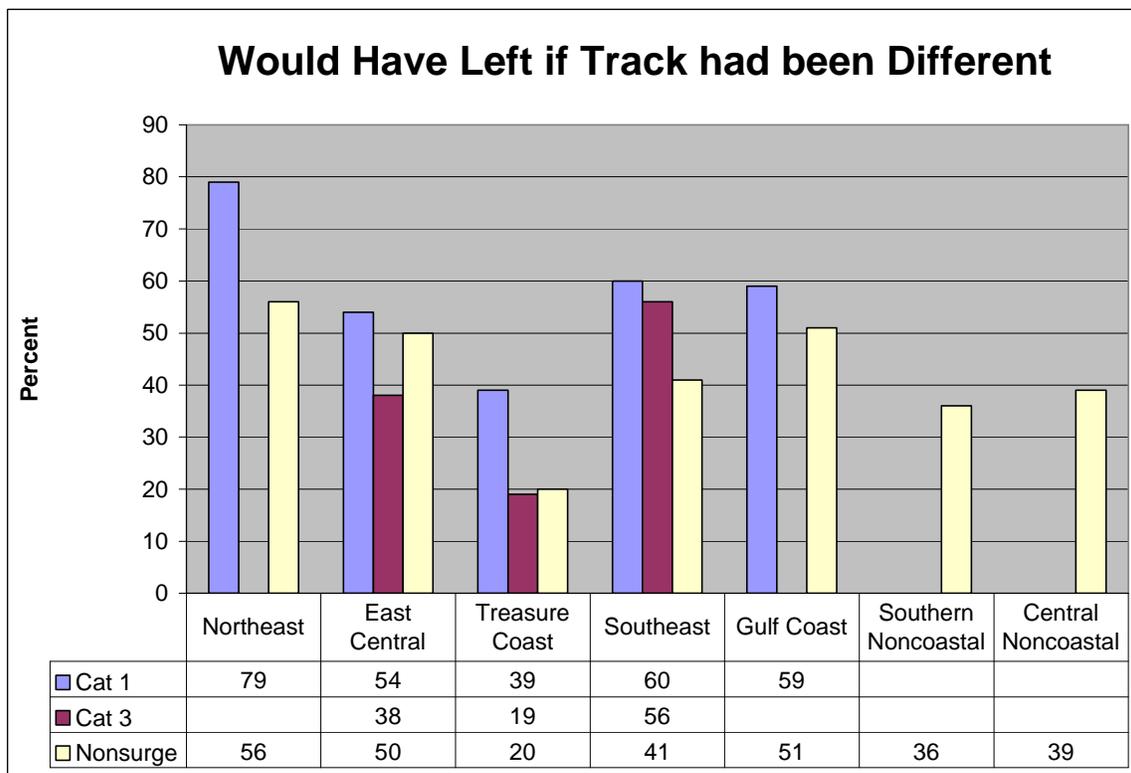


Fig. 11

### Made Preparations to Leave

At least 46% of those who stayed said they had made preparations to leave in case the threat had worsened (Figure 12). The highest response (84%) was in the Northeast cat 1 area. There was relatively little difference among locations or between surge and non-surge areas, although affirmative responses were somewhat greater in surge-prone areas overall.

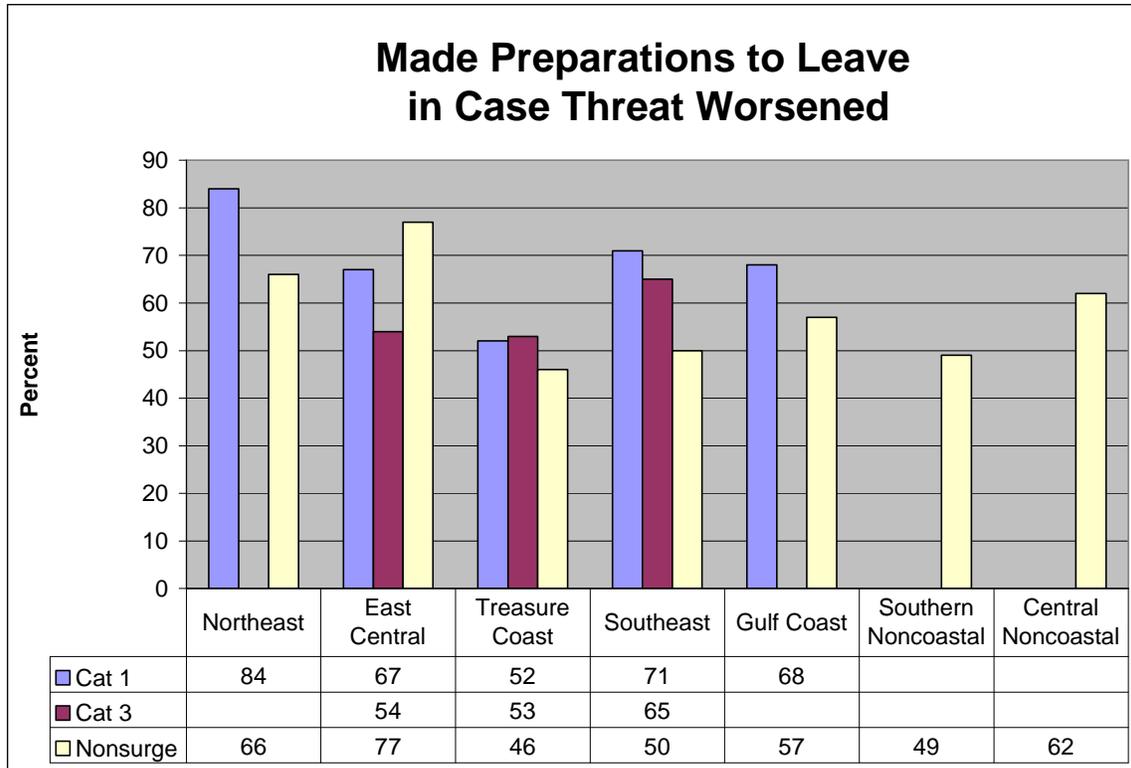


Fig. 12

#### Ready to Survive for Three Days

In all locations, the overwhelming majority (89% to 100%) of those who didn't evacuate said they were prepared to survive on their own for three days after the storm hit, without electricity, telephones, etc. (Figure 13).

#### Felt Safe During the Storm

The great majority (84% to 100%) also said they felt safe staying in their homes during Jeanne (Figure 14). This was true even in the category 1 and 3 surge areas of the Treasure Coast area where landfall occurred, although the area is much larger than the area receiving the worst of Jeanne's effects.

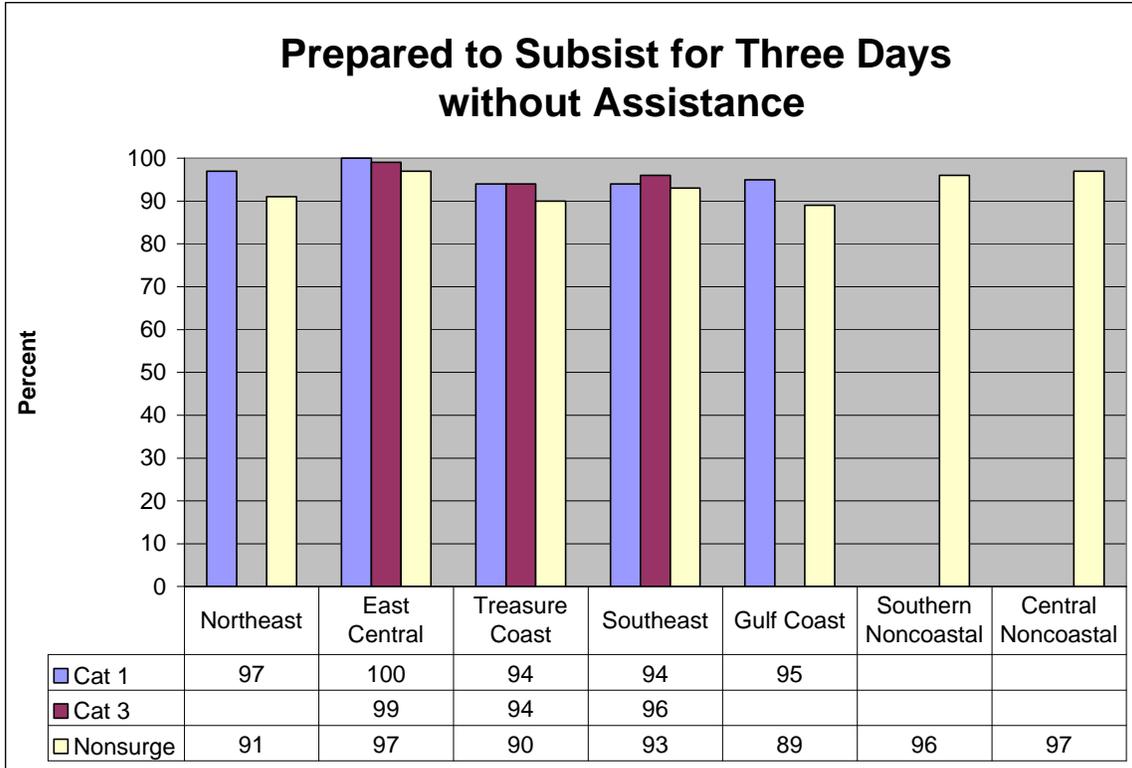


Fig. 13

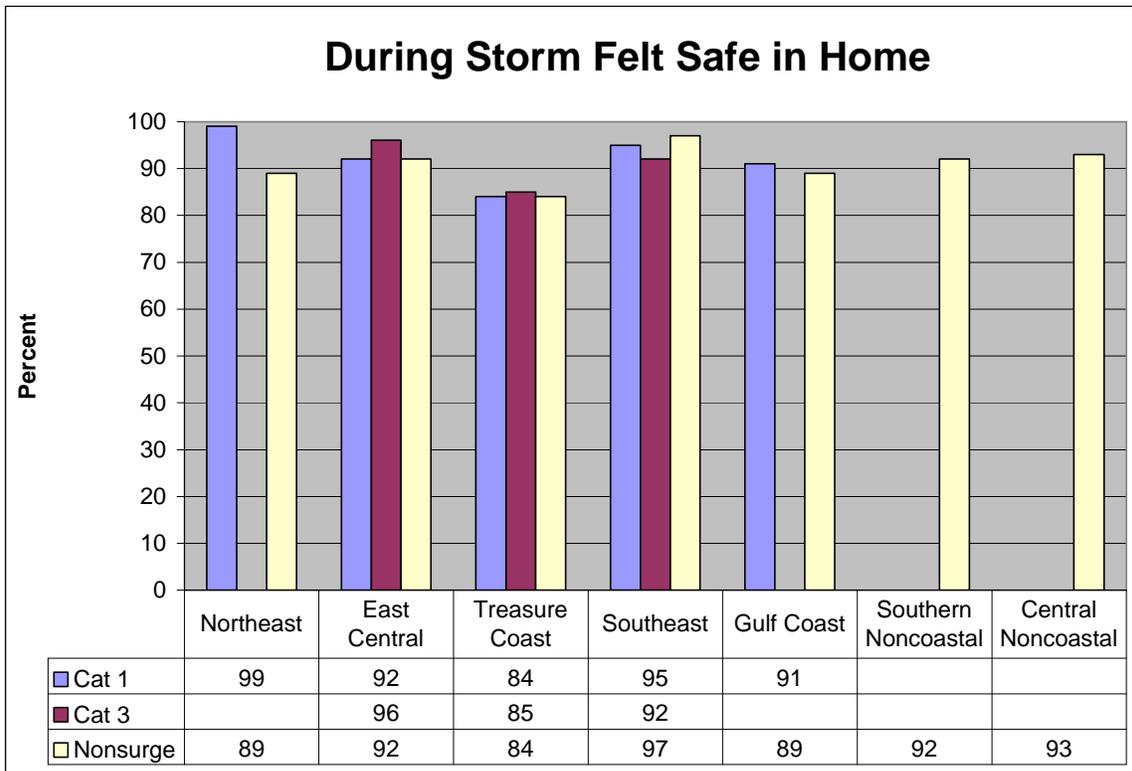


Fig. 14

## Evacuation Notices

All of the counties in the survey issued evacuation notices of one kind or another, but they varied with respect to the areas to which they applied and whether they were mandatory or not. In general, counties on the east coast issued mandatory evacuation orders at least for barrier islands or category 1 areas and recommendations for category 3 areas. On the Gulf Coast and in non-surge areas, including non-coastal counties, evacuation notices were issued for mobile homes and low-lying flood-prone areas. Most inland notices were recommendations but some were mandatory.

### Type of Notice Heard

Figures 15-20 indicate what respondents said they heard. Only in the cat 1 evacuation zones of the East Central and Treasure Coast did a majority say they heard evacuation notices from officials, either directly or indirectly. In those category 1 zones only 40% in the East Central area and 31% in the Treasure Coast area said they heard that their evacuation was mandatory. Few people outside the cat 1 areas said they were told to evacuate.

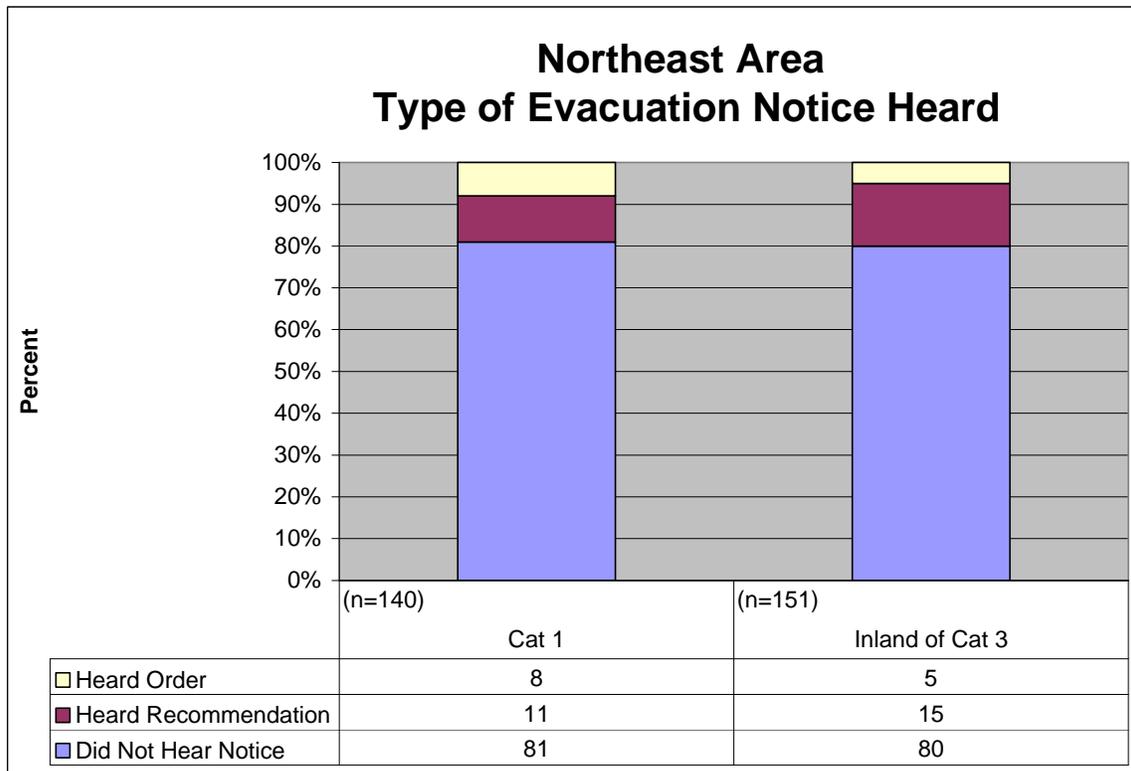


Fig. 15

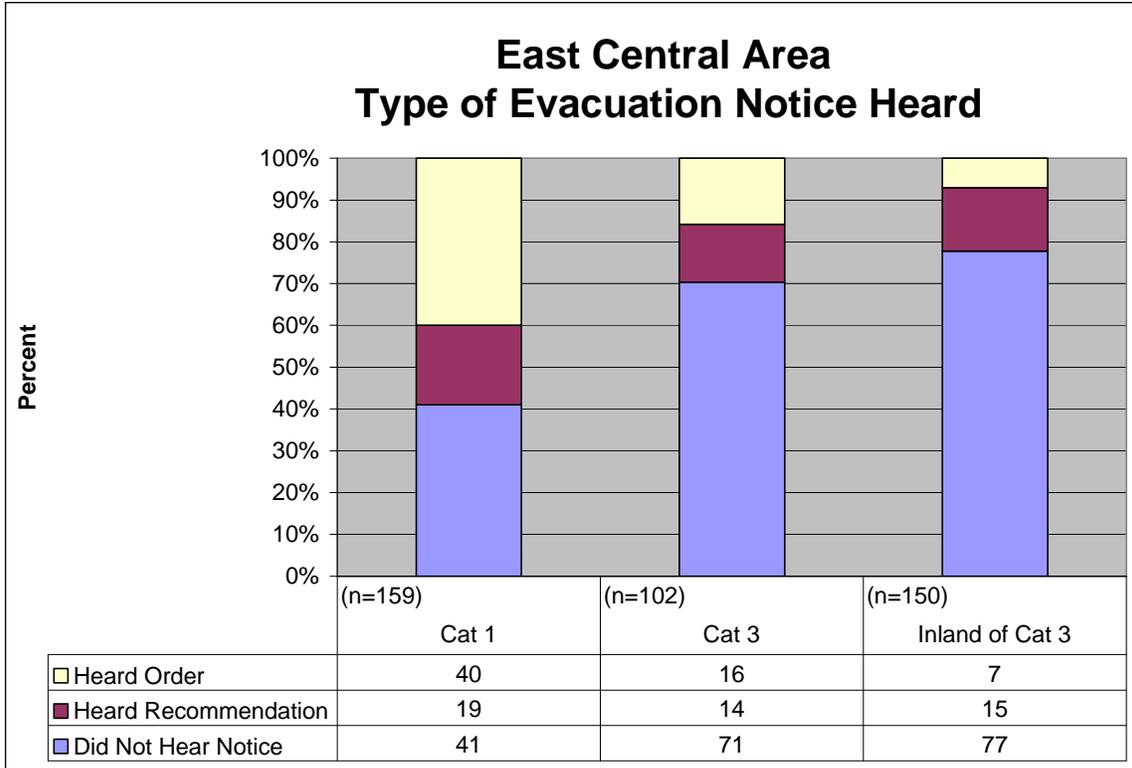


Fig. 16

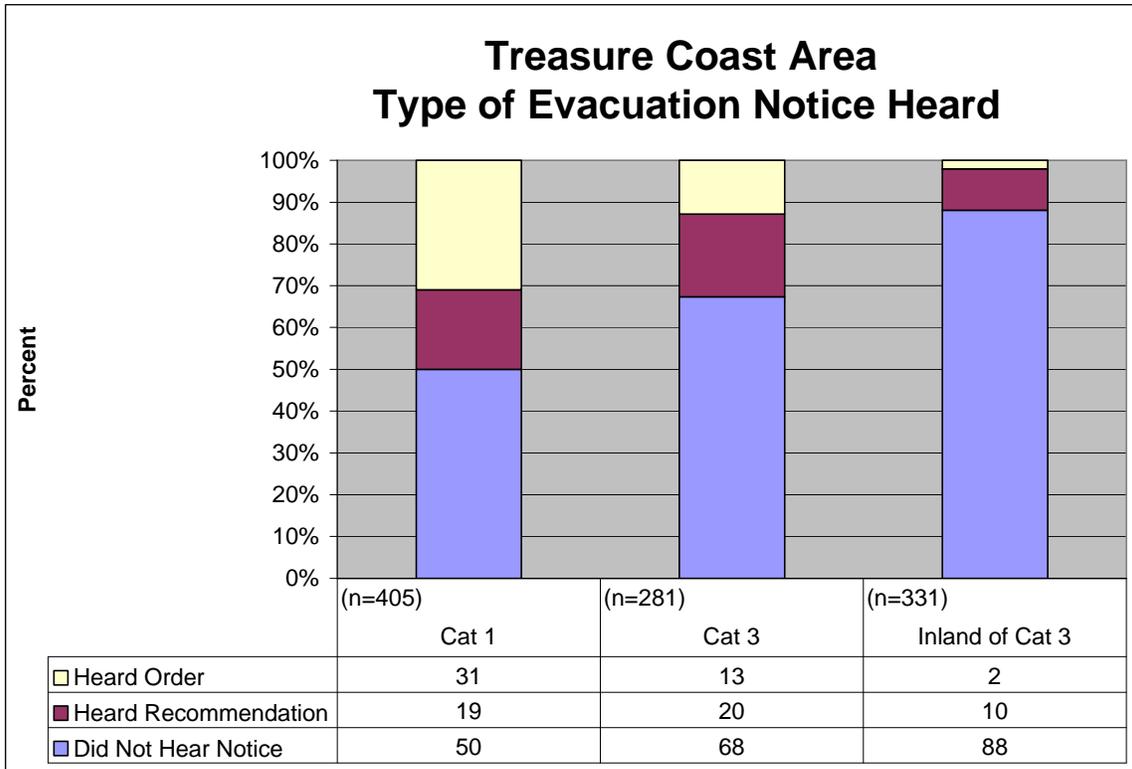


Fig. 17

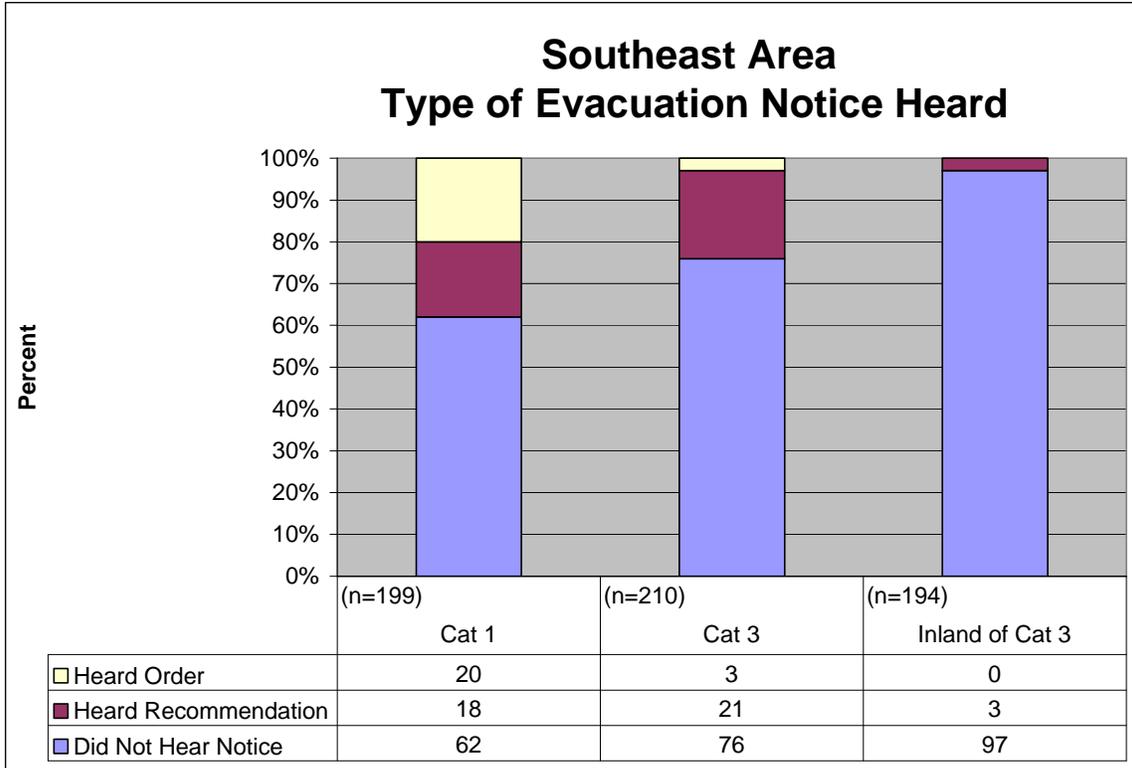


Fig. 18

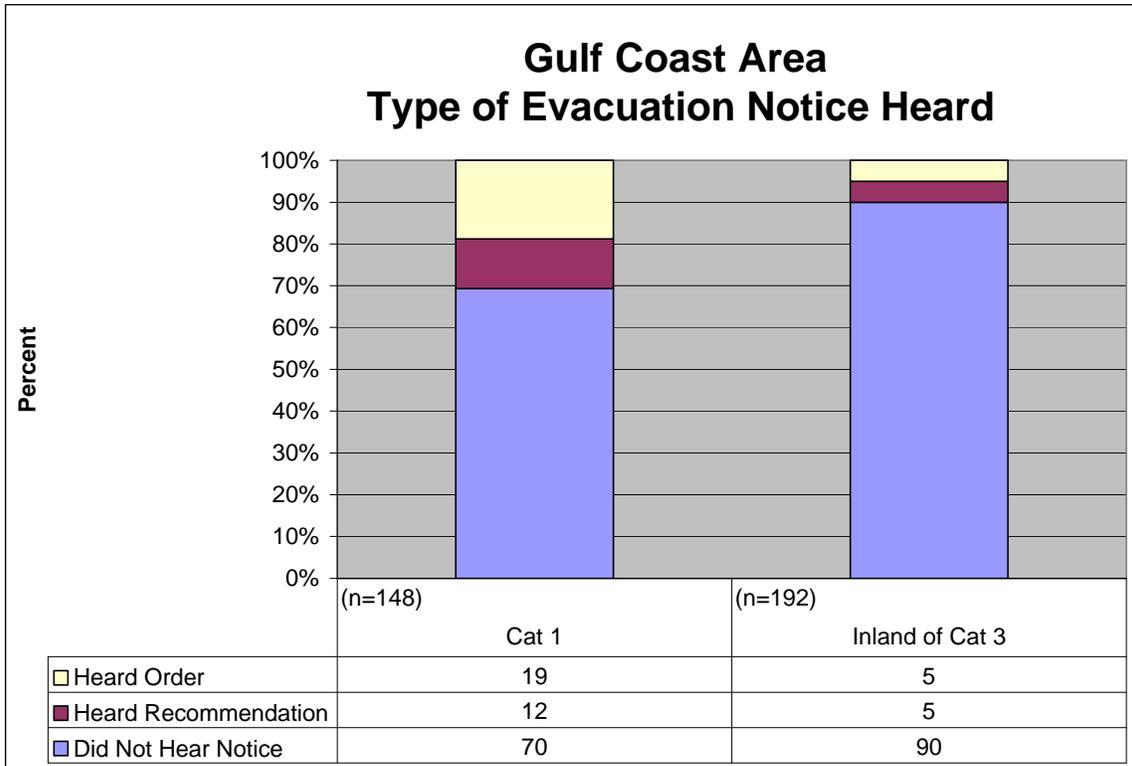


Fig. 19

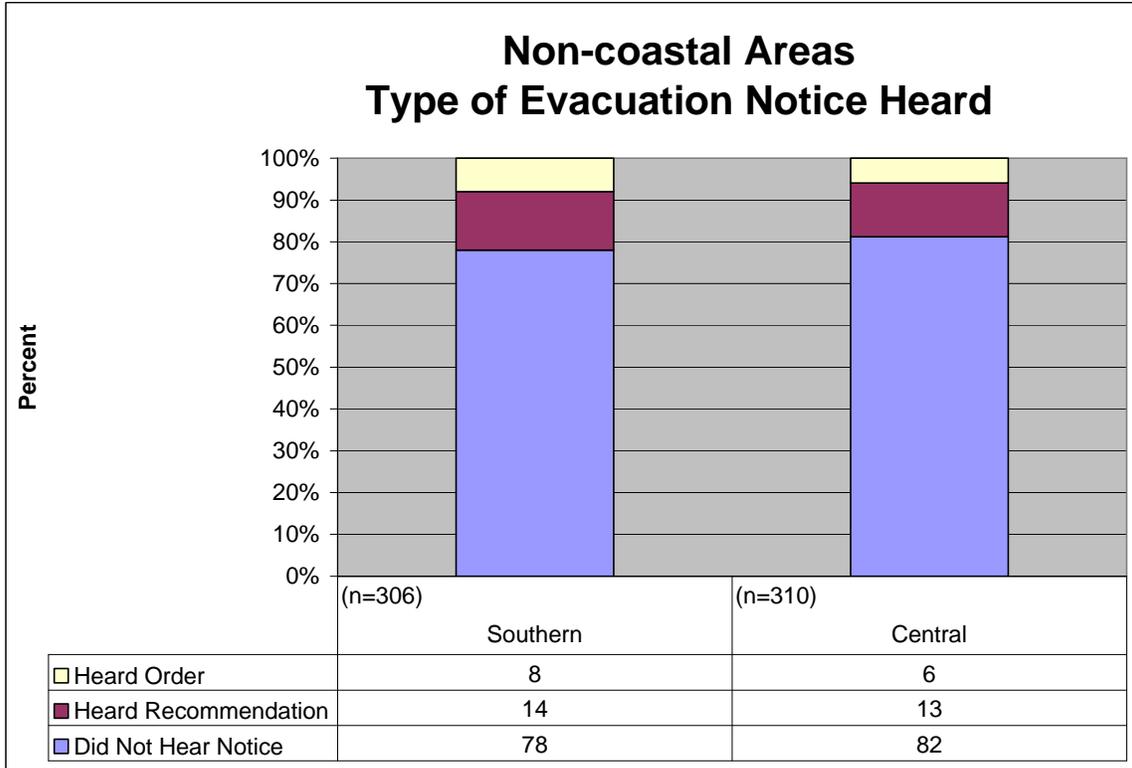


Fig. 20

Neighborhood Dissemination of Notices

People who said they did hear evacuation notices were asked whether police or other authorities came into their neighborhoods going door-to-door or with loudspeakers, telling people to evacuate. Affirmative responses were highest in the category 1 and 3 risk zones of the East Central area, the category 1 zones of Southeast and the Tampa Bay/Big Bend areas, and in the southern noncoastal area (where only 30% said they heard notices).

Effect of Notices on Evacuation

In Figure 22 evacuation participation rates are shown for category 1 risk zone respondents who heard mandatory evacuation orders, those who heard recommendations to evacuate, and those who said they heard neither. Data is shown only for locations where a sufficient number of people said they heard evacuation notices to make comparisons meaningful. The effect of hearing orders was strong in all four areas shown. In the Treasure Coast region 85% of the category 1 risk area respondents who said they heard mandatory evacuation notices evacuated, compared with just 39% of those who said they didn't hear notices at all. Although fewer people evacuated in the other locations, the effect of hearing mandatory evacuation notices was just as strong. Within the category 1 risk zone people who heard mandatory evacuation notices were two to six times as likely to evacuate as people who didn't heard any notices at all. The effect of recommendations was less pronounced.

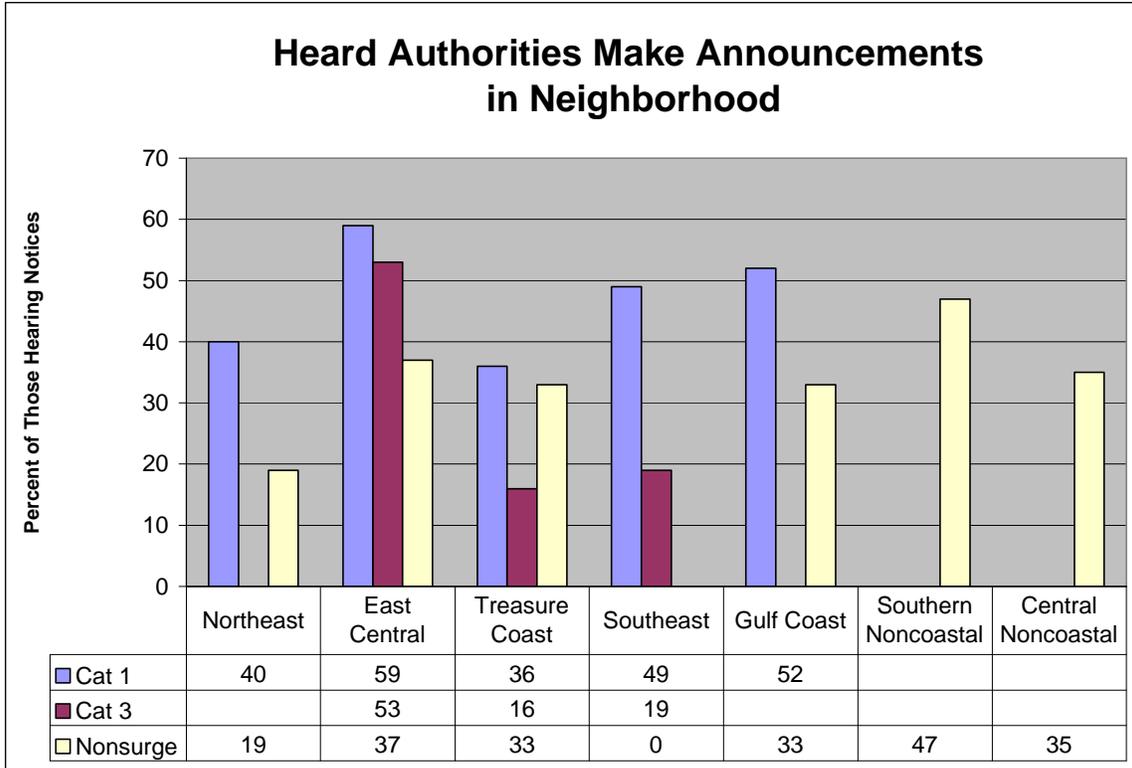


Fig. 21

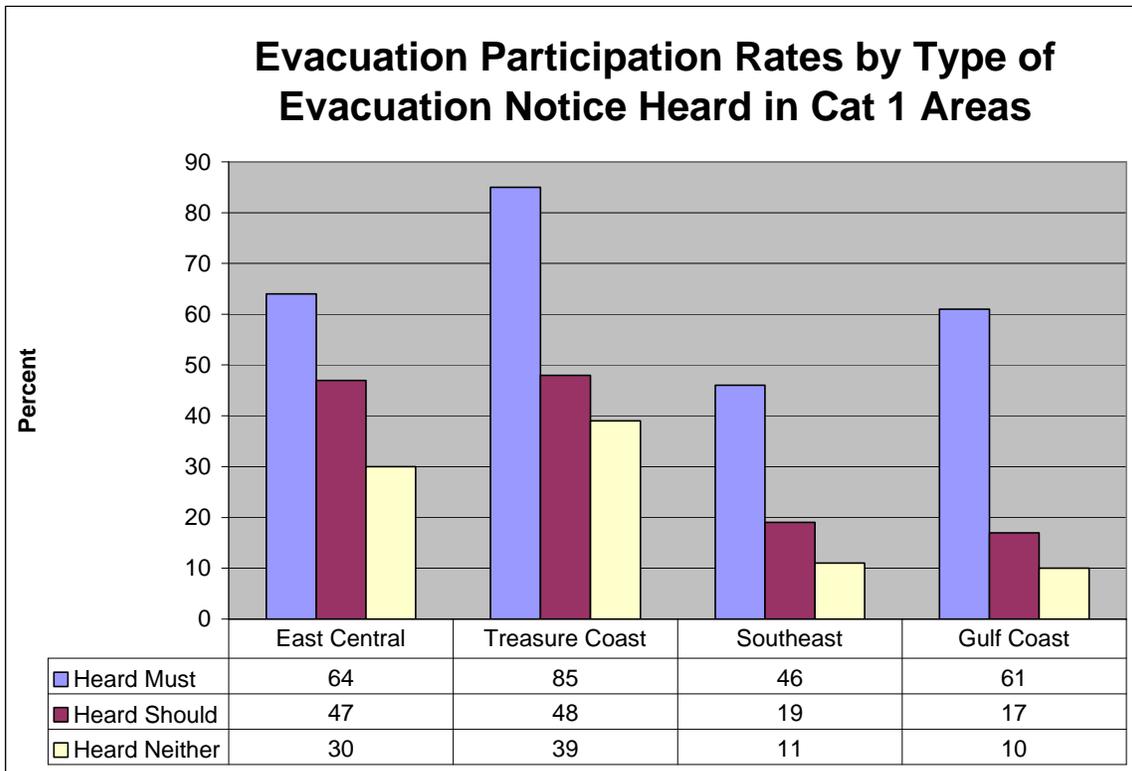


Fig. 22

How Evacuation Notices Were First Heard

The reliance on the media in communicating evacuation notices is shown in Figure 23. Respondents who said they heard evacuation notices were asked how they first heard the notice. Between 61% and 77% said they first heard about it over radio or television. Police in neighborhoods with loudspeakers were mentioned frequently in certain locations. In the Treasure Coast area 11% of those hearing evacuation notices said they first heard the announcement via a phone call from a government agency, presumably a call-down system.

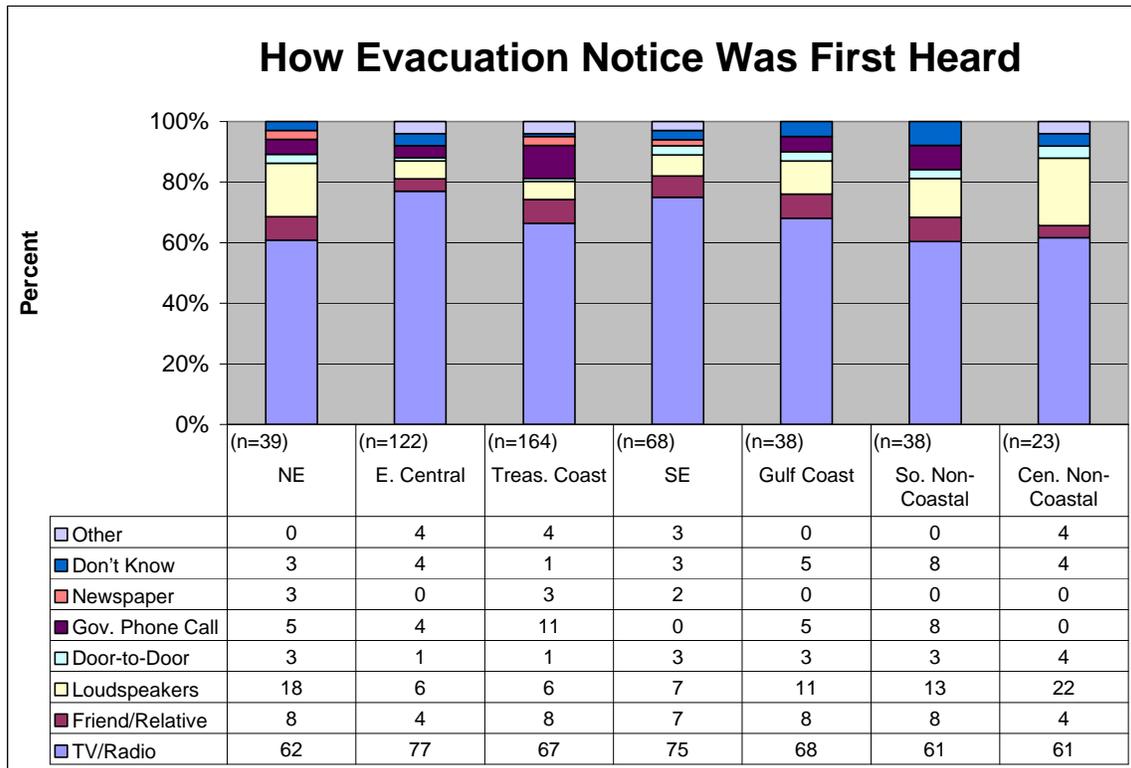


Fig. 23

Satisfaction with Timing of Evacuation Notices

People who heard evacuation notices were asked whether the notices were announced sufficiently early. A large majority in almost all locations said that notices were issued early enough (Figure 24). The lowest figure was 71% in the southern non-coastal area. In other locations 85% to 95% said notices were issued early enough.

Satisfaction with Content of Evacuation Notices

Respondents who heard evacuation notices were also asked if the information in the notice was useful to them (e.g., which specific locations needed to evacuate, what people in those areas needed to do). In all areas at least 75% of the interviewees said the information was useful. The

lowest satisfaction (76%) was in the southern noncoastal area. The average satisfaction level in cat 1 zones was 88%.

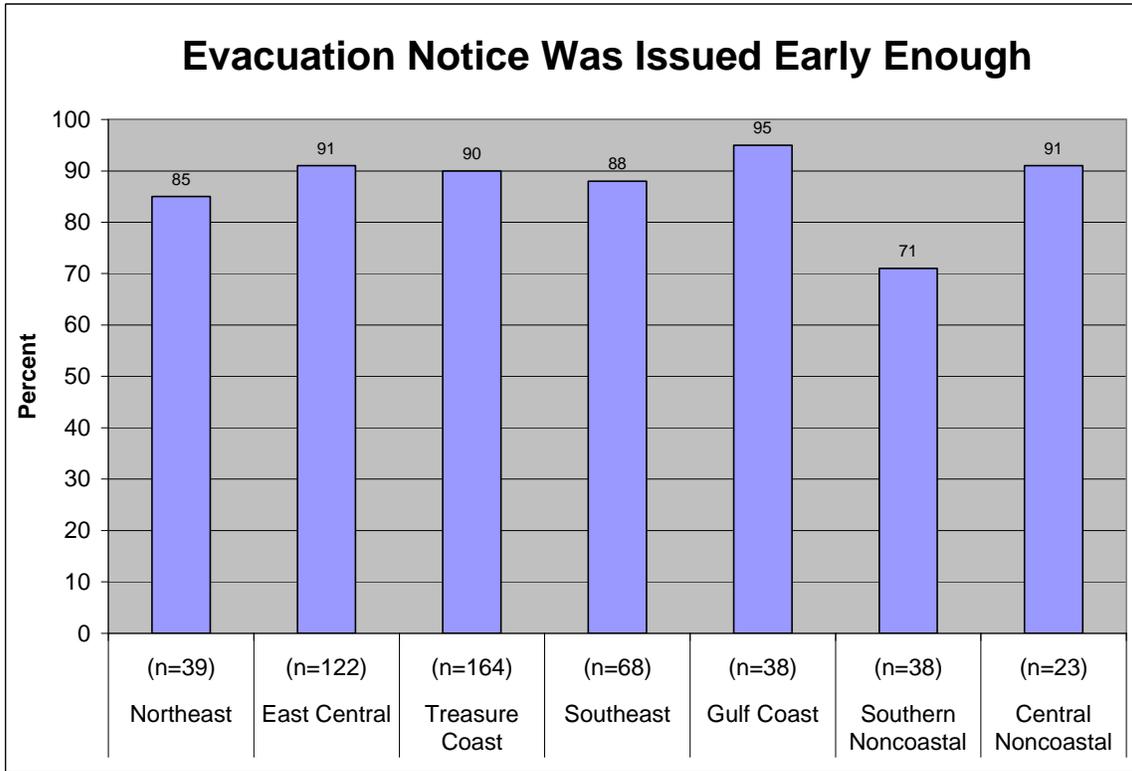


Fig. 24

Beliefs Regarding Who Issues Evacuation Notices

All respondents were asked who in their community is responsible for issuing evacuation notices, and they could provide more than one answer. Between 22% and 35% said they didn't know who was responsible for issued evacuation notices (Table 25). Among people expressing an opinion, law enforcement and local emergency management were the most frequently mentioned parties.

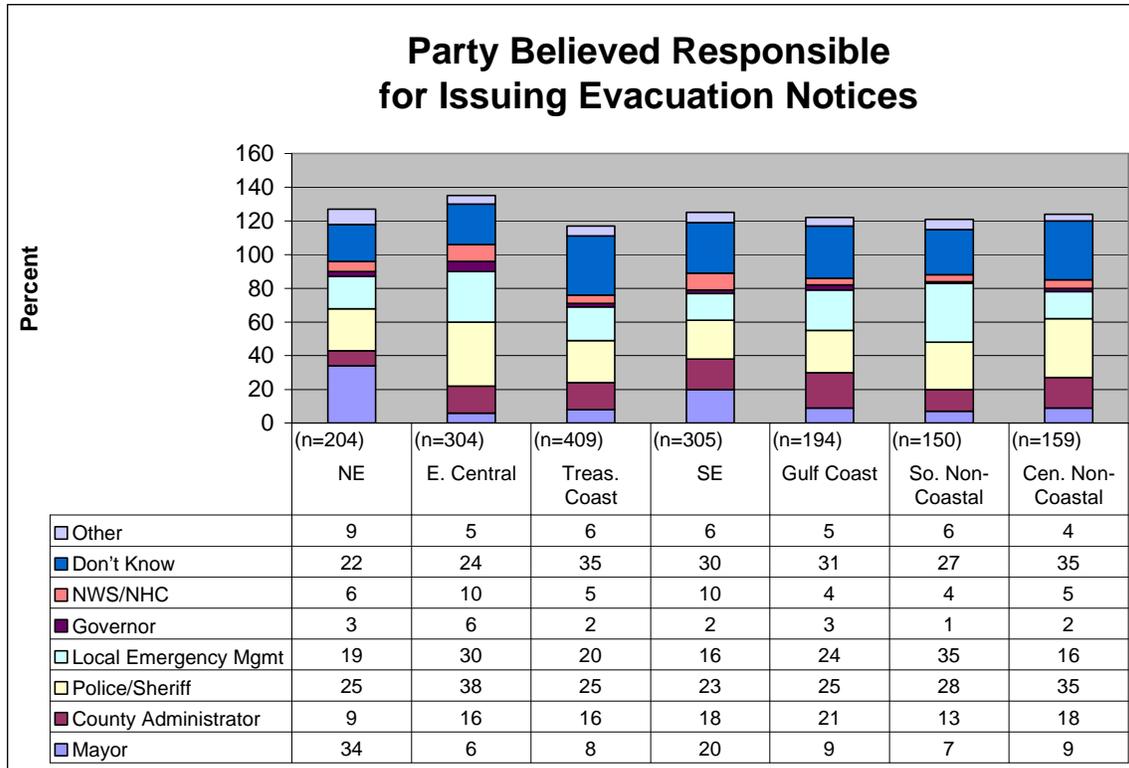


Fig. 25

## Potential Constraints to Evacuation

### Special Needs

Interviewees were asked whether anyone in their household requires assistance from an agency in order to evacuate or whether anyone requires special care in a shelter. Positive responses ranged from 2% to 11%, with most being between 4% and 6% (Figure 26). In households requiring such assistance respondents were asked whether the person needed just transportation, special care in a shelter or both. The number of respondents in each location was small, but overall households tended to need shelter or a combination of shelter and transportation (Figure 27). On the east coast approximately half of the households said that having a person with special needs affected their decision whether to evacuate (Figure 28), with fewer giving that response on the Gulf coast and in non-coastal areas. Again, the number of respondents in each location is small, but the broader generalization appears valid. The actual evacuation rate in households with special needs was the same as that in other households.

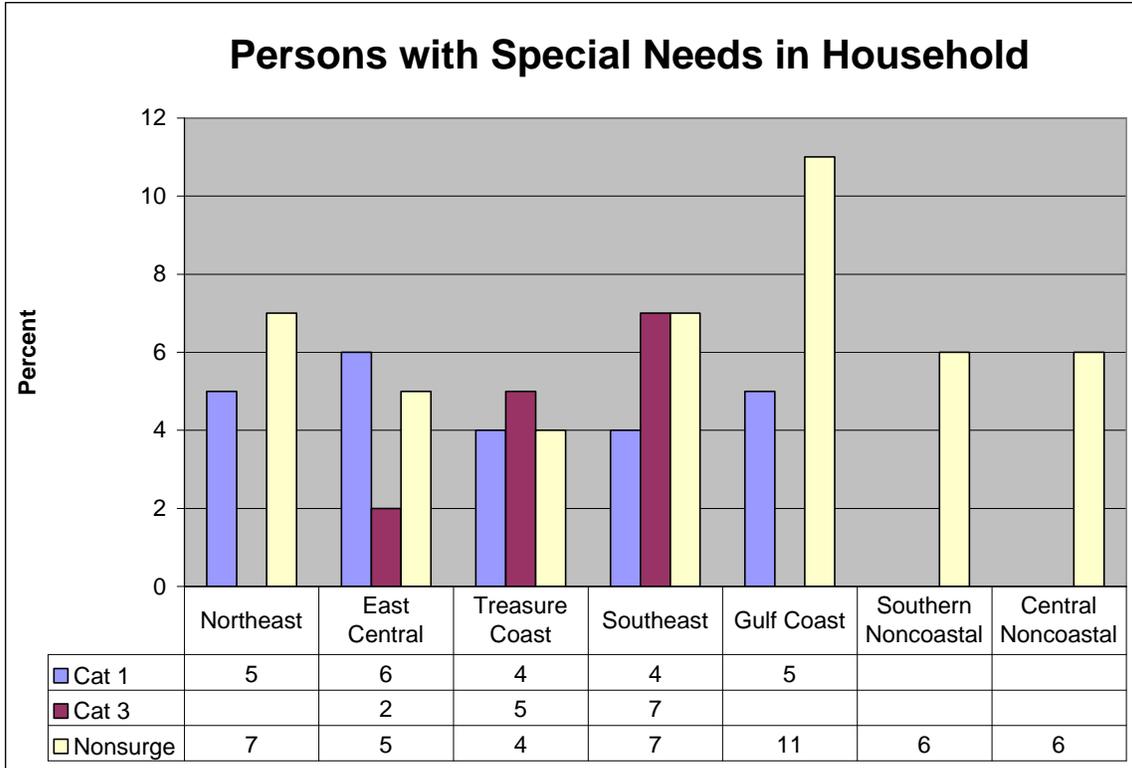


Fig. 26

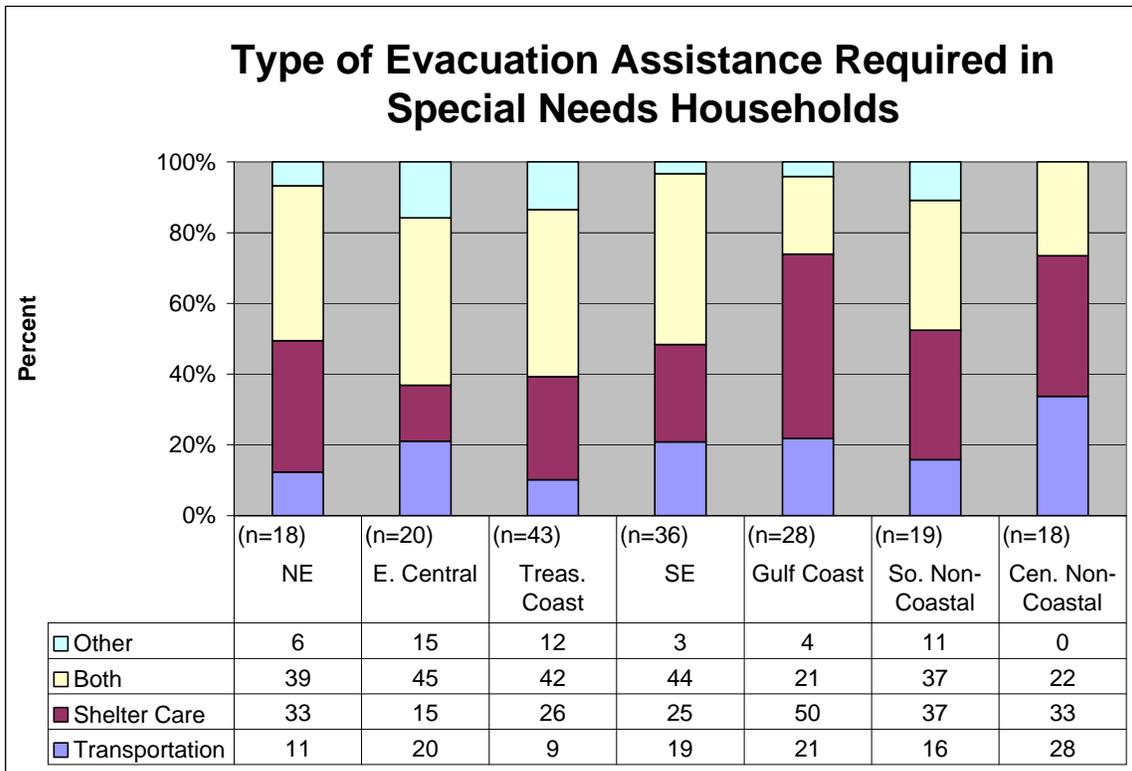


Fig. 27

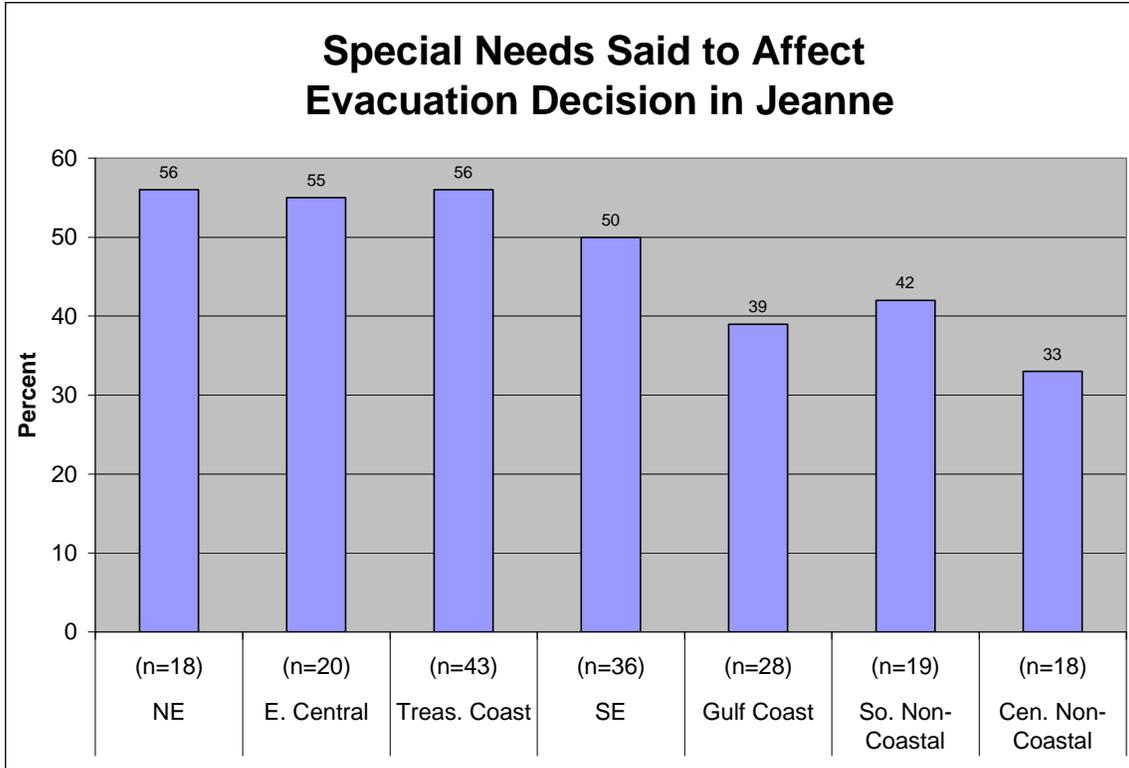


Fig. 28

#### Having to Work

Between 13% and 37% of the respondents said someone in their household had to work during the threat being posed by Jeanne (Figure 29). In all locations most people (61% to 87%) said their household's evacuation decision was not affected by someone having to work (Figure 30). Only 4% to 13% said their household did not evacuate at all because of the work constraint. In the aggregate sample, households in which someone had to work were slightly less likely than other households to evacuate in Jeanne. However, when the sample was broken down by risk zone, there were no differences within comparable risk areas in evacuation rate between households with and without members having to work during Jeanne.

#### School Closings

Most respondents (54% to 84%) in all locations said that schools were closed early enough to permit their household to evacuate (Figure 31). Affirmative responses did not vary a great deal among locations, but they were slightly lower than average in the Treasure Coast and Gulf coast sample areas. They were highest in the Central noncoastal area. There were no differences in evacuation rates between those who said schools closed early enough and others.

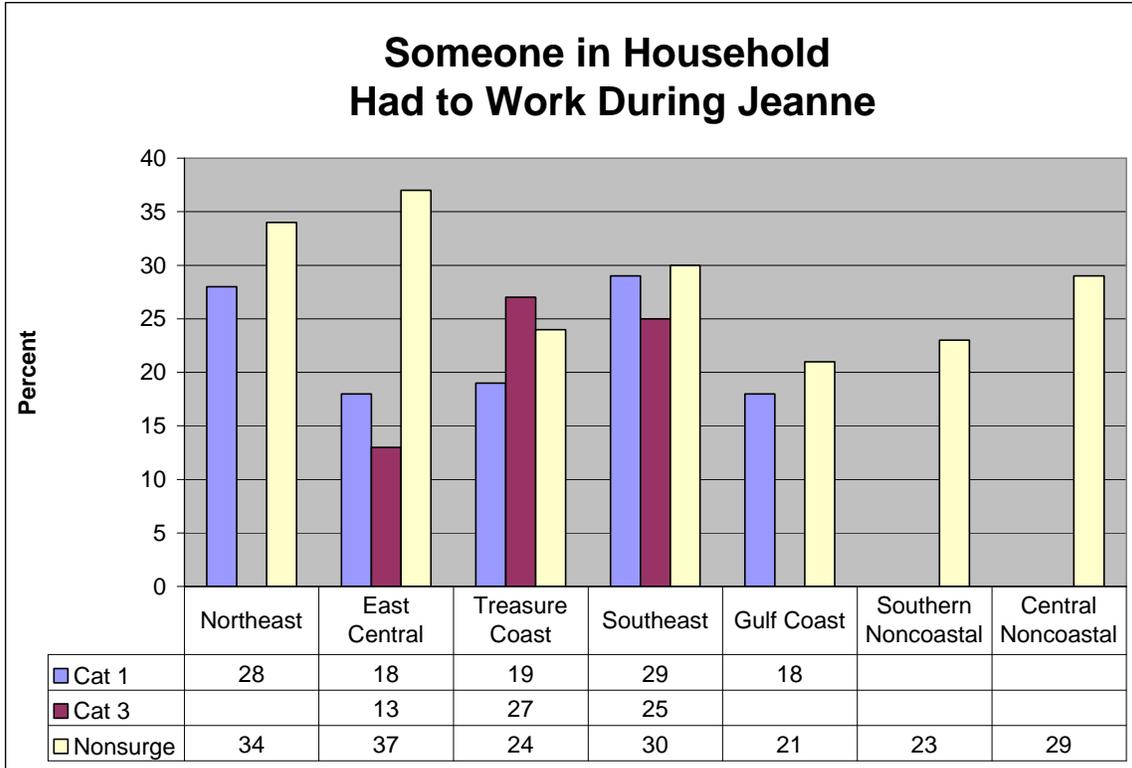


Fig. 29

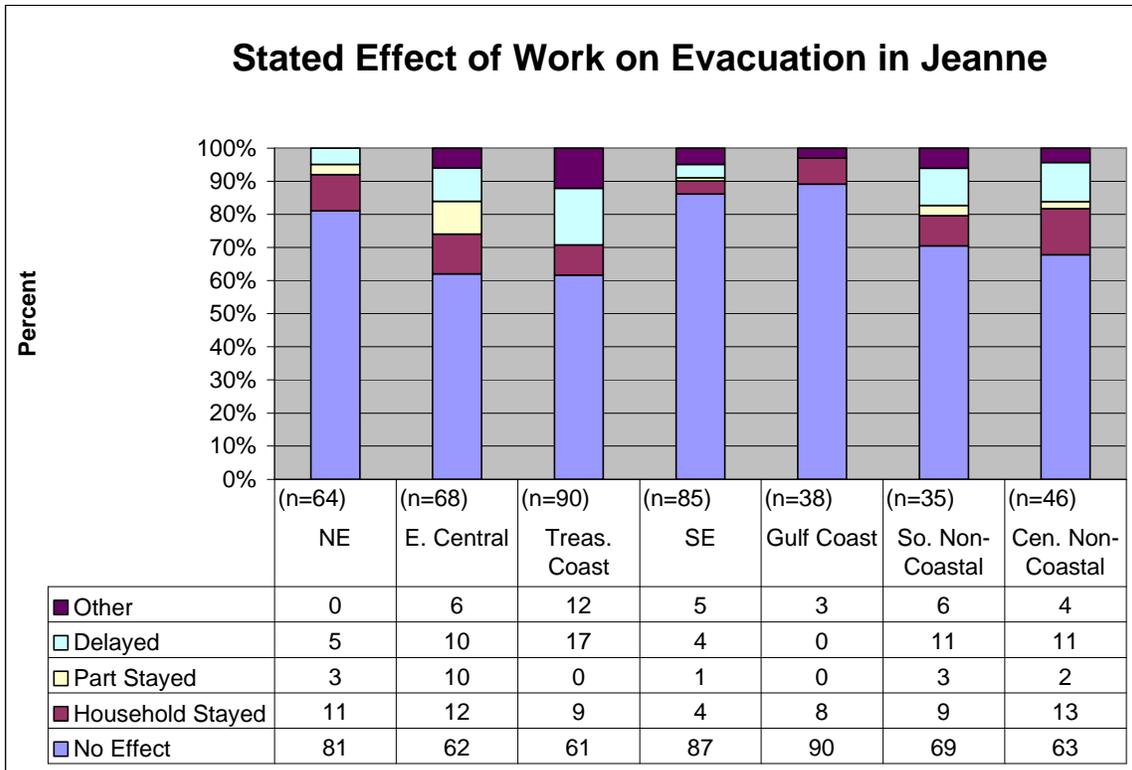


Fig. 30

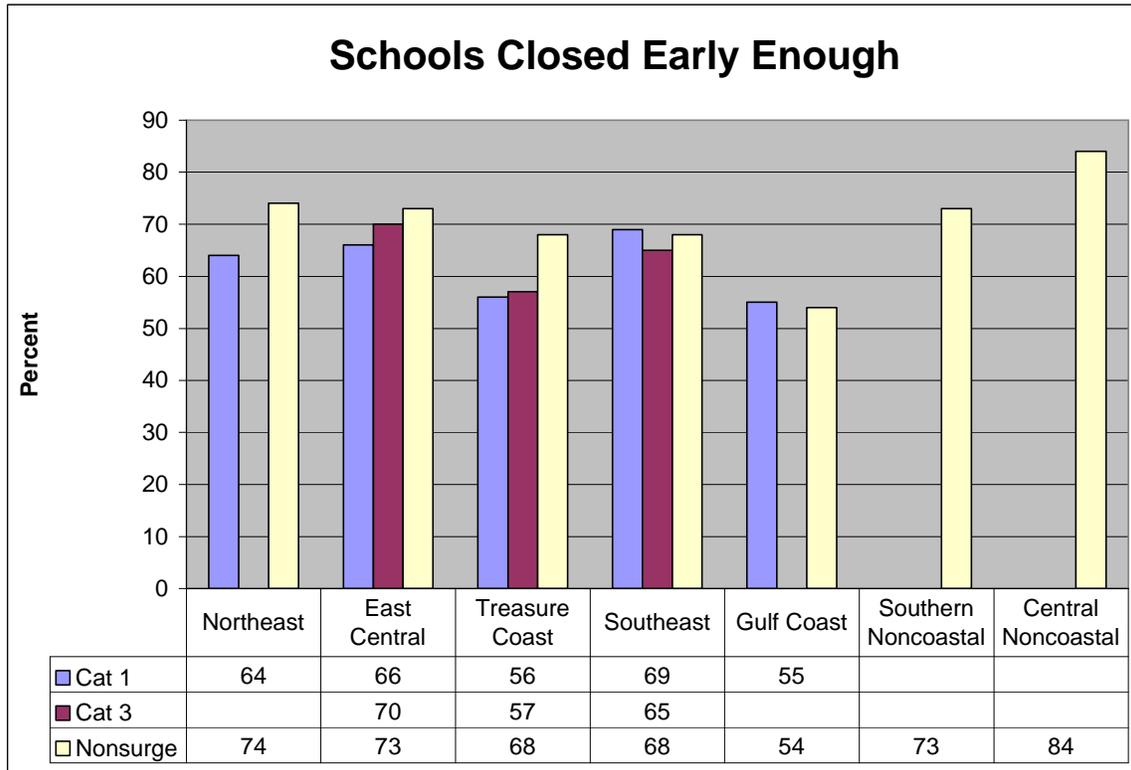


Fig. 31

### Pets

Pets are sometimes viewed as a constraint to evacuating because pets aren't accepted in most public shelters, many hotels and motels, and probably the homes of certain friends and relatives. Between 40% and 62% of respondents said they had pets in their households (Figure 32). As few as 22% and as many as 47% of the interviewees with pets said the presence of a pet affected their decision whether to evacuate (Figure 33). The actual evacuation rate of households with pets was lower than that of other households (23% vs 27%). There was no difference in the Treasure Coast region, however, where Jeanne made landfall.

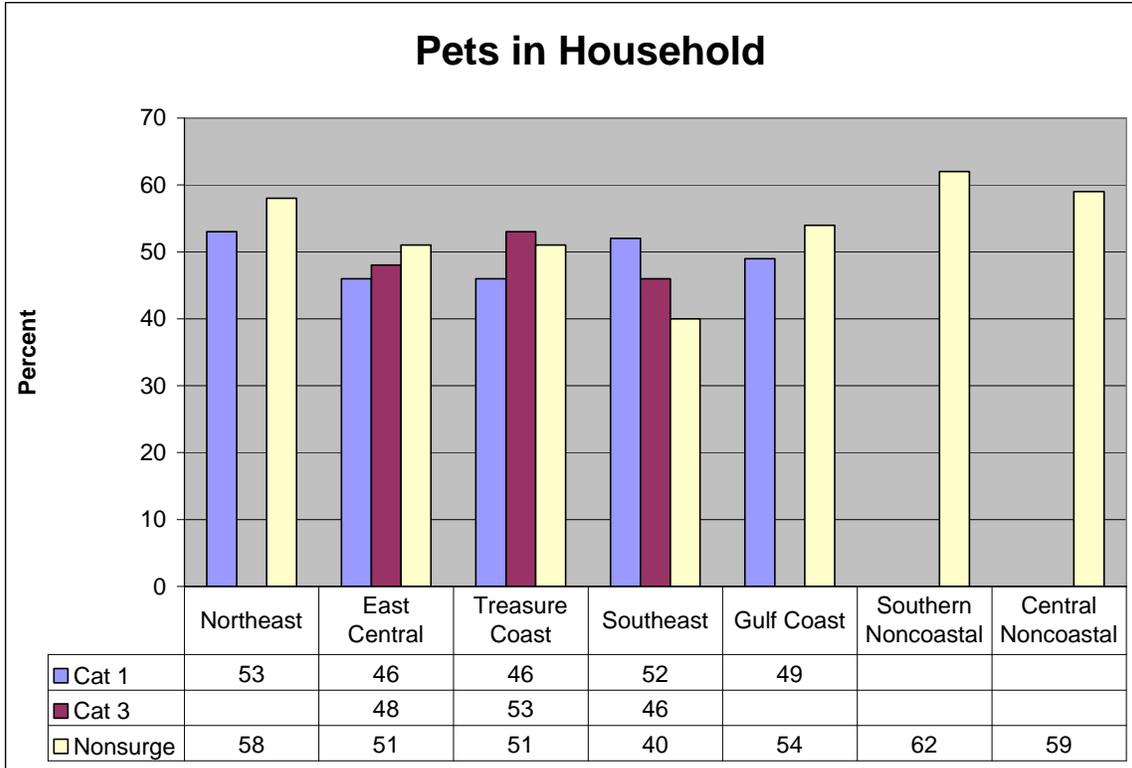


Fig. 32

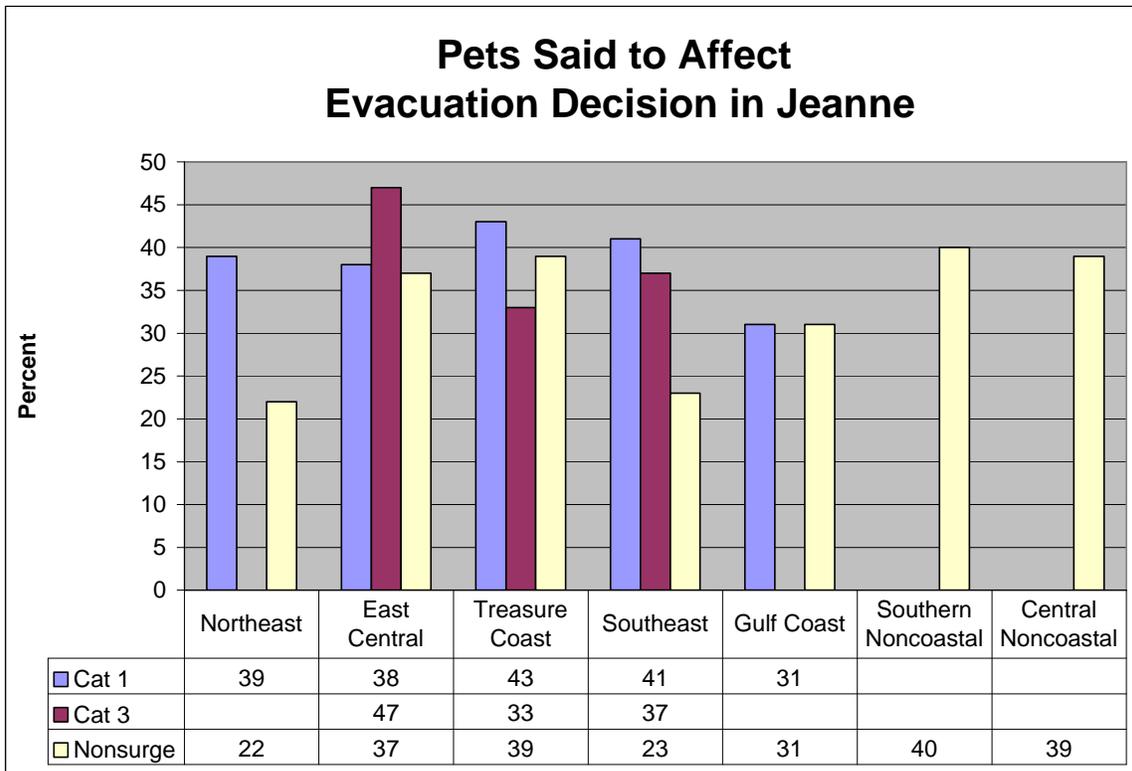


Fig. 33

## Preparations by Evacuees

### Evacuation Supply Kit

Between 61% and 81% of the evacuees said they took kits with them containing items such as food, medicine, personal objects, and extra clothes (Figure 34). Between 49% and 68% of the interviewees said they had their evacuation supply kits ready in advance rather than putting them together at the last minute (Figure 35). In all locations a large majority of people (73% to 100%) said their kits proved to contain everything they needed (Figure 36). Number of respondents was small in most locations.

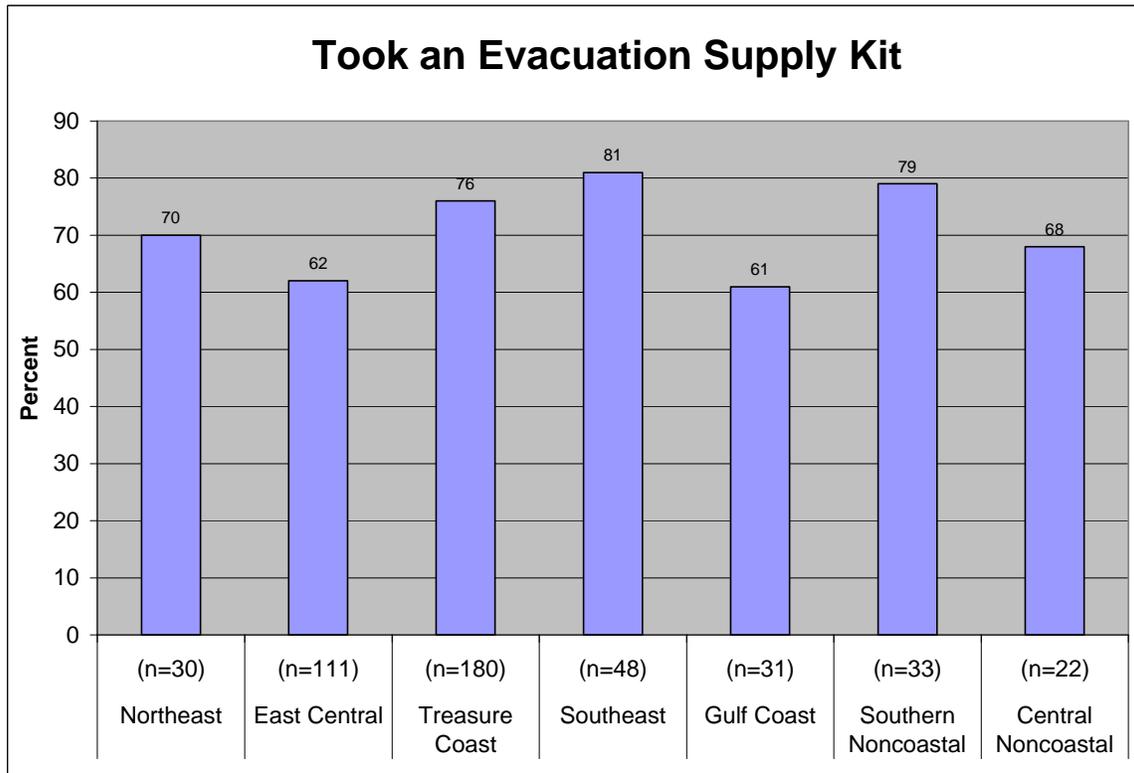


Fig. 34

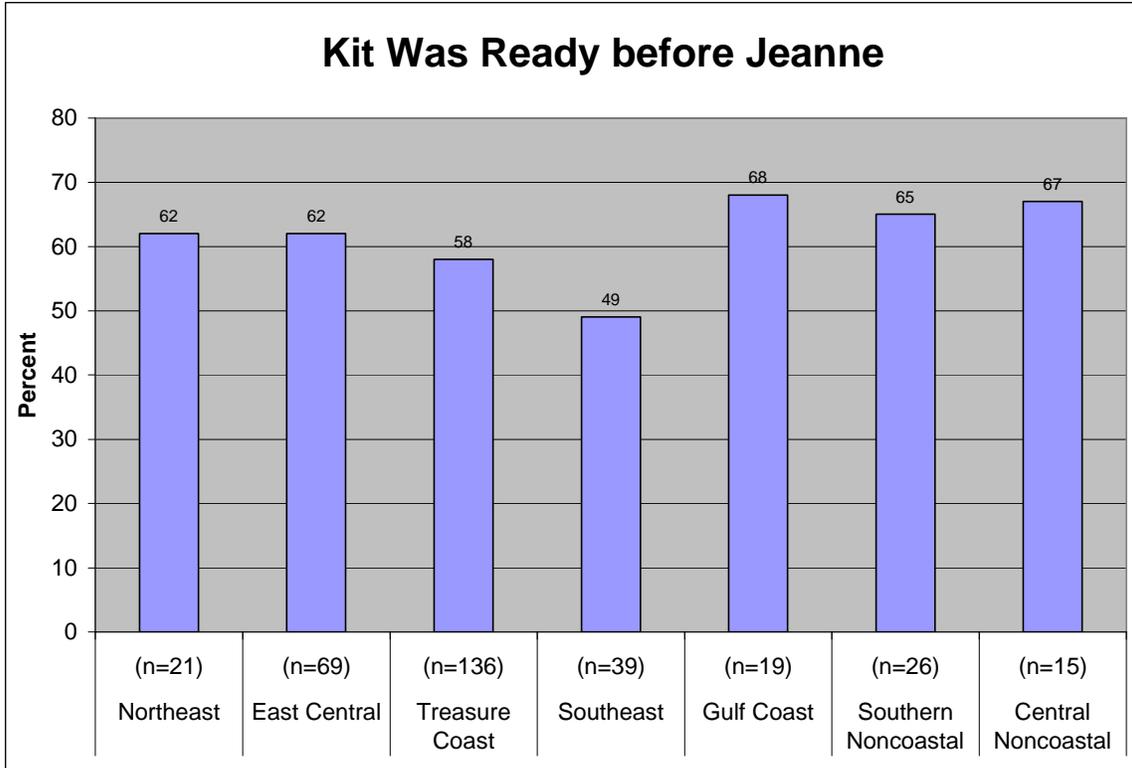


Fig. 35

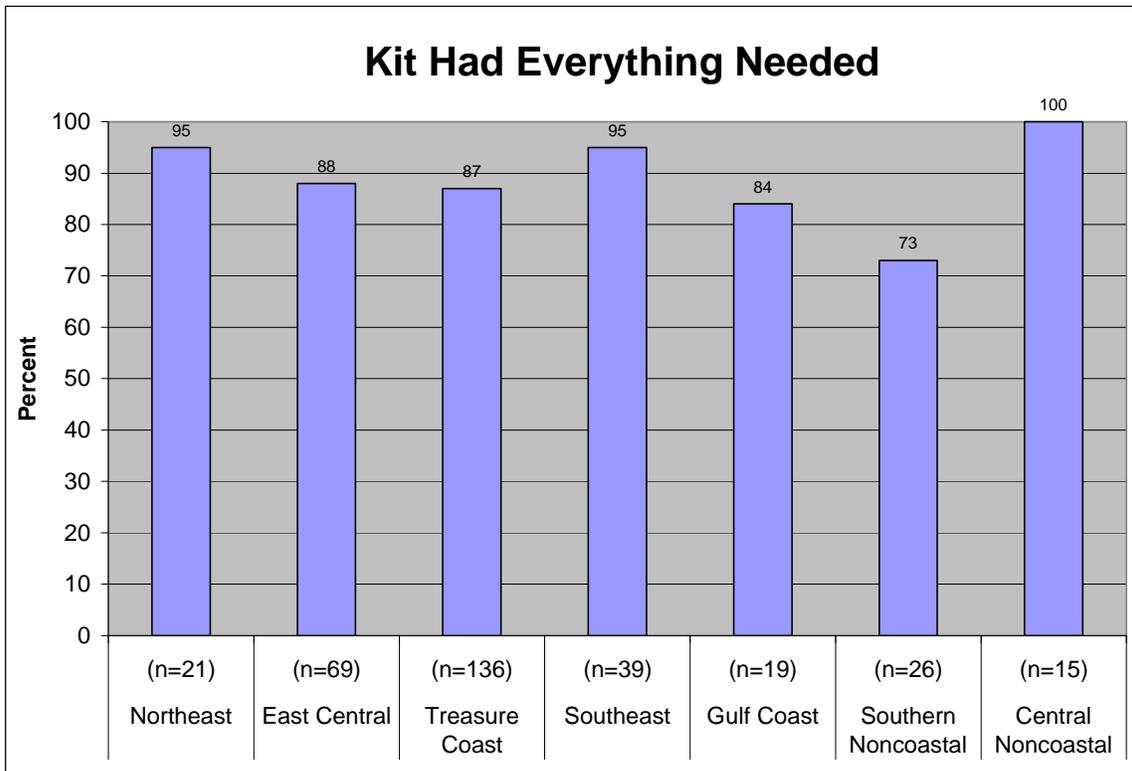


Fig. 36

Property Protection

Between 39% and 78% of respondents said they took actions to protect their homes and property from Jeanne (Figure 37). Positive responses were only slightly higher in coastal counties than in non-coastal counties, and within coastal counties, there was little variation by risk zone. As few as 24% and as many as 54% of the interviewees in households taking protective actions said the actions they took affected their evacuation decisions (Figure 38). The figure was near the low end of the range in the category 1 risk areas of the Northeast, East Central, and Treasure Coast regions. However, the actual evacuation participation rates were the same in households that did and did not take actions to protect their property in all risk zones and in all survey clusters.

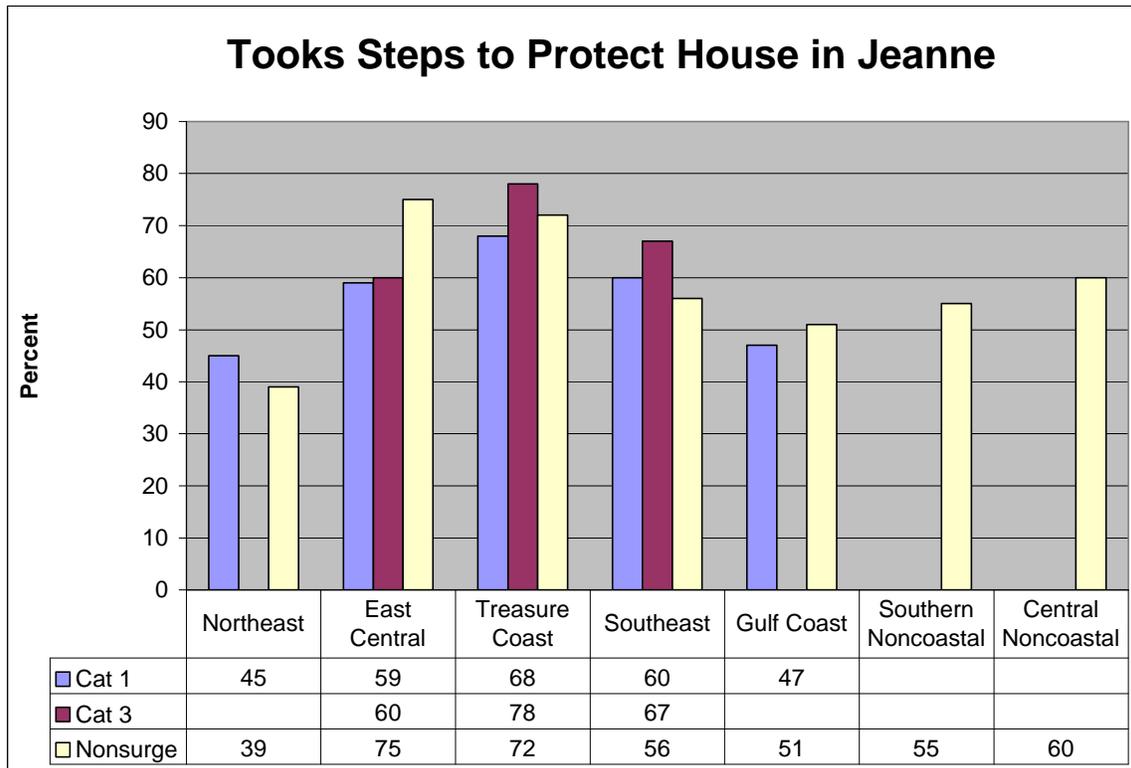


Fig. 37

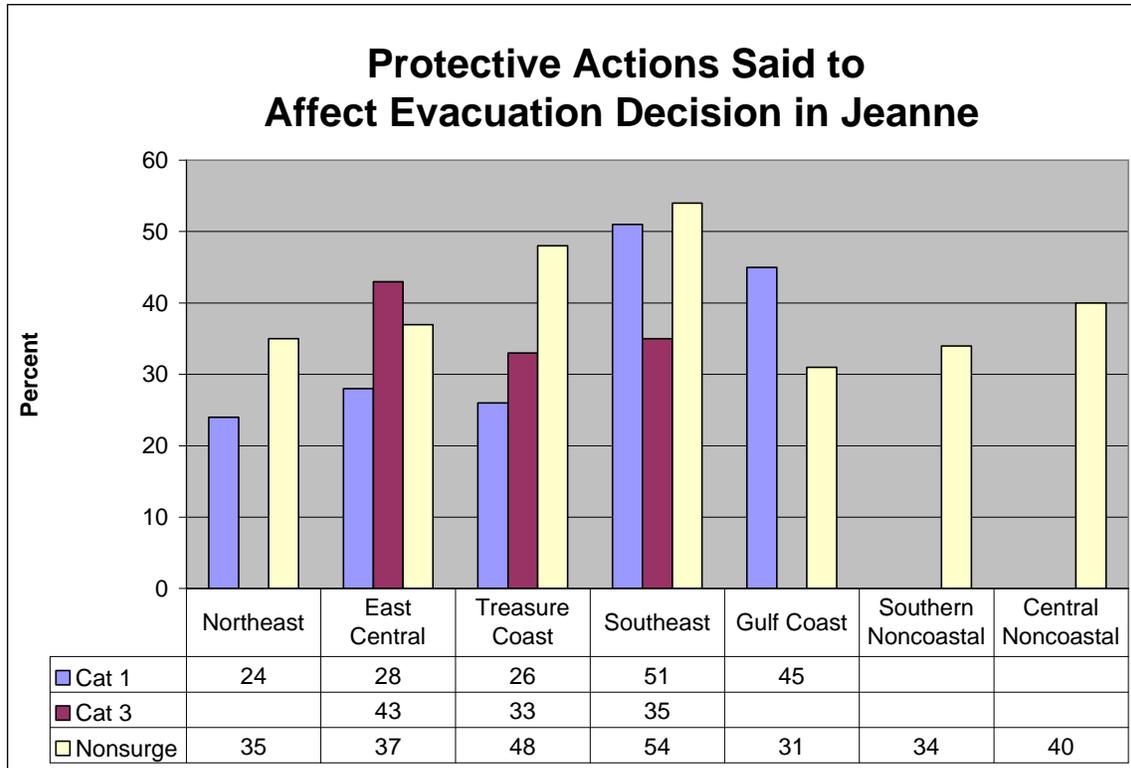


Fig. 38

### Perceived Vulnerability

Respondents were asked two questions about three different hurricanes to measure their beliefs about the safety of their homes. The first question asked whether the hurricanes would cause their homes to flood dangerously from storm surge, waves, or rivers if the storms passed directly over their homes. The second asked whether it would be safe for them to stay in their homes in the storms, considering both wind and water. The storms were described in terms of wind velocity and the Saffir-Simpson scale: 155 MPH, Cat 4; 125 MPH Cat 3; and 100 MPH Cat 2.

#### 155 MPH Category 4

Only a little more than half the respondents in any of the cat1 survey locations believe their homes would flood dangerously in a 155 MPH hurricane (Figure 39). In non-surge locations, including non-coastal counties, between 27% and 36% believe their homes would flood dangerously in that magnitude of storm. Given the sample sizes, the small differences among survey locations, within risk zones, is not meaningful.

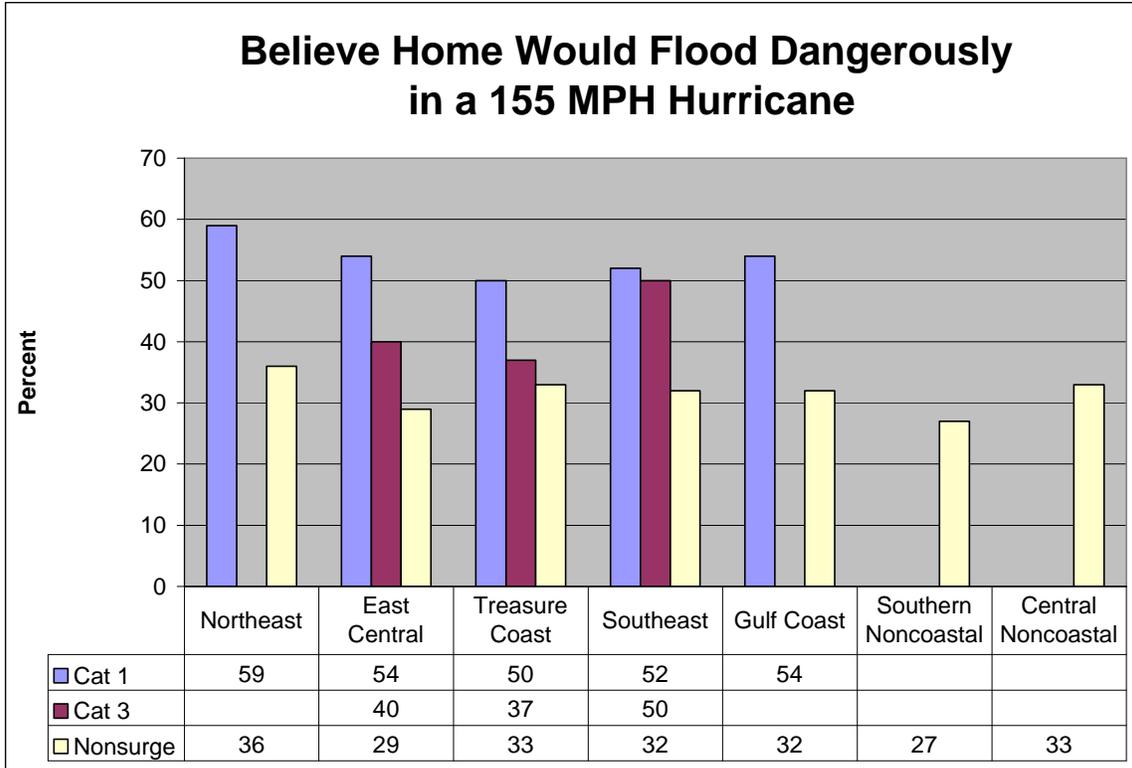


Fig. 39

Significantly more people believe their homes would be unsafe considering both wind and water (Figure 40). Approximately two-thirds to 79% of the cat 1 respondents believe their homes would be unsafe in a 155 MPH hurricane. In cat 3 surge areas 59% to 63% believe their homes would be unsafe. In non-surge areas 47% to 77% said their homes would be unsafe, which could result in shadow evacuation in such a storm.

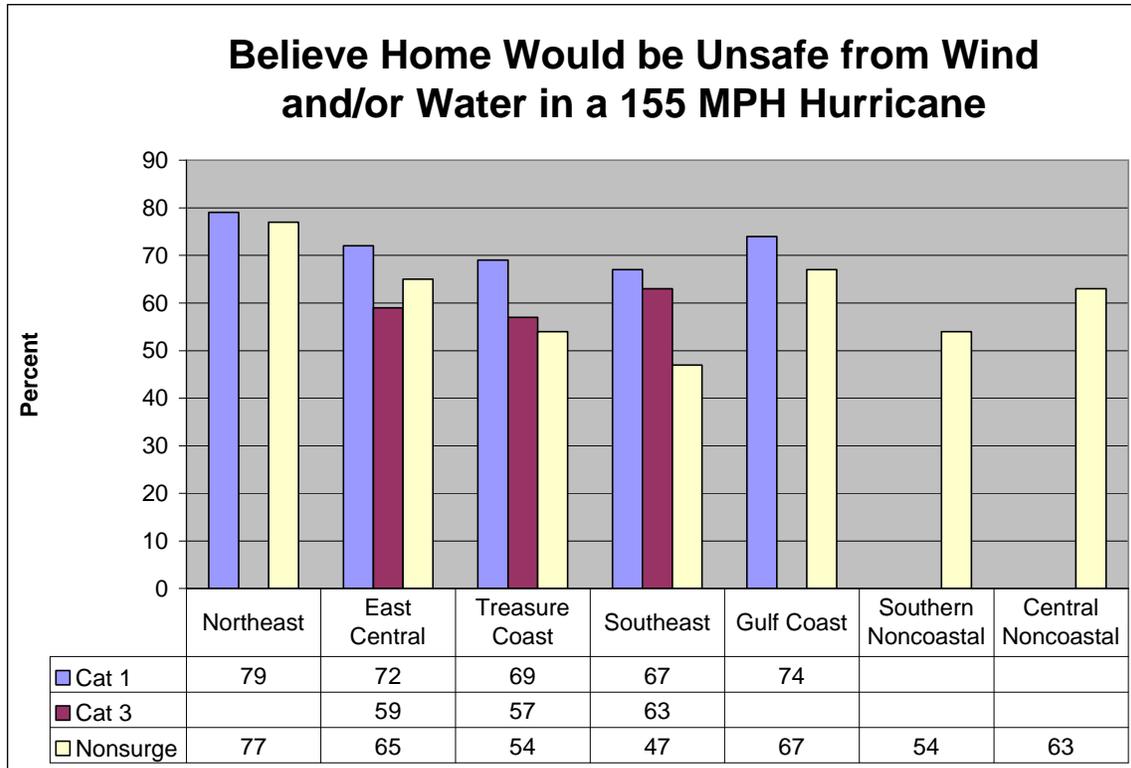


Fig. 40

#### 125 MPH Category 3

Only 32% to 43% of the cat 1 evacuation zone respondents said their homes would flood dangerously in a 125 MPH hurricane (Figure 41). In the East Central and Treasure Coast regions fewer than 25% of the respondents in category 3 zones said their homes would flood dangerously, but the figure was higher in Southeast Florida. In non-surge areas 20% to 28% said they expected dangerous flooding in a 125 MPH hurricane, and those figures were also true in non-coastal counties.

In category 1 surge areas 50% to 67% of those interviewed said it would be unsafe to stay in their homes in a 125 MPH hurricane, considering both wind and water (Figure 42), and 34% to 50% gave that response in category 3 surge areas. Between 29% and 58% of non-surge respondents believed their homes would be unsafe, and in non-coastal counties the range was 43% to 49%.

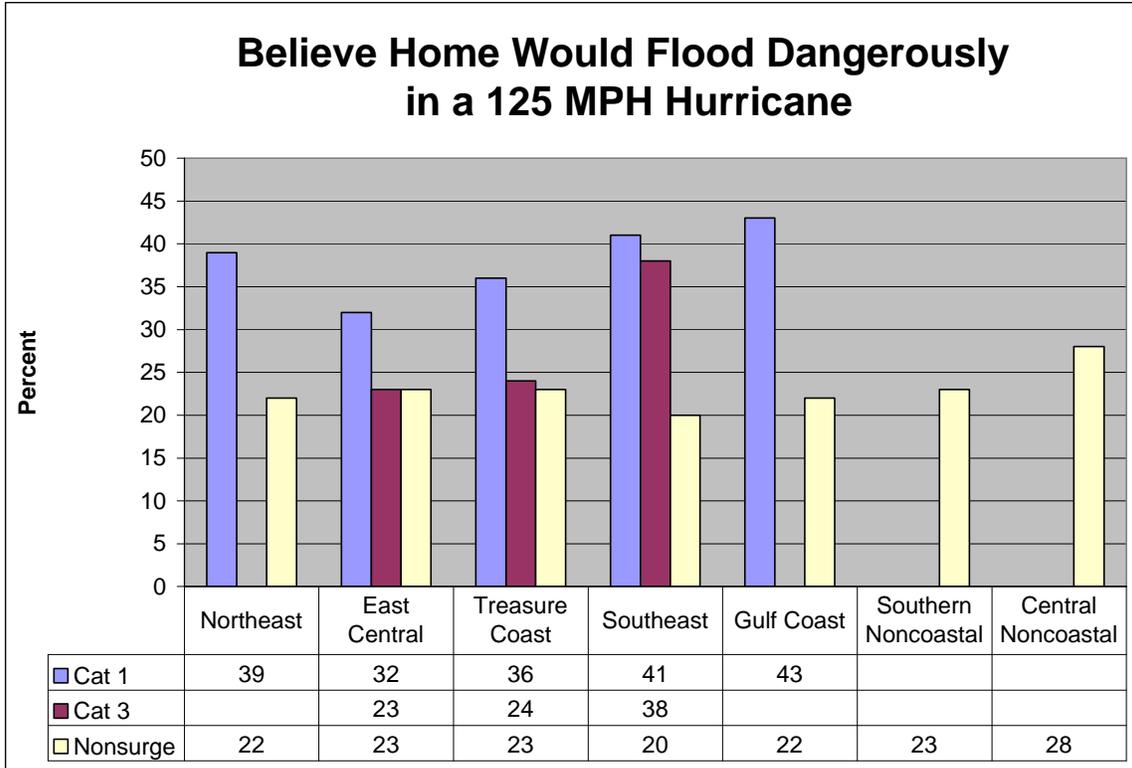


Fig. 41

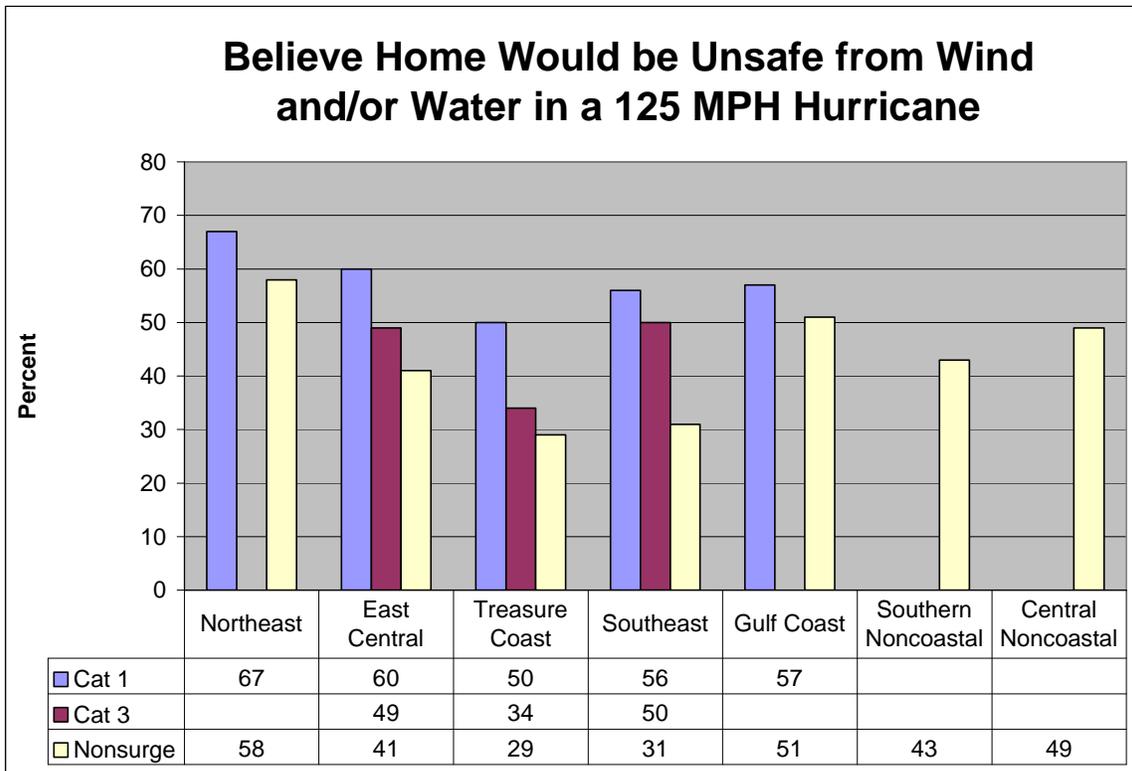


Fig. 42

100 MPH Category 2

For a 100 MPH hurricane expectation of dangerous flooding ranged from 24% to 34% in category 1 risk areas and from 15% to 24% in category 3 risk areas (Figure 43). In non-surge areas 9% to 22% said they expected dangerous storm surge flooding in a 100 MPH storm.

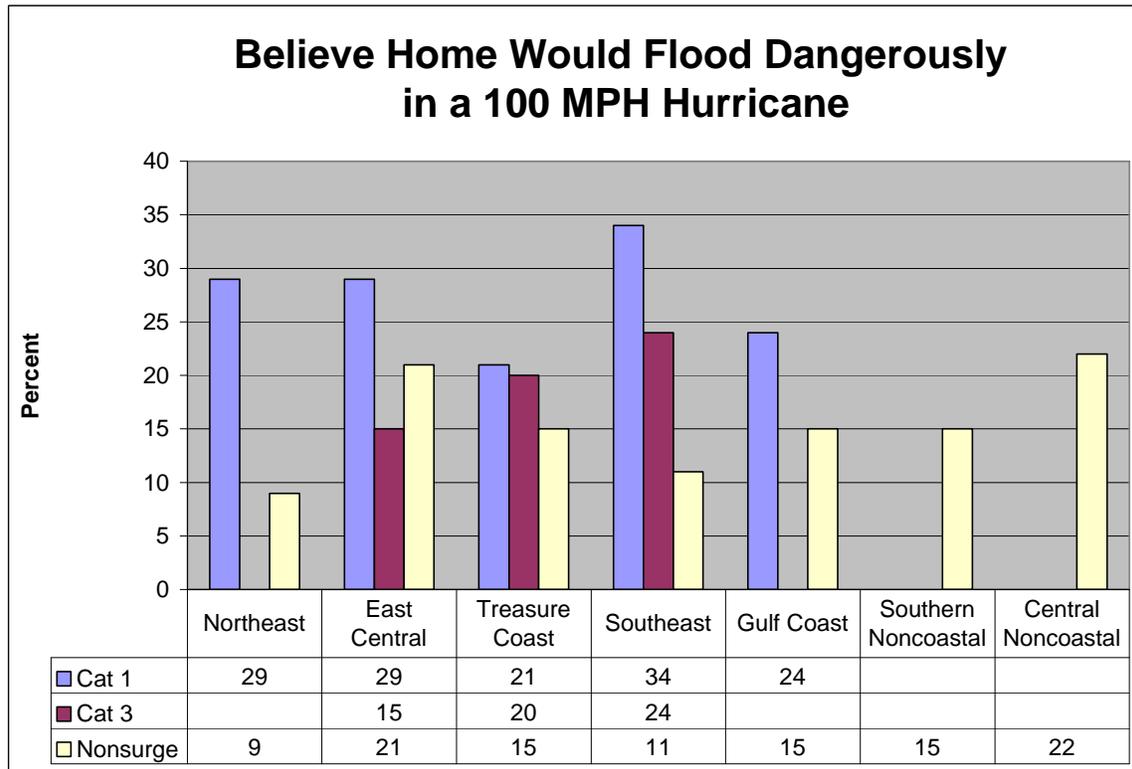


Fig. 43

In category 1 risk areas 32% to 44% said their homes would be unsafe in a 100 MPH hurricane, considering both wind and water (Figure 44). Category 3 respondents were slightly lower, ranging from 25% to 29%. In non-surge areas, including con-coastal counties, more than 30% of those interviewed in four of the seven survey clusters said it would be unsafe to stay in their homes in a 100 MPH hurricane.

Comparisons within Risk Zones

Figures 45, 46, and 47 show some of the same data in Figures 39-44, but arranged to facilitate comparisons within risk zones for all three storms at once. The most obvious overall pattern is the decrease in concern among 155 MPH, 125 MPH, and 100 MPH hurricanes. There are no pronounced spatial patterns in the responses from one survey cluster to another, although the overall perceived vulnerability varied from place to places, especially among non-surge respondents.

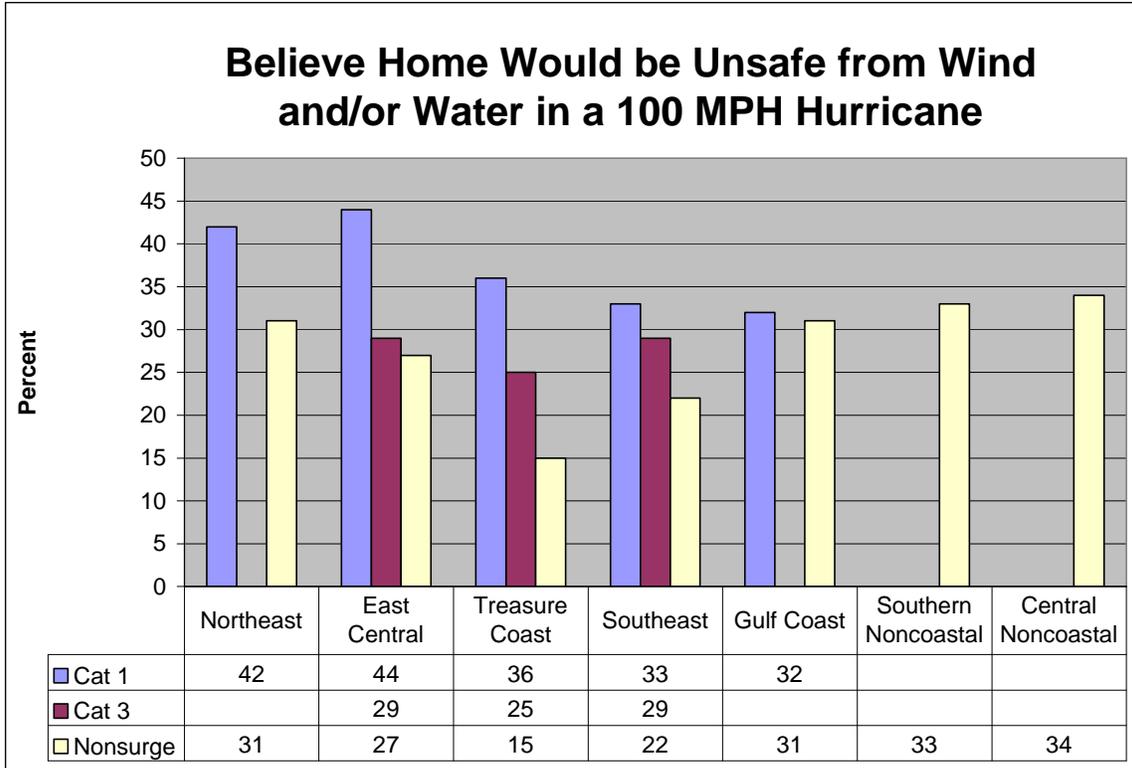


Fig. 44

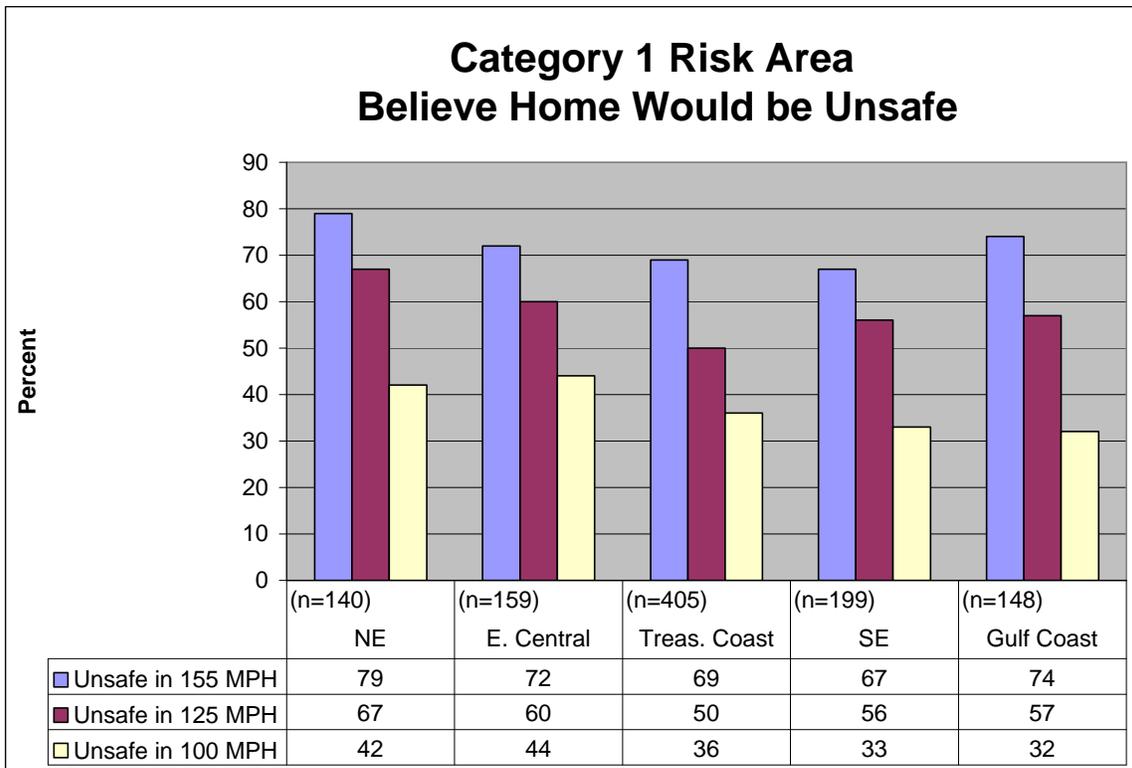


Fig. 45

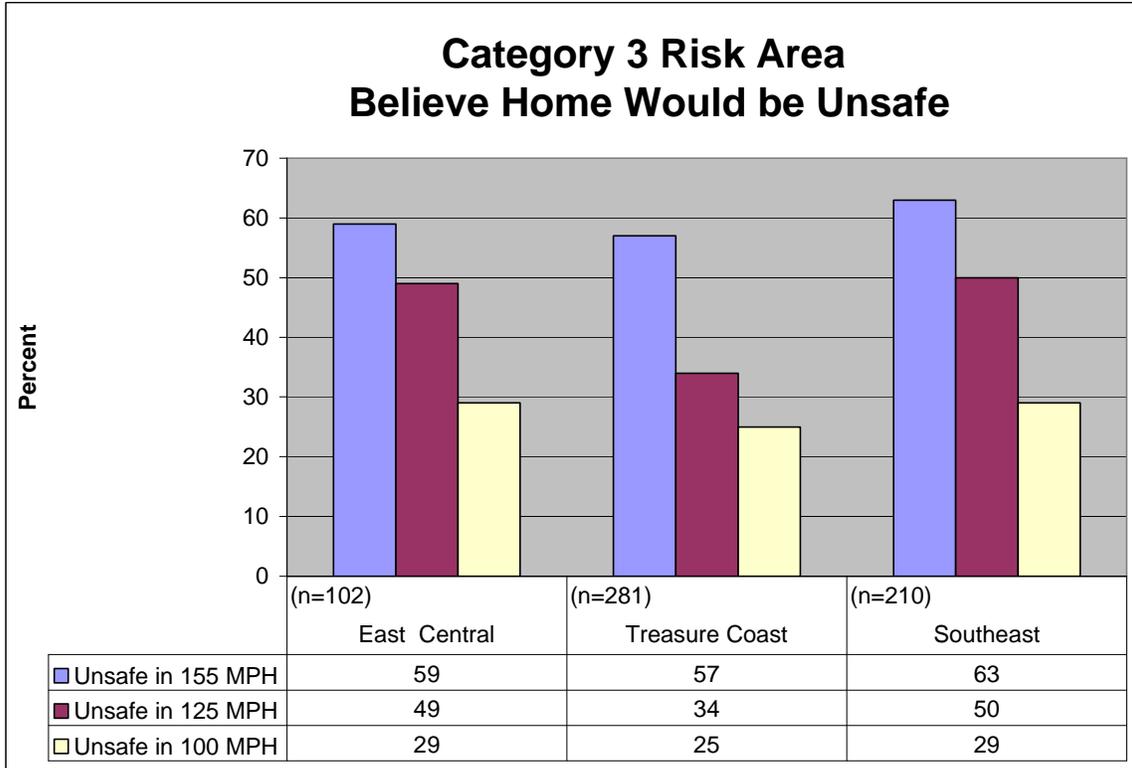


Fig. 46

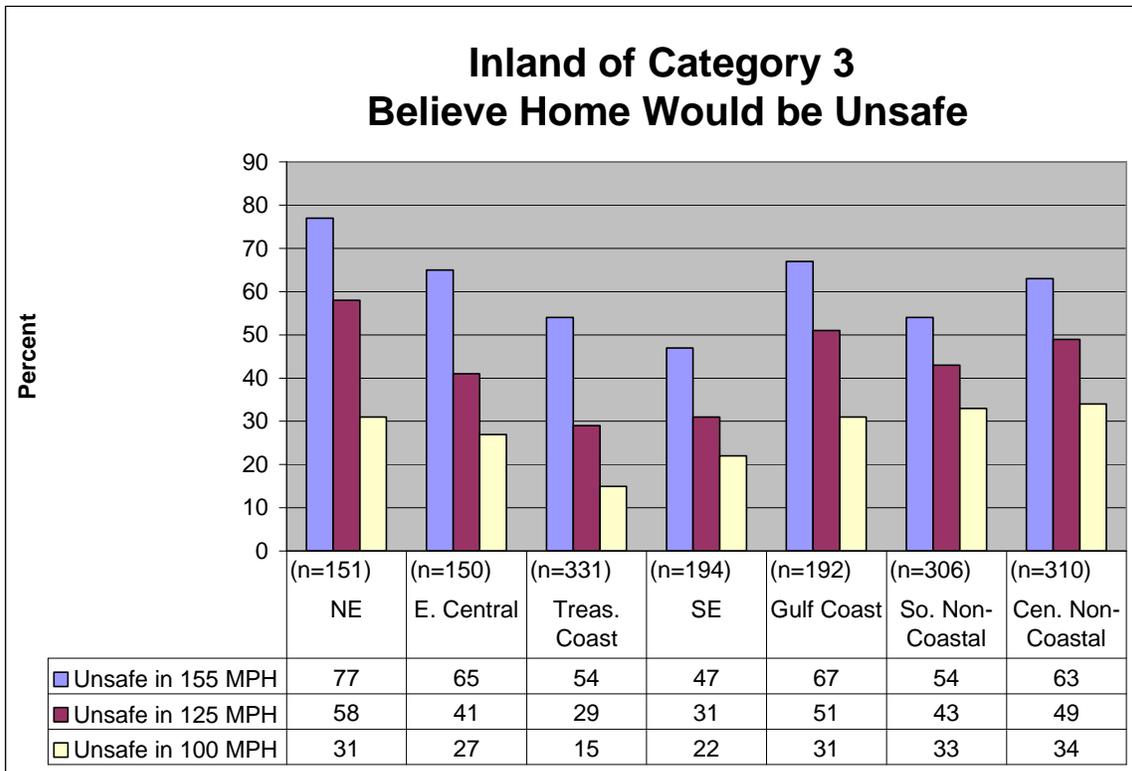


Fig. 47

### Perceived Vulnerability and Housing Type

Figure 48 shows the percentage of people saying their homes would be unsafe in a 125 MPH hurricane for three categories of housing: single family detached, multi-family, and mobile homes. Mobile home residents were less confident about the safety of their homes by a wide margin. People living in post-1993 mobile homes were less likely than other mobile home residents to believe their homes would be unsafe. People with window protection were slightly less likely than others to say their homes would be unsafe considering wind and water. People who described their dwellings as manufactured homes were less likely than mobile home residents to say their homes would be unsafe.

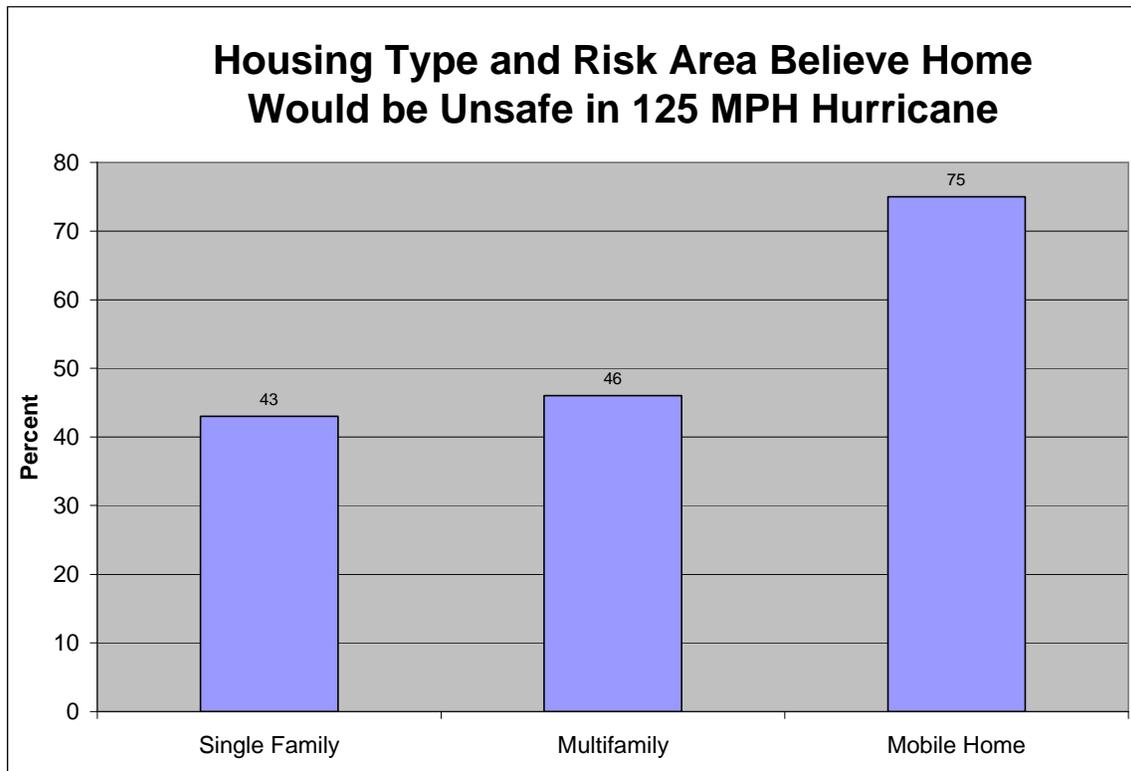


Fig. 48

### Effect of Perceived Vulnerability on Evacuation

Figures 49 - 54 indicate the evacuation participation rate for each survey area, comparing people who said their home would be safe in a 125 MPH hurricane to those who said their home would be unsafe. Figures 49 – 53 show results for the five coastal areas and Figure 54 depicts data for the two non-coastal areas. For each risk area and every location, people who believe their homes would be unsafe in a 125 MPH were more likely than others to evacuate in Jeanne, and in most locations the differences were substantial, averaging two to three times as likely to evacuate if the respondent believed his or her home would be unsafe. In non-coastal counties people who said their homes were unsafe were at least four times more likely than other respondents to evacuate in Jeanne.

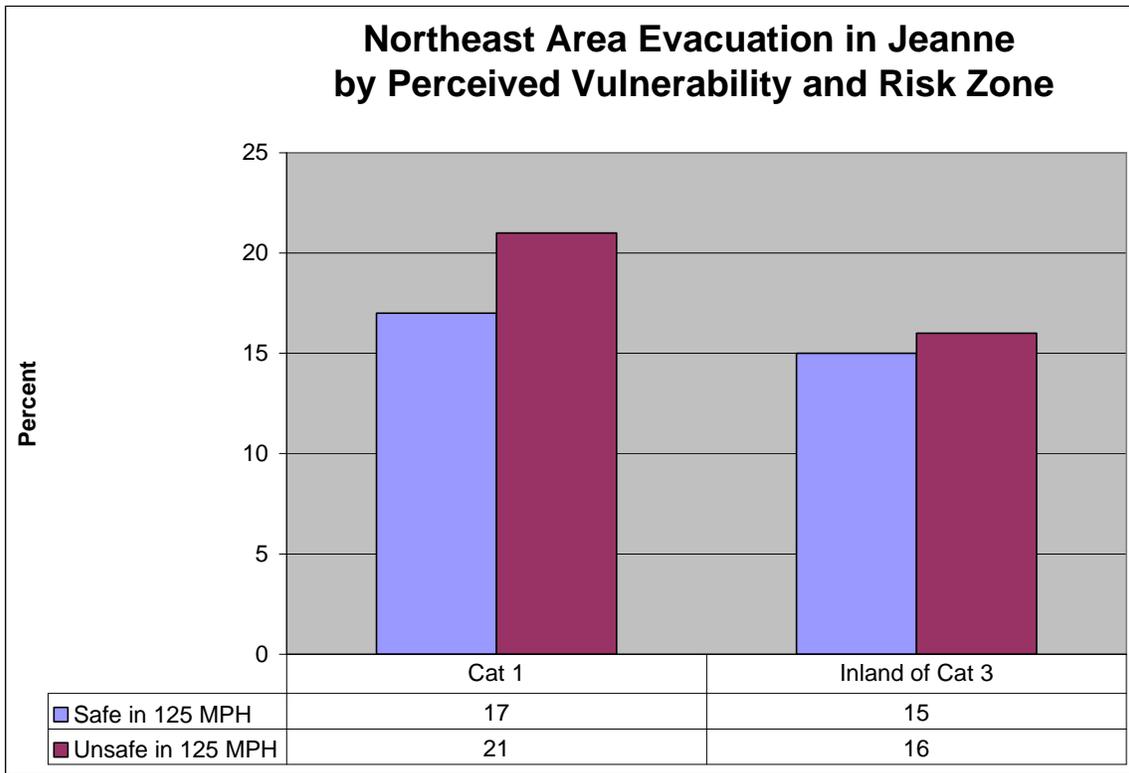


Fig. 49

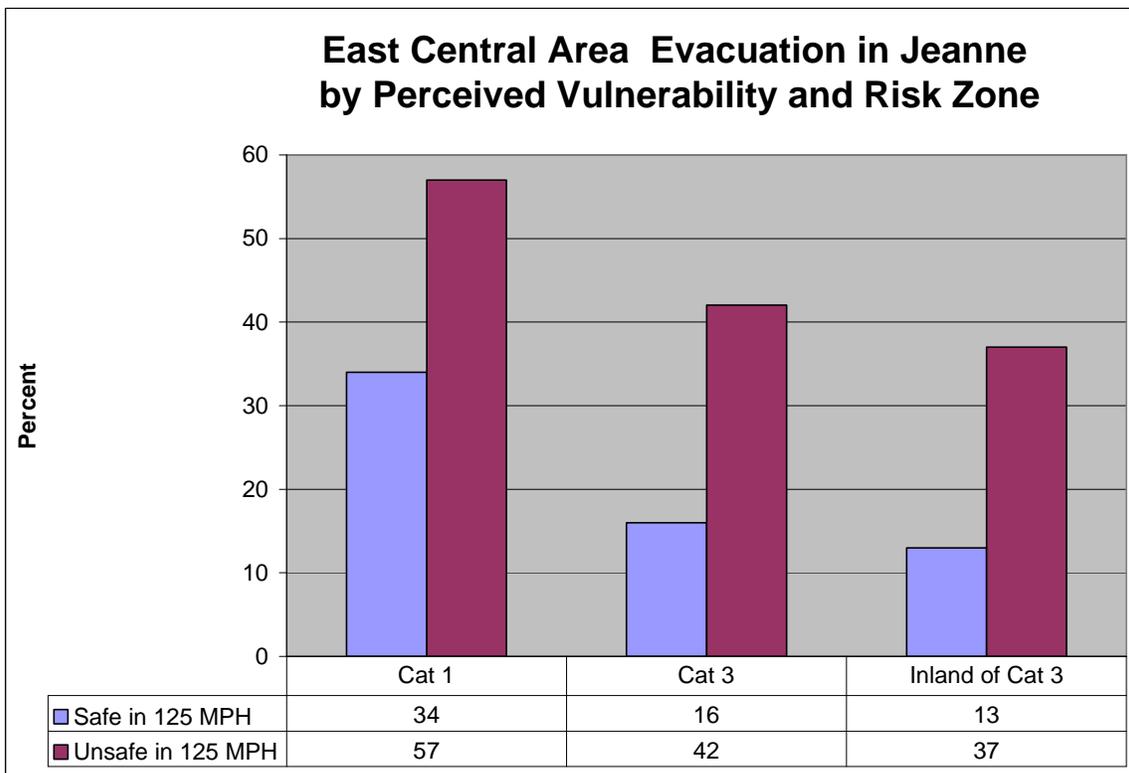


Fig. 50

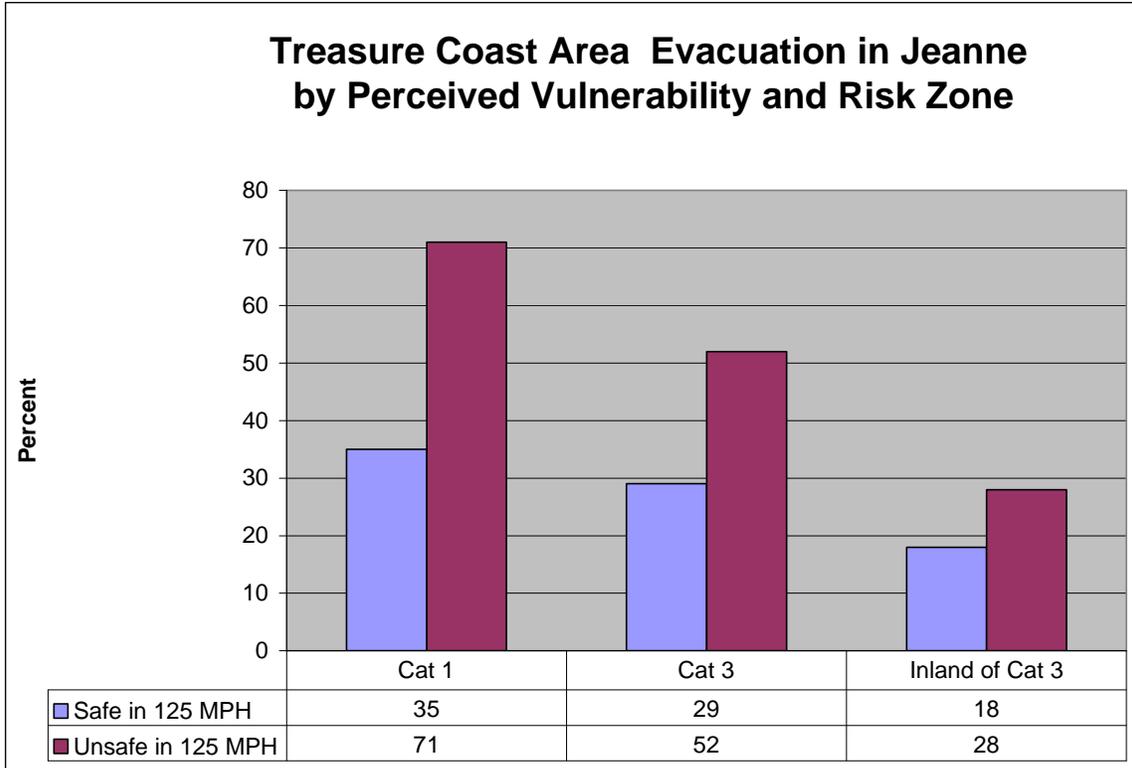


Fig. 51

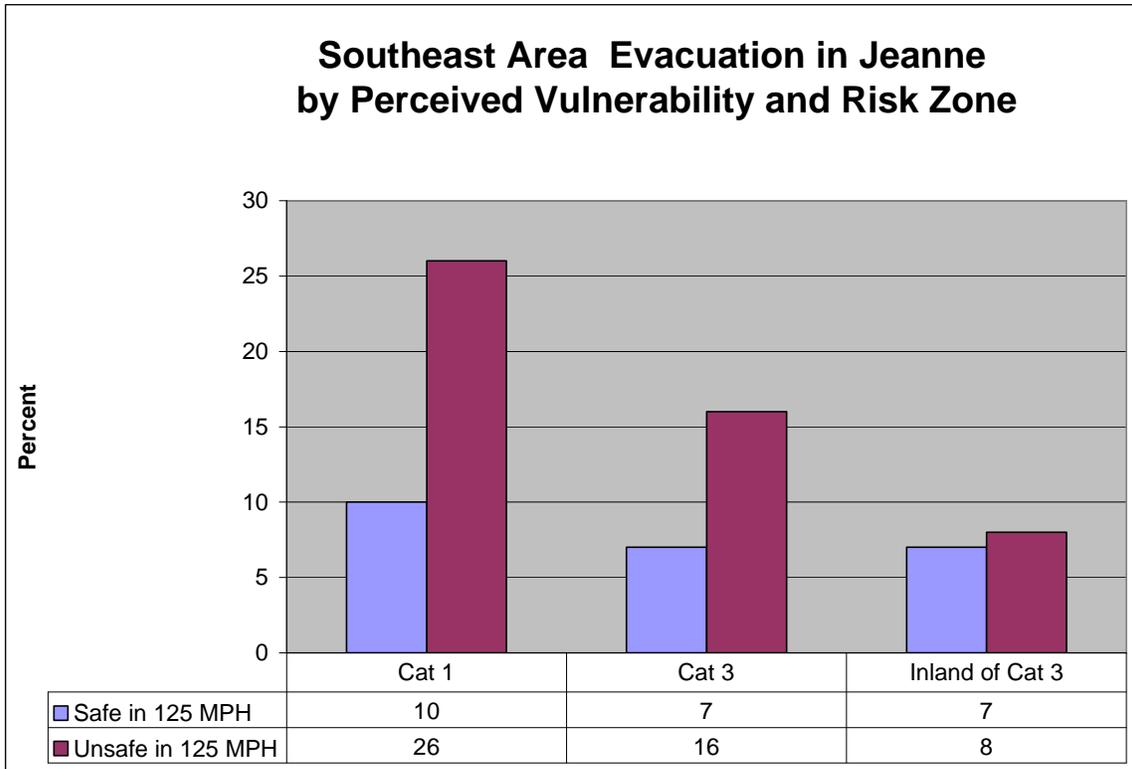


Fig. 52

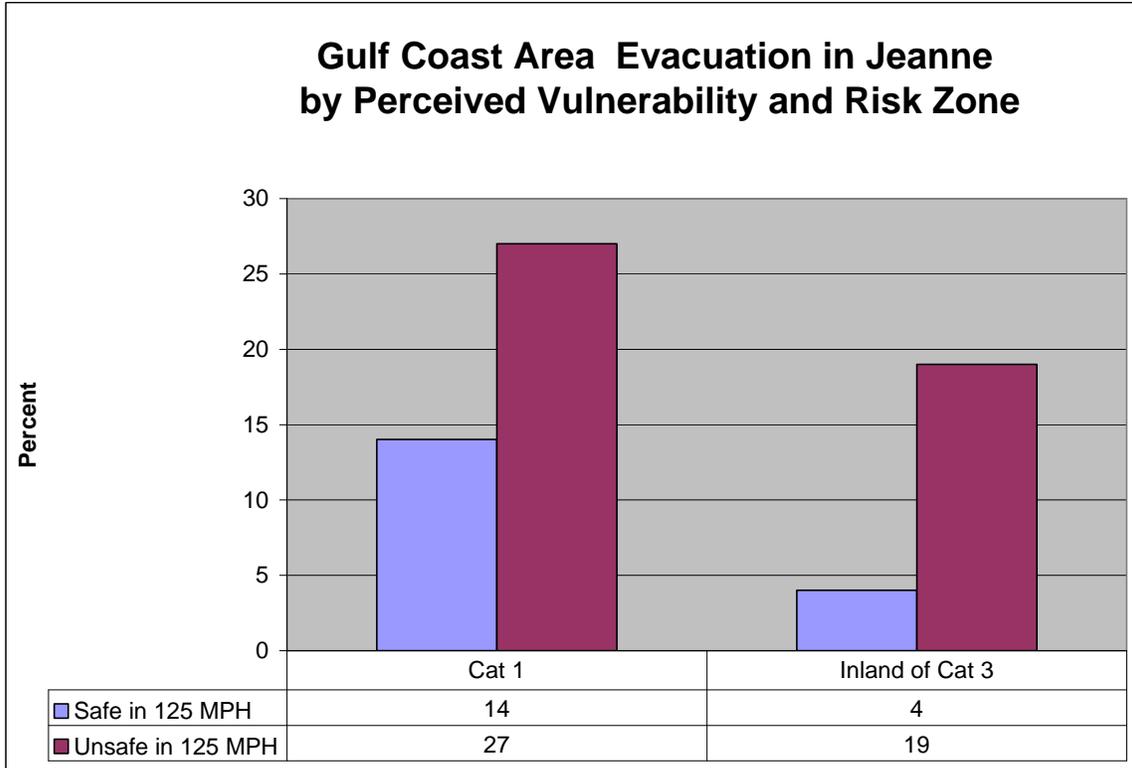


Fig. 53

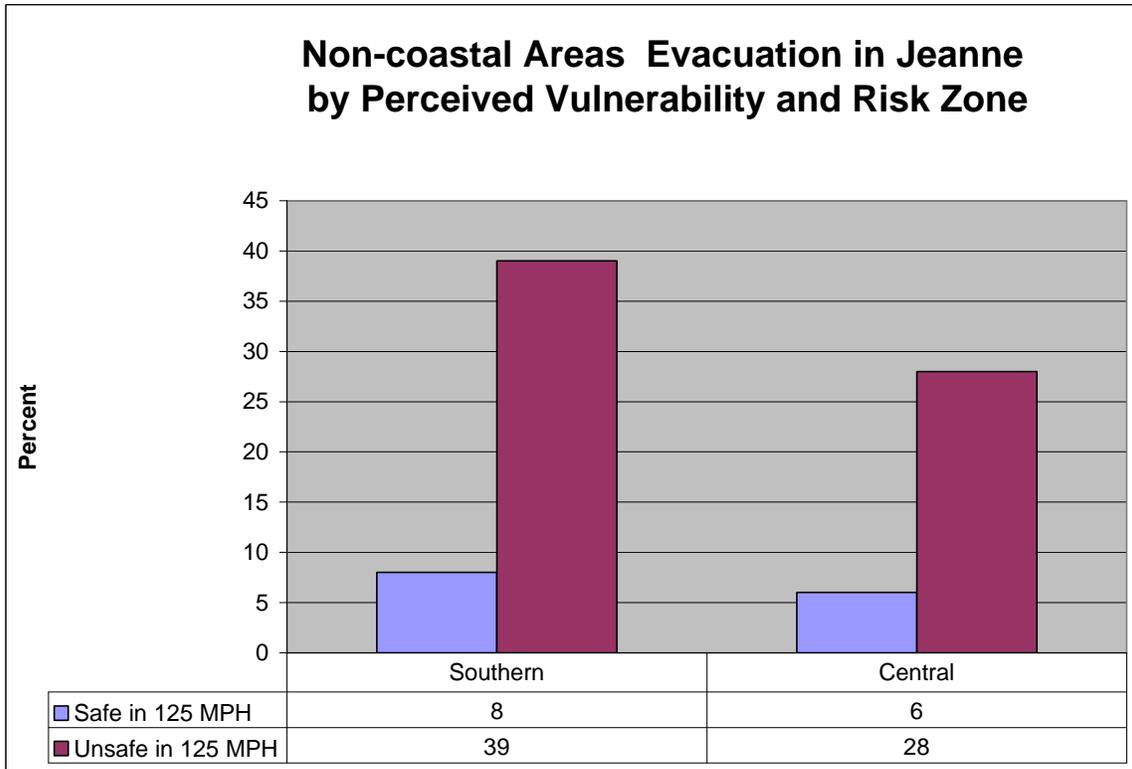


Fig. 54

## Forecast Graphic

Early forecasts for Jeanne's track placed landfall considerably farther north than the eventual landfall location, but by the time the warning for Jeanne was issued, the forecast track was close to the eventual storm path. Nevertheless, concerns remain that too many coastal residents place undue emphasis on the predicted landfall point, neglecting to take into account the error to which forecasts are subject. Some graphical depictions of the forecast path of Jeanne showed just a line, some showed a cone indicating the possible tracks it could follow, and others showed both.

Respondents were asked if they saw a forecast graphic for Jeanne and if so, what type of graphic they saw. The great majority of respondents (87% to 99%) in all locations said they saw some sort of graphic depicting the likely track Jeanne would take (Figure 55). Most of those people said they saw either the cone or both the cone and line (Figure 56).

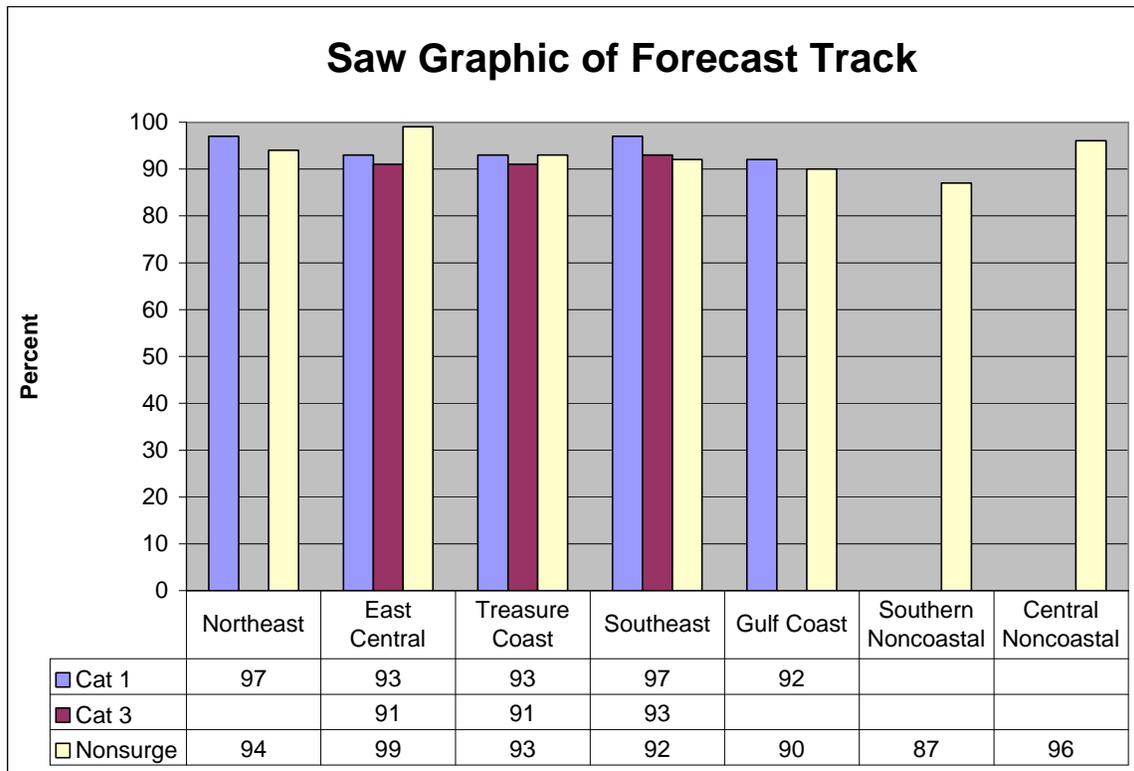


Fig. 55

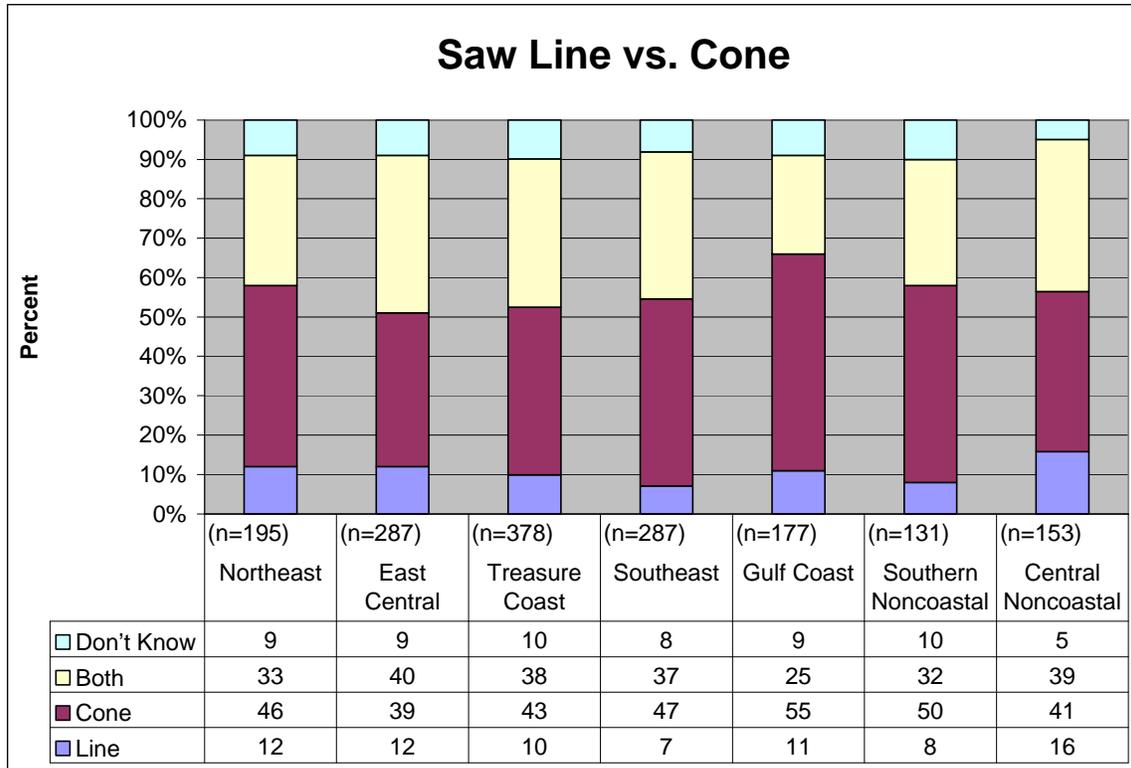


Fig. 56

When asked how important the forecast graphic was to their decision to evacuate or not, most people (56% to 72%) said it was very important, and responses were fairly consistent among locations (Figure 57). However, actual evacuation participation rates do not reflect those statements (Figure 58). The percentage of people evacuating in Jeanne was statistically the same for those who saw each type of graphic (line, cone, both), except in Northeast Florida. Although there are sample differences in other locations, given the magnitude of the differences in the sample data and the sample sizes, the sample differences don't indicate differences in the entire population. At one point during the Jeanne threat, landfall was forecast to occur in northeast Florida. It's possible that people who saw just that graphic (12% of the sample) found it a more compelling reason to evacuate than other people.

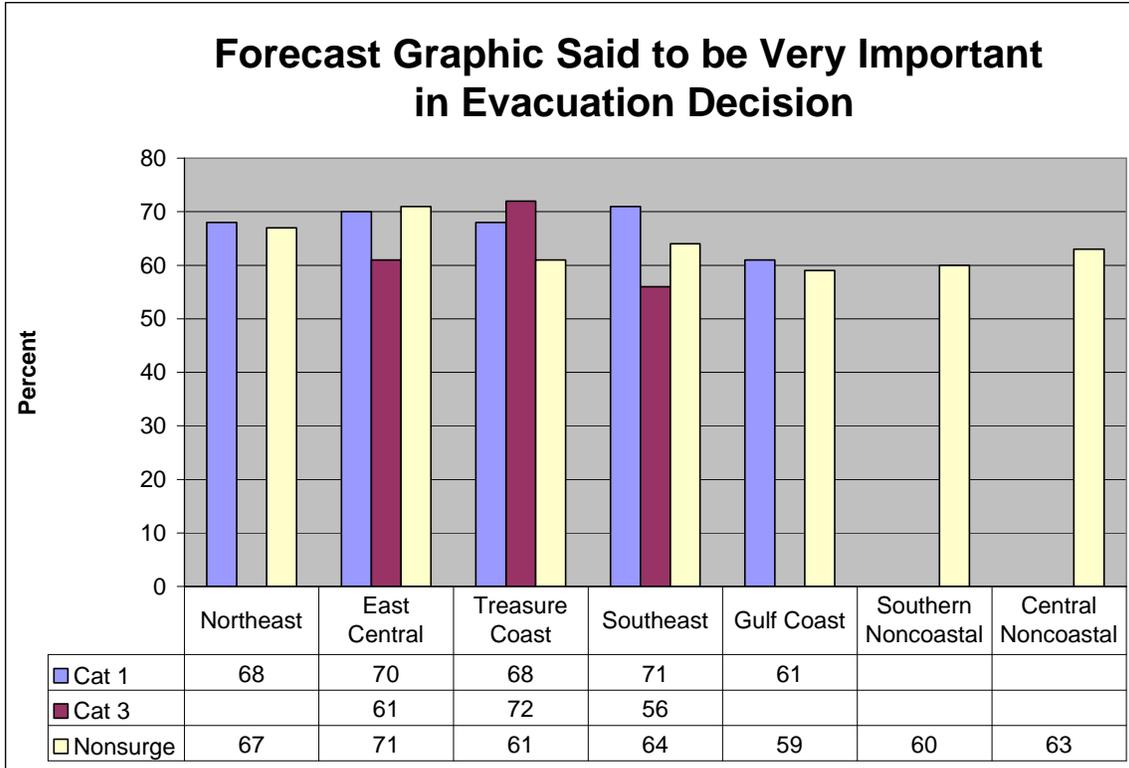


Fig. 57

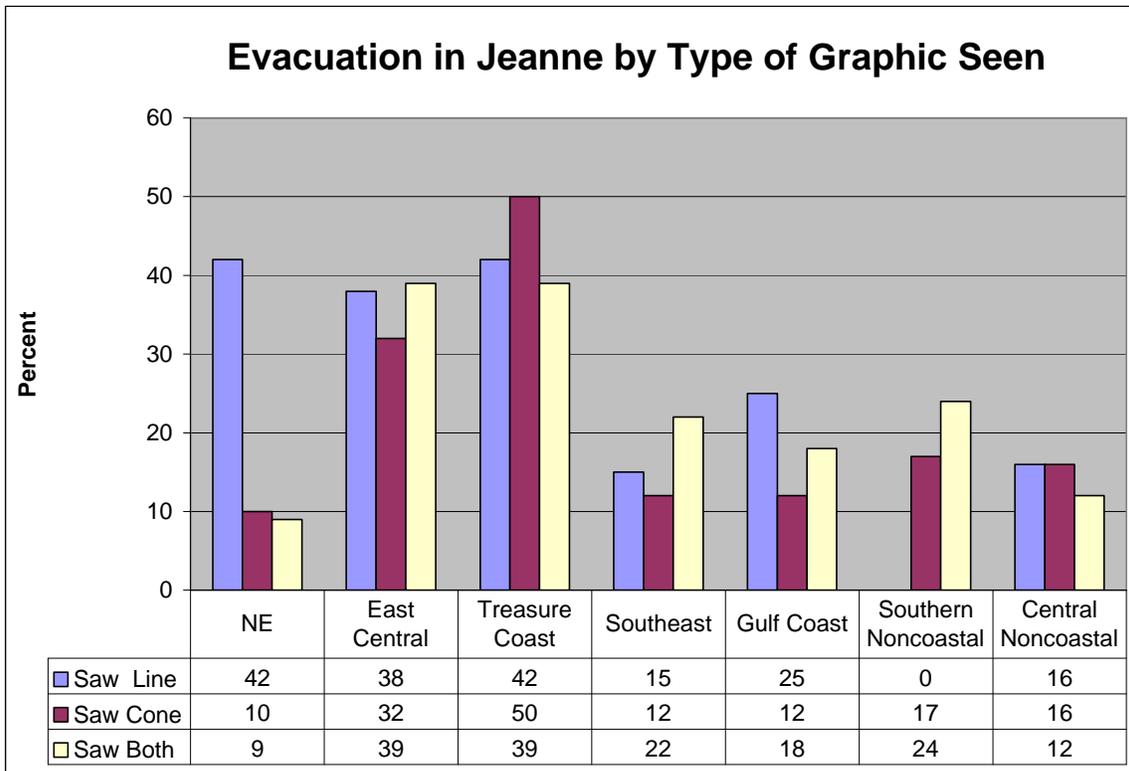


Fig. 58

## Housing and Demographics

Several housing and demographic variables were recorded about respondents, and their relationship to evacuation can be analyzed in a large number of combinations. Some of the more straightforward associations are described here. These are in addition to the associations described previously.

- Housing type. People in mobile homes were more likely than people in other types of housing to evacuate. People in single family detached structures were the least likely.
- Age of mobile home. There was no difference in evacuation rates depending on whether mobile homes were built before or after 1994.
- Window protection. There was no difference in evacuation rates between people in homes with and without window protection, except in non-surge portions of coastal counties. In those locations people without window protection were slightly more likely than others to evacuate
- Building materials. People living in brick homes were less likely than people in wood and concrete block homes to evacuate.
- Children. Households with children were no more or less likely than others to evacuate, except in non-coastal counties. In those areas households with children were slightly more likely than others to evacuate.
- Living alone. People living alone were slightly more likely than others to evacuate.
- Years in home. There was no difference in evacuation based on the number of years people had lived in their home.
- Years in region. People who had lived in their region of Florida for at least 40 years were less likely than others to evacuate.
- Age. Age was not related to evacuation participation rate.
- Income. Evacuation rate was not related to income except in non-coastal counties where it decreased slightly with increased income.
- Education. Education was unrelated to evacuation rate.
- Race. Whites were more likely than others to evacuate.
- Evacuation in Charley. People who evacuated in Charley were more likely other people to leave in Jeanne. Of those who evacuated in Charley, 53% left in Jeanne.
- Previous Hurricane Experience. People who said they had experienced a major hurricane prior to the 2004 season were less likely than others to evacuate in Jeanne.
- Previous Hurricane Damage. People who said they had experienced damage in previous hurricanes (not just Frances) were more likely than others to evacuate in Jeanne. As damage increased evacuation in Jeanne increased.
- Experience in Frances.
  - People who evacuated in Frances were more likely than other people to leave in Jeanne, within each risk area, although evacuation rates were lower overall in Jeanne than in Frances from the same locations. Of those who left in Frances, only 65% left in Jeanne (of those who did not leave in Frances, 12% did leave in Jeanne).
  - Responses to open-ended questions about why Frances evacuees did not leave in Jeanne were mostly similar to those indicating why people didn't leave in Frances. That is, most people either expected the worst of Jeanne to miss their location or to not be strong enough to pose a danger, given the location and construction of their homes.
  - Some respondents who didn't evacuate in Jeanne did make reference to the fact their home wasn't damaged in Frances and so they felt safe in Jeanne, but they were a small number overall.
  - People who experienced damage in Frances were more likely than others in the same locations to evacuate in Jeanne.
  - One factor contributing to lower evacuation rates in Jeanne was reception of evacuation notices from public officials. Only 70% of the people saying they

heard evacuation notices in Frances said they also heard them in Jeanne. Ninety percent of the Frances evacuees who said they heard mandatory evacuation notices in Jeanne evacuated in Jeanne, a much smaller drop off than among those who did not hear evacuation notices in Jeanne.

## Evacuation Timing

### Time between Decision and Departure

Evacuees were asked how much time elapsed from when they made their decision to evacuate and when they left their homes. The overall impression is that for most people there was little delay between decision time and departure time (Figure 59). Times between decision to evacuate and departure were shortest for evacuees from the Tampa Bay/Big Bend area and from the Southern non-coastal area. Some of the locations had few respondents for this question because of the sample size in the location and the low evacuation participation rate. Decision making time might have taken much longer. The responses in Figure 59 show just the time between final decision and departure.

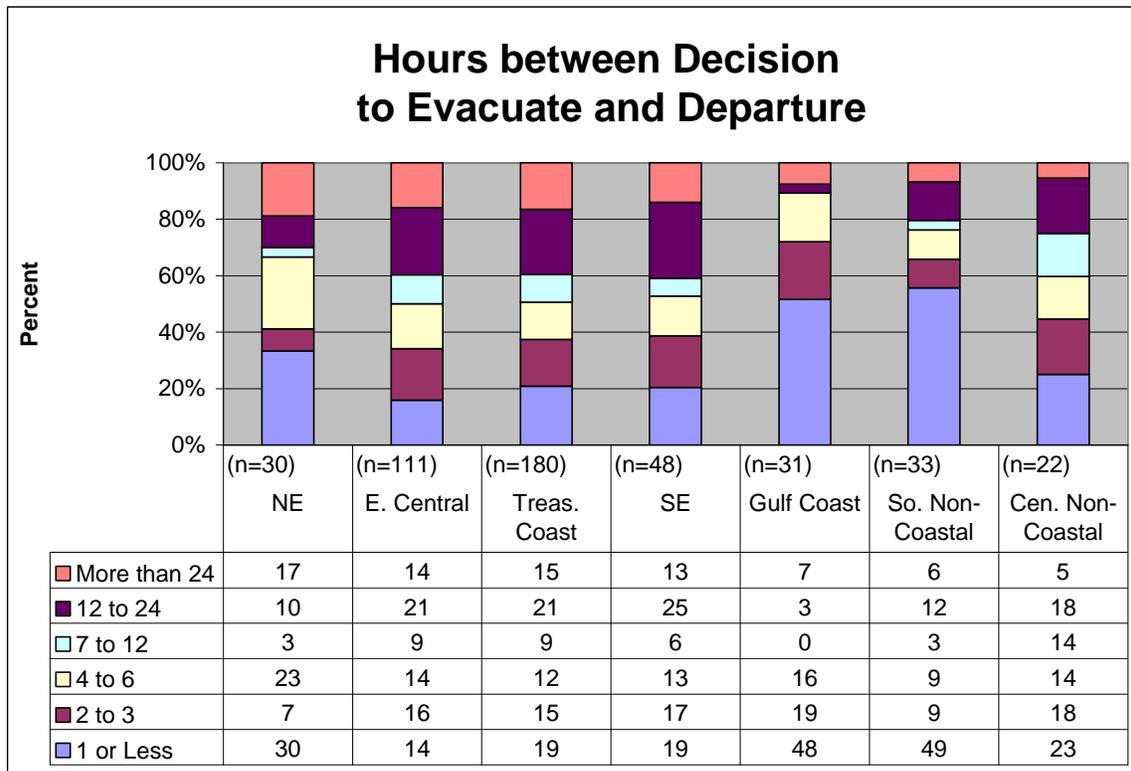


Fig. 59

### Response Curves

After being reminded of when certain events such as warnings and landfall occurred, evacuees were asked when they actually left their homes (time and date). Figure 60 shows cumulative evacuation from three locations between Sept. 24<sup>th</sup> and September 26<sup>th</sup>. That is, it depicts the cumulative percentage of eventual evacuees from each location who had left by various times. A hurricane watch was issued for most of the east coast at 5 AM on the 24<sup>th</sup> and changed to a warning that same evening at 5 PM. The interviews were conducted several months following the evacuation, and some of the respondents had also evacuated for Frances and possibly Charley. Recollections of exact times might not be reliable. More evacuees than usual said they left early,

that is, before warnings were issued by the National Hurricane Center, but that could be a function of the low overall evacuation rate. If more people had left eventually, those early leavers would constitute a smaller percentage of the whole. Timing of evacuation notices are not currently available, but it is unlikely that they preceded the warning. There is a pattern of evacuees leaving in the morning daylight hours, departures tailing off at night, then resuming the next morning. Evacuees from non-coastal areas left later than those from coastal counties. Eye landfall occurred on the east coast near midnight on the 25<sup>th</sup> (officially 12 AM on the 26<sup>th</sup>). Curves are shown only for locations with sufficiently large number numbers of respondents to the question (excluding “don’t know” responses).

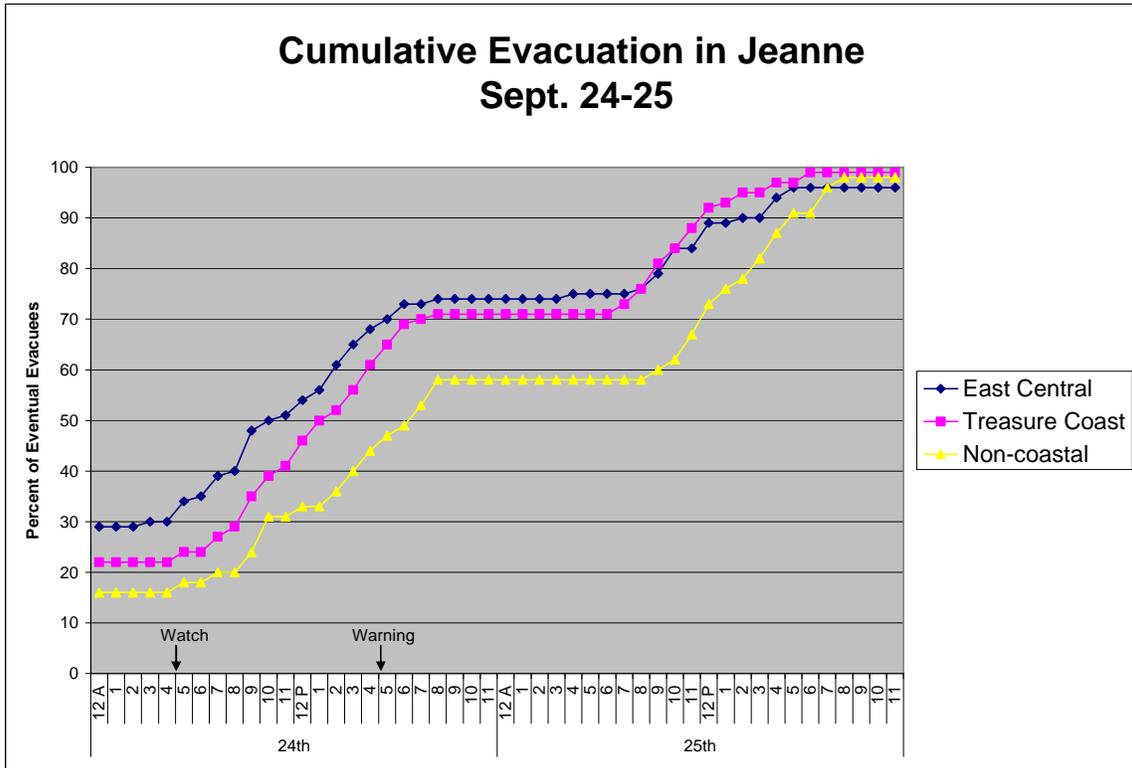


Fig. 60

## Evacuation Destinations and Travel

### Type of Refuge

Evacuees were asked whether they went to a public shelter, a hotel or motel, the home of a friend or relative, or someplace else when they evacuated. Figure 61 shows the distribution of refuge types for the seven survey locations. As in most hurricane evacuations, the majority of evacuees (52% to 69%) went to the homes for friends and relatives. The percentage going to public shelters ranged from 2% in the Treasure Coast area to 14% in the Tampa Bay and Southern non-coastal areas where evacuation rates were low and mainly from non-surge locations. Evacuees from non-surge areas tend to use public shelters more than evacuees from other risk areas. The category labeled “other” includes second homes, workplaces, churches, mobile home park clubhouses, and boats.

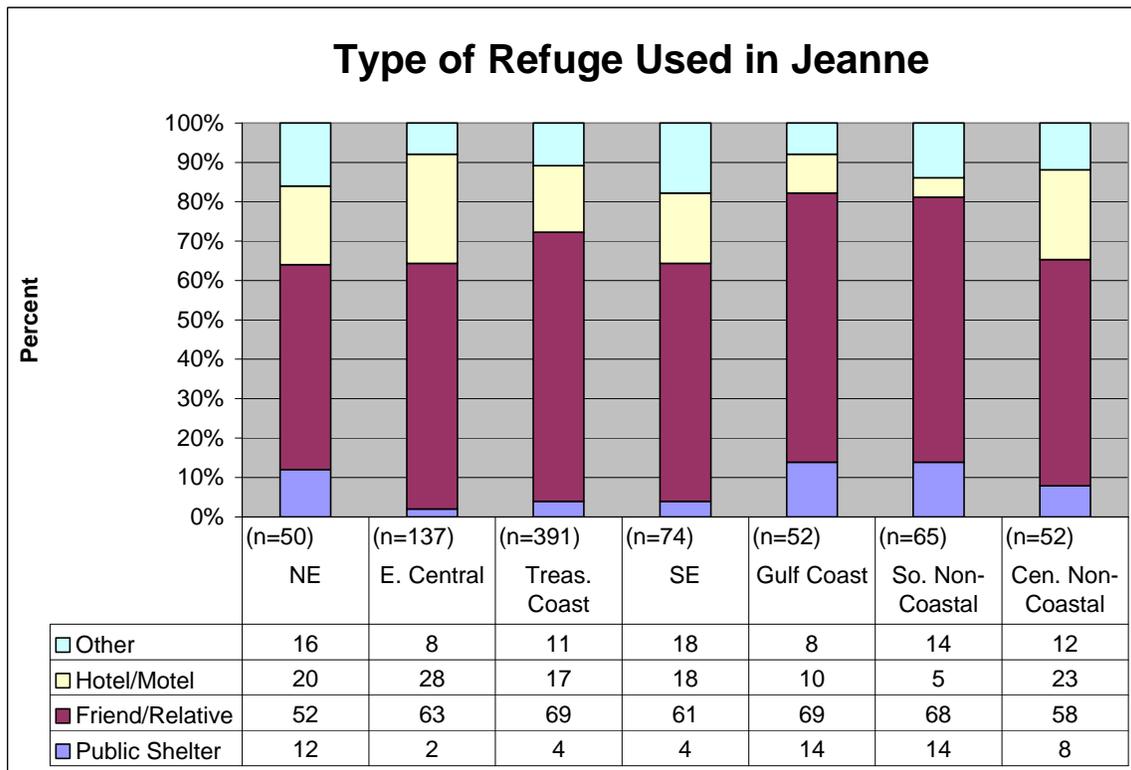


Fig. 61

### Factors Associated with Type of Refuge Used

It is typical for evacuees from more vulnerable locations to rely less than others on public shelters, and that was the case in Jeanne (Figures 62). In Jeanne the greatest difference was between non-coastal counties and other locations. Relatively few evacuees relied on public shelters in any of the risk zones.

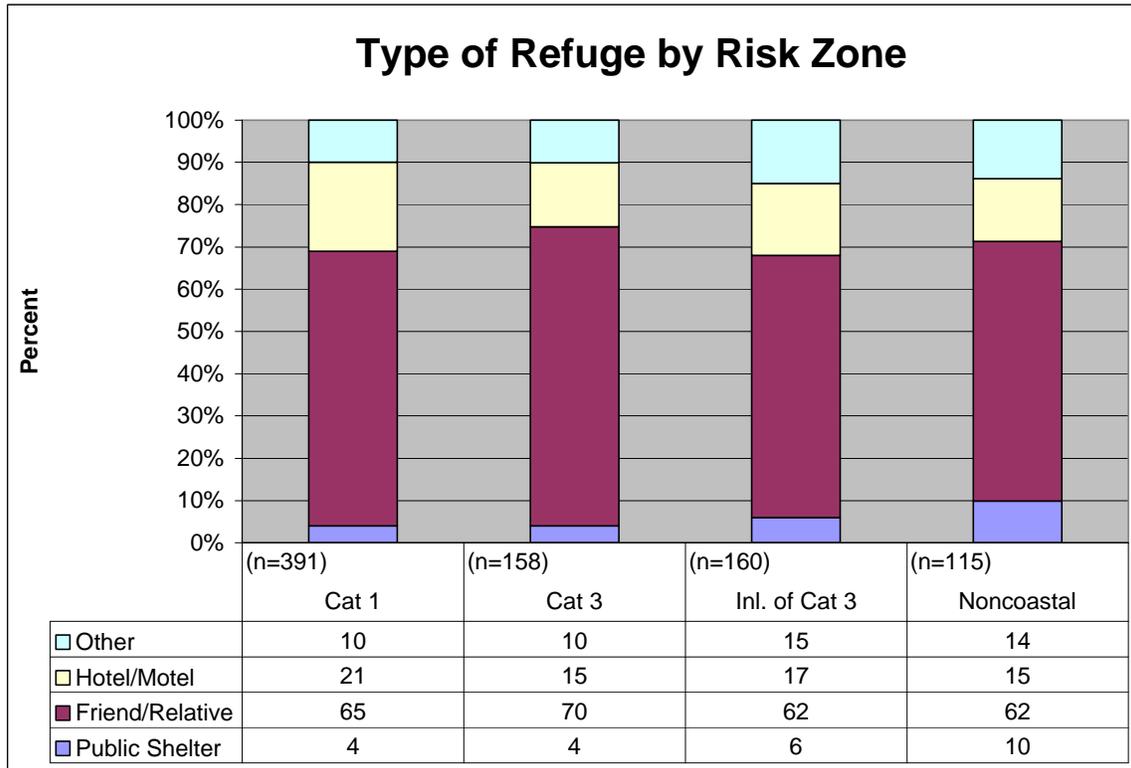


Fig. 62

#### Demographics and Use of Public Shelters

The following demographic variables were related to use of public shelters in Jeanne:

- Mobile home residents used public shelters more than other residents.
- Use of public shelters generally decreased with age except at the ends of the age distribution where the pattern was reversed. Shelter use was lowest among people under the age of 30 and highest among people over the age of 80.
- People in homes in which at least two residents were 80 or more years of age used public shelters more than other people.
- People in homes in which there were people with special needs used public shelters more than other people.
- Non-whites used public shelters more than whites.
- People in households with higher incomes used public shelters less than other people.
- People who had lived in their region of Florida for at least 40 years were less likely than others to use public shelters.
- People with less than some college education were more likely than others to use public shelters.
- People who used public shelters in Frances were more than likely than others to use public shelters in Jeanne. Seventy-five percent of those who used public shelters in Frances also do so in Jeanne (20% went to friends and relatives in Jeanne). Ninety-four percent of those who used public shelters in Jeanne had done so previously in Frances.

There was NO relationship between public shelter use and number of years in ones home, children in the household, living alone, or pet ownership.

## Location of Refuge

Evacuees from the East Central and Treasure Coast areas were more likely than others to go to destinations outside their own counties (Figure 63). In other areas more than half of all evacuees went to places in their own neighborhoods or other places in their own counties.

In most evacuations evacuees from surge areas are less likely than others to go to places in their own neighborhoods and more likely than others to go out of county. In Jeanne that pattern was weak but discernible but weak (Figure 64).

Among evacuees going to public shelters, 69% did so in their own neighborhood and 29% did so elsewhere in their own county. Only two percent of those going to public shelters went outside their own county. Of all the evacuees going out of their own county, less than one percent went to public shelters.

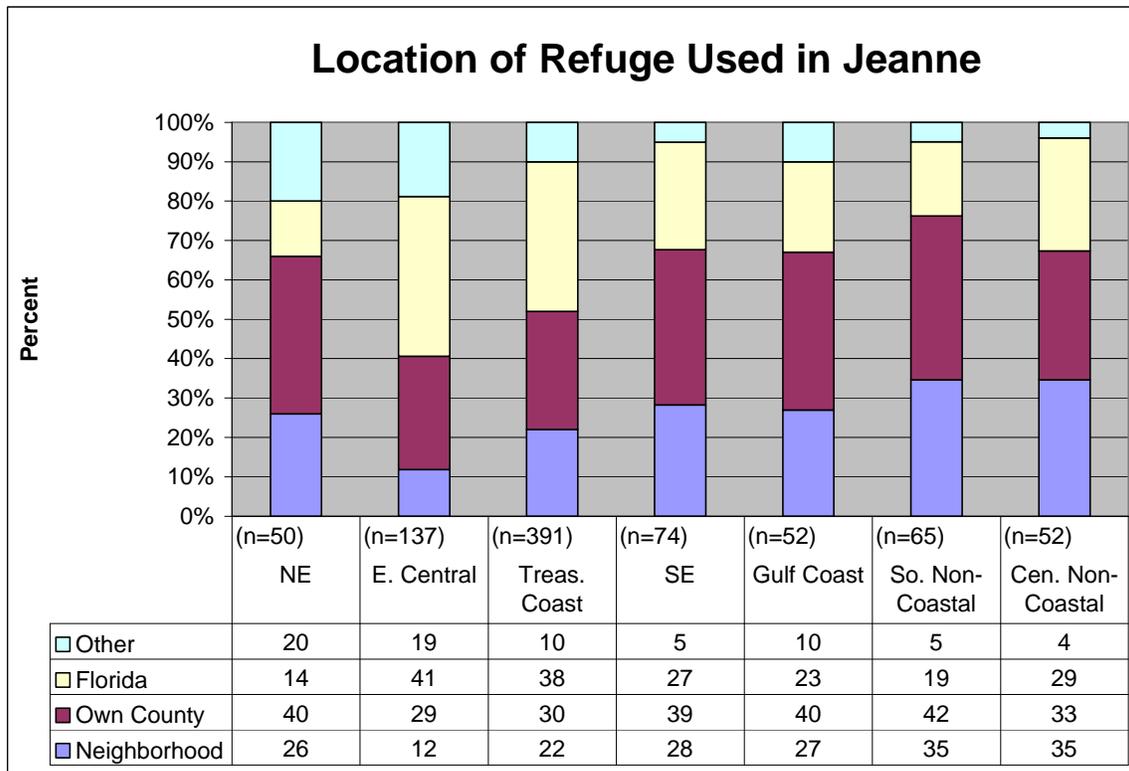


Fig. 63

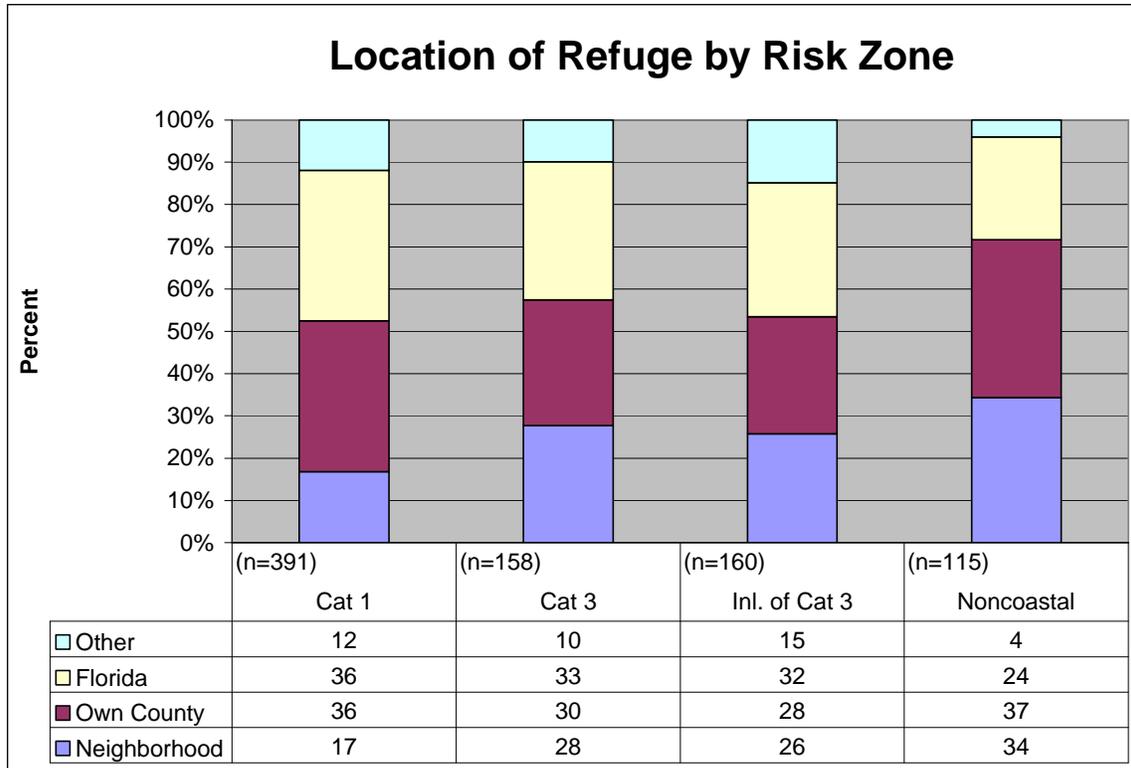


Fig. 64

## Travel

### Original Destination

Almost all evacuees (91% to 100%) said they reached their original destination when evacuating (Figure 65). There was little variation among interview locations.

### Time to Reach Destination

The number of hours traveled en route to destinations was consistent with the distribution of trips to nearby locations. In every location the majority of trips required less than 2 hours (Figure 66). Times were longer in the East Central and Treasure Coast areas than in others but were still low. Travel times in Jeanne were essentially the same as the times normally required to reach the same destinations, reflecting little roadway congestion (Figure 67).

### Distance to Destination

Most evacuees didn't go very far (Fig. 68). The East Central region had the highest incidence of evacuees traveling more than 50 miles (60%).

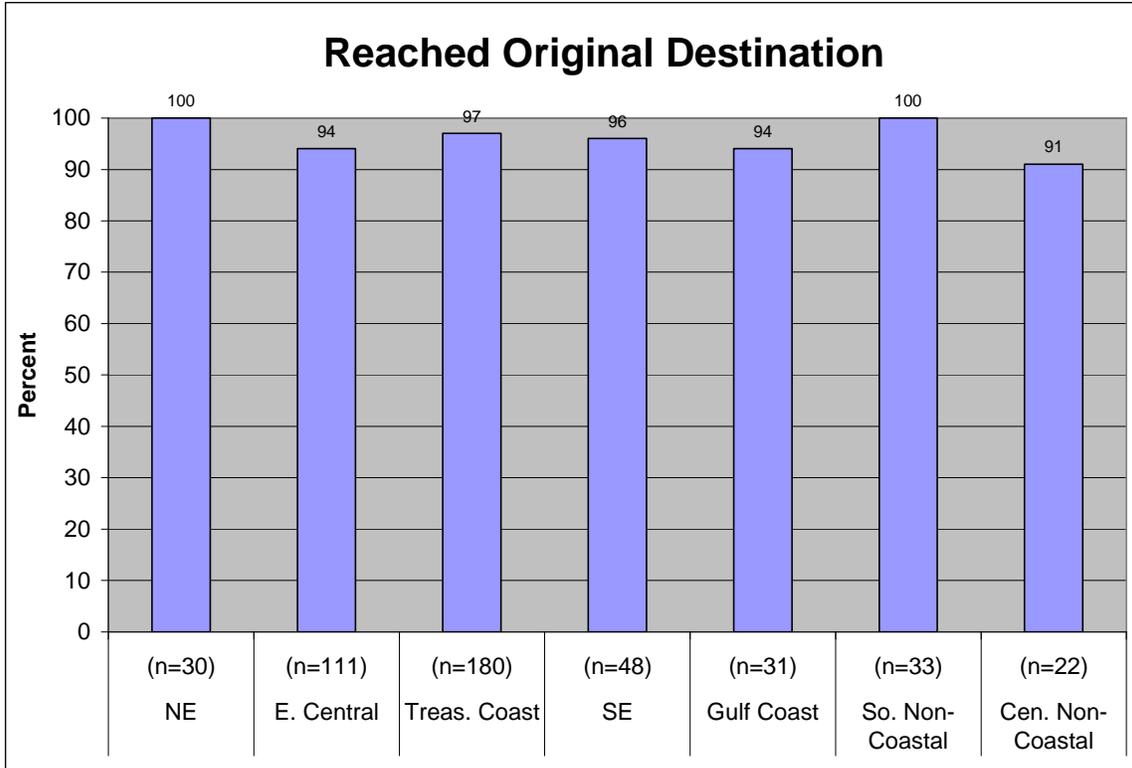


Fig. 65

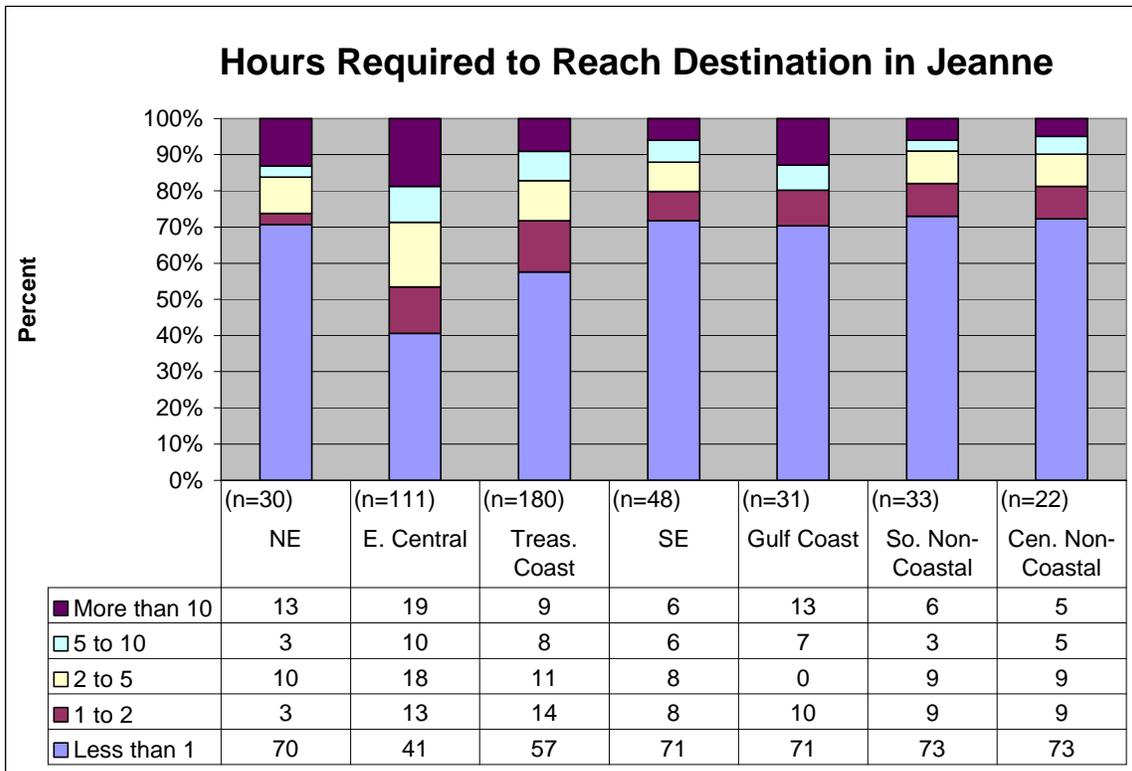


Fig. 66

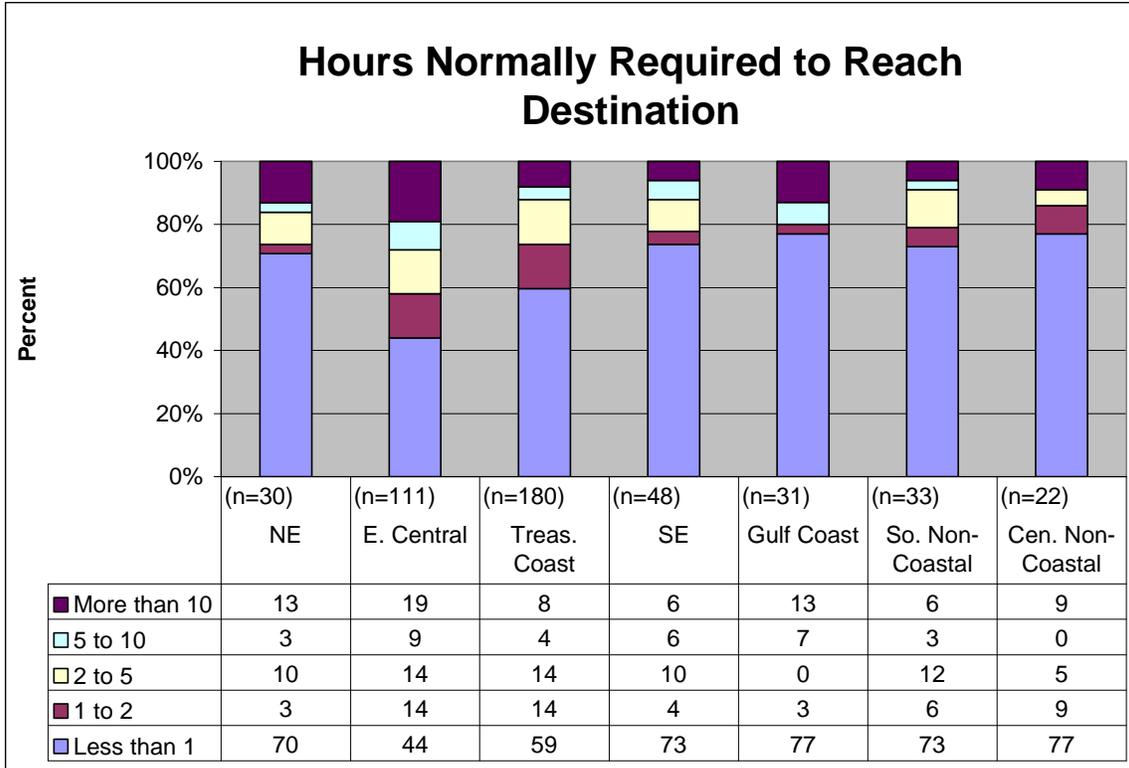


Fig. 67

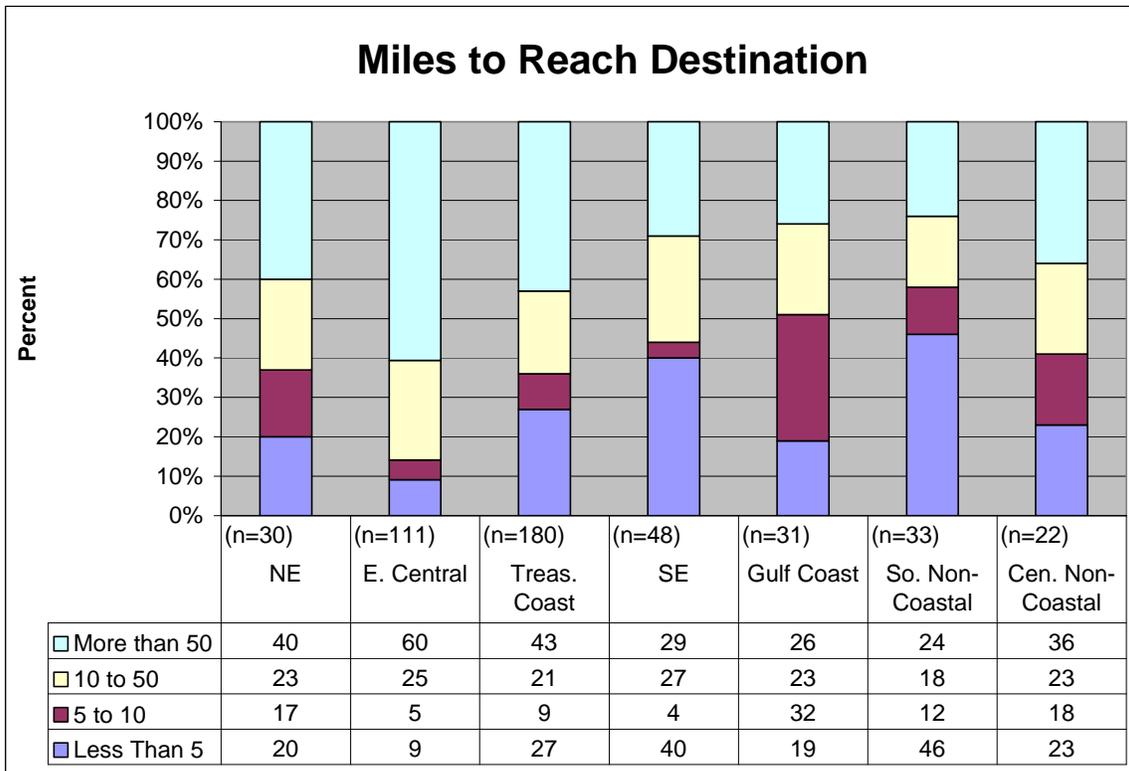


Fig. 68

Choice of Route

Most people said they selected the route they used in evacuating because it was the route they routinely use when going to that place or because they were otherwise familiar with it (Figure 69). Very few respondents said they took the route because of recommendations or instructions from officials.

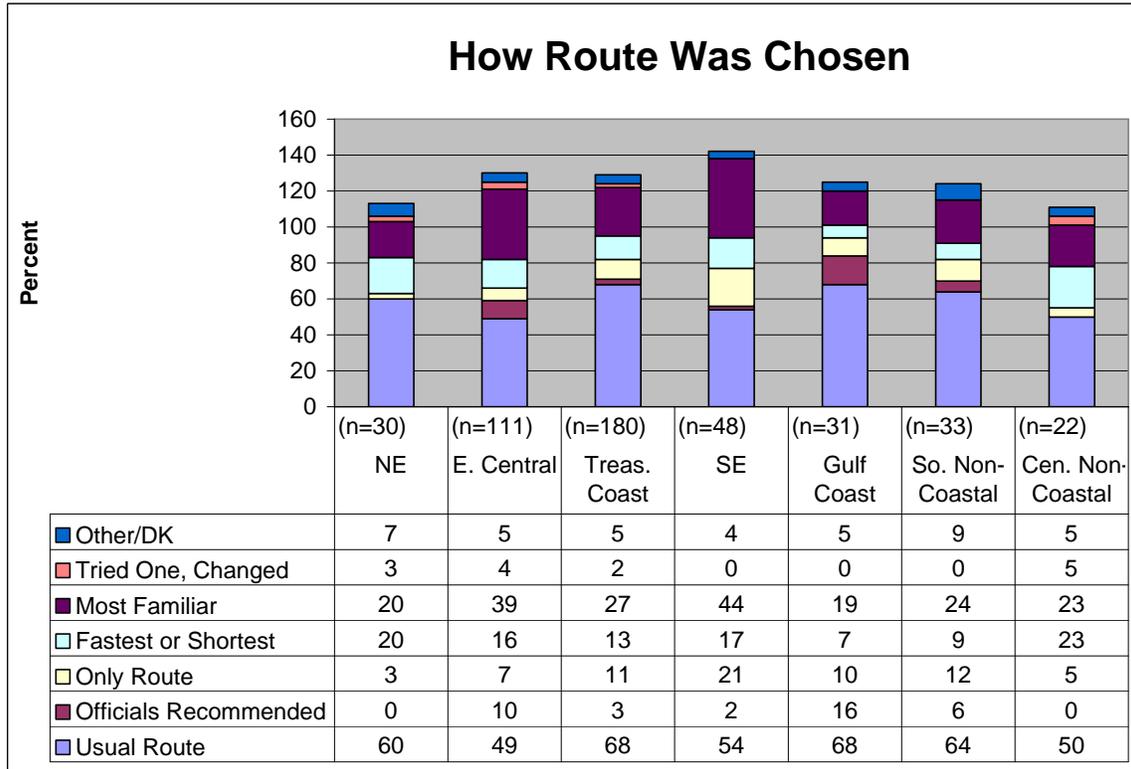


Fig. 69

Availability of Traffic and Road Information

Between 65% and 81% of the evacuees said they were able to find the information they sought about traffic and roads, after leaving home (Figure 70). Responses were closer to 70% in all locations except Southeast Florida, where 81% said they were able to find the information they needed.

Daily Expenditures

Most evacuees said they spent less than \$50 per day during their evacuation (Table 71). Between seven percent and 32% said they spent over \$100 a day. Expenditures by evacuees from East Central Florida were higher than others.

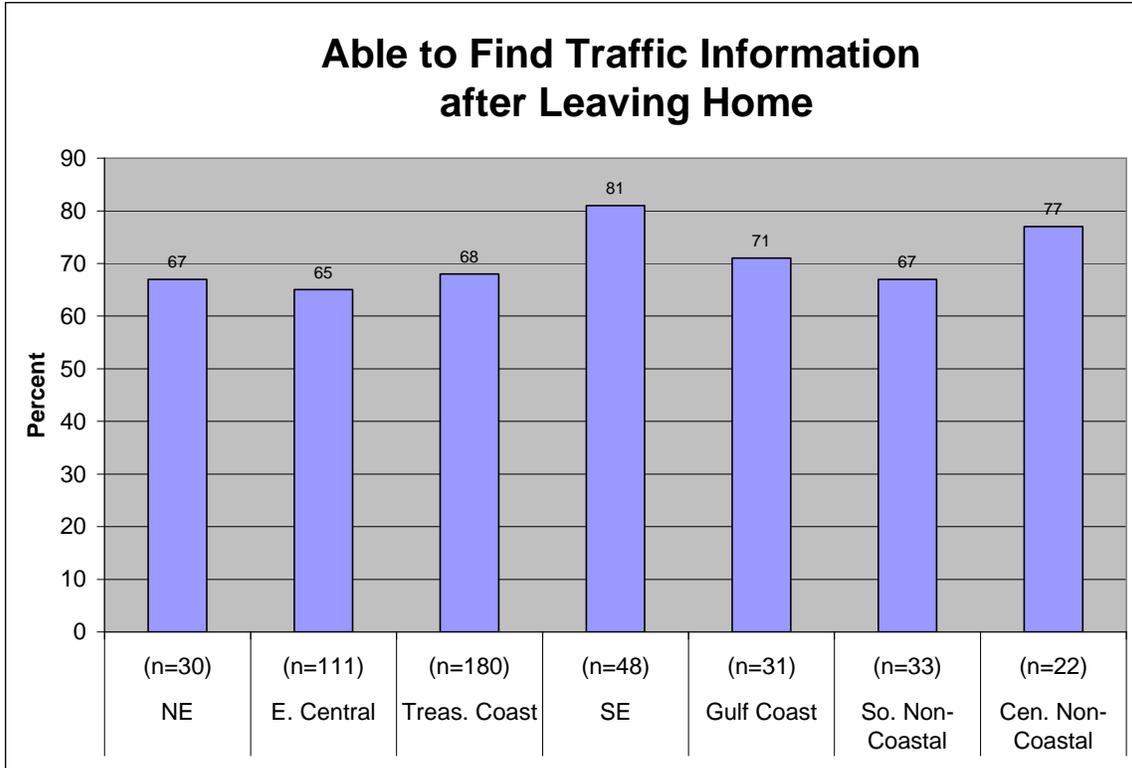


Fig. 70

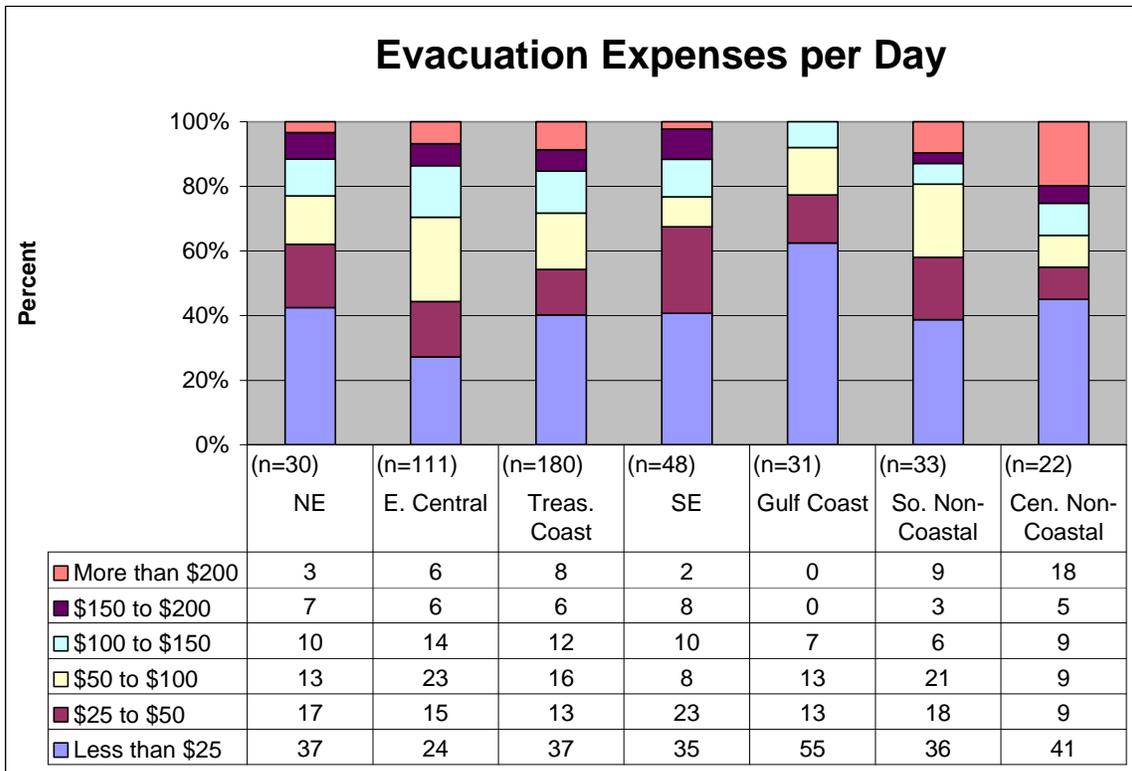


Fig. 71

Time Away from Home

Most evacuees spent three or fewer days away from home, but a significant number were gone at least two days (Figure 72). The longest durations appear to reflect the inability to occupy homes or reenter neighborhoods due to damage following the storm.

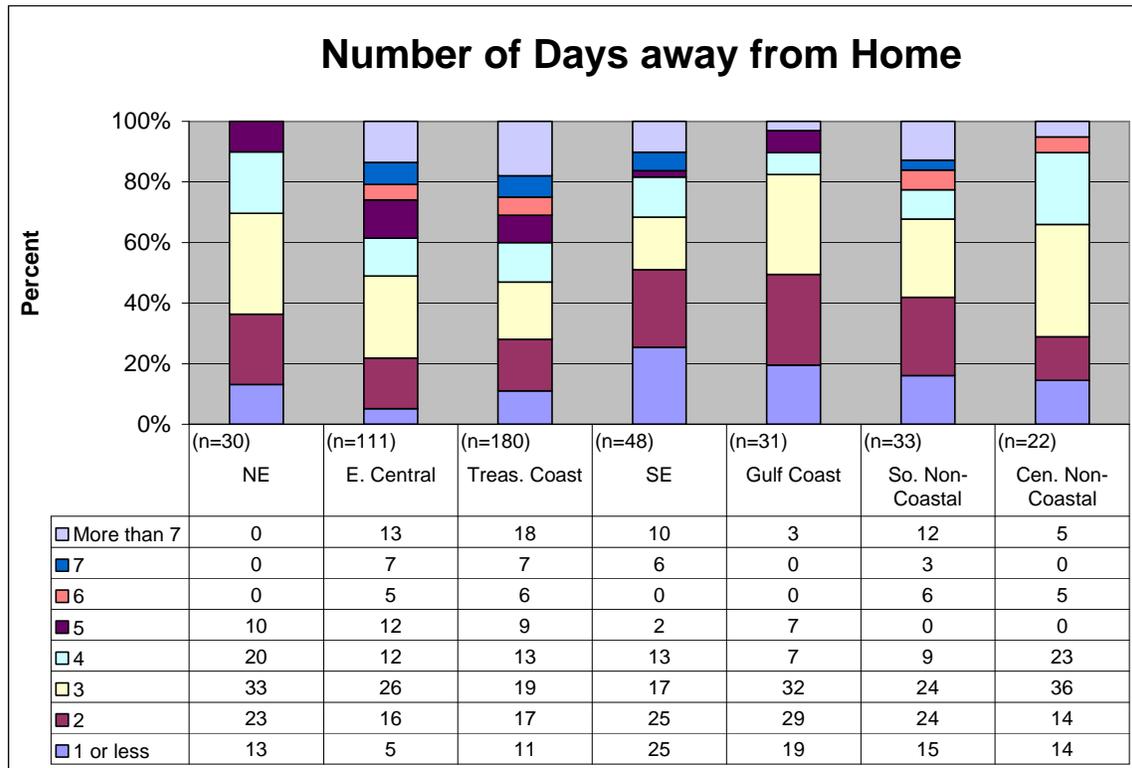


Fig. 72

Availability of Information about Reentry

Treasure Coast evacuees had more difficulty than evacuees from other locations finding reentry information (Table 81). More than a third of those who evacuated from Treasure Coast said they had difficulty finding reentry information, possibly because that region was damaged more than others.

Source of Information about Reentry

At least a plurality of evacuees in all locations said they received their information about reentry from television or radio (Figure 72). In most places television was cited most often. Friends and relatives constituted the third most common source of information. Relatively few telephoned agencies or used the Internet.

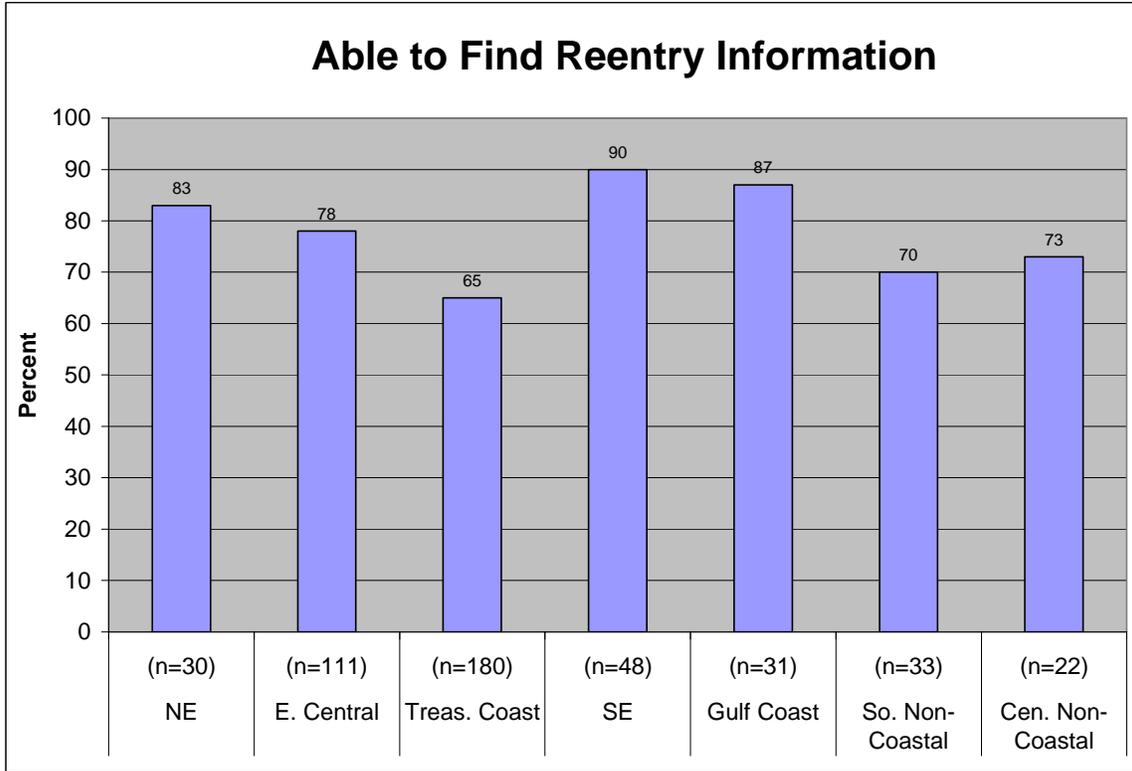


Fig. 73

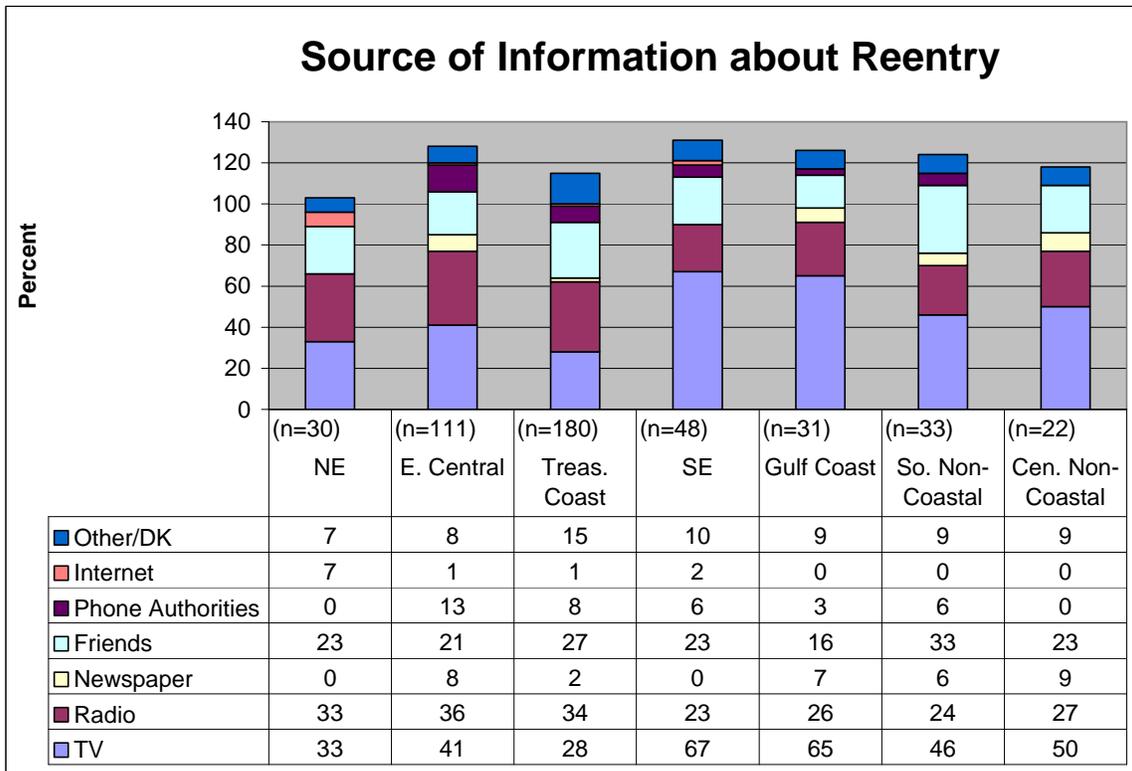


Fig. 74

## Vehicle Use

Evacuees were asked how many vehicles were available for use for the household to evacuate and then asked how many of those vehicles were actually used in Jeanne. Between 67% and 88% of the available vehicles were used in the evacuation (Figure 75). That range is statistically consistent with the 65% to 75% range routinely documented in hurricane evacuations. The areas reporting more than 80% of available vehicles being used had small sample sizes. The number of vehicles used per evacuating household varied from 1.18 in the Tampa Bay/Big Bend area to 1.52 in the Northeast area and 1.5 in the Central non-coastal area (Figure 76). In the areas with the most reliable sample sizes three percent of the households pulled trailers or took motor homes (Fig. 77).

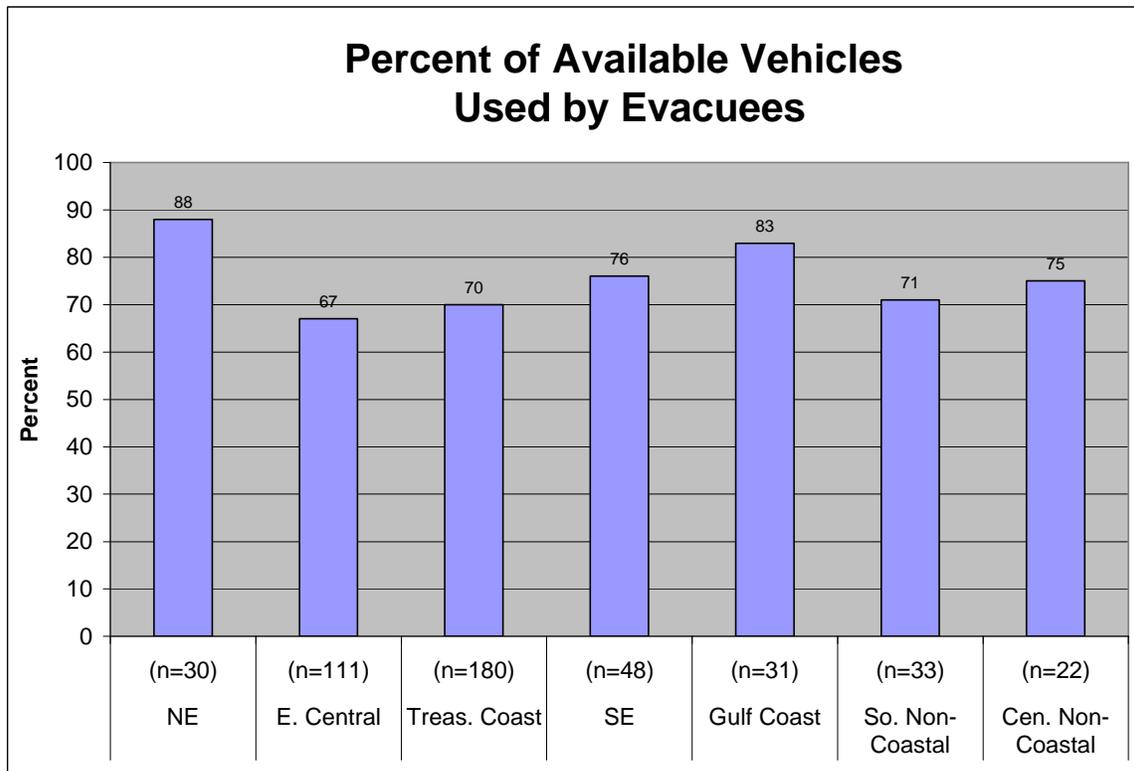


Fig. 75

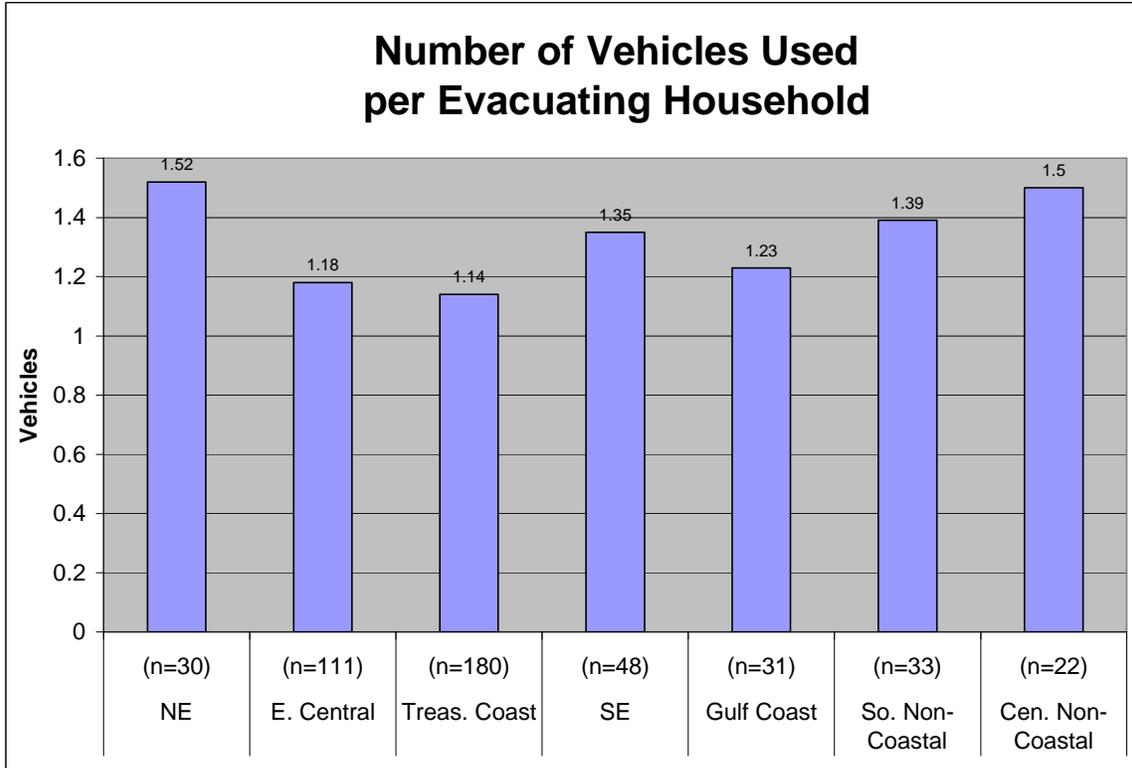


Fig. 76

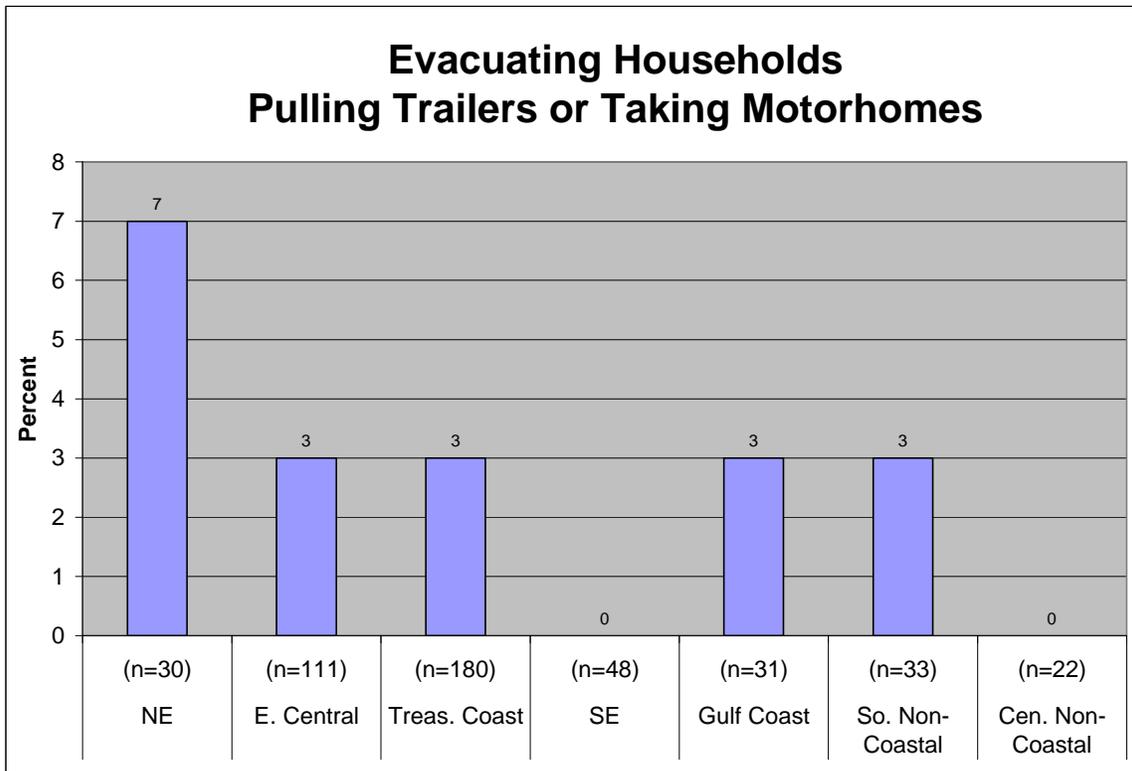


Fig. 77

### Different Response Next Time

Respondents were asked whether they would respond differently in the future if faced with another hurricane threat like Jeanne. The majority, 64% of those who evacuated and 78% of those who did not, said they would do nothing different (Table 3). Of those who didn't leave in Jeanne, 6% said they would next time. Of those who did leave in Jeanne 8% said they would not next time. Small numbers of respondents said they would go to different destinations or leave at a different time.

Table 3. What respondents would do different next time, given the same information (percent of respondents)

Nothing different	64 (if evacuated) 78 (if stayed)
Evacuate (if didn't leave in Jeanne)	6
Stay (if evacuated in Jeanne)	8
Leave earlier	3
Wait later to leave	.3
Go farther	1
Don't go as far	.4
Go to public shelter (if didn't go to shelter in Jeanne)	.5
Go someplace other than public shelter (if used shelter in Jeanne)	2
Use different route	.4

## Information

### Needed Improvements to Evacuation Information

Evacuees were asked whether they had any suggestions for improving evacuation information, and most said they did not (Figure 78). Among those who said they did have suggestions for improvement the most common suggestions had to do with issuing evacuation notices earlier, better identification of locations needing to evacuate, and more information about evacuation routes, although there were no clearly dominant issues (Figure 79). In the east coast locations with the greatest threat from Jeanne the main items were better information about evacuation routes and more frequent updates.

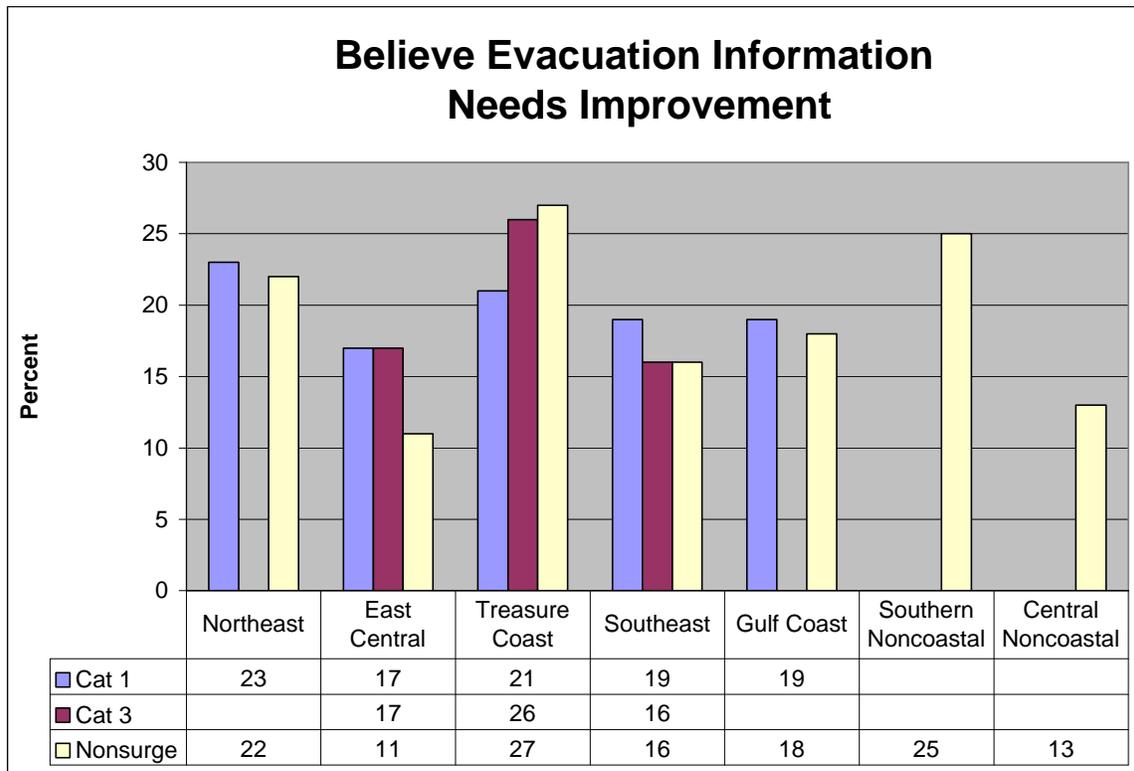


Fig. 78

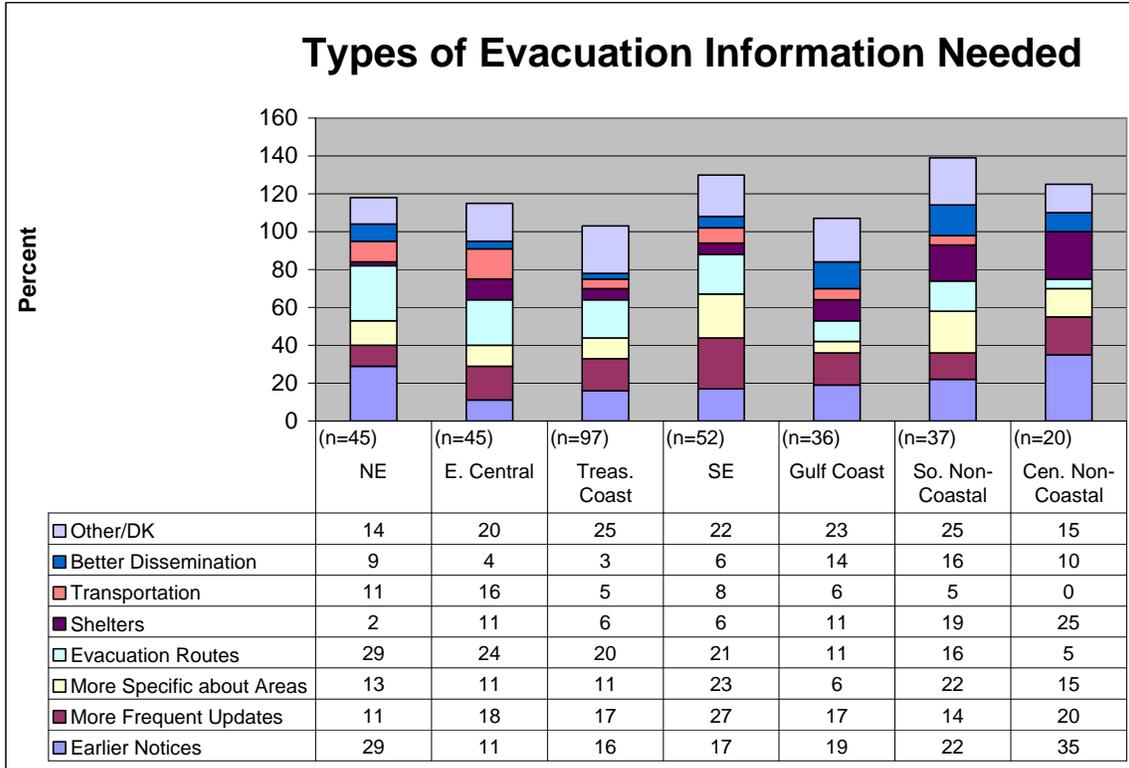


Fig. 79

### Reliance on Various Information Sources

All interviewees were read a list of sources of information about hurricanes and asked how much they relied on each for information about Jeanne. Response options were “not at all,” “a little,” “a fair amount,” and “a great deal.” Figure 80 shows the percentage of respondents who said they relied a great deal of each source of information. Local television was the most frequently cited source in all locations, followed by local radio and the Weather Channel. Only 9% to 22% said they relied a great deal on the Internet for information about Jeanne, but those figures are higher than documented in the majority of earlier hurricane response surveys, higher than Floyd in 1999. Over 30% said they relied on the Internet at least some, and in Southeast Florida almost half said they used it some. Between 32% and 51% said they relied a great deal on The Weather Channel, and 19% to 26% said they relied a great deal on cable channels other than The Weather Channel and CNN. In some cases those were local all news stations.

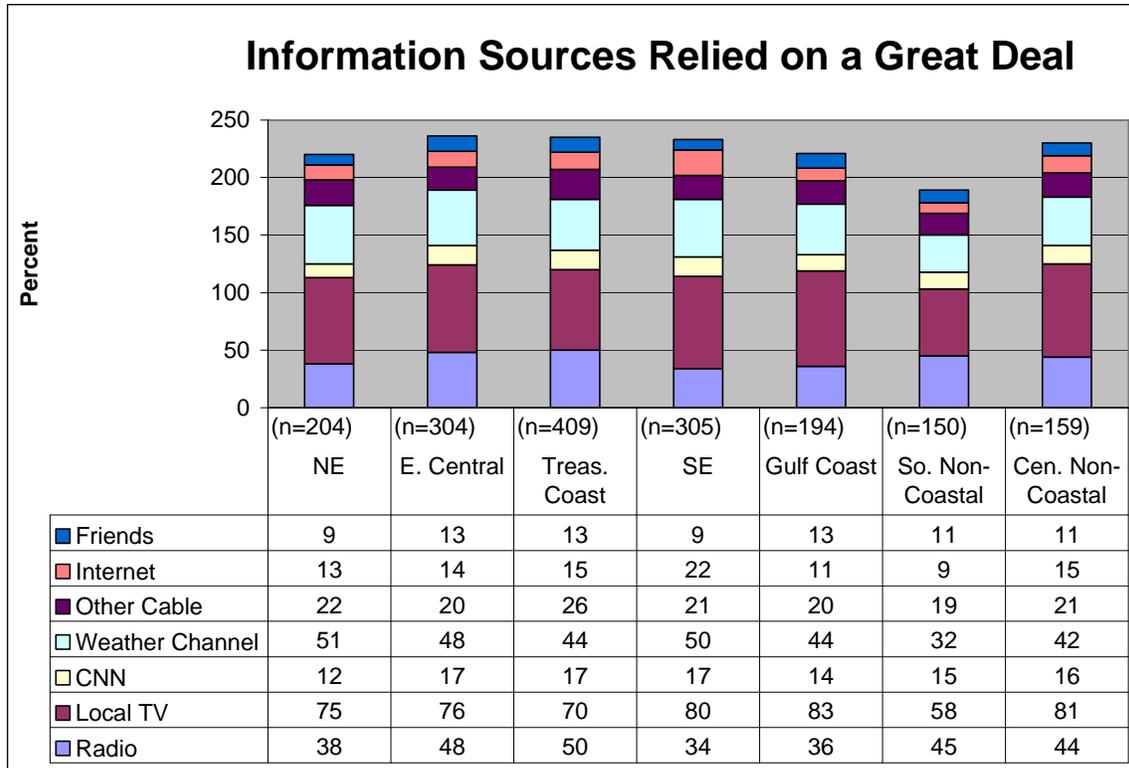


Fig. 80

#### Trust Media for Weather Information

Respondents were asked if they generally trusted their local television or radio stations for general weather information. Replies were extremely affirmative, ranging from 88% to 97% (Figure 81).

#### Sought Information about Jeanne from Local National Weather Service

Between 23% and 41% of the interviewees said they sought weather information from their local National Weather Service office as Jeanne was approaching (Figure 82). Overall there was little difference among locations, but the figure was slightly higher in Southeast Florida than other locations.

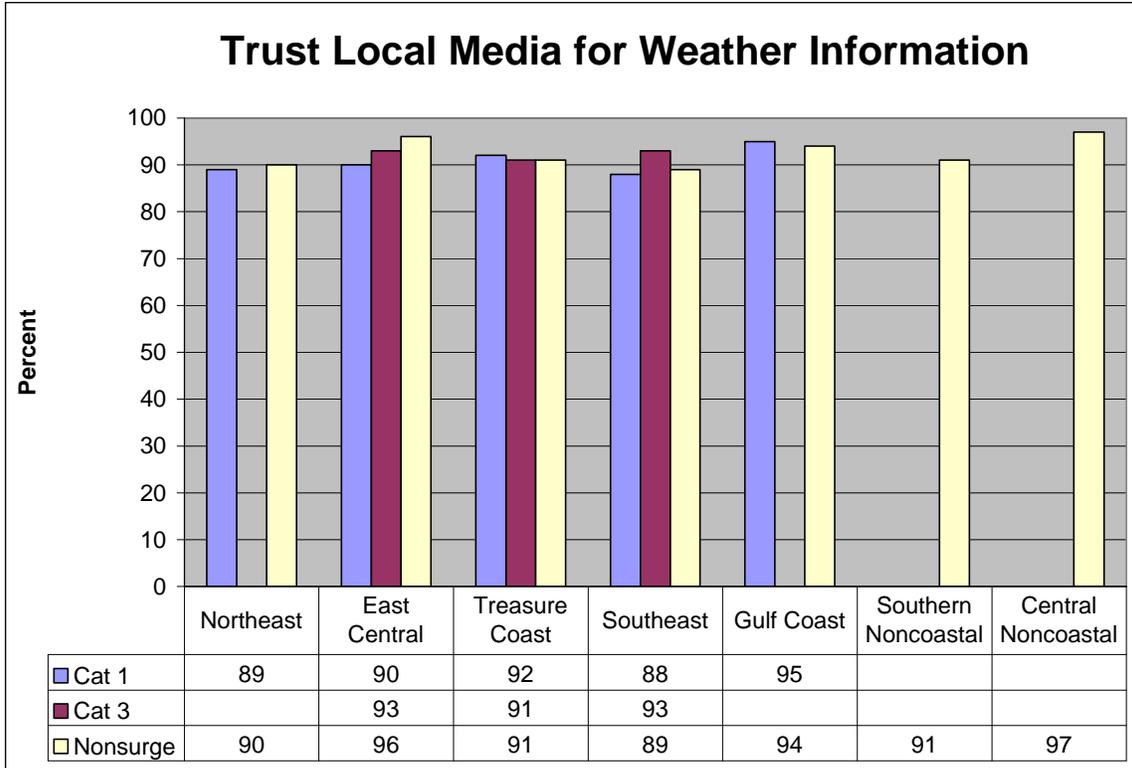


Fig. 81

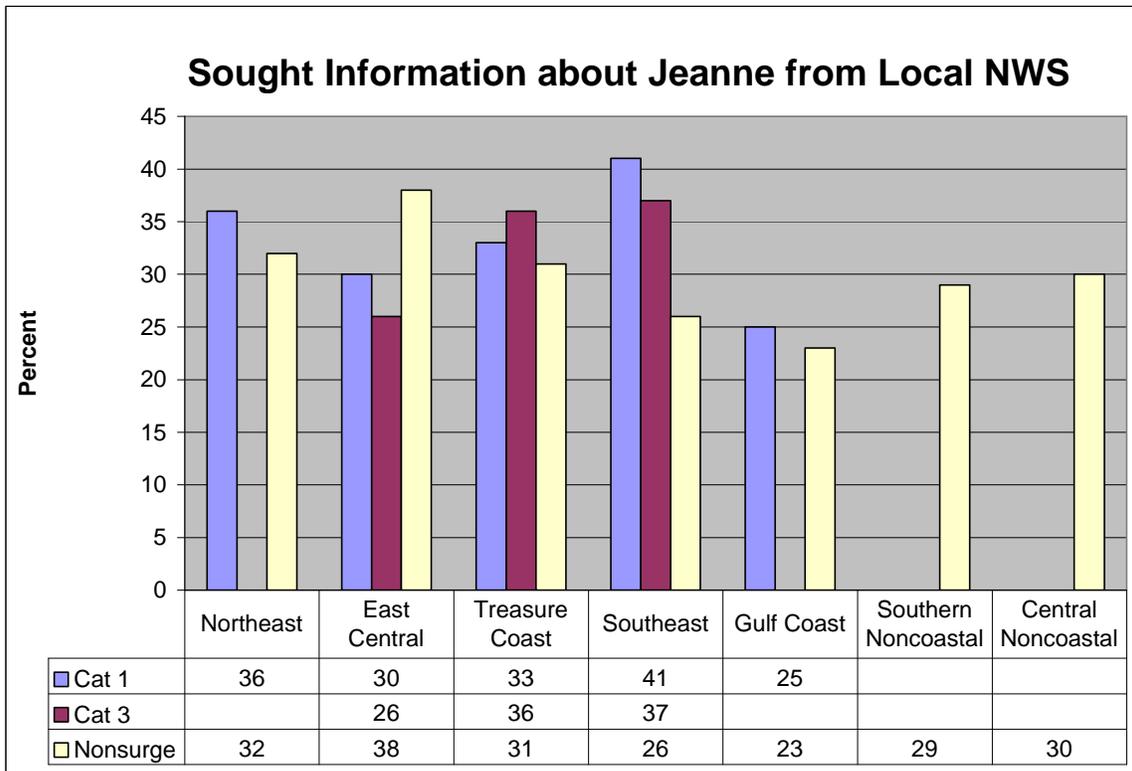


Fig. 82

## Subjects People Would Like to Know More About

Respondents were presented with a list of subjects pertaining to hurricanes and asked if they would like to know more about any of them. Approximately two-thirds of the respondents said they had no desire to know more about any of the subjects (Figure 83). Among people who did want more information, interest was fairly evenly divided among the subjects listed (shelters, mitigation, vulnerability, evacuation routes, roadways, sheltering in place, safe rooms, and insurance). Insurance and evacuation routes were mentioned slightly more often than other subjects. Some respondents said they would like more information about more than one of the subjects.

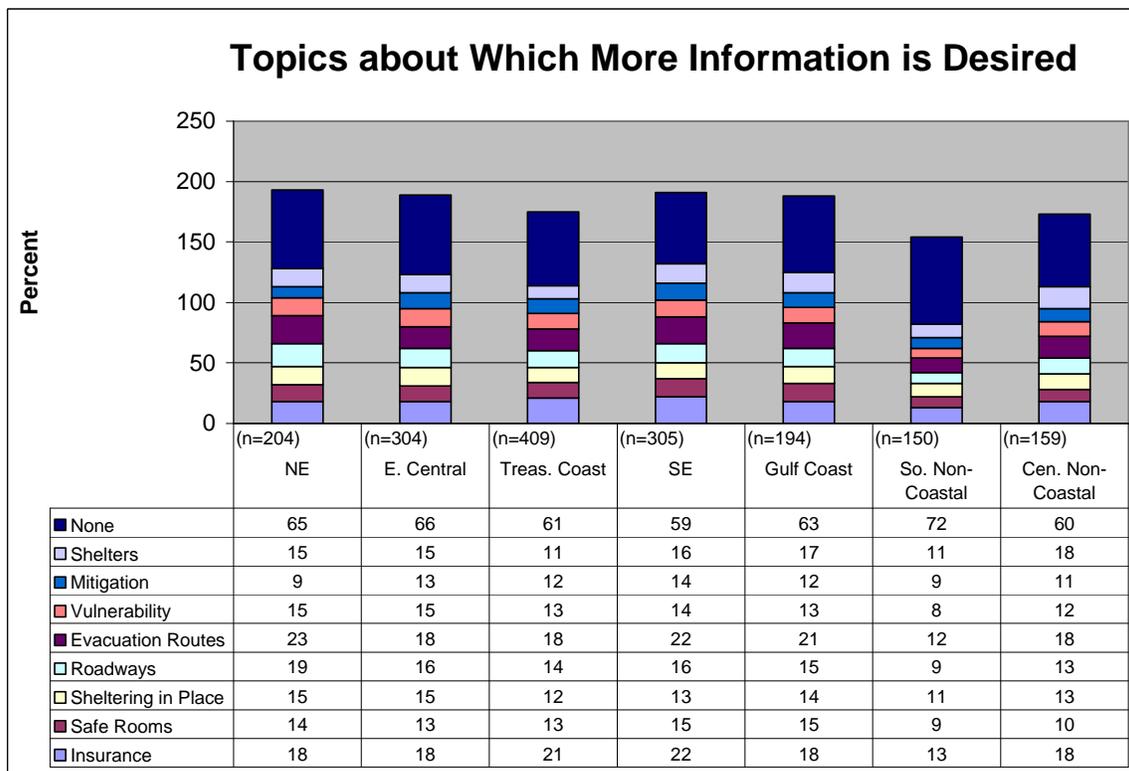


Fig. 83

## Property Protection and Mitigation

### Window Protection

#### Window Protection at the Start of the 2004 Season

Respondents in Southeast Florida and the Treasure Coast region were more likely than others to say they had window protection for their homes at the beginning of the 2004 hurricane season, with Southeast Florida cat 1 area having the greatest incidence of affirmative responses (Figure 84). Affirmative responses were substantially lower in Northeast Florida and in the Tampa Bay/Big Ben area.

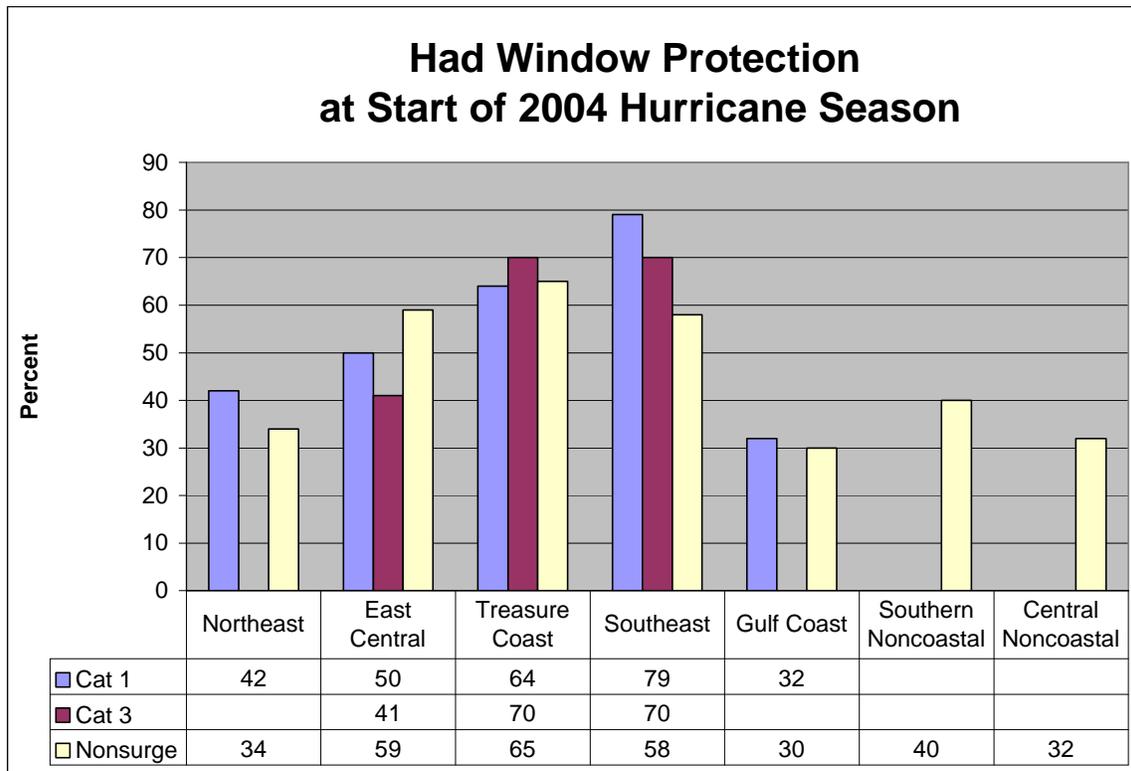


Fig. 84

In households with window protection at the start of the 2004 season, plywood sheets were the most prevalent type, except in Southeast Florida and in the Treasure Coast region (Figure 85). Homes in those two areas were more likely than others to have removable metal panels or roll-down metal barriers.

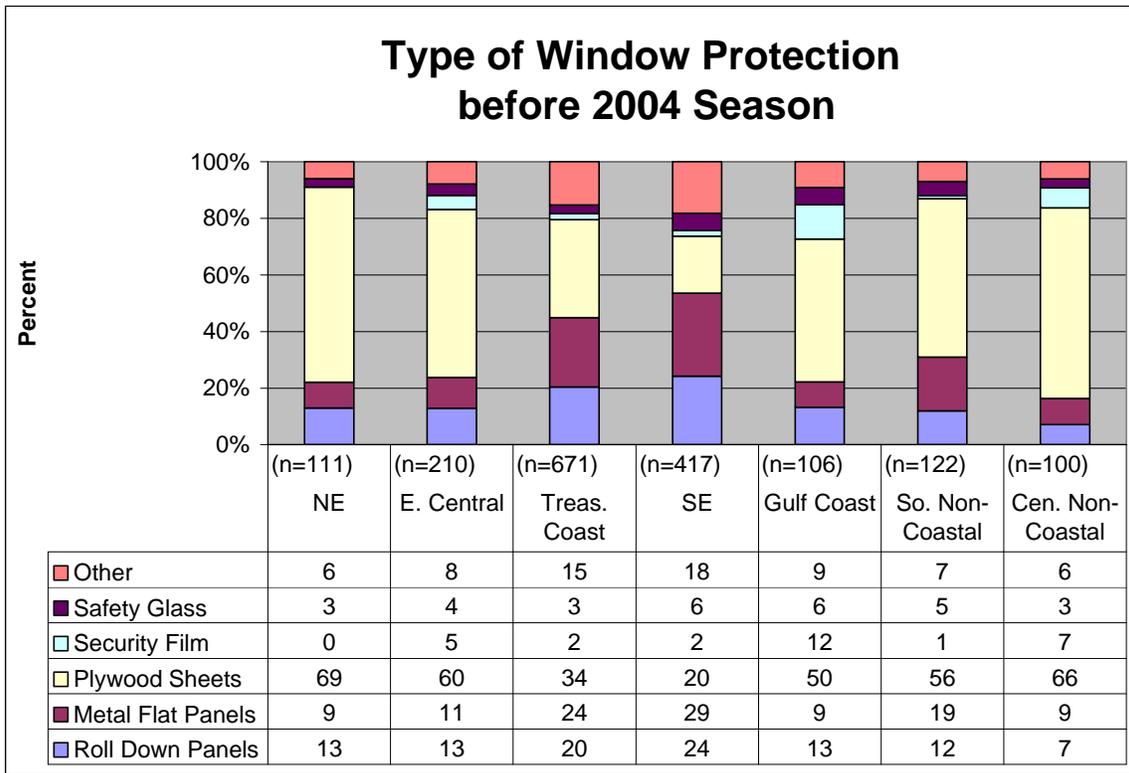


Fig. 85

#### Window Protection Now

Slightly more people said they have window protection now than at the start of the 2004 season (Figure 86). Overall the increase was approximately 5 percentage points. Southeast Florida still has the highest incidence of window protection. Plywood sheets still predominate as the most common form of protection, except in Southeast Florida and the Treasure Coast region (Figure 87).

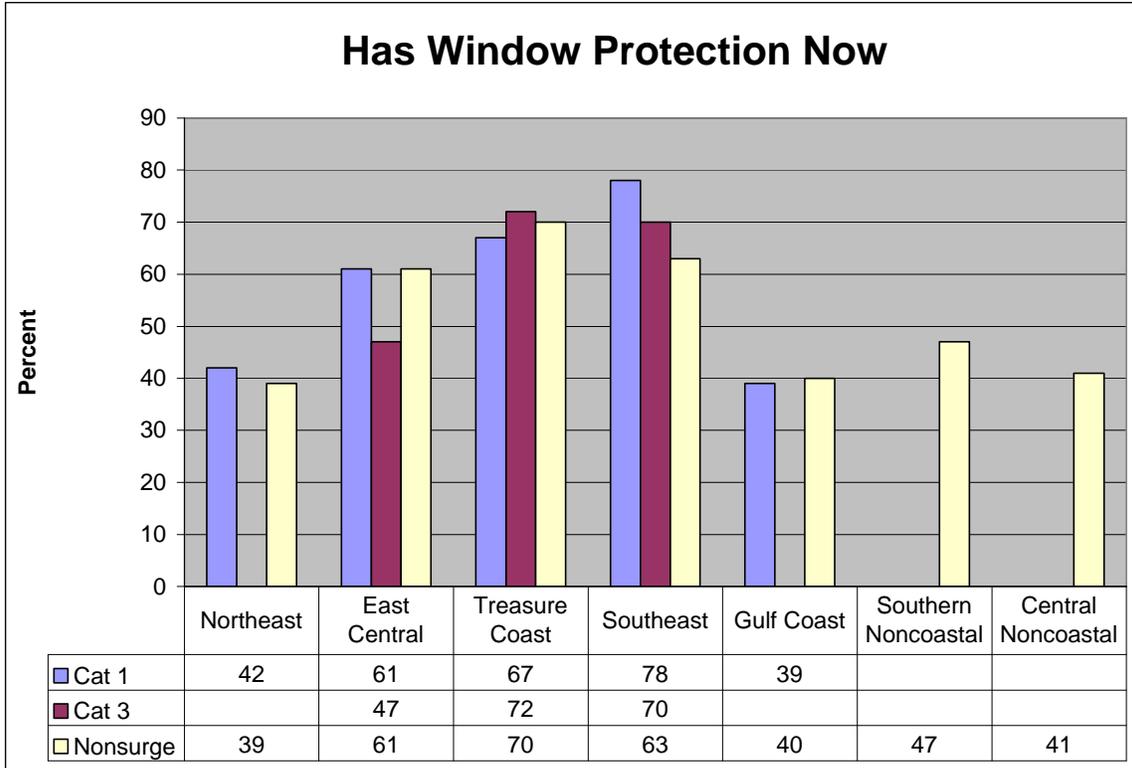


Fig. 86

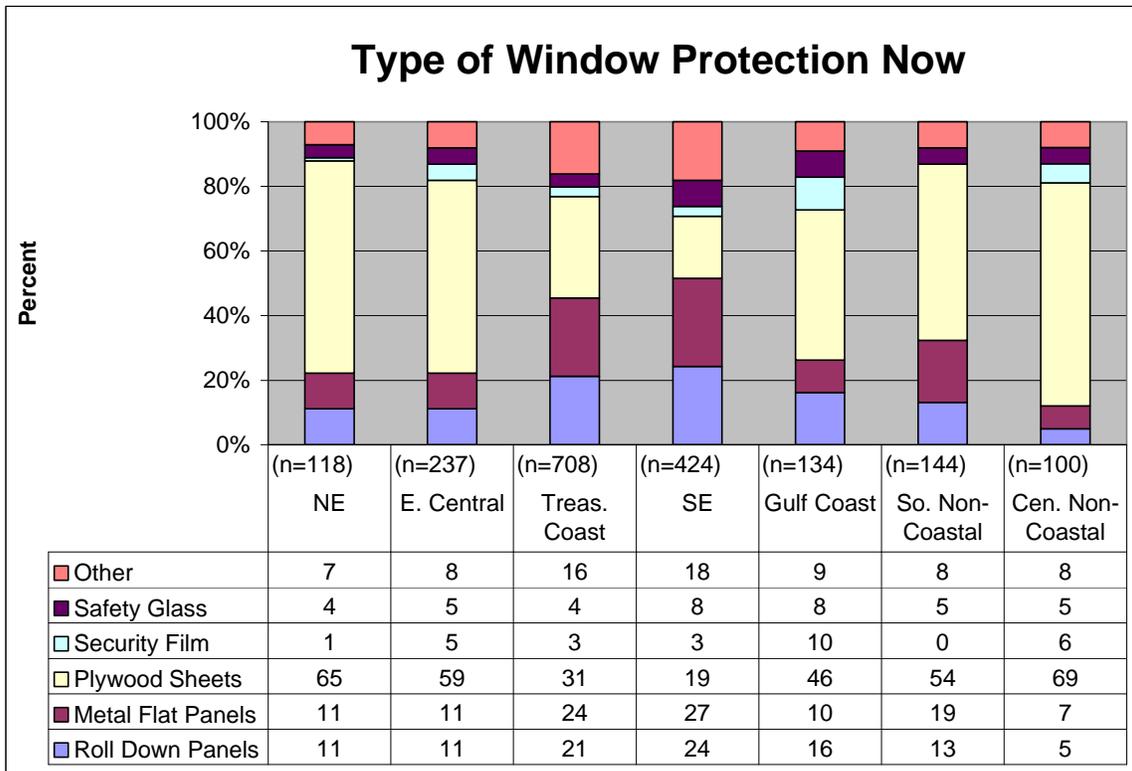


Fig. 87

## Property Protection in Jeanne

As noted earlier 39% to 78% of the interviewees said they took actions to prevent damage to their houses and property in Jeanne (Figure 88). There was little variation among risk zones within regions.

### Permanence of Protective Improvements

The majority of those protective actions were just for Jeanne, not resulting in permanent mitigation improvements to the property (Figure 89). However, 22% to 53% of the improvements were permanent (counting “permanent” and “both” responses), which might include the purchase of items such as plywood that could be used again. Southeast Florida respondents were more likely than those in other areas to say their protective actions were permanent.

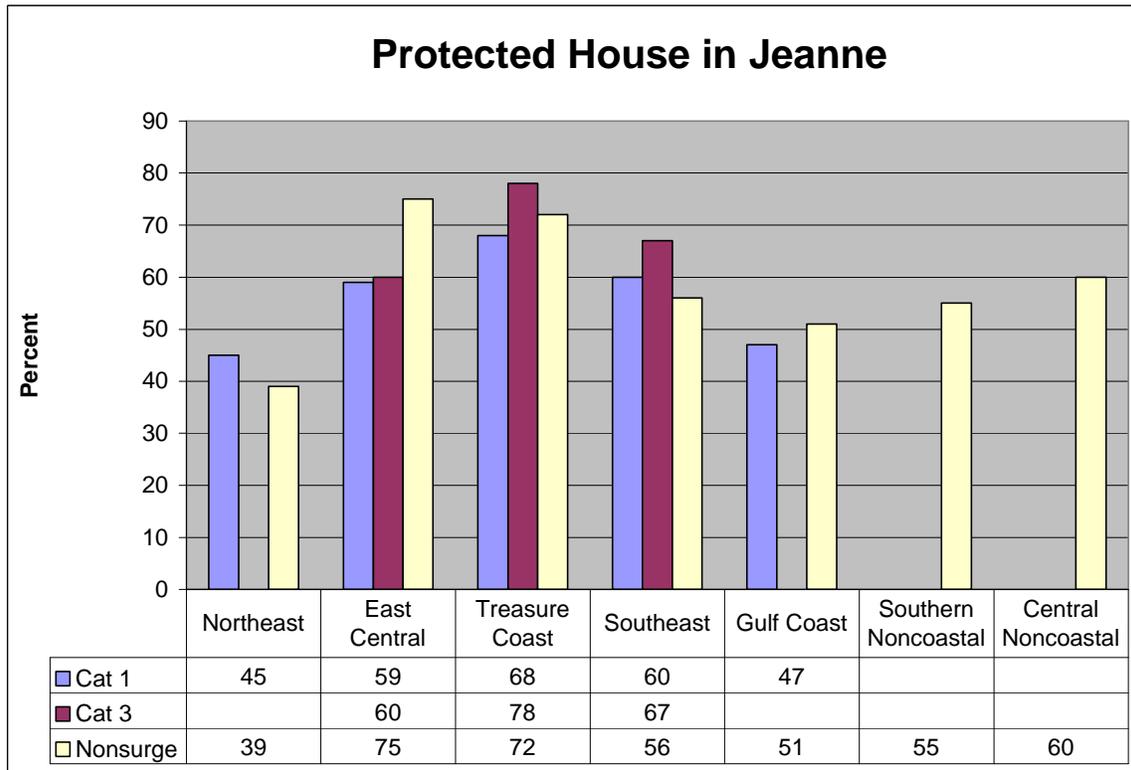


Fig. 88

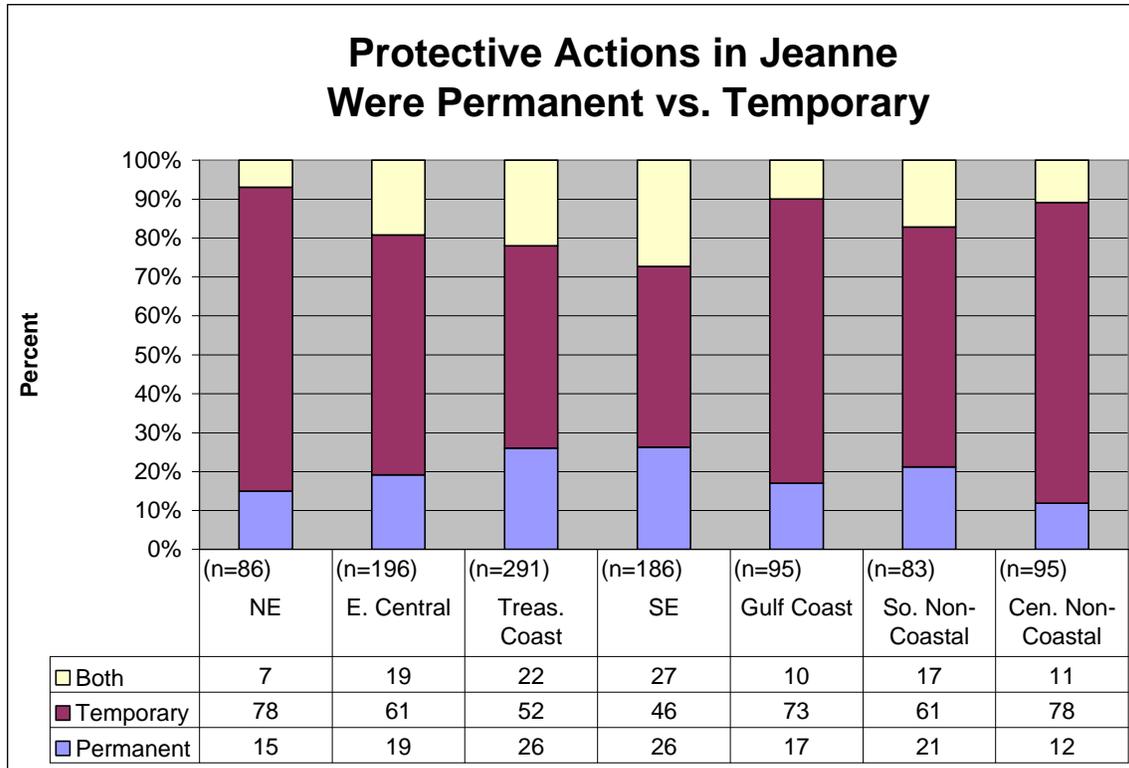


Fig. 89

#### Expenditures on Property Protection in Jeanne

Respondents saying they took actions to protect their property in Jeanne were asked how much they spent. In up to 39% of the homes, people said they didn't spend anything (Figure 90). That could include actions such as installing and applying materials already on hand and securing loose objects. Overall, more than half the sample said they spent less than \$100. East Central Florida and the Treasure Coast area had higher than average expenditures exceeding \$1,000.

#### **Total Expenditures on Hurricane Protection**

Between 32% and 51% of the people in the sample said they had never spent anything on hurricane protection, either during 2004 or before (Figure 91). The Treasure Coast area had the greatest percentage of respondents saying they had spent over \$1,000 (27%). Given the greater incidence of window protection in Southeast Florida it is surprising that reported expenditures were not greater in that region.

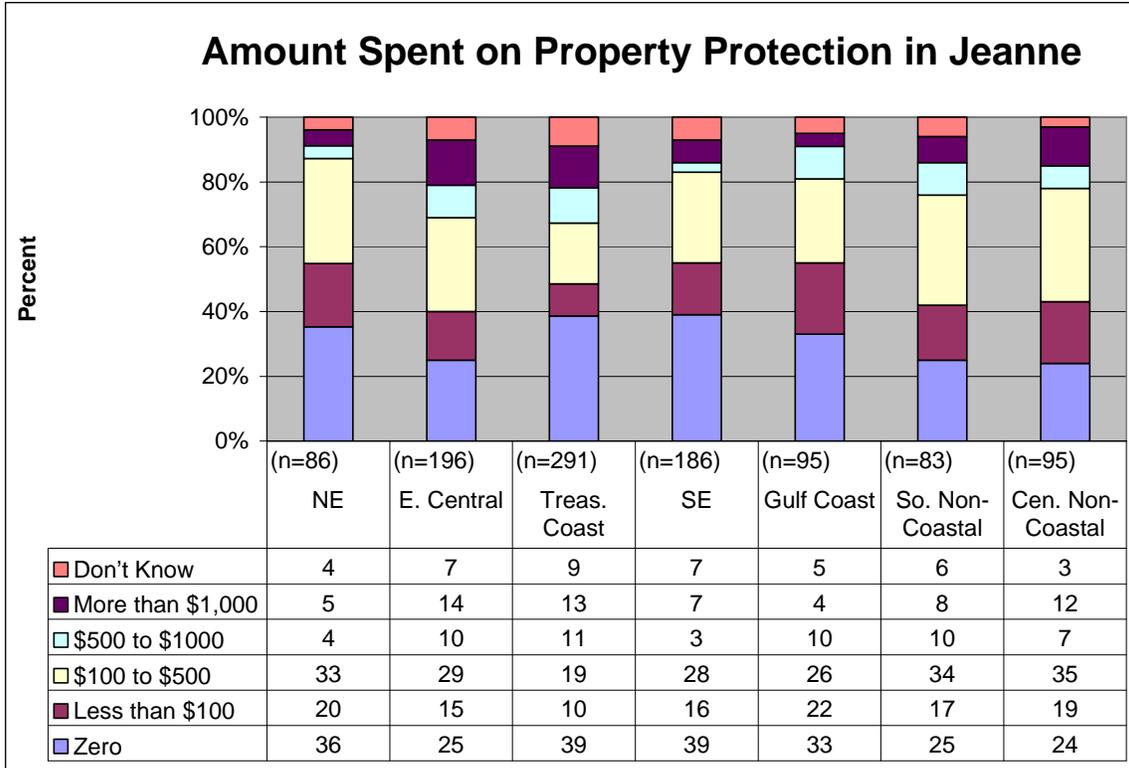


Fig. 90

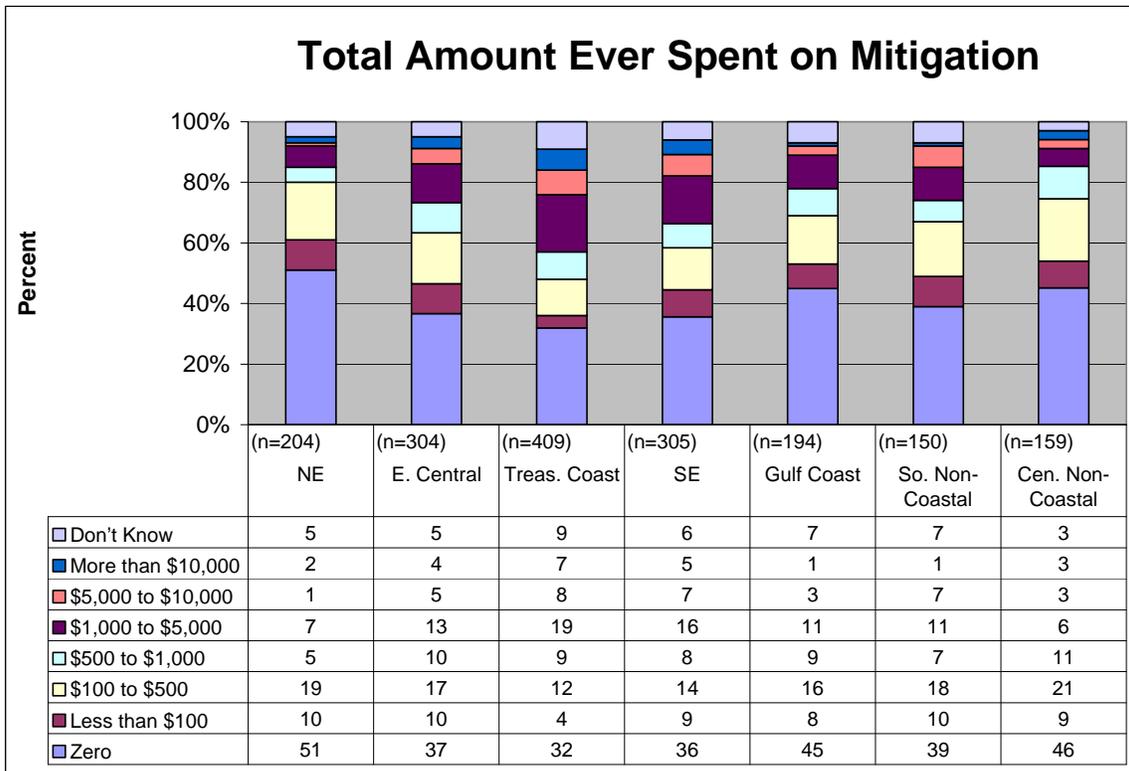


Fig. 91

### Awareness of Mitigation Assistance Grants

Between 11% and 25% of the respondents said they were aware of programs in their community that would provide funds to make homes more hurricane resistant (Figure 92). Affirmative responses were lowest in Southeast Florida, the cat 1 surge area of the Tampa Bay/Big Bend region, and in the non-surge area of Northeast Florida.

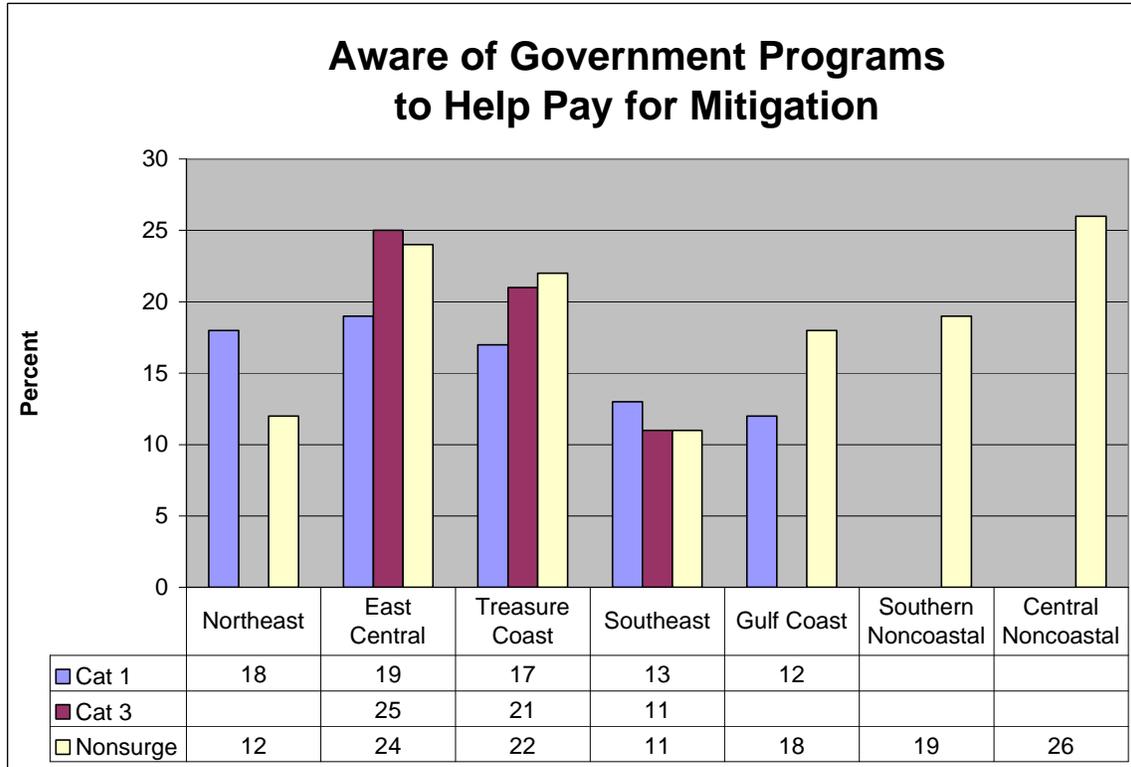


Fig. 92

### Elevation of Homes

In 17% to 45% of the households interviewed, respondents said their home or building was elevated on pilings or fill material to raise it above flood water (Figure 93). Affirmative responses were surprisingly low in the category 1 risk zones except for Southeast Florida and surprisingly high in the non-coastal counties.

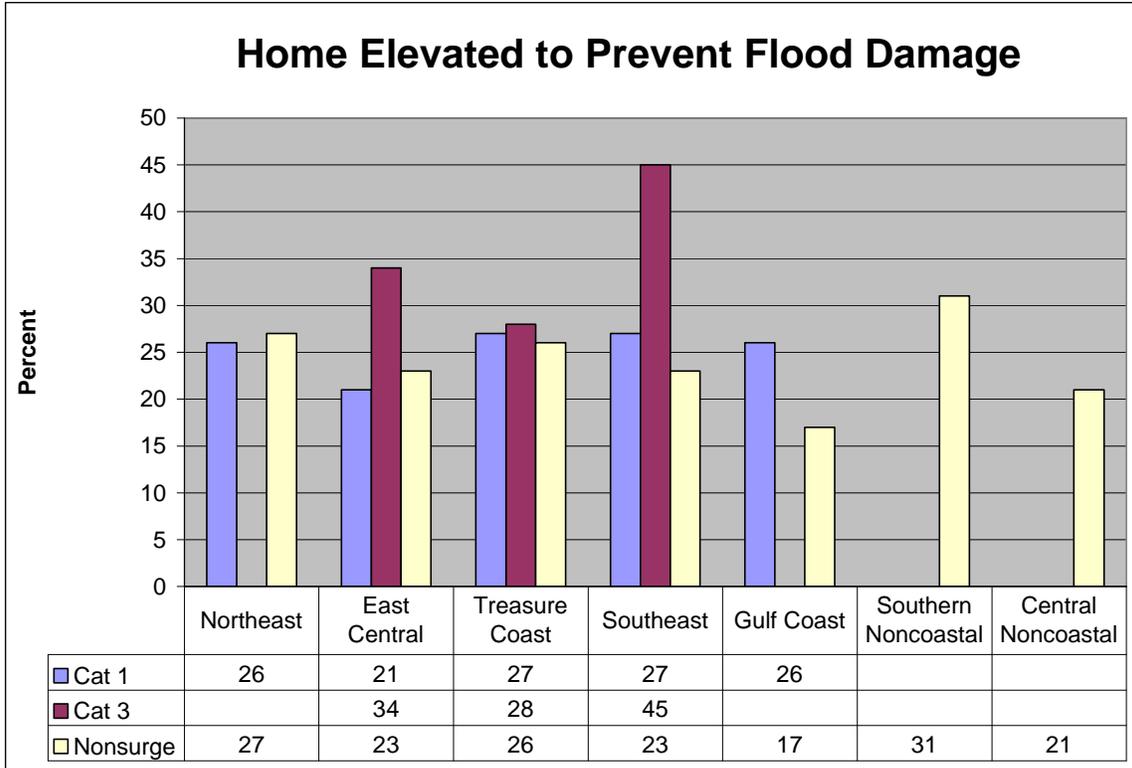


Fig. 93

## Effects of Jeanne

### Lost Work

A relatively small percentage of interviewees said they lost work due to Jeanne (Figure 94). Up to 9% in the Treasure Coast area and 8% in East Central Florida said they lost work.

Of those who lost work, 27% said they were out of work less than a week and 48% said they were out less than two weeks (Figure 95). Six percent said they were still out of work at the time of the survey.

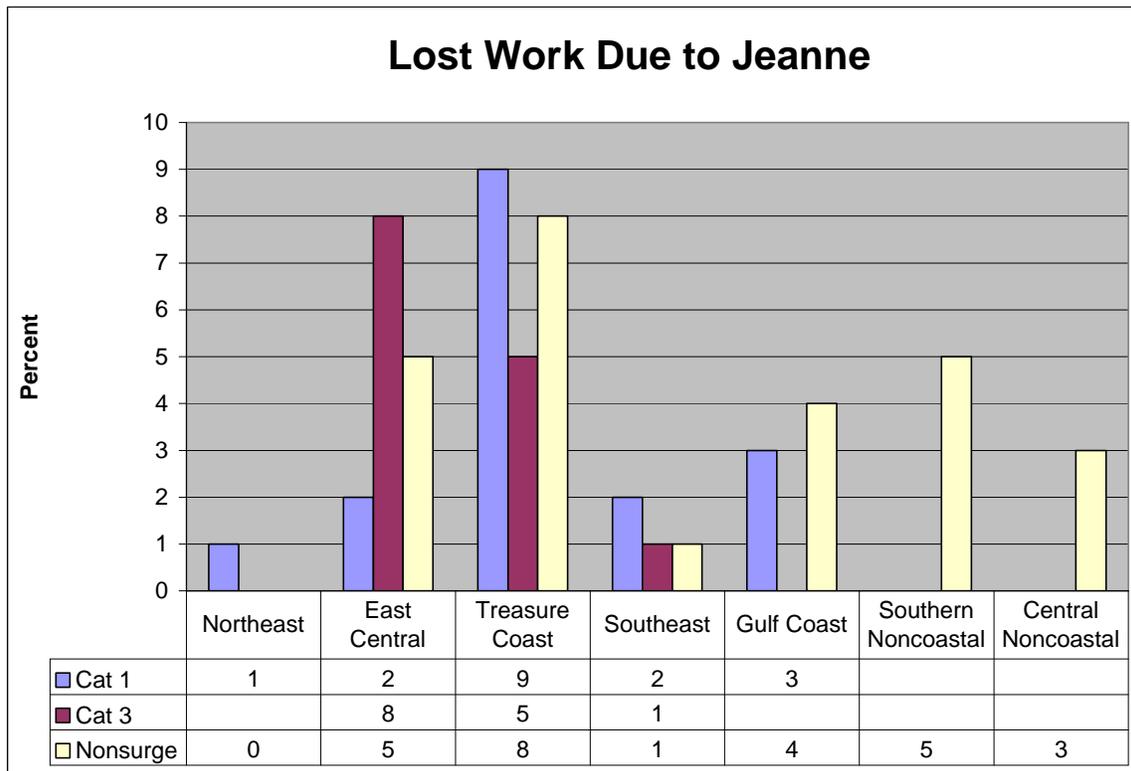


Fig. 94

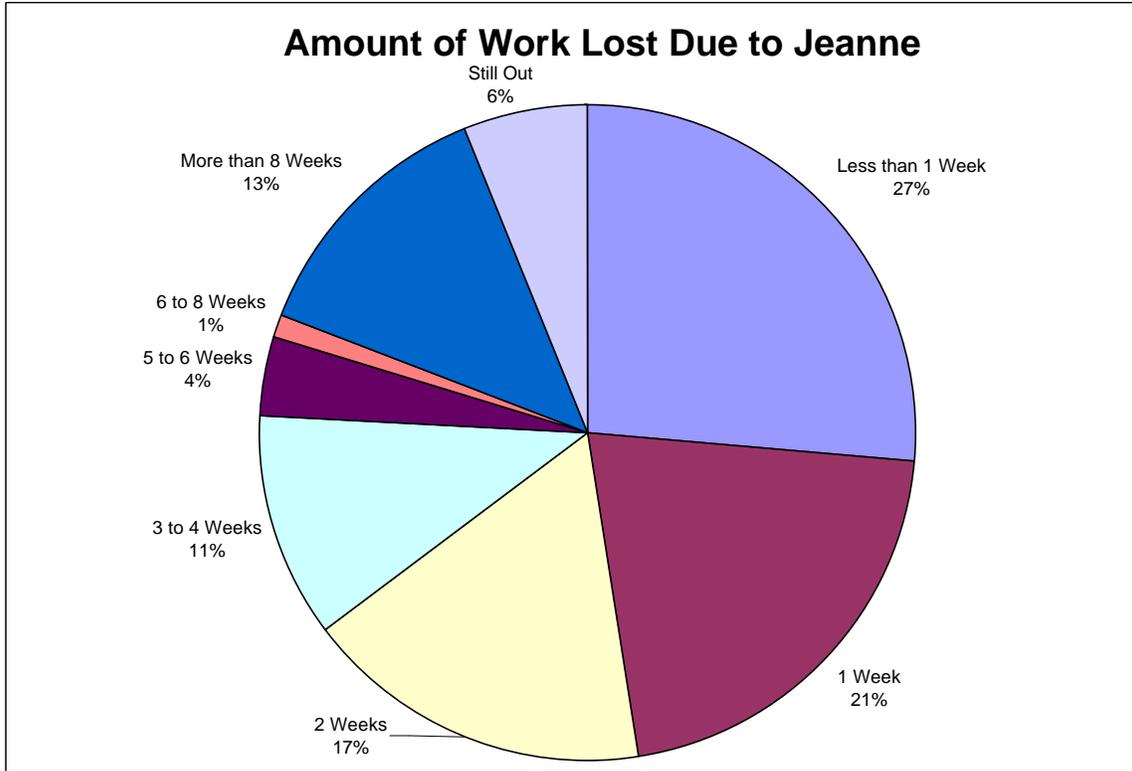


Fig. 95

#### Plan to Move to Someplace with Fewer Hurricanes

As many as 11% of the respondents (in the category 3 risk zone of the Treasure Coast region) said they planned to move someplace with fewer hurricanes (Figure 96). In other locations 1% to 10% said they planned to move.

Between 8% and 30% of those interviewed said they owned their own business, which probably includes part time businesses operated out of one's home (Figure 97). Up to 7% of those who own businesses said they plan to move their business to a place with fewer hurricanes (Figure 98).

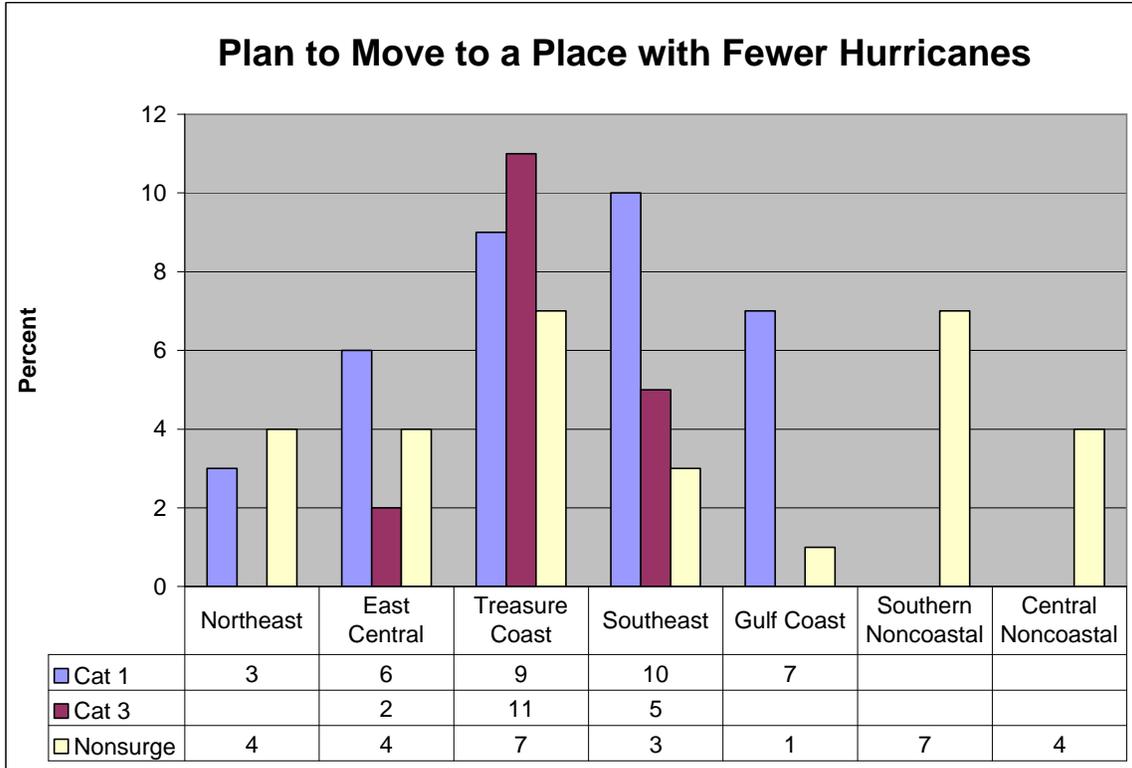


Fig. 96

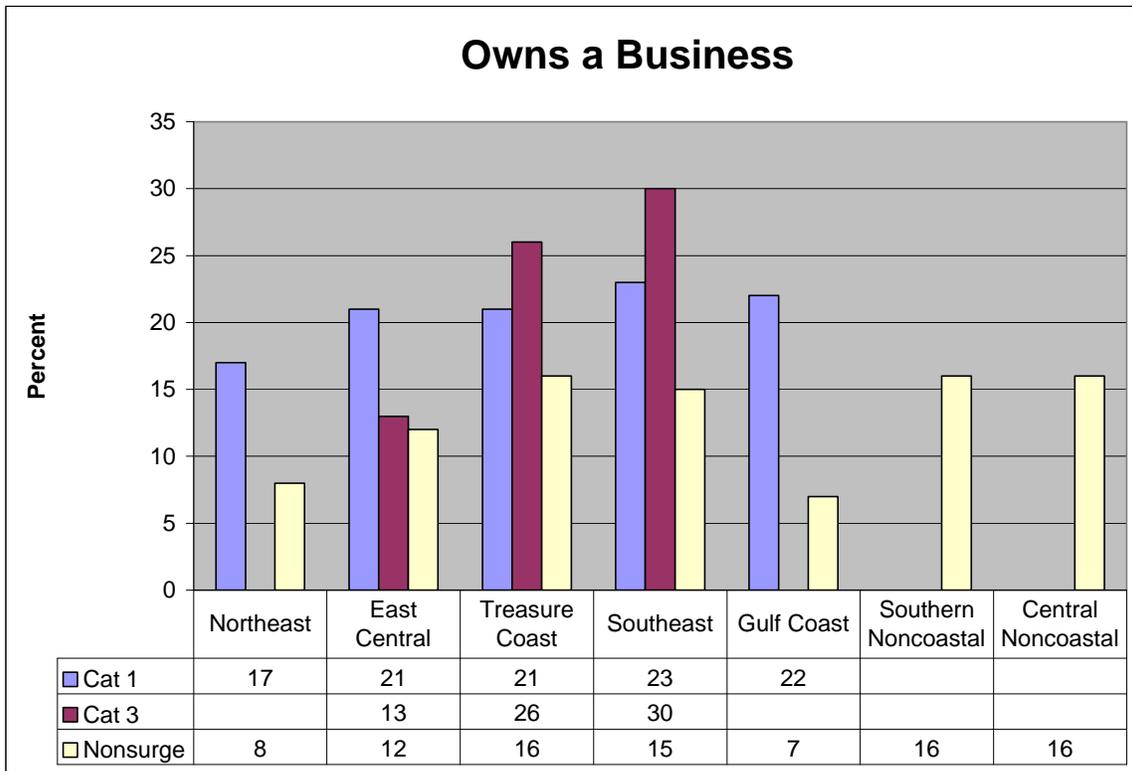


Fig. 97

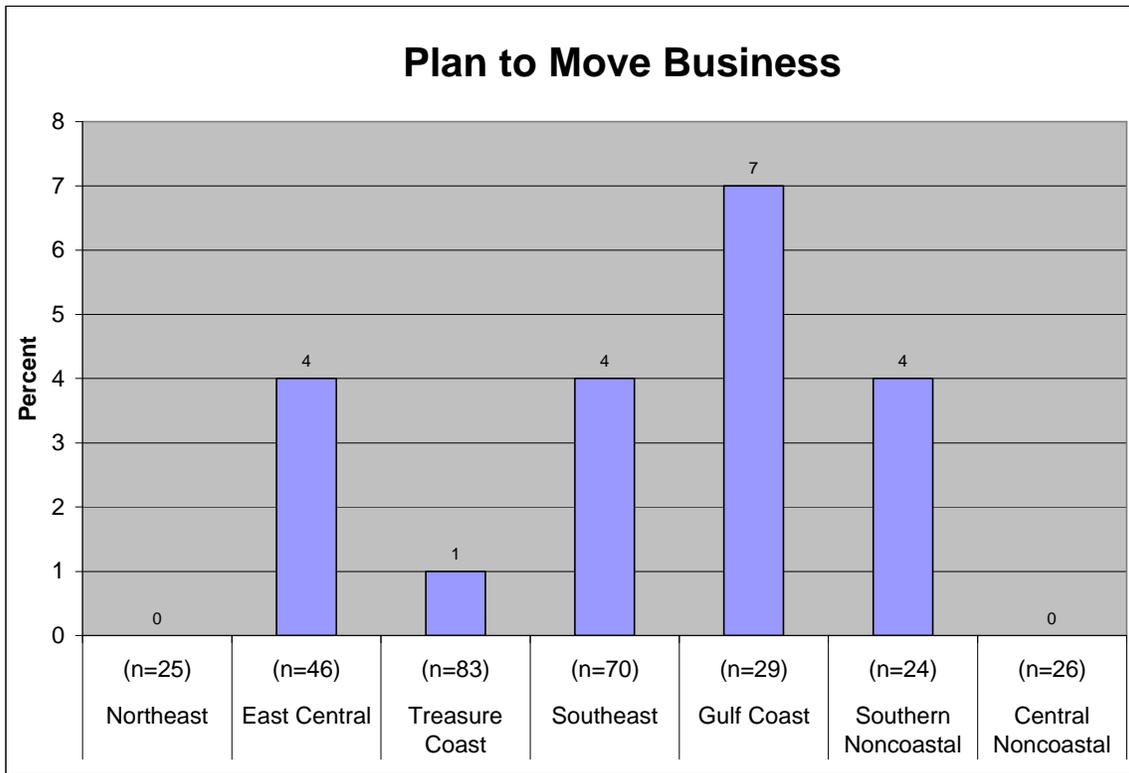


Fig. 98

### Damage in Jeanne

The highest incidence of people saying their homes were damaged in Jeanne were in the Treasure Coast region (50% to 56%), followed by East Central Florida (33% to 47%). (Figure 99). Forty percent to 46% of the respondents in the non-coastal areas said they experienced damage.

The largest dollar value of damages occurred in the Treasure Coast area (Figure 100). *In households experiencing damage in Jeanne*, 73% of the Treasure Coast households said they experienced at least \$1,000 in damage, and 20% said they experienced at least \$25,000 in damage. In East Central Florida 65% said they had at least \$1,000 in damage, and 11% said their damages were at least \$25,000.

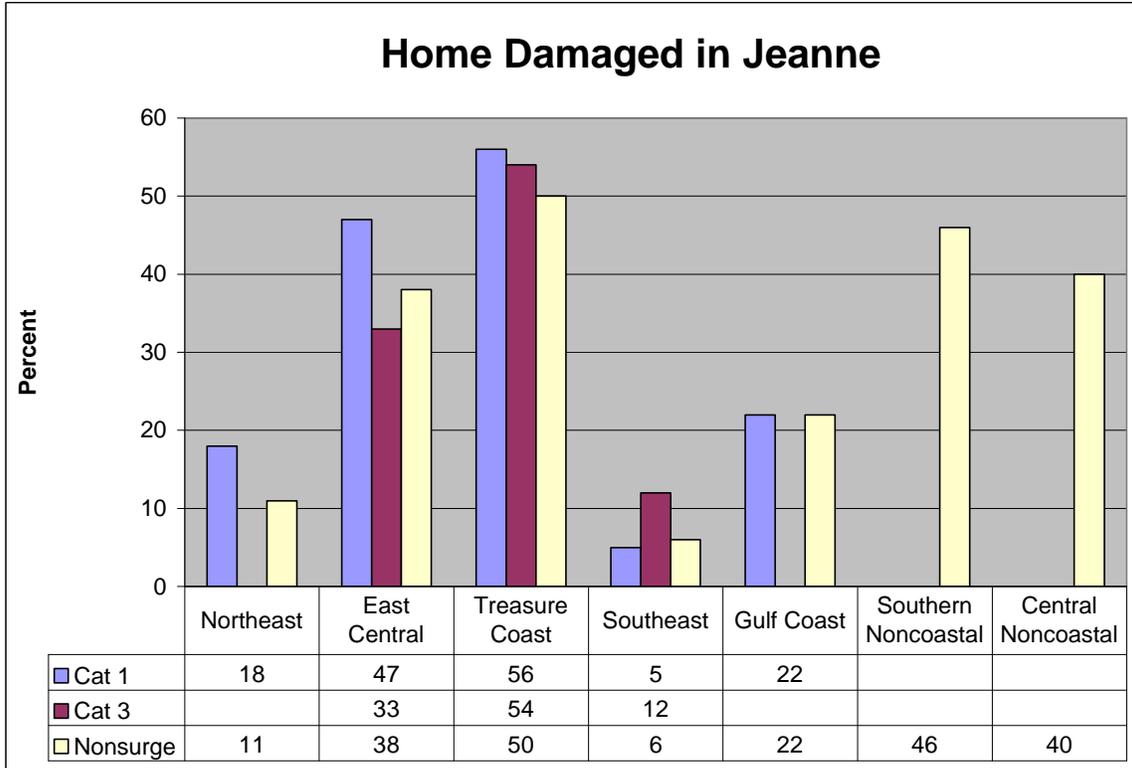


Fig. 99

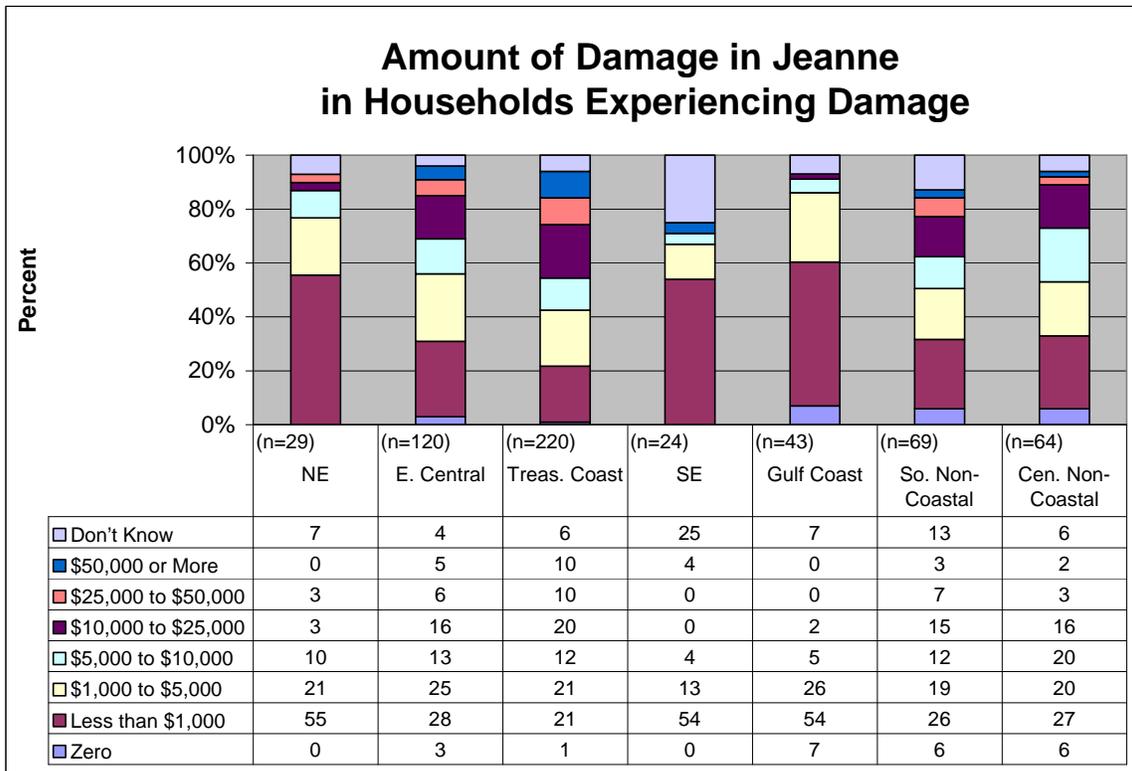


Fig. 100

## Worst Damage Ever

Interviewees were asked for the worst damage they had ever experienced in any hurricane, including Jeanne. Results are shown in Figure 101. In the Southeast, Tampa Bay/Big Bend, and Northeast Florida areas more than half said they had never experienced any hurricane damage. The Treasure Coast area reported the greatest historical losses (which could have included Jeanne and Frances), but respondents in the non-coastal survey locations said they had greater than average losses also.

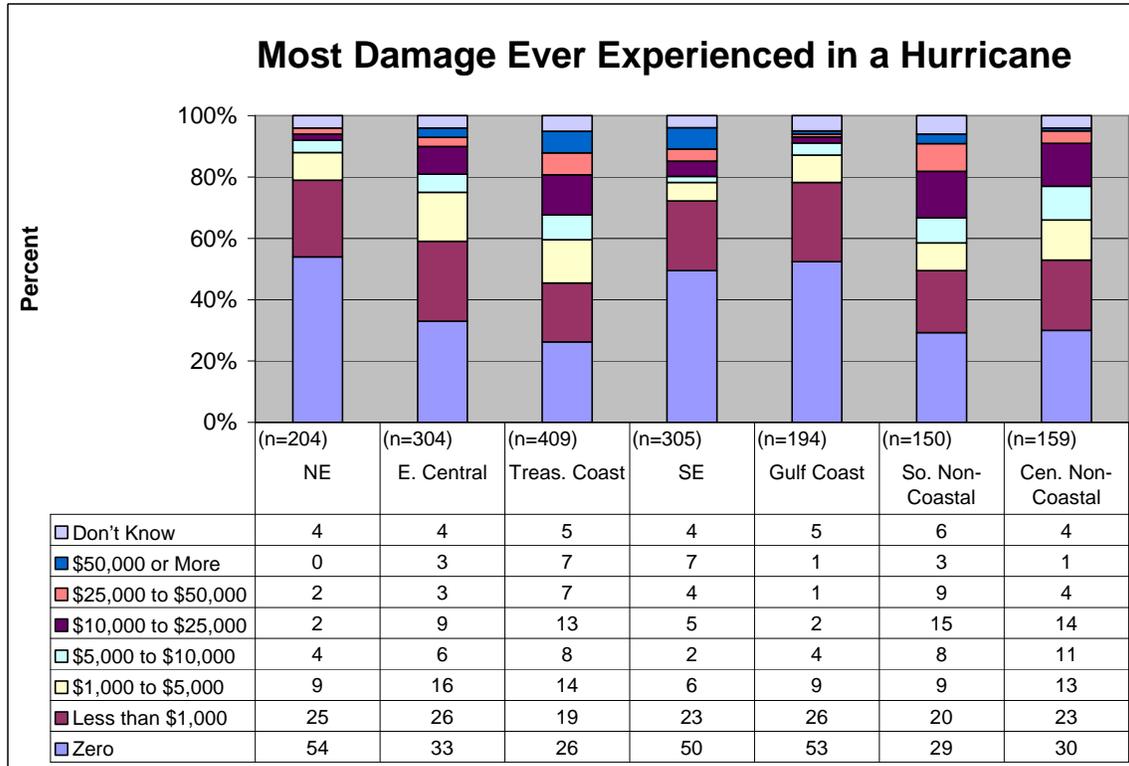


Fig. 101

## Major Hurricane Experience

### Before 2004

Between 47% and 80% of those interviewed said they had experienced a major hurricane prior to 2004 (Figure 102). Southeast Florida had the highest percentage 80% of respondents saying they had experienced a major hurricane before 2004, probably referring to Andrew.

### 2004

In the Treasure Coast, East Central, and non-coastal survey areas, between 79% and 89% of the respondents said they experienced a major hurricane in 2004 (Figure 103). In the Southeast, Tampa Bay/Big Bend, and Northeast areas 38% to 55% thought they experienced a major hurricane in 2004.

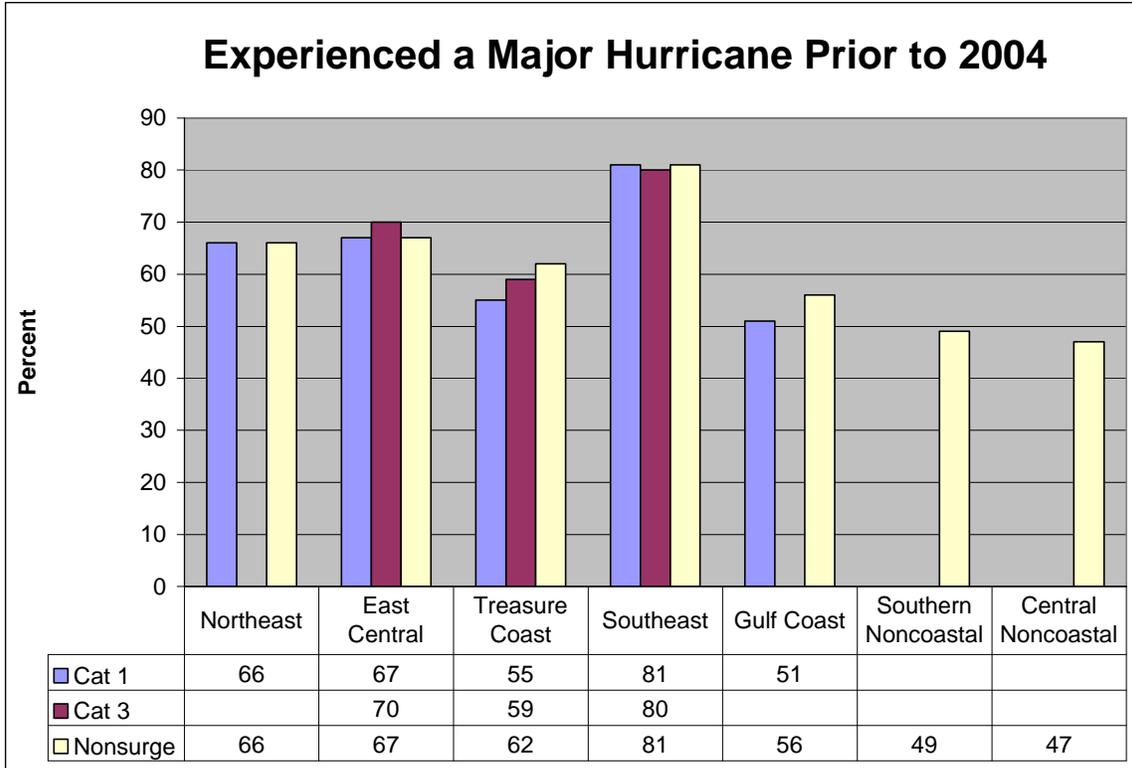


Fig. 102

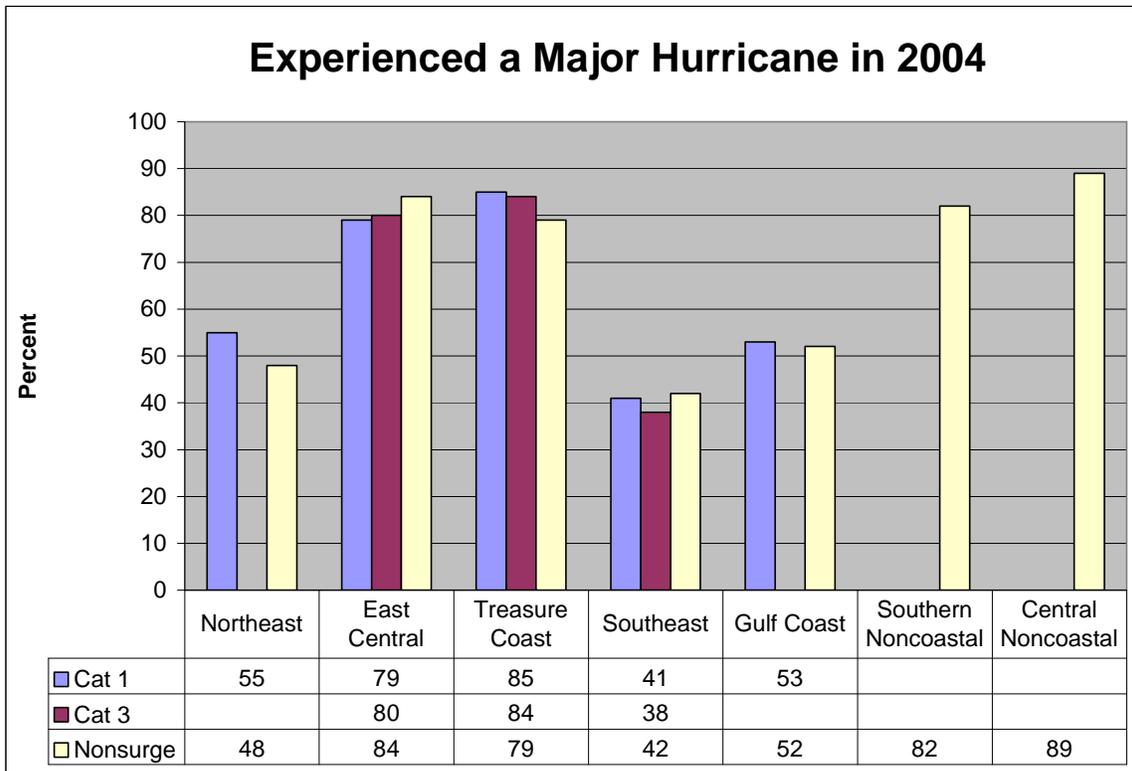


Fig. 103

Appendix A  
Statistical Reliability and Sample Sizes

Statistical Reliability of Survey Results

Data reported in the survey cited in this report are based upon samples taken from larger populations. The sample values provide estimates of the values of the larger populations from which they were selected, but are usually not precisely the same as the true population values. In general, the larger the number of people in the sample, the closer the sample value will be to the true population value. A sample of 100 will provide estimates which you can be 90% "confident" are within 5 to 8 percentage points of the true population values.\* With a sample of 50, you can be 90% "confident" of being within 7 to 11 percentage points of the actual population value. A sample of 25 is 90% "accurate" only within 10 to 17 percentage points. To be 95% or 99% "confident" you have to use an even wider range

The ranges (e.g., "10 to 17") stem from the fact that the reliability of an estimate depends not only on the size of the sample but also upon how much agreement there is among the responses. Having 90% of the respondents give a particular answer means almost everyone agreed. By the same reasoning, if only 10% gave a particular response, almost everyone agreed (i.e., 90% disagreed with the 10% but agreed with one another). The maximum disagreement is for the responses to be split 50-50. Thus, if 90% (or 10%) of a sample of 100 give a particular response, that estimate will be within 5 percentage points of the true population value 90% of the time. If 75% (or 25%) of a sample of 100 give a particular response, that estimate will be within 7 percentage points 90% of the time. If 50% of a sample of 100 give a particular response, that estimate will be within 8 percentage points 90% of the time.

Table B-1 summarizes the reliability values for samples of various sizes and response distributions. For example, suppose you interviewed 200 people in the category 1 surge zone of a group of counties and 50% of those 200 people said they believed their home would flood in a hurricane. You can be 90% "confident" that between 44% (50% - 6%) and 56% (50% + 6%) of *all* the people who live in the category 1 surge zone of those counties believe their homes would flood. If you wanted to be 95% or 99% "confident" of your estimate, you would need to add and subtract even larger values in order to a intervals of values in which you could have the desired confidence.

Table B-1. Approximate sample reliabilities for 90% confidence intervals, as a function of sample size and distribution of responses (i.e., variance)

Sample Size	Percent Giving Response		
	50%	25% or 75%	10% or 90%
25	± 17%	± 15%	± 10%
50	± 12%	± 10%	± 7%
75	± 10%	± 8%	± 6%
100	± 8%	± 7%	± 5%
200	± 6%	± 5%	± 4%
400	± 4%	± 4%	± 2%
800	± 3%	± 3%	± 2%
1500	± 2%	± 2%	± 1%

## Assessing Differences

Differences of a few percentage points in sample results do not necessarily mean the populations from which the samples were drawn are different. A “quick and dirty” way of comparing results is to add and subtract values in Table B-1 to and from of the two values being compared and seeing whether the ranges overlap. If there is overlap in the ranges created by adding and subtracting from the sample estimates, you should be reluctant to conclude that the population values differ. For example, suppose two samples of 100 yielded values of 50% and 40%. From Table B-1 you see that the 50% value for the population might actually be as low as 42%, and the 40% value might actually be as high as 48%. The 42% to 50% and 40% to 48% ranges overlap.

A more accurate method of assessing whether sample differences are large enough to imply population differences involves “tests of statistical significance.” In some instances the results of such tests are reported in this analysis. In general the following guidelines can be used. For samples in 50 in each group, the sample differences must be at least 20% (20 percentage points); samples of 100 must differ by at least 15%; samples of 200 must differ by at least 10%; and samples of 350 must differ by at least 7%. Those rules-of-thumb apply in cases in which both sample estimates are near 50% (55% vs. 45%, for example). In cases where the estimates are much higher or lower (90% vs. 80% or 10% vs. 20%) slightly smaller sample differences are required to conclude that population differences also exist. In those circumstances samples of 100 require only differences of 15% to imply population differences, for example.

Tests of statistical significance were performed for a number of sets of variables in the survey. The detailed results of the tests are not presented in the report, but the conclusions from the tests often are. For certain types of response, the report states that there was no difference between two groups in the sample. This means that given the sample size, differences in the sample did justify the conclusion that differences existed in the population from which the sample was drawn.

\*More correctly this means that if you took a “large” number of additional samples of the same size, 90% of those samples would yield estimates of the population value that were within 5 to 8 percentage points of the value you found with the original sample.