

HURRICANE IVAN BEHAVIORAL ANALYSIS

September 2005

B. Evacuation Behavior

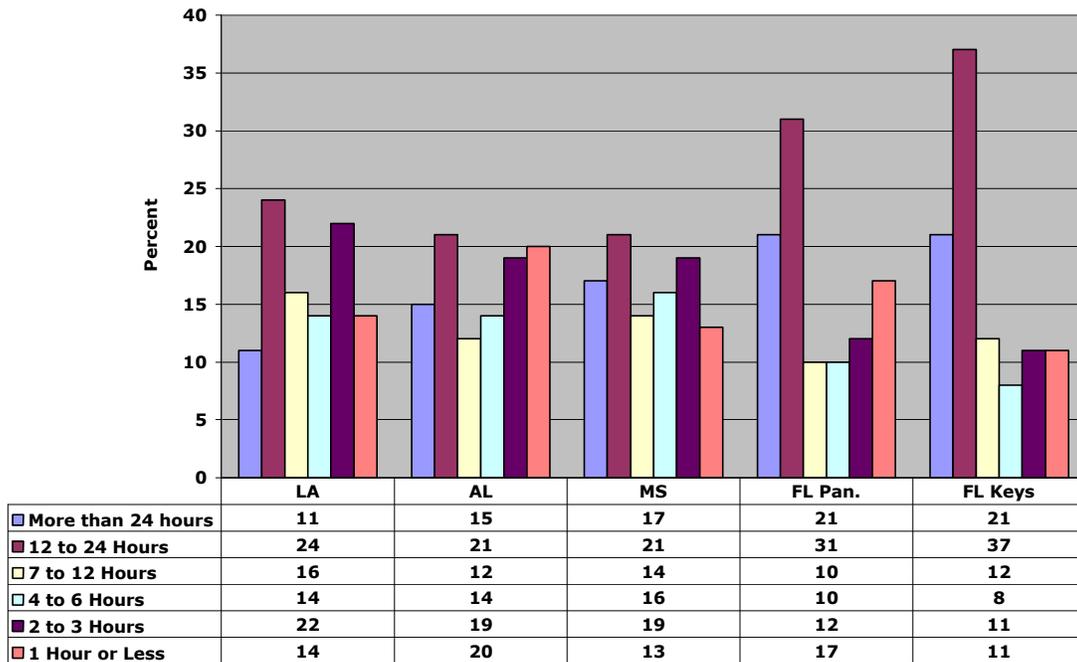
The next series of questions relate to the actual evacuation experiences of Ivan evacuees, both before and after leaving their home.

1. Evacuation Response Rates

Evacuees were asked how long it was from when they decided to evacuate until they actually left their home. The next figure provides an overview of these response rates by region.

Figure 20.

Response Time to Evacuate by Region

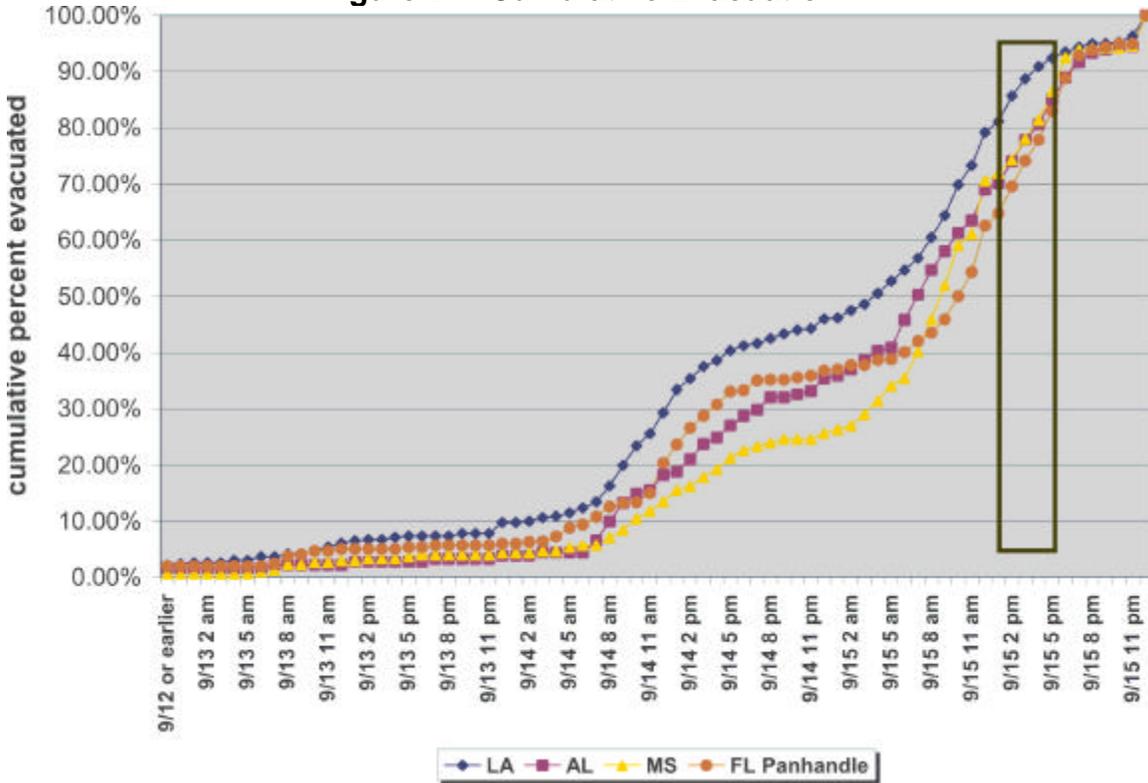


The responses are distributed throughout the time frame from one hour or less to more than 24 hours. The most common response was that they left within 12-24 hours after deciding to evacuate. However, respondents in the Florida sample tended to decide earlier before leaving. This may be an effect of previous evacuation experience. In the case of the Florida Keys it may have been affected by the staged timing of evacuation by officials, where people who planned to evacuate had to wait for the evacuation time specified for their area of the Keys.

2. Time of Departure

The next figure shows the cumulative evacuation curve for all the areas except for Monroe County. The box indicates the approximate forecasted arrival of tropical force winds along coastal Louisiana, Mississippi, Alabama, and the Florida panhandle.

Figure 21. Cumulative Evacuation



During most of the time period depicted, Keys evacuees had already evacuated and were returning. In general the timing is the same for all the other regions, although more people in Louisiana completed their evacuation somewhat earlier.

3. Miles Traveled to Destination

Evacuees were asked how many miles they traveled to their refuge. Given that several traveled more than a thousand miles, median is the most appropriate average measurement to use, and the median distance traveled ranged from 225 miles for Monroe County to less than 60 in the Florida Panhandle.

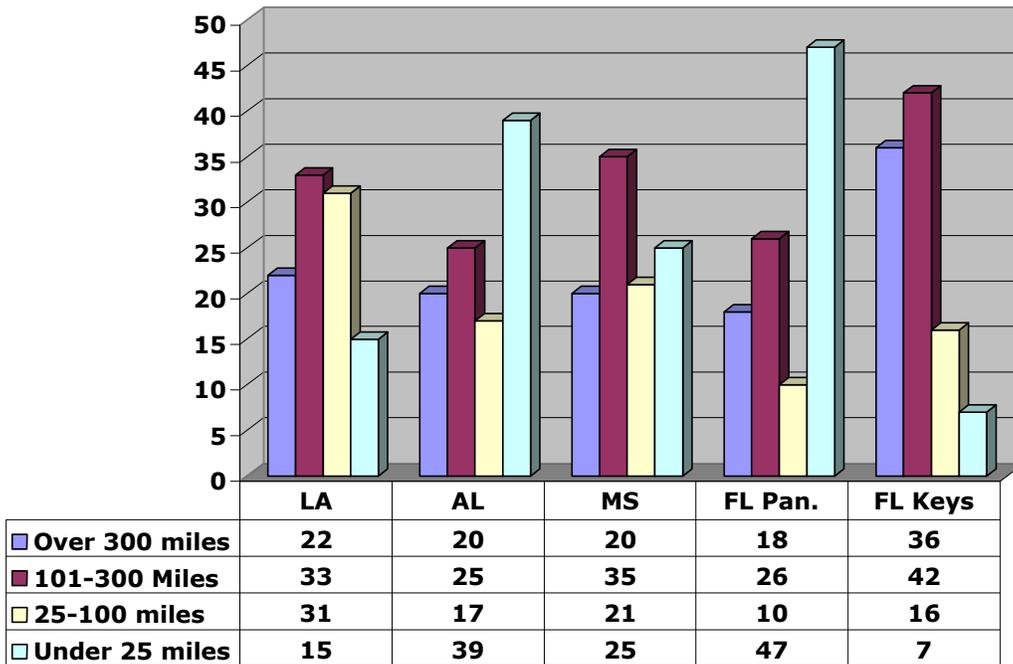
Table 10. Miles Traveled

Region	Average Miles	Median Miles
Louisiana	198	125
Alabama	156	77
Mississippi	177	128
Florida Panhandle	166	50
Florida Monroe County	272	230
Overall	182	117

The next figure depicts another way to look at distance traveled -- how many households traveled each distance.

Figure 22.

Households Traveling Each Distance (Percent)



Residents of the Florida Keys traveled the farthest, not surprising given their location.

4. Time to Destination

There was considerable variation in travel times to destination. As shown in Table 11, Louisiana and Florida Keys residents had the longest travel times.

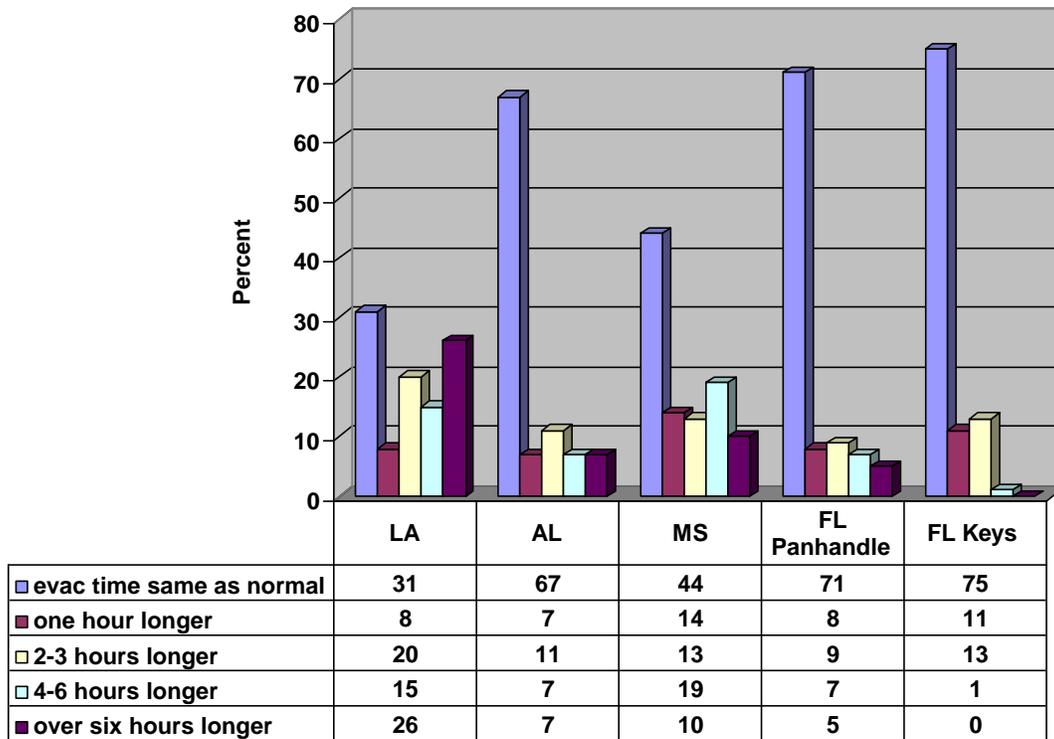
Table 11. Time to Destination

Region	Average Number of Hours
Louisiana	8.0
Alabama	4.5
Mississippi	5.0
Florida Panhandle	4.5
Florida Monroe County	7.0
Overall	6.5

5. Time Compared to Normal

Respondents were asked to compare their travel time with how long it would normally take to reach that destination. The next figure illustrates regional differences in how much longer the trip took than normal.

Figure 23.



The most common response was that it took the same amount of time. Of most interest, over 60% of Louisiana evacuees said the trip took at least 2 hours longer, and for 26% the trip was more than 6 hours longer. The region with the second largest differences in trip times was Mississippi. Evacuation from the Keys appears to have gone well, in terms of time taken.

It is interesting to see the results geographically as illustrated in the next figures.

Figure 24. Trip Time Compared to Normal –Gulf Regions

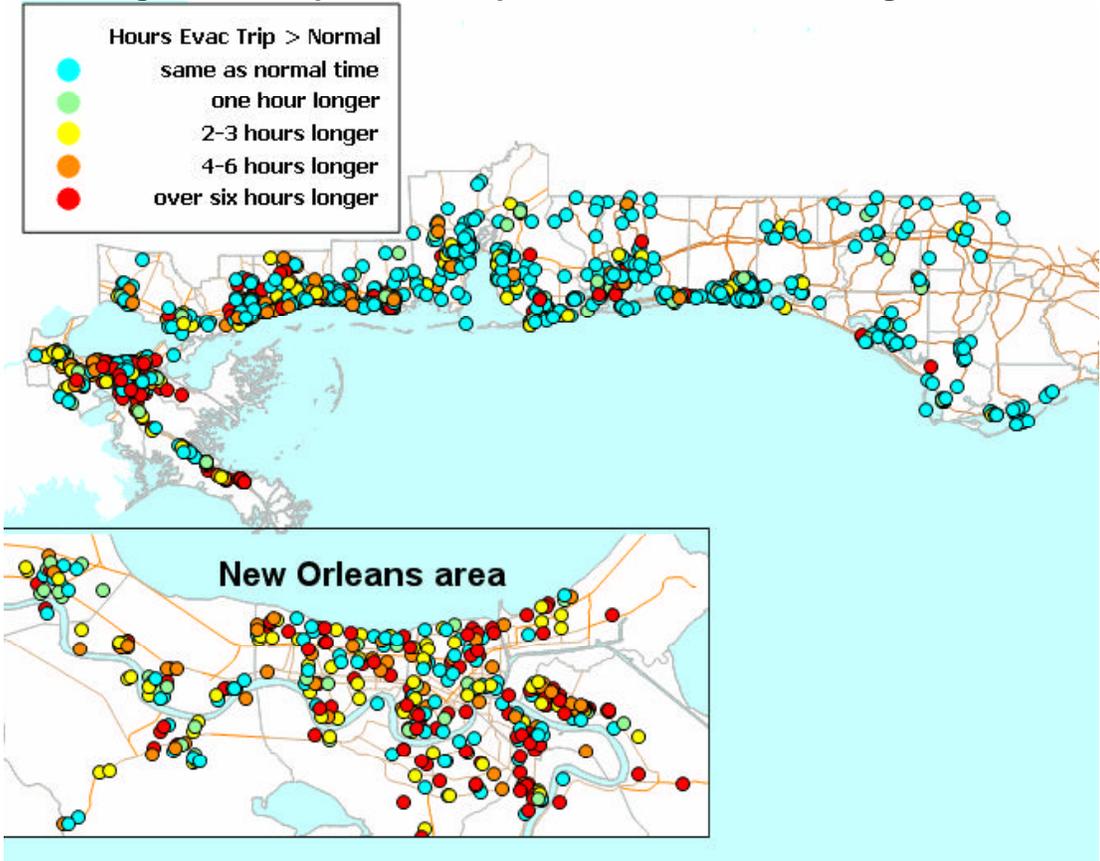
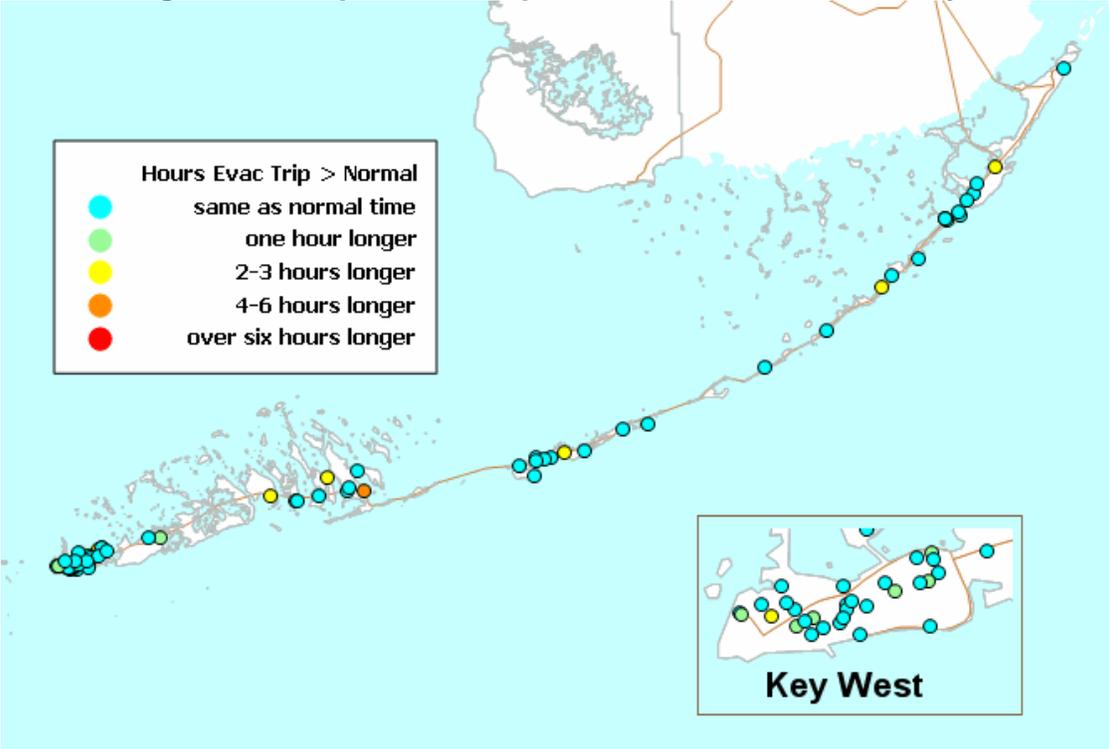


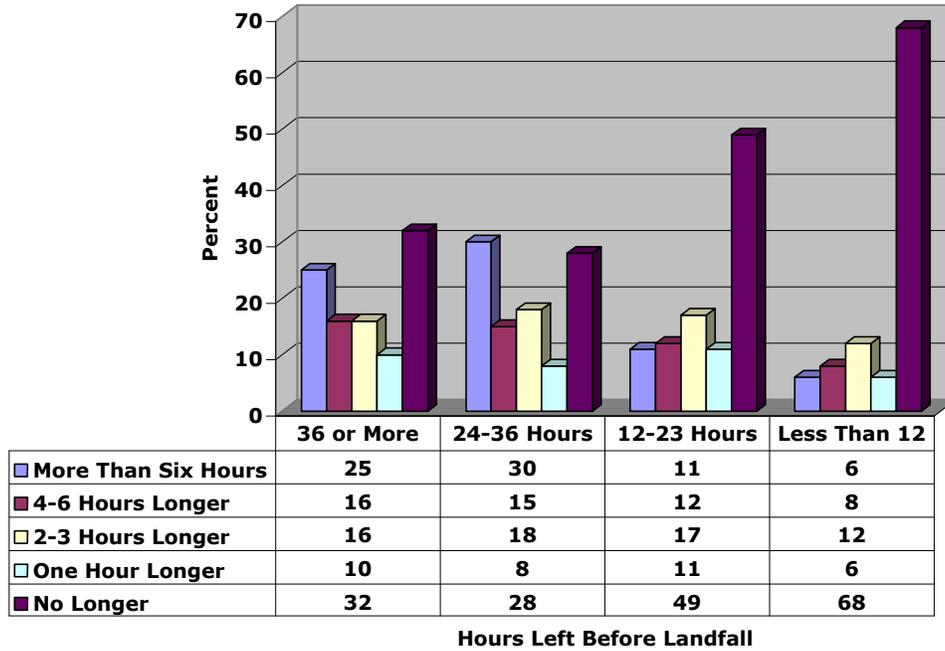
Figure 25. Trip Time Compared to Normal –Florida Keys



The next set of figures looks at how long before landfall evacuating respondents left home, and its relation to traffic delays. This is significant because the longest delays are during the time when evacuation was supposed to have taken place.

Figure 26.

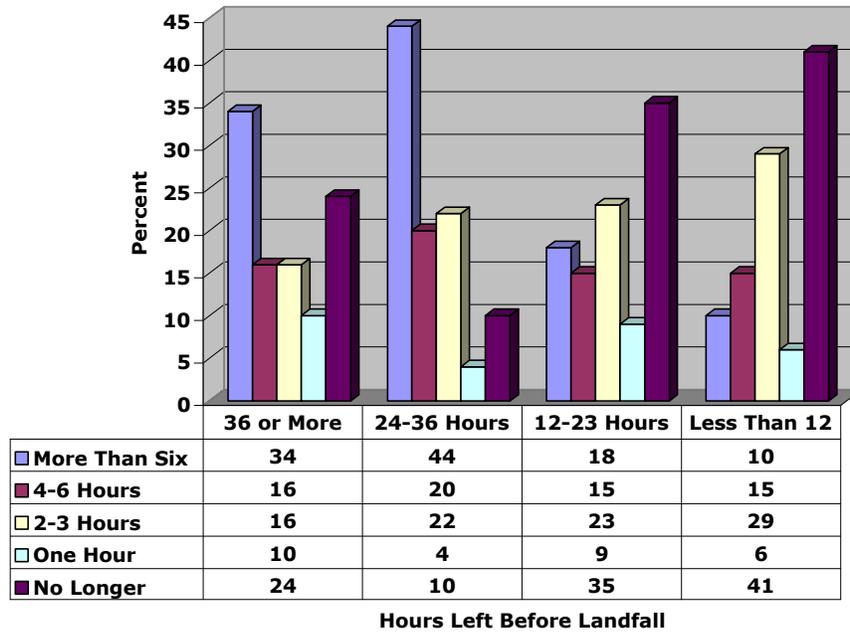
When Left and Hours to Destination - Total Sample



In general people who waited until the day tropical storm force winds were forecast to arrive faced less traffic delays. Of course, if more people followed this example, last minute delays and risk would have greatly increased. As shown in the next figures, this finding was true in every region.

Figure 27.

When Left and Hours to Destination - Louisiana



The most serious delay were reported by Louisiana evacuees who left when they were supposed to, between 24-36 hours before landfall.

Figure 28.

When Left and Hours to Destination - Alabama

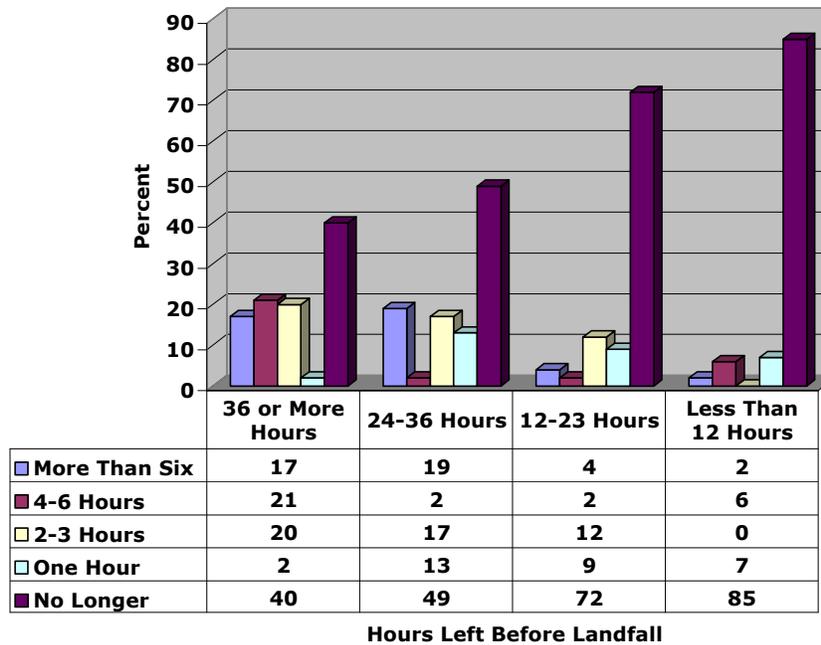
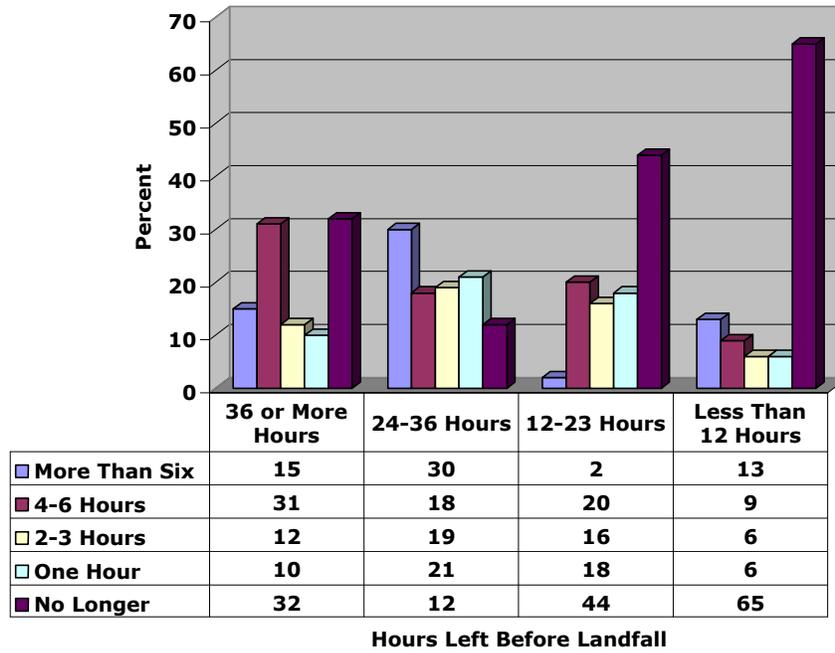


Figure 29.

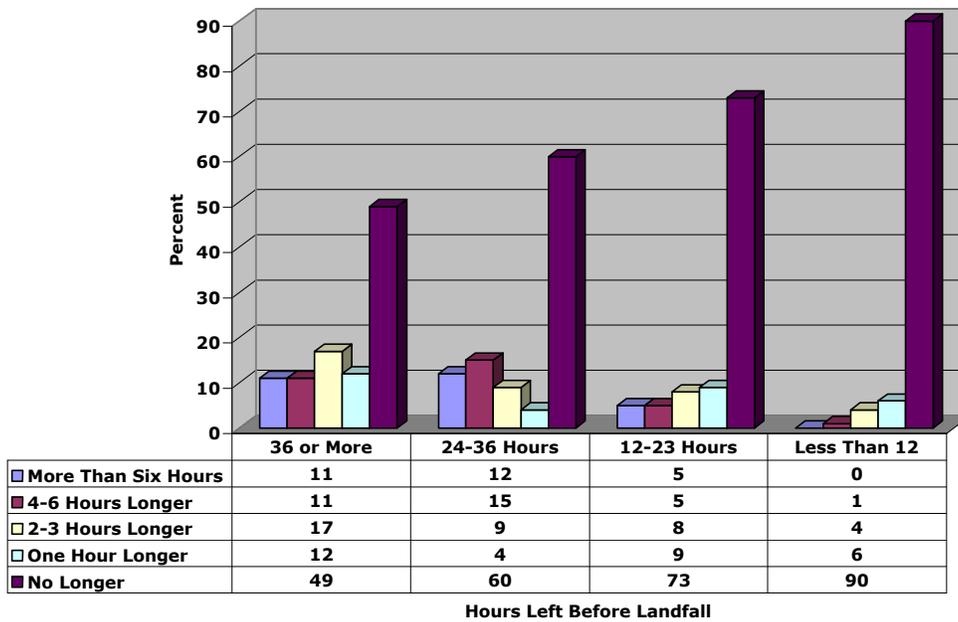
When Left and Hours to Destination - Mississippi



Again, while less than Louisiana, those living in the Mississippi counties included in the study who left 24-36 hours before landfall experienced the longest delays.

Figure 30.

When Left and Hours to Destination - Florida Panhandle



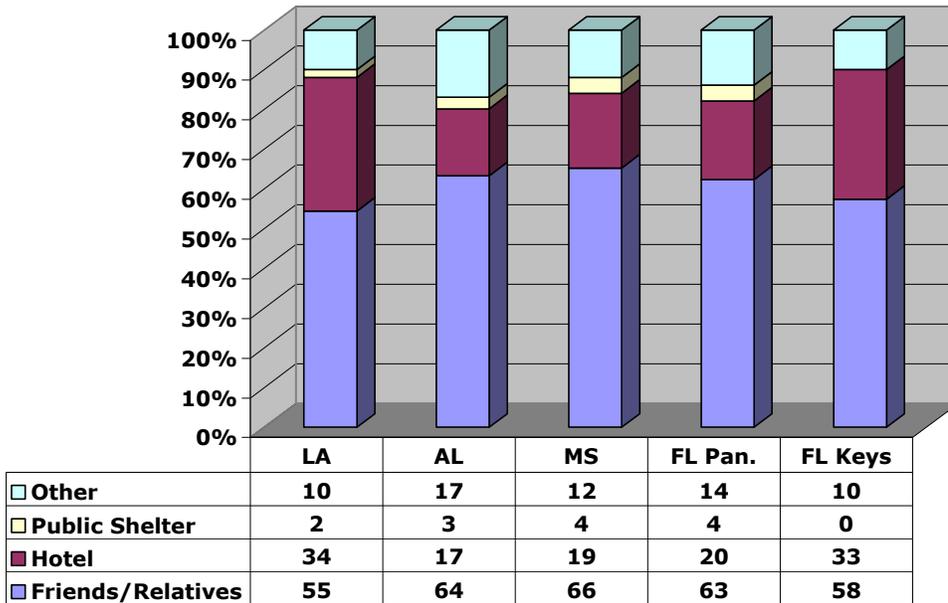
Surprisingly few delays occurred in the Florida Panhandle, especially considering the number of people who evacuated.

6. Type of Refuge

Evacuees were asked where they sheltered from the storm. As shown in the next figure, the majority in every region stayed with friends or relatives, with hotels ranking second.

Figure 31.

Type of Refuge by Region

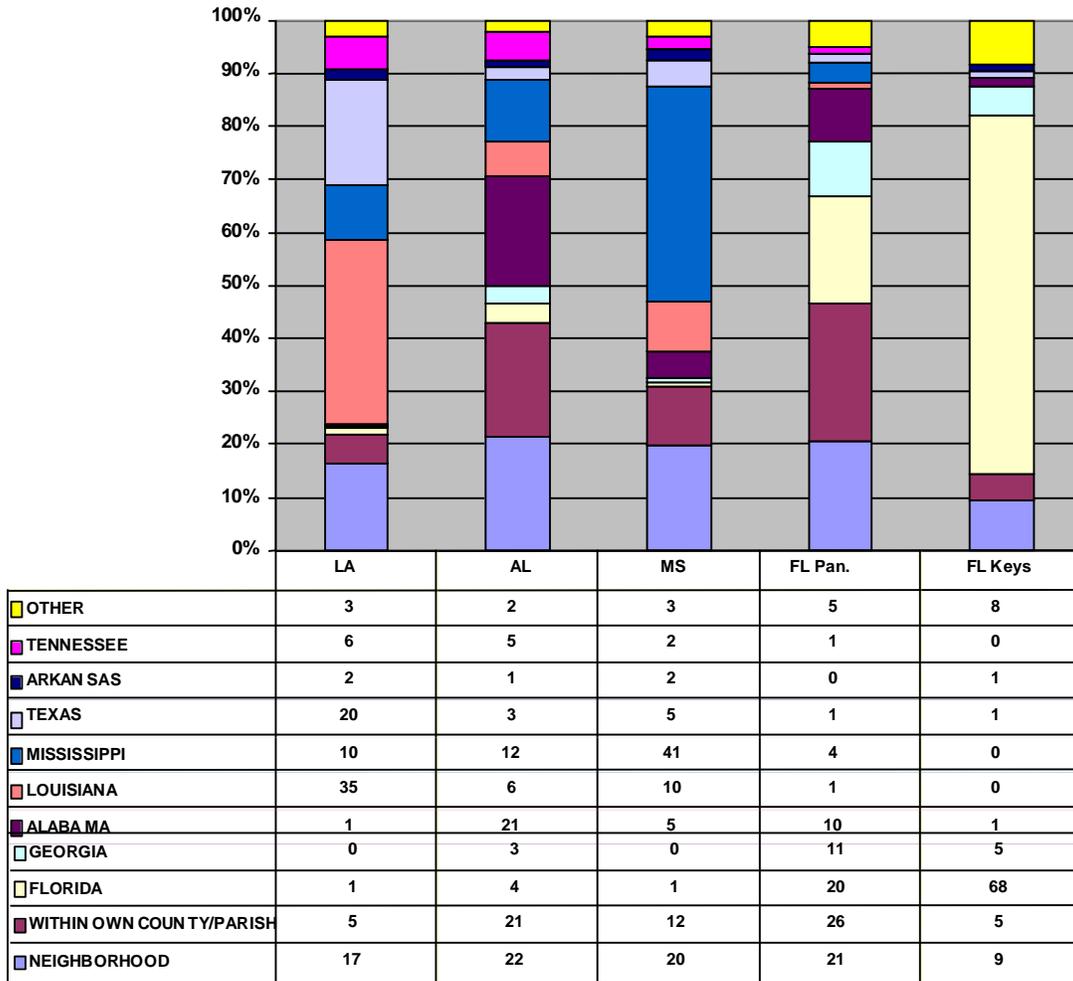


Only 3% of the total sample used public shelters. The rates for Mississippi and the Florida Panhandle were the highest at 4%. Monroe County only has shelters for Category 1 or 2 storms. For others the designated shelter is in Miami-Dade County, 150 miles north of Key West. None of these respondents sheltered there.

7. Destination of Evacuees

Evacuees were asked if their evacuation refuge was located in their neighborhood, county or parish, or another state. Of the total sample, 19% remained in their own neighborhood and about 13% stayed within their own county or parish. For those who left their local area, regional destinations provide important information to evacuation officials.

Figure 32. Destination by Region



Most evacuees stayed within their own neighborhood, county or parish, or state. Destinations were most varied for evacuees from Alabama and the Florida Panhandle.

When asked if this was their intended destination when they left home, 88% answered affirmatively.

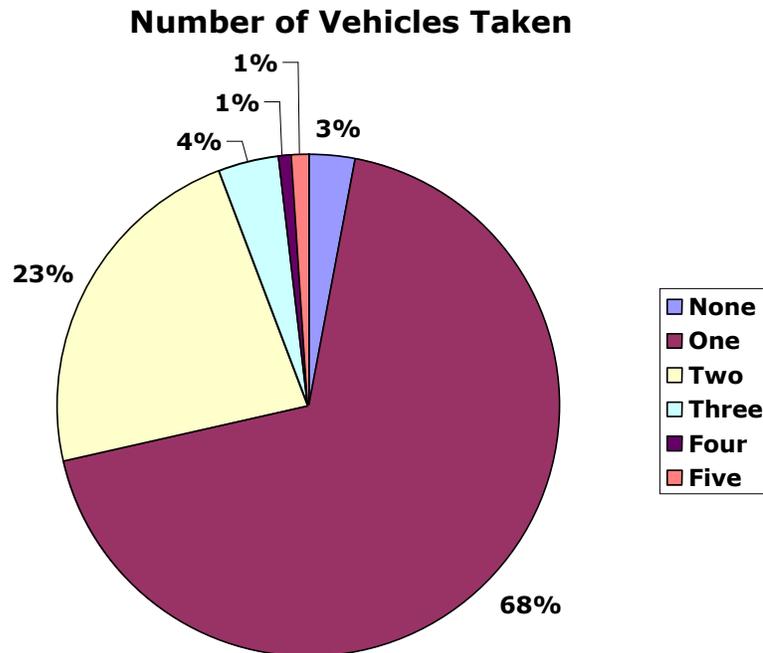
8. Route and Travel Information

When asked what route they used, about half said they used the same route they always use, but in Louisiana only 35% gave that answer. About 3% followed officials' recommendations, and only 1% of the total sample reported being forced by officials to use a route. Over two-thirds in all regions said they were able to get the traffic information they needed while on the road.

9. Vehicles Taken

Those who evacuated were asked how many vehicles were available for household evacuation. Most households owned two cars, but there was some variation, with Florida Panhandle households averaging slightly more and the Florida Keys slightly fewer. Of the vehicles available, evacuees were asked how many were taken and the results are depicted below.

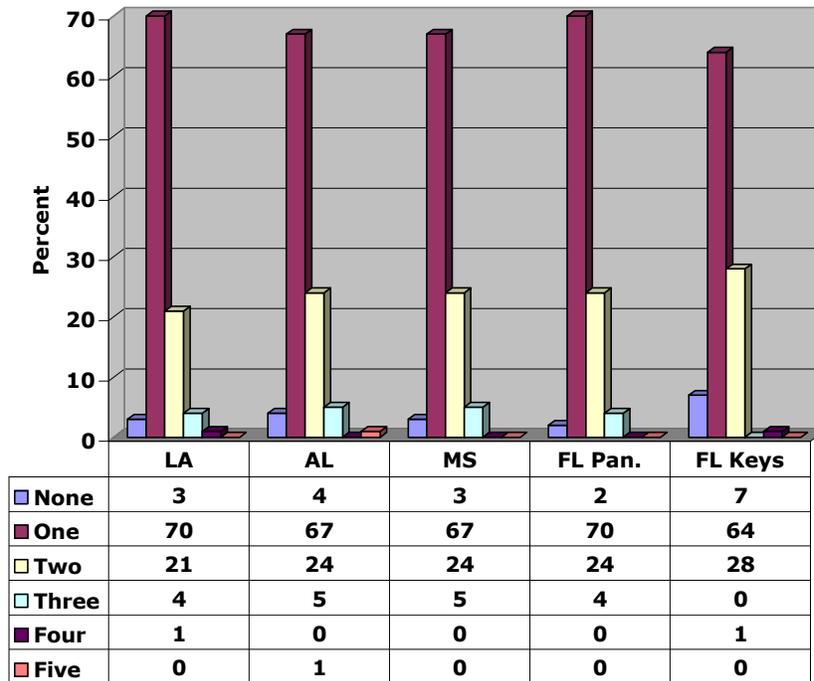
Figure 33.



The vast majority (69%) of evacuees took only one car, with 23% taking two. Only 3% of these households did not take their own car.

Figure 34.

Vehicles Taken by Region



Across regions there were no significant differences in number of cars taken per household.

Respondents were also asked about the percent of total available household cars they took when they evacuated, and the rate varies from 71% to 73% except for Monroe County where it rises to about 80%. Across all regions only about 7% took a motor home or pulled an RV, camper or boat, but in Monroe County the rate was 11%.

10. Contra-Flow

During the Hurricane Ivan evacuation, Louisiana officials implemented contra-flow procedures for part of the evacuation route. Questions about contra-flow were asked of Louisiana respondents only, and about three-quarters said it did not affect their evacuation decision.

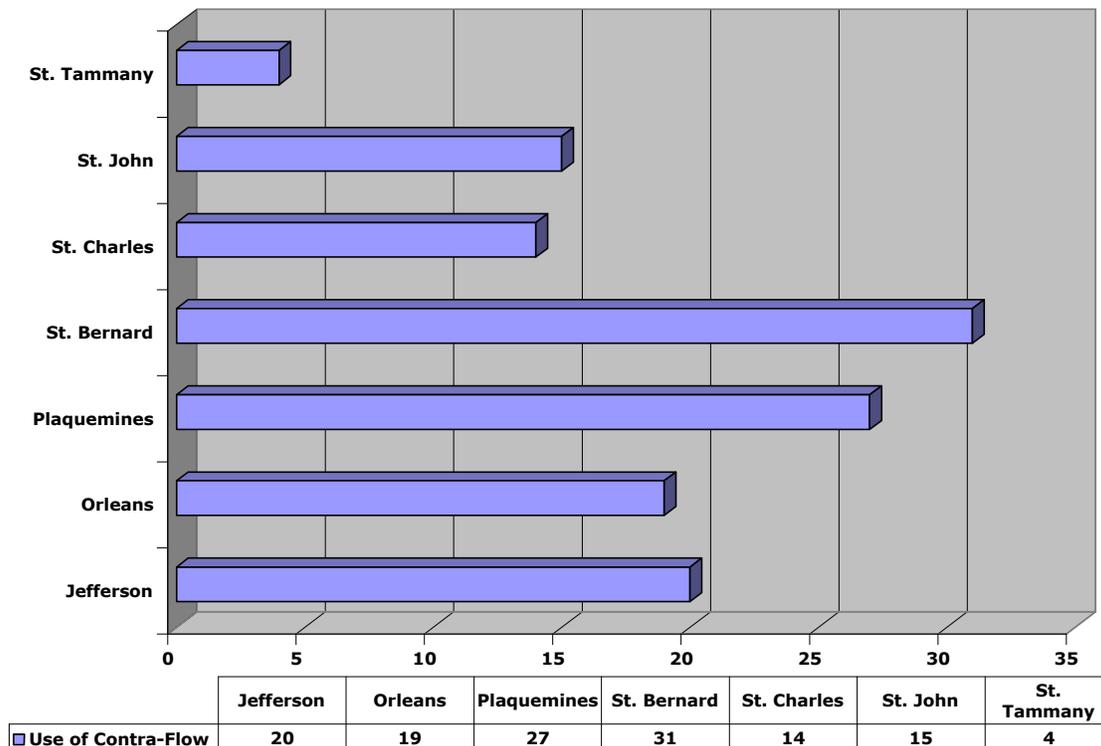
Table 12. Effect of Contra-Flow on Evacuation Decision

Contra-Flow Effect in Louisiana	Percent
Yes	13
No	76
Didn't Know About It	4
Evacuated Before Contra-Flow Lanes Established	7

An important finding is that, of the Louisiana residents who said contra-flow affected their decision, over half (56%) said it made them *more* likely to evacuate while one-quarter said it made them *less* likely to leave.

Less than 20% of Louisiana evacuees reported actually driving on a contra-flow road while evacuating, and of those, there were about the same number of reports of it causing additional problems (37%) as there were people who felt it improved traffic flow (38%), with the rest being undecided. The next figure provides a breakdown of those who drove on contra-flow lanes by parish.

Figure 35. Use of Contra-Flow Lanes by Parish



Officials should note that 61% of the Louisiana sample said contra-flow lanes would make them more apt to evacuate next time. However, much of this additional evacuation could be earlier: about 60% also said they would likely

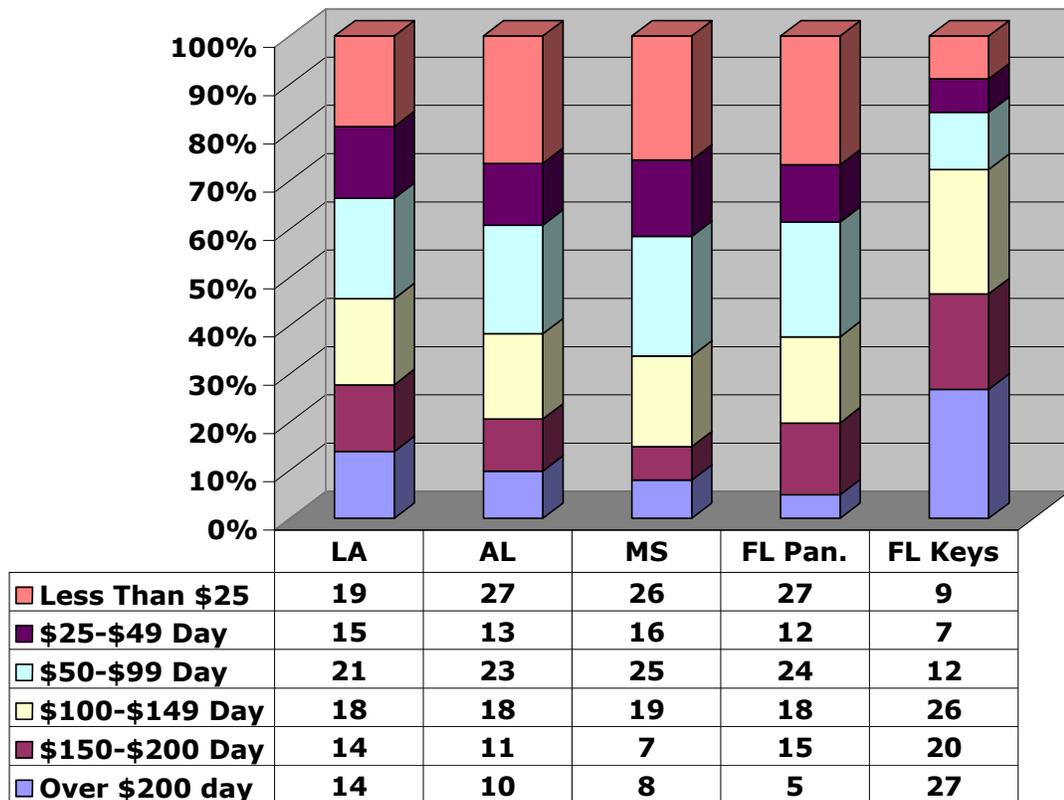
leave early the next time to avoid contra-flow. The vast majority (84%) are aware that contra-flow plans have been revised to address the problems encountered during the Ivan evacuation.

11. Daily Expenditures of Evacuees

When evacuees were asked how much money their household spent per day while away from home, with the exception of Monroe County, most reported spending less than \$99 per day.

Figure 36.

Daily Expenditures by Region



For the Monroe County residents, evacuation was much more expensive, with nearly 75% spending more than \$100 and more than a quarter spending over \$200 per day. This could be related to these experienced evacuees using the trip to take vacations (something reported in research on earlier evacuations from the Keys), as well as higher costs of lodging, etc. in Florida.

12. Days away

Time away from home ranged from one day or less to more than one week. About half of the respondents in Louisiana and Mississippi were away from home between two and three days. The time was slightly less for residents of Alabama

and the Florida Panhandle and longer for evacuees from Monroe County, the majority of whom were gone four or more days. This is especially interesting given their higher level of expenditures. Clearly, evacuation is a more expensive proposition for residents of the Florida Keys.

13. Supplies While Away

About three-fourths reported taking an evacuation supply kit (food, medicine personal items, and extra clothing) with them. Slightly over 40% had it packed before the storm, except for Monroe County where the rate was nearly 60%. Over 80% reported having everything they needed.

14. Return Information

More than one-quarter of the respondents who evacuated said it was not easy finding information about getting back into their communities. It appeared to be most problematic for Monroe County evacuees, with 40% indicating this was a problem. Television was the primary source of information, followed by radio, and word of mouth from friends and relatives. Compared to the others, Florida respondents were more likely to call authorities for information. It is interesting that more than 3% of the total sample used the internet for this purpose.

C. Knowledge and Information

1. Responsibility for Evacuation Notices

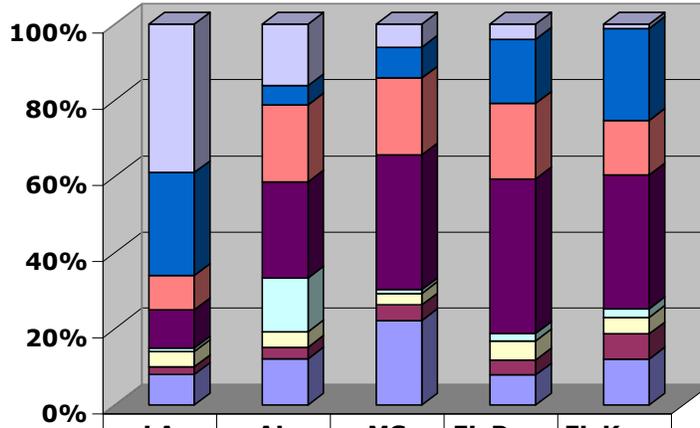
As part of this post-Ivan assessment, respondents were asked several questions to assess their general knowledge about hurricanes and hurricane procedures. The first asked who is responsible for deciding whether or not people need to evacuate and issuing evacuation notices. While there was a wide range of answers, the most common answer in Louisiana was the parish administrator, and for the other regions it was the local emergency managers.

Table 13. Who Is Responsible for Evacuation Notices

	Percent
Mayor	21
County or Parish Administrator	19
Police or Sheriff	15
Local Emergency Management Director	25
Governor	3
National Weather Service	4
National Hurricane Center	3
Other	10

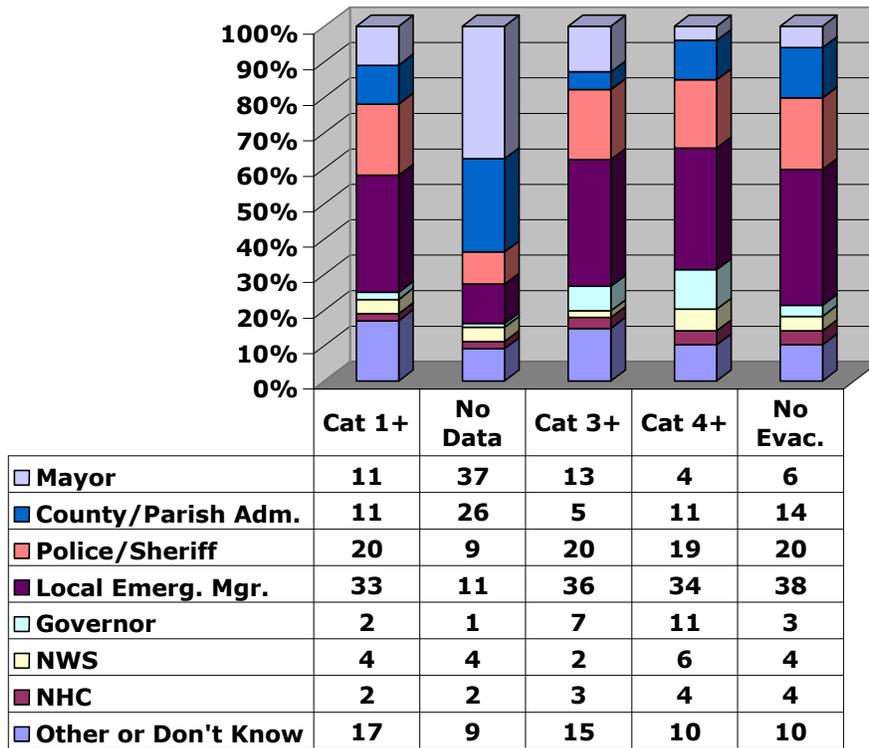
Considerable regional variation occurred with this question that will be of interest to officials.

Figure 37. Who Gives Evacuation Orders by Region



	LA	AL	MS	FL Pan.	FL Keys
Mayor	39	16	6	4	1
County/Parish Adm.	27	5	8	17	22
Police/Sheriff	9	20	20	20	13
Local Emerg. Mgr.	10	25	35	41	32
Governor	1	14	1	2	2
NWS	4	4	3	5	4
NHC	2	3	4	4	6
Other or Don't Know	8	12	22	8	11

Figure 38. Who Gives Evacuation Orders by Risk Zone



2. Knowledge of Evacuation Zone

Respondents were asked two questions related to their knowledge of whether or not they live in an evacuation zone. About one-quarter of the respondents said that before Hurricane Ivan approached they did not know if their home was in an evacuation zone, except for Monroe County where only 8% gave this response. When asked if they *now* know whether they live in an evacuation zone, nearly three-quarters said yes. This varied from 97% in Monroe County, to 58% in the Florida Panhandle.

3. Knowledge of Watches and Warnings

Respondents were tested on their knowledge of the terms watch and warning and the results are tabled below. They were asked how many hours before expected landfall does the National Hurricane Center issue a Hurricane Warning and the choices were 12 hours, 24 hours, 36 hours, and Don't Know. The question was then repeated for Hurricane Watch. Of the total sample, 62% chose the correct definition for hurricane watch, and only 40% knew the definition for hurricane warning. The next table gives the percent of respondents who knew the correct definition of each by region.

Table 14. Respondents Correctly Defining Watches and Warnings (Percent)

	Louisiana	Alabama	Mississippi	Florida Panhandle	Florida Keys	Total
Hurricane Watch	63	63	64	60	70	62
Hurricane Warning	40	35	43	40	41	40

There was little regional variation with 60%-70% knowing the meaning of watches, and 35%-43% correctly defining warnings. Given the hurricane experience of many of these respondents, and the efforts of the NWS and media to educate the public, it is surprising that so many still do not understand these terms. This adds to the growing evidence that the use of these terms warrants further study.

4. Hurricane Experience

When respondents were asked if they had ever experienced a major hurricane, 80% said yes. Regional variations ranged from 76% to 85% with the highest rate being from Mississippi. Given the limited number of major hurricane landfalls in these areas, it appears that there is a great deal of “false” hurricane experience, i.e. people who think they have gone through a major storm, but have not.

Not surprisingly, three-fourths of Florida Panhandle and Alabama respondents said they experienced a major hurricane in 2004, while most of the others believed they had not.

5. Topics Needing More Information

Several questions asked respondents whether they needed more information on a variety of topics.

Table 15. Topics Needing Further Information

	Louisiana	Alabama	Mississippi	Florida Panhandle	Florida Keys
Insurance	67	77	68	76	69
Safe rooms	64	62	64	62	60
Sheltering in place	70	65	64	65	65
Roadway info.	83	74	73	76	55
Evacuation routes	81	70	73	69	45
Vulnerability	73	67	66	67	59
Mitigation	63	57	54	58	57
Shelters	70	62	63	64	57

Based on this sample there appears to be considerable need for more information on insurance, safe rooms, sheltering in place, roadway information, evacuation routes, vulnerability, mitigation techniques, and sheltering. There was little variation across regions, although people in Louisiana were more likely to express a need for more information on roadways and evacuation routes.