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South Carolina's Response to Hurricane Floyd

Kirstin Dow
Susan L. Cutter

Hazards Research Lab
Department of Geography
University of South Carolina
Columbia, SC 29208
E-mail: scutter@sc.edu
kirstin-dow@sc.edu

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ABSTRACT

Ten years after Hurricane Hugo, Hurricane Floyd threatened a more densely populated South Carolina coastline. The increased coastal development, tremendous population growth, and high evacuation rates contributed to an evacuation that involved an unprecedented number of people, traffic problems, and level of public criticism. Our analysis of evacuation decision making addressed three central topics based on the Hurricane Floyd evacuation experience: residents' criteria and sources of information for evacuation decisions, factors contributing to traffic congestion, and differences in public and elected official opinions on priorities in planning and what constitutes a successful evacuation. This research involved three components: 1) a mail survey of 223 Horry County residents whom we had first surveyed following Hurricane Bonnie in 1998; 2) a phone survey of 536 residents throughout the coastal South Carolina evacuation zone; and, 3) a survey of local elected officials' perceptions of emergency planning priorities.

The surveys of coastal residents documented a number of evacuation characteristics relevant to future hurricane preparedness efforts. The overall evacuation rate was relatively high, 64.2% (+/- 4.2%) in coastal counties. The public is using information other than evacuation advisories/orders in making their decisions to remain in place or evacuate. Among those households that evacuated, more than 20% of the households took two or more cars, which added a significant number of vehicles to an already heavy traffic flow out of the coastal areas. Improvements are needed in the dissemination and availability of information on evacuation route options. Traffic and associated travel times are emerging as issues affecting household evacuation decisions. Finally, and perhaps most importantly, despite the history of near misses by hurricanes, the uncertainty of the storm track, and the ensuing criticisms of the evacuation process itself, public support for evacuation as a protective, precautionary strategy is strong.

INTRODUCTION

Residents of South Carolina are becoming increasingly familiar with the phenomena of approaching hurricanes. Over the past four years, six hurricanes of varying strength have threatened the coast. Nonetheless, Hurricane Floyd was a surprise in many ways, particularly the massive evacuation followed by the heavy rains and flooding. An estimated 2.5 million people left homes both near and somewhat distant from the Atlantic coast, in order to avoid the impacts of Floyd. In South Carolina, approximately ½ million people were involved in the evacuation that resulted in bumper-to-bumper traffic on the interstate highways. Under these conditions, distances of 100 miles sometimes took over 15 hours by car.

Criticism mounted quickly as people stuck in traffic picked up their cell phones and radio stations aired talk shows. Traffic in the major problem area, Interstate 26 between Charleston and Columbia, was finally relieved by lane reversal accomplished late in the day. From the governor's office to the Emergency Preparedness Division to the Department of Transportation, the failure to have a plan to reverse traffic flow out of the Charleston area on I-26 became a focal point in the debate about the success or failures of the evacuation. Despite the traffic jam, by some measures, this unparalleled evacuation was a success. Evacuees were off of the roads before landfall. The majority of the coastal population evacuated and no lives were lost. Despite the later flooding and an apology from the governor, the most heated and widespread debate

centered on a narrowly framed question of what is a successful evacuation. Significantly, by June 2000, new highway renovations and preparedness strategies for I-26 lane reversal were all in place.

The experience with Hurricane Floyd, as well as other recent evacuations in South Carolina, provided an opportunity to examine three main sets of research issues:

1. Evacuation rates and rationales, including how people evaluate and use available information to guide evacuation decisions;
2. Factors contributing to the heavy concentration of highway traffic;
3. Differences in public and official evaluation of successful evacuations.

This analysis combined a number of research methods in order to capture the differences in perspectives among residents and public officials in South Carolina. Studies involving residents throughout the states' coastal areas, as well as a follow-up study in Horry County, are reported here side by side in order to illustrate regional differences and similarities. The priorities of residents and public officials in evacuation planning are also compared in the context of planning for and measuring success in evacuations.

METHODOLOGY

A three-part approach was used to address the research issues. The first component was a mail survey of 223 Horry County residents whom we had first surveyed following Hurricane Bonnie in 1998. The second component was a phone survey of residents throughout the coastal South Carolina evacuation zone. These two surveys were designed together and contain many identical questions, as well as some questions drawn from our past surveys in the area, for comparative purposes. In both the Horry County mail survey and the coastal Carolina phone survey, we screened respondents to assure that they were residents of the evacuation area. The third component focused on local elected officials' perceptions of emergency planning priorities.

Coastal South Carolina Phone Survey

In cooperation with University of South Carolina Institute of Public Affair's Survey Research Lab, we conducted a survey of residents throughout coastal South Carolina. Phone numbers were randomly selected from the complete sets of phone numbers within completely and partially evacuated zip code areas (Figure 1). The survey included both open-ended and closed question formats and took approximately 10 minutes to complete and was administered in the evenings between October 25 and November 9, 1999. Completed interviews numbered 513, and another 19 interviews were partially completed for a survey total of 536 households. The response rate for this survey was 63.5%. The sampling is accurate to within +/- 4.2% for South Carolina.

Horry County Mail Survey Characteristics

Horry County is in the northern part of South Carolina, near the North Carolina border. In the past four years, six hurricanes have barely missed the South Carolina coast and made landfall

within 100 miles north of Myrtle Beach. In 1999, in addition to Floyd, two other hurricanes (which made landfall as tropical storms) also prompted evacuation concerns. In a previous survey of residents' evacuation responses to Hurricane Bonnie, one of these close calls, 223 of the people we interviewed agreed to follow-up future interviews. These residents were part of a convenient sample of residents who participated in a 10-minute face-to-face survey in September 1998. These residents were asked their evacuation decisions for Hurricane Bonnie, as well as for Hurricanes Bertha and Fran, which occurred two years earlier. They were also asked about the sources of information they used in making decisions and their assessments about the reliability of information. These questions were incorporated in the survey about Hurricane Floyd as well.

We contacted this repeat group through a mailed survey sent on October 29, 1999, six weeks after Hurricane Floyd, concurrent with the coastal population phone survey. That package contained a cover letter, survey, and return envelope. Their responses were linked to their 1998 answers about Hurricane Bonnie, so we could assess changes in behavior over time. We recorded responses as they arrived and, two weeks after the initial mailing, sent a reminder postcard. Finally, a month from the original mailing date, we sent a final letter, a second survey, and a return envelope. The response rates are reported in Table 1.

Table 1: Horry County Mail Survey Response Rate

	Survey Totals	Adjusted Response Rate
Responded	123	74% (123)
No Response	43	26% (41)
Undeliverable	13	NA
Total	179	166

Elected Officials

To contact elected officials we coordinated with the ongoing biannual survey of elected officials conducted by the USC Institute of Public Affairs. This is a broad survey sent to local elected officials throughout the state on a variety of issues and concerns for local government. In addition to the regular questions asked on the survey, we were permitted a single question on emergency planning and response. This question, "What is the most important factor to consider in preparing an evacuation for a hurricane," generated 431 responses.

CHARACTERISTICS OF RESPONDENTS

The two groups of residents differed most significantly in geographic distribution within the state; however there were also some differences in demographic characteristics as well. As Table 2 shows, the principal differences are that the coastal phone survey included more African-Americans and more male respondents. As a group, the Horry County residents distinguished themselves as having more experience with hurricane evacuations.

Table 2: Demographic Comparison of the Survey Respondents

Demographic characteristics	Horry County Mail Survey (N=123)	Coastal South Carolina Phone Survey (N=536)
Age 18-40 years	26%	35%
41-60	44%	40%
61+	28%	25%
Race*		
Anglo-American	97%	77%
African-American	1%	21%
Other	2%	2%
Sex		
Male	35%	42%
Female	65%	58%
Number in Household Over 18		
1	23%	31%
2	61%	57%
3+	14%	12%
Have Weather Channel at Home	98%	87%
Have Evacuated for a Hurricane Prior to Floyd**	89%	44%

* Based on interviewer observation in Myrtle Beach; self identification in phone survey
** In Myrtle Beach, reported evacuating at some time since 1996

EVACUATION RATES AND RATIONALES

Using the Horry County and coastal Carolina surveys allowed us to observe both geographic variations in evacuation rates and longitudinal responses to hurricanes among the Horry County residents. As Table 3 shows, the majority of respondents evacuated in anticipation of Hurricane Floyd. As a coastal average, the 64% evacuation rate is the highest reported in the state since Hurricane Hugo in 1989 (see Dow and Cutter, 1998). The evacuation participation rate for

Hurricane Fran (1996) in Hilton Head was 65%, but lower elsewhere in the state (Dow and Cutter, 1998). Regional variation in evacuation rates is not uncommon. In the case of Floyd, the evacuation rate was almost 20% higher among our "experienced" Horry County residents than elsewhere in the state, although among the Horry County residents contacted in the coastal Carolina survey, the evacuation rate was 62%. Several factors may account for the difference between the surveys. The mail survey may involve some level of self-selection of people particularly concerned with hurricanes. There have been several near misses for Horry County over recent years, and the Horry County residents have also evacuated more often in the past.

Table 3: Hurricane Floyd Evacuation Rates

Did you evacuate?	Horry County Mail Survey	Coastal Carolina Phone Survey
No	17 % (20)	34 % (183)
Yes	83 % (102)	64 % (344)
Tried to evacuate but was unsuccessful	NA	2 % (9)
Grand Total	123	536

Since we began conducting research on hurricane evacuation in South Carolina in 1996, six hurricanes have threatened the state's coast. Our longitudinal data on Horry County residents documents evacuation rates among a group of 123 people over this 3-year period. As Table 4 shows, the evacuation rates associated with Hurricane Floyd were significantly higher than rates seen in recent years.

Table 4: Horry County Longitudinal Survey Hurricane Evacuation Responses

	Dennis	Irene	Bertha	Floyd	Bonnie	Fran
Strength at Landfall	Tropical Storm 8-9/99	Tropical Storm 10/99	Category 2 Storm 7/96	Category 2 Storm 9/99	Category 2/3 Storm 8/98	Category 3 Storm 8-9/96
Max. Wind Speed (mph)	104	109	115	155	115	121
Evacuate	17%	7%	38%	84%	44%	46%
Not Evacuate	82%	93%	62%	16%	56%	54%

In general, these evacuation rates indicate some consistency between number of evacuees in Horry County and the category of the storm at landfall. Hurricane Floyd, however, is a clear exception to this trend. The high evacuation rates for Floyd suggest that the maximum wind speed might be a better indicator of potential evacuation rates. It is clear from respondents' comments about their decision-making process, that although the wind speed and category are considered, the decision to evacuate involves many other factors. Among them are personal characteristics (such as past experience), social relationships, trust of officials, and their location (an evaluation of home safety). Research on the reported strength of the hurricane at the time of evacuation is being initiated.

The 1998 and 1999 surveys captured Horry County respondents' explanations for their evacuation decisions for Hurricanes Bonnie, Dennis, Floyd and Irene. For Hurricane Bonnie, primary reasons for evacuating were the governor's evacuation order (10%), followed by the strength of the storm and past experience (7% each). In contrast, 22% reported that the strength of the storm was the top reason for evacuating prior to Hurricane Floyd. The probability of a nearby landfall provided motivation for another 14% of the respondents, and the Governor's evacuation order was very important to 9%. Hurricane Floyd's pre-landfall strength as a category four hurricane made a strong impression on Horry County residents.

Table 5 compares the Horry County residents with the broader sample of coastal Carolina residents. While the severity of the storm was a top concern all along the coast, landfall location emerged as more important in the northern part of the state, especially in Horry County, where the landfall probability grew greater as Floyd came closer to land. Past experience was more influential along the southern coast; perhaps this could be expected because of past experiences included Hurricane Hugo. Throughout the coastal areas, the perceived safety of the home was the major factor in residents deciding to stay in an area despite evacuation orders (Table 5). In Horry County, location of four near misses in the previous three years, past experience was the second most often given explanation for not evacuating.

Table 5: Explanations for Evacuation Behavior for Hurricane Floyd

	Most important factor that convinced people to leave		Horry County Mail N=76	Coastal Carolina Phone N=346
Did you evacuate?	**Yes**	Landfall location	23.7%	5.5%
		Severity of the storm	36.8%	23.1%
		Governor advice/order	15.8%	18.8%
		Past experience	5.3%	17.3%
		Local TV, National Weather Station, Weather Channel	7.9%	12.6%
		Other (work, fear of floods, advice/actions of friends/relatives)	10.5%	22.7%
	Most important factor that convinced people NOT to leave		**Horry County**	**Coastal Carolin**

		Mail N=15	a Phone N=192
NO	Landfall location	6.7%	6.5%
	Home is safe	33.3%	14.1%
	Past experience	26.7%	7.1%
	Work obligations	0	12.4%
	Didn't think anything would happen	0	17.6%
	Didn't want/plan to leave	0	5.9%
	Other (includes traffic concerns, work, pets; all less than 5% each)	33.3%	46.4%

Among Horry county residents, the evacuation behavior in response to Hurricane Floyd is consistent with respondents' anticipated actions. In 1998 following Hurricane Bonnie, we asked what they would do if another hurricane threatened the South Carolina coast, and many responded that their decision would depend on various factors. Table 6 reports respondents' 1998 beliefs about their future decisions against their actual 1999 evacuation for Floyd, a year later. Despite limitations of this type of correlation, the consistency between behavior intent (in 1998) and actual evacuation decisions (in 1999), suggests that in this area respondents are becoming practiced and are developing fairly robust criteria for individual evacuation decision making.

Table 6: Anticipated and Actual Evacuations

Will you evacuate in the future?		Did you evacuate for Floyd?	
Depends On		Yes %	No %
	Landfall location (n = 16)	75%	25%
	Severity of the storm (n = 47)	85%	15%
	Governor's orders (n = 08)	89%	11%

A closer look at the sources of these judgements reveals that the residents of Horry County are becoming hurricane savvy. As a group, these Horry County residents have considerable experience with hurricanes. The majority, 63%, have been advised to evacuate at least five times, 19% have been advised to evacuate over 10 times. Within this group, 44% have suffered hurricane damage in past storms. In addition, as the following paragraphs elaborate, residents invest a great deal of time staying well informed on hurricane issues.

RESIDENTS' SOURCES OF INFORMATION ABOUT HURRICANES

The importance of forecasts of storm severity and storm track relative to the warnings of government officials led us to examine the major sources of information used by respondents. Residents of South Carolina sought a variety of sources of information to aid in their decision making. The frequency with which they consult various sources and their judgement about the accuracy of the risk reporting were investigated in the Horry County sample (Table 7). Subscription to the Weather Channel is common in coastal South Carolina, with approximately 87% of the households responding that they have access to this cable channel. In Horry County, the Weather Channel is the most frequently consulted source of information with 33% of the population reporting that they leave it on all day, and another 33% checking it every hour during a hurricane event. Local television is a strong second choice, with 47% of residents reporting that they leave the TV on a local channel all day or consult it every hour, much more frequently than other potential sources such as national television, local radio, or the Internet.

Table 7: Frequency of Use of Weather Information Sources

Frequency	Local TV	2ndLocal TV	National TV	Weather Channel	Local radio	NOAA/ NWS radio	Family, friends, co-workers	Internet
Once a day	19%	18%	21%	5%	13%	8%	24%	14%
Three times a day	23%	16%	16%	20%	11%	7%	16%	11%
Every hour	24%	11%	6%	33%	5%	6%	7%	3%
Leave it on all day	23%	7%	4%	33%	15%	6%	2%	2%
Never	1%	11%	17%	1%	17%	34%	16%	28%
No response	11%	37%	37%	11%	40%	39%	37%	41%

The Weather Channel and local television stations are also the sources most people believe get the information about hurricane risks "just right" (Table 8). While there was some belief that some sources underestimated the risks, reports that risks were overestimated were more common. National television, and family, friends, and co-workers were the two categories described most often as giving reports that overestimated or very overestimated the risks, 37% and 32% respectively. However, the Weather Channel, local television, and the governor were also seen by at least 27% of respondents as overestimating the risks.

With the increasing availability of the Internet and stories of difficulty accessing government sites for weather information, it is interesting to observe that 30% of the respondents reported using the Internet and only 5% checked it more than three times a day. It may also be a measure of the relatively recent exposure to the Internet that only 11% of Horry County residents were willing to comment on their perception of the risk information they found there. Of those, the majority believed that the assessment of hurricane risks they found was "just right."

Table 8: Quality of the Information about Hurricane Risks

	Local TV	Nat'l. TV	Weather Channel	Local radio	NOAA/ NWS radio	Governor	Emer. Mgmt. Official	Family, friends, co-workers	Internet
Very underestimated	1%	0	0	0	0	2%	1%	3%	0
Underestimated	4%	7%	5%	7%	4%	7%	4%	4%	1%
Just right	56%	33%	57%	37%	28%	39%	40%	27%	7%
Overestimated	24%	25%	20%	14%	5%	22%	15%	21%	1%
Very overestimated	7%	12%	7%	4%	1%	5%	7%	11%	2%
Don't know	1%	6%	1%	14%	30%	8%	11%	11%	4%
No response	7%	18%	10%	24%	32%	18%	23%	24%	85%

We asked respondents to identify the Internet sites they used. Despite the 30% use rate reported by respondents only 13 individuals answered this question. The sites they consulted (some used more than one) are listed below in Table 9. None of these sites offers real-time information.

Table 9: Internet Sites Used by Horry County Residents

Site addresses	Number of users
intellicast.com	3
weathercast@wis	1
weatherchannel.com	7
www.noaa.gov	2
www.wunderground.com	2

EVACUATION TRAFFIC

Most coastal residents of South Carolina are familiar with traffic congestion in the form of morning and evening commutes or holiday arrivals and departures. However, the evacuation traffic was well beyond those more common experiences. The traffic volume on the Interstate highways was above that anticipated by the Department of Transportation. According to our survey of coastal Carolina residents, I-26 between Charleston and Columbia was the most heavily used route during the evacuation, with 19% of respondents taking it during part of their evacuation journey. Interstate 95, the second most commonly used route, carried about 10% of the respondents.

According to our coastal survey, 56% of our respondents left South Carolina, 32% stayed in state, and 9% stayed in their county of origin. Figure 2 shows the destinations of respondents broken down by densely populated communities (e.g. Hilton Head and Beaufort, Charleston, Myrtle Beach). All nearby states, including the more distant Tennessee, were destinations. Note the number of evacuees who traveled to North Carolina and moved into areas at greater risk due to the uncertainties in landfall projections at the time.

For those evacuees who stayed within South Carolina, Columbia, Augusta, and Greenville were generally important destinations. Figure 3 shows another dimension of the regional variability of evacuation practices among residents in the state. None of the evacuees in the southernmost part of the state (Beaufort) stayed in their counties of origin. While in the Charleston area and particularly in the Horry County/Myrtle Beach regions, more residents evacuated within their home county.

After the fact, the traffic volume can be explained in several ways. Some households were said to have taken more than one car, in order to protect that piece of property. As traffic was concentrated on the Interstate highways and comparatively light on the state and county roads, some observers speculated that evacuees did not have maps with them and were reluctant to take alternative, less familiar routes. Some observers also suggested that the relatively short interval between the announcement of the voluntary and mandatory evacuations, as well as the evacuees traveling north from Georgia and Florida, contributed to the greater congestion.

As Table 10 indicates, at least 21% of households took two cars. This observation is in keeping with planning assumptions that some households will take more than one vehicle. Despite multiple cars, 92% reported that the entire household was headed to the same destination.

Table 10: Number of Cars per Household

Number of Cars	Myrtle Beach Mail Survey*	Coastal Carolina Phone Survey
0	2%	3%
1	72%	72%
2	26%	21%
3+	2%	4%

In asking about route selection, we focused on access to and use of maps. Approximately 65% of our respondents to both surveys had maps in their cars (Table 11). Nearly half of coastal Carolina residents used those maps to select routes suggesting that more people were potentially aware of alternative routes than actually selected them. The low use of maps among Horry County residents undoubtedly reflects to some degree the limited number of routes away from the coast in that area.

Table 11: Use of Map in Selecting an Evacuation Route

Use map?	Horry County Mail Survey	Coastal Carolina Phone Survey
No	81%	51%
Yes	18%	49%

The timing of an evacuation order and the public's response is important to the flow of traffic out of the affected area. Figure 4 shows the timing of evacuations among respondents. The voluntary evacuation was called at 7 a.m., Tuesday, September 14, 1999, and the mandatory evacuation order followed at noon that same day. The majority of residents (61%) left on Tuesday, followed by a second large group (31%) on Wednesday, the 15th. Only a small percentage left Monday (5%) prior to any evacuation advisory or order. In other words, an estimated 359,000-412,000 people left the coast on Tuesday. The vast majority of them left in one of two periods, either between 9 a.m. and noon (25.4%) or between noon to 3 p.m. (22.6%).

MEASURING SUCCESS

Respondents were asked to evaluate the appropriateness of the evacuation strategy in two different ways (Table 12). In all cases, at least 80% supported the evacuation order, based on the knowledge they had before landfall as well as the uncertainties in that knowledge.

Table 12: Was Evacuation the Appropriate Response?

	No		**Yes**		**Don't Know**	
Survey Questions	Horry County	Coastal Carolina	Horry County	Coastal Carolina	Horry County	Coastal Carolina
A. Given what you knew about the storm before it made landfall, was evacuation the proper response to Hurricane Floyd?	11%	10%	83%	86%	7%	4%
B. On another	5%	8%	87%	84%	5%	4%

issue. . . given the uncertainties about the hurricane track, was evacuation the appropriate response to Hurricane Floyd?						

Despite the approval reported above, this evacuation was largely seen as unsuccessful by the media. Local papers, television, radio, as well as national coverage, presented the extensive public criticism of the evacuation. State senators, mayors, and news columnists weighed in and the Ravenel report requested by South Carolina Governor Hodges reflected more anger than familiarity with the processes of emergency response management.

In this context, we inquired about how the residents evaluated successful evacuations. We sought to examine different facets of both evacuation goals and characteristics of the evacuation (and re-entry) process. Table 13 reports the responses that rank a range of evacuation procedures and goals on a five-point scale of importance: not important at all, not too important, somewhat important, very important, and finally, extremely important. We divided these characteristics into goals and process considerations. The goal of saving lives was extremely important to most people. Assuring ready availability of disaster recovery support was also a widely supported goal. But respondents were less consistent in their beliefs about whether all people should be evacuated to safe inland areas or that it was necessary to all people to return to their homes within three days after the landfall or that services be restored before the return.

Overall the goal of assuring that no lives were lost was followed by a process consideration of keeping traffic flowing (68%) and making information on evacuation routes readily available over the radio. Conducting the evacuation in phases was somewhat less important, but still extremely important to at least 45% of the respondents, while maintaining the ability to change plans depending on the storm characteristics was a lesser concern. The suggestion that tourists be required to evacuate first was much more strongly endorsed by Horry County residents, verifying regional differences in issues affecting the evaluation of hurricane evacuation.

Table 13: Importance of Evacuation Characteristics

	Coastal Carolina *Extremely important*	Horry County *Extremely important*	Coastal Carolina *Very Important*	Horry County *Very Important*	Coastal Carolina *Not too important or not*	Horry County *not too importan t*

					important at all	*or not at all*
Goals						
Making sure that lives are not lost	77.5	94.2	20.4	5.8	0.6	-
Providing readily available disaster assistance for rebuilding when people first return	46.1	50.4	41.1	31.4	1.8	2.4
Evacuating all people to safe inland areas	43.1	54.2	41.3	28.3	3.3	2.5
Allowing people to return home no later than three days after landfall	30.1	56.4	39.1	29.1	8.2	1.7
Restoring services, such as electricity, before people return to their homes	30.0	27.7	33.9	29.4	12.3	18.4
Process Considerations						
Keeping traffic flowing out of the area	68.6	70.8	28.3	26.7	0.8	-
Providing readily available information on evacuation routes on the radio	55.4	55.8	37.6	40.0	2.3	-
Conducting the evacuation in phases, from	44.3	45.5	43.3	40.2	2.8	-

the barrier islands inward						
Being able to change the evacuation plans based on the size and direction of the hurricane	36.3	42.5	47.6	41.7	3.6	0.8
Requiring tourists to evacuate first	19.0	47.5	28.1	17.5	29.3	10.8

Table 14 expands on views about timing in the evacuation process. In a successful evacuation, most people believe that the mandatory and voluntary evacuation orders should be spaced by at least 24 hours, with about 20% suggesting that 12 hours would be a sufficient interval. The majority of respondents believe that the evacuation delays should not be more than two times the normal length of the trip and that they should be able to return home within two days, although the restoration of services might take a day longer.

Table 14: Timing In A Successful Evacuation

Timing of steps	Short intervals						Long intervals	
	Horry	Coast	Horry	Coast	Horry	Coast	Horry	Coast
Amount of time between voluntary and mandatory orders	1 to 8 hours apart		9 - 12 hours apart		13 - 24 hours apart		Over 24 hours apart	
	16%	17.4%	21%	19.7%	41%	40.8%	18%	22.1%
Evacuation travel time in comparison to normal travel service	1.5 tmes longer		2 times longer		3 + times longer			
	17.2%	6.4%	61.2%	67.2%	9.5%	19.9%	-	-
Days to restore service	1 - 2 days		2 - 3 days		3 - 4 days		4 + days	
	23.8%	15.5%	47.5%	47.9%	14.8%	3.2%	8.9%	33.3%
Days before residents are	1 day or less		1 - 2 days		2 - 3 days		4 days +	

allowed to return home								
	42.6%	28.7%	38.9%	28.5%	17.6%	23.8%	0.9%	16.5%

These time frames give a rough estimate of our respondents' desires and expectations about the disruptions caused by hurricanes. While it may be impossible to accommodate these concerns directly in hurricane evacuation planning due to other considerations (route networks, clearance times, etc.), knowledge of these expectations among the emergency management community may engender greater public support of the evacuation process.

PUBLIC OFFICIALS' EMERGENCY PLANNING PRIORITIES

As part of their biannual survey of local elected officials, University of South Carolina's Institute of Public Affairs included one question on hurricane evacuation. The question focused on the most important factor to consider in preparing for an evacuation for a hurricane. Table 15 indicates that the concerns of officials overlapped in the areas of evacuation routes, traffic, and transportation. This overlap is not too surprising, given the recent evacuation experiences. Interestingly, priorities somewhat differ from those of the survey respondents, as neither public safety nor public notification ranked high among officials' concerns.

Table 15: South Carolina Elected Officials' Hurricane Preparedness Priorities

Responses	%
Evacuation routes	17%
Ensure public safety	11%
Notify citizens	9%
Planning/preparedness	9%
Traffic and transportation	9%

CONCLUSIONS

Ten years after Hurricane Hugo, the largest evacuation in South Carolina history took place. Increased coastal development, tremendous population growth, and high participation rates stressed the evacuation process in unprecedented ways, most noticeably in major traffic jams along I-26. Hurricane planning in South Carolina had more salience and became both a major concern and a source of consternation for agencies and residents alike. Our analysis of evacuation decision making addressed three central topics based on the Hurricane Floyd evacuation experience: residents' criteria and sources of information for evacuation decisions,

factors contributing to traffic congestion, and differences in public and elected official opinions on priorities in planning and what constitutes a successful evacuation.

The overall evacuation rate was relatively high, 64.2% (+/- 4.2%) in coastal counties. Responses of coastal residents and longitudinal research with Horry County residents suggest that the severity of the storm was the most important factor in respondents' decisions to evacuate. Further, among the experienced Horry County residents, this heightened evacuation rate corresponded to their previously reported intentions to evacuate during future hurricanes. This experienced group considers a variety of information sources and consults regularly with some of them to assist their evacuation decision making. They also are more likely to turn to the news media than government sources, such as gubernatorial orders.

Once evacuees were on the roads, major traffic pressure developed on the Interstate system. About 63% of respondents carried road maps, yet only 51% used them to determine their route. The majority of South Carolinians traveled out of state to destinations farther than necessary for safe sheltering. This destination aspect of decision making merits further attention, as the traffic caused by the large number of evacuees from within South Carolina and other coastal states pushed the limits of the infrastructure capacity.

Despite the history of near misses and precautionary evacuations for South Carolina in recent years, over 90% of the respondents felt that given the uncertainties, calling an evacuation was the right decision. Respondents measured successful evacuations according to a number of criteria, many of which are extremely or very important to the majority of the respondents. These concerns were not strongly mirrored by the responses of elected officials overseeing local planning efforts. While traffic issues were a priority for both groups, emphasis on public information was significantly lower among elected officials, but quite important to the information-seeking respondents of this survey.

The survey of coastal residents highlighted a number of important lessons for future evacuations. First, more than 20% of the households took two or more cars, which added a significant number of vehicles to an already stressed traffic flow out of the coastal areas. Second, the public is using information other than evacuation advisories/orders in the decisions to remain in place or evacuate. Third, navigational information and the length of time to reach destinations needs to be improved. Finally, and perhaps most importantly, despite the uncertainty of the storm track and the ensuing criticisms of the evacuation process itself, public support for evacuation as a protective, precautionary strategy is strong.

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hazctr@colorado.edu