Hurricanes Bertha and Fran in North and South Carolina: Evacuation Behavior and Attitudes Toward Mitigation

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prepared by

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Introduction

During the 1996 hurricane season hurricanes Bertha and Fran prompted evacuations in both North and South Carolina and struck North Carolina, with both storms, particularly Fran, causing substantial damage. Telephone interviews were conducted with residents of both states to document their evacuation behavior and to measure their attitudes toward and adoption of practices to reduce damage in the future.

The Hurricanes

Hurricane Bertha struck between Wrightsville and Topsail Beaches, North Carolina around 4 PM on July 12, 1996. Winds at landfall were 105 MPH, and the storm caused insured losses alone to reach $135 million. Bertha had earlier threatened north Florida and Georgia, but stayed approximately 200 miles offshore and paralleled the Florida and Georgia shores. At 11 PM on July 9 the National Hurricane Center issued a hurricane watch which included all of the North and South Carolina coasts, and at 11 AM on July 10 posted a hurricane warning from Sebastian Inlet, Florida to Little River Inlet, SC (at the North Carolina/South Carolina border). The warning area was extended to include all of the North Carolina coast at 5 PM on July 10. Following the warnings, officials in both states urged residents to evacuate. During most of its approach to the Carolina coasts, Bertha's winds had been 80 MPH (having weakened from 100 MPH earlier and began to strengthen about 12 hours prior to landfall. Forecast tracks originally

predicted the center of Bertha would cross the shoreline in South Carolina but gradually shifted farther east into North Carolina.

Fran hit at Cape Fear, North Carolina at 8 PM to 9 PM on September 5, with winds estimated at 115 MPH. Damage was much more extensive than in Bertha, with insured losses in North Carolina of $1.275 billion and $20 million in South Carolina. Early forecasts called for Fran to strike near Savannah, Georgia, but subsequent predictions moved landfall progressively farther north and east. On September 3, at 11 PM the National Hurricane Center issued a hurricane watch from Sebastian Inlet, Florida to Little River Inlet, South Carolina (the border between the Carolinas). The watch was extended to Oregon Inlet, North Carolina, which included most of the North Carolina coast at 11 AM the following day (September 4). Later that day, at 5 PM, a hurricane warning was posted from Brunswick, Georgia to Cape Lookout, North Carolina (in Carteret County, including and just east of the area surveyed in this study), and it was extended northward to the North Carolina/Virginia border at 11 PM. . Fran was not only stronger than Bertha at landfall, but had been stronger and larger throughout its approach to the coast. Officials in both the Carolinas called for evacuations.

Survey Method

In the Myrtle Beach area of South Carolina and in southeastern North Carolina 815 residents were interviewed by telephone in January of 1997. The survey instrument is attached to this document as Appendix I. Respondents were asked how they responded in hurricanes Bertha and Fran and asked a number of questions concerning practices designed to reduce damage from hurricanes. In addition they were queried about their

perceived risks from hurricanes and about their backgrounds, including demographics and how long they had lived in the region.

In North Carolina the residents lived in Brunswick, New Hanover, Pender, and Onslow Counties. In South Carolina most of the interviews were conducted in Horry County, but some came from the northern part of Georgetown County.

One of the most important variables affecting how people respond (and should respond) to hurricanes is the vulnerability of their location to storm surge. Therefore the sample was stratified to ensure adequate representation from certain predetermined risk zones. In North Carolina there were three zones: barrier islands (beaches), mainland surge areas susceptible to flooding in hurricanes, and areas of coastal counties inland of the surge zones (referred to in the report as non-surge areas). The Myrtle Beach area doesn't lend itself to that same sort of differentiation, so the boundaries were tied more explicitly to highways and the Intracoastal Waterway (ICW in some tables in the report), as these were the referents used to delineate evacuation zones in Bertha and Fran. Table 1 indicates the number of respondents from each risk zone in each state.

Table 1. Completed sample sizes by state and risk zone.

	South Carolina	North Carolina
East of Bus. Hwy. 17	106	
East of Hwy. 17	75	
Hwy. 17 to Bus. Hwy. 17	86	
Intracoastal to Hwy. 17	45	
West of Intracoastal	71	
West of Hwy. 17	29	
Beaches		195
Mainland Surge		104
Non-surge		104
Total	**412**	**403**

In South Carolina different boundaries were used depending upon location within the study area. In areas where the Highway 17 Business route did not exist, locations were classified as being east of Highway 17. In areas where Business route 17 existed, locations between Highway 17 and Business 17 were labeled as such. In the southern part of the study area where the Intracoastal Waterway was not comparable to the rest of the area, locations were characterized as being west of Highway 17. In general, in South Carolina risk was assumed to decrease as a function of distance west of the Atlantic Ocean. The breakdown in Table 1 also allowed various combinations of risk area to be constructed for the analysis, as the areas evacuated by officials in Bertha and Fran differed, for example.

Because the interviews were conducted in January, very few seasonal residents were included in the sample. In particular this caused the people in high-rise structures near the beach to be underrepresented. Because the sample was stratified by risk area, reverse telephone directories were used for sampling. That is, locations were selected for interviewing, streets were selected from those locations, and directories listing phone numbers on those streets were used for selecting phone numbers to call. This method is expected to be less representative than a random digit dialing technique but far more cost-effective at arriving at the required sample sizes in each risk area. At least three callbacks were used for each phone number before discarding it.

Statistical Reliability

Figures reported from surveys 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 the samples were selected, but usually are 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 one can be 90% "confident" (or "sure") are within 5 to 8 percentage points of the true population values. With a sample of 50, one can be 90% "confident" of being within 7 to 12 percentage points of the actual population value. A sample of 25 is 90% "accurate" only within 10 to 17 percentage points.

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.

Therefore, readers should keep in mind that some estimates provided in this report are more statistically reliable than others. This is particularly noteworthy in drawing conclusions about whether two survey results are "different" from one another. Differences of a few percentage points in sample results of 100 or less do not necessarily mean the populations from which the samples were drawn are different. When the

aggregate samples are broken down into subgroups, the reliability of estimates for the subgroups suffers. Tables contain actual sample sizes used to calculate the values reported in the table. Sample sizes vary from table to table because not all questions were asked of all respondents (people who didn't evacuate weren't asked where they went, for example), some respondents refused to answer some questions, and in a few cases responses were invalid.

In many instances "tests of statistical significance" were conducted to ascertain whether patterns observed in the sample were indicative of patterns in the population from which the sample was drawn. The narrative of this report distinguishes between differences which were statistically significant (at the 90% level of confidence or better) and those which were not.

Response in Bertha

Evacuation Rates

In Bertha 34% of the respondents in South Carolina and 44% of those in North Carolina said they left their homes to go someplace safer (i.e., evacuated). These global numbers are relatively meaningless, however, as response varies greatly among risk areas. Table 2 indicates the breakdown by risk area in each state. Response in South Carolina was lower than that in North Carolina, and even east of Business Highway 17 only slightly more than half said they evacuated. In North Carolina response was higher, but almost 30% said they didn't evacuate the beach areas. Also significantly, evacuation from the mainland surge area was no greater than that from areas farther inland in coastal counties.

Table 2. Percent evacuating by risk area in Bertha.

	South Carolina	North Carolina
	(N=370)	(N=363)
East of Bus. 17	53	
ICW to Bus 17	34	
West of ICW	14	
Beaches		71
Mainland Surge		18
Non-surge		24

In South Carolina the Governor requested a voluntary evacuation of barrier islands, beachfront areas, and mobile homes in coastal counties at 7:00 PM on July 10. The South Carolina coast had been under a hurricane watch since 11 AM on the 10th, and the call for a voluntary evacuation came shortly after the warning area was extended to

include all of North Carolina. At 12:20 PM the following day (July 11), the Governor ordered a mandatory evacuation of all areas east of the Intracoastal Waterway.

Evacuations in North Carolina were at the discretion of the counties, and government actions consequently varied more than in South Carolina. Brunswick, for example, only recommended evacuation and did so at 11 AM on July 11. New Hanover ordered a mandatory evacuation at 10 AM that same day, and Pender did so near noon. Onslow requested a voluntary evacuation of tourists at 11:30 AM on the 10th and requested evacuation of residents in flood prone areas, mobile homes, and beaches at 8:00 AM on the 11th. Evacuations generally applied to barrier island beach areas and "low-lying areas" adjacent to the Intracoastal Waterway.

Many people in both states said they never heard from officials that they were supposed to evacuate, and fewer than a third in either state thought they were required by officials to leave (Table 3).

Table 3. Percent hearing officials say to evacuate in Bertha

	South Carolina	North Carolina
	(N=368)	(N=358)
Didn't Hear Officials	42	51
Heard Should	29	21
Heard Must	29	28

As one would expect, people in areas of greater risk were more likely than others to hear evacuation notices from officials (Table 4). Only 25% of those living east of Business 17 in South Carolina and 15% of the beach residents in North Carolina said they didn't hear official evacuation notices. However, in the rest of the area east of the

Intracoastal Waterway in South Carolina 37% said they didn't hear officials say to leave. Less than half the South Carolina respondents, even those east of Business 17 understood the notice to be mandatory. Few (20%) in mainland surge areas in North Carolina said they heard officials call for their evacuation.

Table 4. Percent hearing officials say to evacuate in Bertha, by risk area, by state

South Carolina

	East of Bus. 17	ICW to Bus. 17	West of ICW
	(N=96)	(N=186)	(N=85)
Didn't Hear	25	37	73
Heard Should	30	32	19
Heard Must	45	31	8

North Carolina

	Beaches	Mainland Surge	Non-surge
	(N=177)	(N=96)	(N=90)
Didn't Hear	15	80	89
Heard Should	29	17	8
Heard Must	55	4	2

People who heard evacuation notices from officials were more likely to evacuate than others, and those who believed they were ordered to evacuate were most likely of all to leave (Table 5). In North Carolina (where the storm actually struck), 81% of those who said they were ordered to leave said they did so, followed by 58% of those who said officials only recommended that they evacuate. The effect was not as great in South Carolina, but differences were still substantial. Of those hearing officials say they must leave, 56% said they evacuated, compared to 38% who said they heard a recommendation, and 18% who said they heard no evacuation notices at all.

Table 5. Percent evacuating in Bertha, by hearing officials say to evacuate

	South Carolina	North Carolina
	(N=368)	(N=358)
Didn't Hear Officials	18	18
Heard Should	38	58
Heard Must	56	81

Table 6 indicates the combined effect of living in a high-risk location and hearing mandatory evacuation notices. In North Carolina 81% left from beach areas if they heard evacuation orders, and 68% did so if they heard recommendations. This compared to only 35% leaving if they did not hear notices from officials. The effect was much less pronounced in mainland surge areas, however. (Evacuation rates for people saying they heard they must leave from mainland surge areas and must or should from non-surge areas are statistically unreliable due to the small number of people in these categories.)

East of Business route 17 in South Carolina, 67% who said they were ordered to leave said they did evacuate, and almost half those who said they heard voluntary evacuation notices also evacuated. About a third of those not hearing notices left from east of Business 17. The effect between the Intracoastal Waterway and Business 17 was weaker but still evident.

Table 6. Percent evacuating in Bertha, by hearing officials say to evacuate, by risk area, by state

South Carolina

	East of Bus. 17	ICW to Bus. 17	West of ICW
	(N=96)	(N=186)	(N=85)
Didn't Hear	33	19	10
Heard Should	48	35	31
Heard Must	67	52	14*

North Carolina

	Beaches	Mainland Surge	Non-surge
	(N=177)	(N=96)	(N=90)
Didn't Hear	35	14	16
Heard Should	68	19	75*
Heard Must	81	75*	100*

*Based on fewer than 10 observations.

Elsewhere in the interview respondents were told that at one point Hurricane Fran's winds were near 125 MPH and asked whether they thought their home would have been at risk to dangerous flooding from storm surge or waves if Fran had struck near their location with 125 MPH winds. Although these beliefs might have changed since the time Bertha threatened, they provide an indicator of current hazard perception. Those beliefs appear in Table 7. A minority of people in both states believe their homes would have experienced dangerous flooding in a 125 MPH storm.

Table 7. Percent believing their home would flood in 125 MPH hurricane

	South Carolina	North Carolina
	(N=369)	(N=363)
Would Flood	28	42
Wouldn't Flood	64	55
Don't Know	8	3

Not surprisingly, people expecting dangerous flooding were more likely than others to evacuate in Bertha (Table 8). People saying they didn't know whether their homes would flood were more likely to evacuate than those who believed their homes would not flood.

Table 8. Percent evacuating in Bertha, by belief home would flood in 125 MPH storm

	South Carolina	North Carolina
	(N=369)	(N=363)
Would Flood	52	61
Wouldn't Flood	25	31
Don't Know	50	42

Only 44% of those living east of Business 17 in South Carolina and 61% of those in beach areas of North Carolina said they thought their homes would flood in a 125 MPH storm (Table 9). In the remainder of the Bertha evacuation zones, a third or fewer thought their homes would flood.

Table 9. Percent expecting flooding in 125 MPH storm, by risk area, by state

South Carolina
(N=411)

	East of Bus. 17	ICW to Bus. 17	West of ICW
Would Flood	43	27	12
Wouldn't Flood	44	65	84
Don't Know	12	8	4

North Carolina
(N=403)

	Beaches	Mainland Surge	Non-surge
Would Flood	61	33	22
Wouldn't Flood	35	65	75
Don't Know	4	2	3

When broken down by risk area, expectation of flooding is still a fair to good predictor of evacuation in Bertha (Table 10). In South Carolina, there was no significant difference among those expecting flooding and others east of Business 17. In the area

between the Intracoastal Waterway and Business 17 and in the area west of the Intracoastal Waterway the difference was greater. In North Carolina the effect existed but was small in the beach areas, nonexistent in the mainland surge areas, and fairly large in non-surge areas.

Table 10. Percent evacuating in Bertha, by expectation of flooding, by risk area, by state

South Carolina

	East of Bus. 17	ICW to Bus. 17	West of ICW
	(N=97)	(N=187)	(N=85)
Would Flood	52	54	44
Wouldn't Flood	49	25	10
Don't Know	67	43	25*

North Carolina

	Beaches	Mainland Surge	Non-surge
	(N=173)	(N=98)	(N=92)
Would Flood	77	19	48
Wouldn't Flood	62	17	16
Don't Know	57*	0*	33*

*Based on fewer than 10 observations.

Interviewees were also asked whether, considering both wind and water, they would have been safe in their homes, had Fran struck them with 125 MPH winds, and the results appear in Table 11. A few more people in both North and South Carolina believe their homes would be unsafe rather than safe in a 125 MPH hurricane.

The predictive power of perceived safety of one's home is comparable to that of expectation of flooding (Table 12). People who believe their homes would be unsafe were about twice as likely as others to evacuate in Bertha.

Table 11. Percent saying their home would be safe in 125 MPH storm, considering both wind and water

	South Carolina	North Carolina
	(N=410)	(N=403)
Safe	39	43
Not Safe	51	47
Don't Know	10	10

Table 12. Percent evacuating in Bertha, by belief their home would be safe in 125 MPH storm, considering both wind and water

	South Carolina	North Carolina
	(N=368)	(N=363)
Safe	20	28
Not Safe	48	65
Don't Know	21	44

In South Carolina both east of Business 17 and between the Intracoastal Waterway and Business 17, most people regard their homes as unsafe in a 125 MPH hurricane (Table 13). West of the Intracoastal, however, most believe their homes would be safe. In North Carolina most beach residents believe their homes would be unsafe, but in mainland surge areas and in non-surge areas, a minority have that opinion.

Table 13. Percent saying their home would be safe in 125 MPH storm, considering both wind and water, by risk area, by state

South Carolina

	East of Bus. 17	ICW to Bus. 17	West of ICW
	(N=105)	(N=205)	(N=100)
Safe	32	36	52
Not Safe	60	54	36
Don't Know	8	10	12

North Carolina

	Beaches	Mainland Surge	Non-surge
	(N=195)	(N=104)	(N=104)
Safe	34	53	49
Not Safe	57	39	36
Don't Know	9	8	15

In all three risk zones in both states, people who believed their homes would be unsafe in a 125 MPH storm were substantially more likely to evacuate than others (Table 14). In the North Carolina beach areas 80% evacuated if they believed their homes were unsafe, and this does not take account of whether they heard evacuation notices. The mainland surge area of North Carolina continued to be a peculiarity. Only 33% evacuated, even if they thought their homes would be unsafe in a 125 MPH storm. Whereas Bertha was no 125 MPH storm, and it might not have been expected to strike their locations, the evacuation rate was lower than that among non-surge residents who thought their homes would be unsafe.

Table 14. Percent evacuating in Bertha, by belief their home would be safe in 125 MPH storm, considering both wind and water, by risk area, by state

South Carolina

	East of Bus. 17	ICW to Bus. 17	West of ICW
	(N=96)	(N=187)	(N=85)
Safe	38	21	5
Not Safe	61	45	30
Don't Know	57*	16	9

North Carolina

	Beaches	Mainland Surge	Non-surge
	(N=173)	(N=98)	(N=92)
Safe	52	7	6
Not Safe	80	33	55
Don't Know	87	13*	14

*Based on fewer than 10 observations.

Other Predictors of Evacuation in Bertha

1. *Type of residence.* In South Carolina people living in multistory buildings and in mobile homes were more likely to evacuate than people living in single family homes. The multistory residences were more likely to be east of Business 17. North Carolina residents of multistory buildings were more likely to evacuate than those in single family or mobile homes.

2. *Years lived in region.* People who had lived in the Carolina coastal region for a shorter time were more likely than others to evacuate in Bertha. In North Carolina the effect was linear (evacuation decreasing fairly continuously as years on the coast increased), but this was probably an artifact of risk area, where newcomers were more likely than others to live in beach areas. In South Carolina the relationship was not linear. People living in the region five or fewer years were most likely to evacuate, but those in the area between six and ten years were least likely. In South Carolina years of residency was not associated with risk zone, but when each risk zone was analyzed separately, there was a relationship between

length of residency and evacuation only in the area between the Intracoastal Waterway and Business 17.

3. *Children in the home.* In North Carolina homes with at least one child under the age of 18 were less likely than others to evacuate. Again, however, this is confounded with risk area, as beach areas are the most likely to contain homes without children. In South Carolina there was no relationship.

4. *Pet ownership.* People in homes without pets were more likely than others to evacuate. In South Carolina this can be explained by the fact that homes west of the Intracoastal Waterway were more likely to have pets. In North Carolina, however, there was no variation in pet ownership across risk zones.

5. *Race.* There were relatively few nonwhites in the sample, which might be an underrepresentation of that group. If so, it could be due to a lower rate of telephone ownership, a higher rate of unlisted phone numbers, a higher rate of refusal to divulge race to the interviewer, or a higher rate of refusals to participate in the survey. Nonwhites in North Carolina were less likely than whites to evacuate in Bertha, but nonwhites were also less likely to live in beach areas. In South Carolina there was no difference in evacuation rate between whites and nonwhites.

6. *Income.* In North Carolina the relationship between income and evacuation was fairly straightforward; people with household incomes greater than $40,000 per year were more likely than others to evacuate. In

South Carolina people making less than $12,000 or between $25,000 and $40,000 were less likely than other groups to leave. Income was also associated with risk area, however.

7. The following variables were not statistically related to whether the respondent evacuated in Bertha.

   a. Age

   b. Years lived in current home

   c. Living alone

   d. Home ownership

Location of Evacuation Destinations

In both states slightly fewer than half the evacuees stayed close to home (Table 15). In South Carolina 22% went to destinations in their own neighborhood, as did 28% in North Carolina. Another 20% and 21% went outside their neighborhood but stayed within their own county. Forty-three percent in South Carolina and 38% in North Carolina went elsewhere in their home states, and the remainder went out-of-state.

Table 15. Percent of evacuees going to various destinations in Bertha

	South Carolina	North Carolina
	(N=121)	(N=158)
Own Neighborhood	22	28
Other Own County	20	21
Other Own State	43	38
Out of State	15	13

Predicting Neighborhood Destinations

Several variables were tested to ascertain whether they could help distinguish evacuees who went to destinations in their own neighborhood from those who didn't. Nothing proved to be a consistent predictor. The following variables were associated with whether evacuees went to destinations in their own neighborhoods. If one state is mentioned and the other is not, in the omitted state there was no association between the predictor and going someplace in one's own neighborhood.

1. *Risk area.* In North Carolina people living in beach areas were less likely than others to go to destinations in their own neighborhood.
2. *Type of residence.* In North Carolina evacuees from mobile homes were most likely to stay in their neighborhood, followed by people living in single family residences.
3. *Years in current home.* In North Carolina people who had lived in their current homes for longer periods were more likely than others to go to neighborhood destinations.
4. *Years in region.* In North Carolina people who had lived in the region for longer periods were more likely than others to go to neighborhood destinations.
5. *Children.* In South Carolina people with children in the home were more likely to go to a destination in their neighborhood.
6. *Home ownership.* In North Carolina homeowners were more likely to go to neighborhood destinations.

7. *Race.* In North Carolina nonwhite evacuees were more likely than white evacuees to stay in their neighborhood.
8. *Income.* In South Carolina evacuees with lower incomes were more likely than others to go someplace in their own neighborhood.
9. *Living alone.* In South Carolina people who lived alone were more likely than others to evacuate to locations in their own neighborhood.
10. *Pets.* Pet ownership was not associated with neighborhood destinations in either state.

Predicting In-County Destinations

There were even fewer variables useful in predicting whether people stayed in their own county but left their neighborhood, and these too were inconsistent between the states.

1. *Years in current home.* In South Carolina people who had lived in their current home more than ten years were more likely than others to go someplace in their own county (but outside their neighborhood).
2. *Years in region.* Also in South Carolina people who had lived on the South Carolina coast more than ten years were more likely than others to go someplace in their own county.
3. *Race.* Nonwhite evacuees in South Carolina were more likely than whites to stay in county.
4. *Income.* In North Carolina evacuees from households with lower incomes were more likely than others to go to destinations in their own counties but outside their neighborhoods.

5. *Living alone.* In South Carolina people who lived alone were more likely than others to go to destinations in their own county.
6. The following were not associated with going in-county in either state:
    a. Type of residence (single family, etc.)
    b. Children in the home
    c. Home ownership
    d. Pets
    e. Risk area (Note that there were few evacuees from non-beach areas in North Carolina for comparison.)

Type of Refuge Used by Evacuees

Very few evacuees went to public shelters: 3% in South Carolina and 8% in North Carolina (Table 16). In both states more than half the evacuees went to the homes of friends and relatives (59% and 57%). Slightly more people went to hotels and motels in South Carolina (14%) than North Carolina (20%). The remaining evacuees went to places such as churches, workplaces, and second homes.

Table 16. Percent of evacuees using various types of refuges in Bertha

	South Carolina	North Carolina
	(N=126)	(N=162)
Public Shelter	3	8
Friend/Relative	59	57
Hotel/motel	24	15
Other	14	20

Predicting Public Shelter Use

Government agencies and the Red Cross are generally more concerned about demand for public shelter than other types of refuge because they have taken on the responsibility for providing that option to the public. In the following analysis looking for variables associated with shelter use, the North and South Carolina samples were combined into a single analysis. The number of people in the sample using public shelters in each state was too small to allow detection of usage patterns in the populations from which the samples were drawn, even when such patterns exist.

1. *Destination.* Public shelter use was strongly related to the destination of the evacuee. Almost 90% of those going to public shelters went someplace in their own neighborhood. Of those who went someplace in their own neighborhood, 20% went to public shelters, compared to only 1% of those going outside their neighborhood.
2. *Risk area.* In North Carolina public shelter use was lowest for evacuees from beach areas and greatest for people in non-surge areas. (The states were separated for this test due to differences in the way risk areas were defined.)
3. *Type of residence.* Mobile home residents were most likely to use public shelters, followed by people from single family dwellings.
4. *Years in region.* The meaningfulness of this result is questionable, but residents having lived on the coast between 21 and 42 years were most likely to have used public shelters (12%), and those living there between 10 and 20 years the least. Six to seven percent of those who had lived in the region fewer than 10 years or more than 42 years went to public shelters.

5. *Race*. Nonwhites were more likely to use public shelters than whites.

6. The following were <u>not</u> related public shelter use.

    a. Age

    b. Years in current home

    c. Children

    d. Pets

    e. Living alone

Response in Fran

Evacuation Rates

In Fran 49% of the respondents in South Carolina and 57% in North Carolina said they left their homes to go someplace safer. This was higher than the 34% and 44% in Bertha. Table 17 indicates the most common reasons given by people for why they chose to evacuate. Advice or orders from elected officials was the most frequently mentioned reason in South Carolina (48%), and in North Carolina 15% gave that response. General concern about the storm's severity was a very prevalent explanation in both states (35%), and specific worries about flooding and wind were also cited. In both states 15% of the evacuees indicated that advice from the National Weather Service was a factor in their decisions to leave. In North Carolina advice or orders from police or firefighters were mentioned by 20%.

Table 17. Percent of evacuees giving various reasons for evacuating in Fran

	South Carolina	North Carolina
	(N=202)	(N=228)
Advice/Order by Elected Official	48	15
NWS Advice	15	15
Police/Fire Advice/Order	7	20
Media Advice	10	9
Advice from Friend/Relative	12	7
Severity of Storm	35	36
Change in Strength	5	8
Concern about Flooding	5	9
Concern about Wind	8	10
Believed it Would Hit	7	8
Past Experience	8	8

Those who said they did not leave their homes to go someplace safer were asked why they stayed in place. A majority said they felt safe, the storm wasn't going to hit their location, the storm wasn't strong enough to be dangerous to them, their houses were adequate, and so forth. Other reasons had response rates below 10%, with most being 5% or less. This included items such as no transportation, no place to go, wanting to protect property from looters or from the storm, having left unnecessarily in past storms, waiting too late to leave, and traffic being too bad.

Evacuation rates in Fran were higher than those in Bertha in all risk areas, although the evacuation zone in South Carolina was somewhat different in the two storms (east of the Intracoastal Waterway in Bertha and east of Highway 17 in Fran, the latter being closer to the shoreline) (Table 18). The evacuation rate from beaches in North Carolina was particularly good (87%).

Table 18. Percent evacuating in Fran by risk area

	South Carolina	North Carolina
	(N=412)	(N=401)
East of Bus. 17	66	
Hwy 17 to Bus 17	48	
West of Hwy 17	38	
Beaches		87
Mainland Surge		27
Non-surge		29

In South Carolina the Governor urged voluntary evacuation of barrier islands, beachfront property, low-lying areas on or near the coast, and mobile homes along the entire South Carolina coast, slightly before 7AM on September 4. A hurricane watch which included South Carolina had been issued by the National Hurricane Center at 11

PM the previous evening. Later that day, between 3 PM and 4 PM, the evacuation was made mandatory for all coastal counties in South Carolina, apparently in anticipation of the hurricane warning being issued by the Hurricane Center at 5 PM, from Brunswick, Georgia to Cape Lookout, North Carolina. In Horry and Georgetown Counties it applied to areas east of Highway 17 (referred to as the Highway 17 By-pass in part of Horry, to distinguish it from Business 17 which was nearer the shoreline). This affected a smaller area than in Bertha.

In North Carolina evacuation actions were left to individual counties. Brunswick at 7:00 AM on September 5 recommended evacuation within a half-mile of the Intracoastal Waterway, in low-lying areas, and in mobile homes throughout the county. At 8:30 AM officials made the evacuation mandatory. In New Hanover the evacuation began between 7 AM and 8 AM for barrier islands, low-lying areas and coastal mobile homes. The county referred to the notice as an evacuation order but also said that evacuation was suggested. Pender commenced a mandatory evacuation for Topsail Beach at 8 AM on the 5th and followed it with evacuation of the remaining barrier islands and low-lying areas along the Intracoastal Waterway. Evacuation of mobile homes was recommended. In Onslow County residents and tourists of North Topsail Beach were requested to evacuate voluntarily on the evening of September 4. Evacuation of beaches, mobile homes, and flood-prone areas was requested the following morning at 8:30 AM.

In both states more people said they heard officials say to evacuate than in Bertha (Table 19). The greatest difference was in the number who said evacuation notices were mandatory rather than recommended.

Table 19. Percent hearing officials say to evacuate in Fran

	South Carolina	North Carolina
	(N=412)	(N=401)
Didn't Hear Officials	38	48
Heard Should	18	15
Heard Must	44	37

In the official evacuation area in South Carolina, most people said they heard officials say to leave, and most of those understood the notice to be mandatory (Table 20). However, 24% of the residents east of Business 17 said they didn't hear officials say to leave, as did 31% in the rest of the evacuation zone. In North Carolina most respondents in beach areas said they heard official evacuation notices, but not in mainland surge areas. When viewed by risk zone, differences between Bertha and Fran were greater in South Carolina than in North Carolina. In North Carolina beaches awareness of evacuation notices was slightly higher in Fran than in Bertha, in mainland surge areas they were essentially the same, and in non-surge areas they were notably higher in Fran. In South Carolina substantially more people in all risk areas said they heard officials say to evacuate in Fran than in Bertha

Table 20. Percent hearing officials say to evacuate in Fran, by risk area, by state

South Carolina

	East of Bus. 17	17 to Bus. 17	West of ICW
	(N=105)	(N=161)	(N=145)
Didn't Hear	24	31	57
Heard Should	19	20	24
Heard Must	57	49	19

North Carolina

	Beaches	Mainland Surge	Non-surge
	(N=193)	(N=103)	(N=104)
Didn't Hear	16	78	78
Heard Should	21	17	16
Heard Must	63	5	6

Respondents hearing official evacuation notices were much more likely to evacuate than others (Table 21). In North Carolina 90% hearing they must leave said they did so, as did 70% in South Carolina. In North Carolina hearing only recommendations had more effect than in South Carolina.

Table 21. Percent evacuating, by hearing officials say to evacuate in Fran

	South Carolina	North Carolina
	(N=412)	(N=399)
Didn't Hear Officials	31	29
Heard Should	42	70
Heard Must	70	90

Evacuation rates in the highest risk areas were good among people saying they heard mandatory evacuation orders (Table 22). In the North Carolina beaches 93% said they left if they heard evacuation orders, and 81% did so east of Business 17 in South Carolina. In the beach areas of North Carolina 85% left if they said they heard official recommendations to evacuate, but that message was less effective in other locations. In South Carolina differences between those hearing recommendations and those not hearing notices at all were small except west of Highway 17 (i.e., outside the evacuation area), where perceived recommendations to evacuate were effective.

Table 22. Percent evacuating in Fran, by hearing officials say to evacuate, by risk area, by state

South Carolina

	East of Bus. 17	17 to Bus. 17	West of Hwy. 17
	(N=105)	(N=161)	(N=145)
Didn't Hear	44	30	27
Heard Should	45	34	46
Heard Must	81	65	61

North Carolina

	Beaches	Mainland Surge	Non-surge
	(N=193)	(N=103)	(N=102)
Didn't Hear	63	21	23
Heard Should	85	50	53
Heard Must	93	67*	50*

*Based on fewer than 10 observations

People who evacuated in Bertha also tended to evacuate in Fran (89% in South Carolina and 91% in North Carolina). Of those who didn't leave in Bertha, fewer than a third left in Fran (Table 23).

Table 23. Percent evacuating in Fran, by response in Bertha

	South Carolina	North Carolina
	(N=370)	(N=361)
Left in Bertha	89	91
Didn't Leave in Bertha	29	28

Table 24 indicates that respondents who believe their homes would be subject to dangerous flooding in a 125 MPH hurricane were more likely than others to evacuate in Fran. The effect was slightly greater in North Carolina than in South Carolina. As in

Bertha, people saying they didn't know whether their home would flood were more likely to evacuate than people who were confident their home would not flood.

Table 24. Percent evacuating in Fran, by belief home would flood in 125 MPH storm

	South Carolina	North Carolina
	(N=411)	(N=401)
Would Flood	65	75
Wouldn't Flood	41	41
Don't Know	61	67

The effect of expectation of flooding on evacuation in Fran persisted in all risk areas in both states (Table 25). The highest evacuation rate was in North Carolina beach areas among people who believed their homes would flood in a 125 MPH hurricane. Figures in the "Don't Know" category are less reliable than other figures in the table.

Table 25. Percent evacuating in Fran, by expectation of flooding, by risk area, by state

South Carolina

	East of Bus. 17	ICW to Bus. 17	West of Hwy 17
	(N=106)	(N=160)	(N=145)
Would Flood	65	60	74
Wouldn't Flood	60	42	33
Don't Know	92*	42	33*

North Carolina

	Beaches	Mainland Surge	Non-surge
	(N=195)	(N=104)	(N=104)
Would Flood	92	35	50
Wouldn't Flood	78	24	23
Don't Know	86	50	33

*Based on fewer than 10 observations.

Adding considerations of safety from wind made little difference in likelihood of evacuating, compared to concern about flooding alone (Table 26). In both states evacuation rates in Fran were higher for all three response categories than in Bertha.

Table 26. Percent evacuating in Fran, by belief their home would be safe in 125 MPH storm, considering both wind and water

	South Carolina	North Carolina
	(N=410)	(N=403)
Safe	29	35
Not Safe	66	77
Don't Know	38	59

In the North Carolina beach areas more than 90% of the respondents evacuated if they didn't believe their homes would be safe in a 125 MPH hurricane, and 76% left even if they thought their homes would be safe (Table 27). There was a major drop in evacuation in the mainland surge zone, however, where slightly more than half evacuated, even if they thought their homes would be unsafe in a 125 MPH storm. This was the same as in non-surge areas of the North Carolina coastal counties. In South Carolina the results were comparable but less dramatic. Seventy-five percent east of Business 17 left if they didn't think their homes were safe in such a strong storm, compared to 50% who thought their homes would be safe. West of Highway 17 60% left if they believed their homes were unsafe, essentially the same as in the area between Highway 17 (By-pass) and Business 17. Only 22% to 26% left from those areas if they thought their homes were safe, however. Evacuation rates were uniformly higher in Fran than in Bertha in all response categories in both North and South Carolina.

Table 27. Percent evacuating in Fran, by belief their home would be safe in 125 MPH storm, considering both wind and water, by risk area, by state

South Carolina

	East of Bus. 17	17 to Bus. 17	West of Hwy 17
	(N=105)	(N=160)	(N=145)
Safe	50	22	26
Not Safe	75	64	60
Don't Know	75	40	17

North Carolina

	Beaches	Mainland Surge	Non-surge
	(N=195)	(N=104)	(N=104)
Safe	76	11	6
Not Safe	92	54	56
Don't Know	94	13	14

Other Predictors of Evacuation in Fran

1. *Type of residence.* In South Carolina mobile home residents were the most likely to evacuate and people living in single family units the least. In North Carolina residents of multistory buildings were most likely to leave, followed by those in mobile homes. Multistory residences were most prevalent in higher risk areas in both states.
2. *Years in current home.* In South Carolina people who had lived in their present homes fewer than 10 years were more likely than others to evacuate in Fran. In North Carolina the trend was the same but the break point was 20 years.

3. *Years in region.* In both states people who had lived on the Carolina coast longer were less likely to evacuate in Fran. In North Carolina newcomers were more likely to live in beach locations, but not in South Carolina.
4. *Children.* In North Carolina households without children were more likely than others to evacuate. However, households without children were also more likely to be in beach areas.
5. *Pets.* In South Carolina households without pets were more likely than others to evacuate in Fran. Those homes were more likely to exist in the area east of Highway 17 (the evacuation area in Fran).
6. *Race.* Whites were more likely than nonwhites to evacuate in North Carolina, but they were also more likely to live in beach areas.
7. *Income.* In North Carolina evacuation in Fran increased with income, which also increased with proximity to the shoreline.
8. The following were not associated with evacuation in Fran in either North or South Carolina.
    a. Age
    b. Living alone
    c. Home ownership

Sources in Information in Fran

Respondents were presented with a list of eight sources of information about Fran and asked how much they relied upon each as the storm approached. Not surprisingly, local television and radio were relied upon a great deal by as least a third of the respondents in both states (Table 28). Local television was the most common source of

information, but cable television's The Weather Channel was also important. In North Carolina 49% said they depended upon The Weather Channel a great deal, and in South Carolina 61% gave that response, placing The Weather Channel well ahead of local radio in South Carolina. CNN on cable was a distant fourth place in both states. Out-of-town television provided by cable, the Internet, and on-line computer services such as America Online were relatively unimportant. People who relied a great deal on The Weather Channel were more likely than others to rely a great deal on CNN and other cable stations also, but not on other sources of information.

Table 28. Percent relying on various sources of information about Fran

South Carolina (N=411)

	None	A Little	Fair Amount	Great Deal
Local Radio	23	20	23	35
Local TV	8	11	14	68
CNN	54	14	16	16
Weather Channel	14	8	18	61
Other Cable	74	11	9	7
Internet	94	2	2	2
Online Computer	98	1	1	1
Word of Mouth	61	20	9	10

North Carolina (N=403)

	None	A Little	Fair Amount	Great Deal
Local Radio	20	13	16	51
Local TV	12	9	13	66
CNN	58	20	10	12
Weather Channel	29	10	13	49
Other Cable	75	13	6	6
Internet	94	3	1	2
Online Computer	97	2	1	<1
Word of Mouth	51	20	16	13

When asked whether they found any one of the information sources to be more accurate than others, most respondents said they did not (Table 29). Of those who said yes, The Weather Channel, local television, and local radio were mentioned most often (also being the sources relied upon most).

Table 29. Percent perceiving sources of information in Fran as more accurate than others

	South Carolina	North Carolina
	(N=412)	(N=397)
None	57	52
Local Radio	8	12
Local TV	12	13
CNN	1	2
Weather Channel	18	17
Other Cable	<1	<1
Internet	1	1
Online Computer	<1	1
Word of Mouth	<1	<1

In South Carolina people who said they relied upon The Weather Channel a great deal were more likely than others to evacuate. There was no relationship between reliance upon other sources and evacuation in South Carolina. In North Carolina respondents saying they depended on The Weather Channel a great deal in Fran were also more likely than others to evacuate, but the same was true of people who said they relied a great deal on local television, out-of-town television (via cable), and CNN, although the effect was weaker in those instances. People in North Carolina who said they relied on local radio a great deal were less likely than others to evacuate. (This might be due to

people staying behind relying more on radio after the evacuation decision was already made.)

Information from Government Sources

Respondents were also asked whether they received any information from local and state government officials about whether Fran was going to be a danger to their safety or how to protect their property. This might include hearing evacuation notices but could also include other types of information. In South Carolina roughly half the sample said they received such information from both local (52%) and state (47%) governments (Table 30). In North Carolina 48% said they heard that kind of information from local government, but only 24% said they heard it from state officials.

Table 30. Percent receiving information from local and state government about dangers from Fran or how to protect property

	South Carolina	North Carolina
	(N=411)	(N=402)
Local Government	52	48
State Government	47	24

Those saying they received information from government sources were asked whether they found the information to be generally accurate (Table 31) and useful (Table 32). The great majority (82% to 95%) in each state said the information from both local and state officials was generally accurate and useful. Local sources received slightly better appraisals than state, and North Carolina officials scored a little better than those in South Carolina. The latter differences might be attributable in part to the fact that Fran actually struck North Carolina and "missed" South Carolina.

Table 31. Percent receiving information from local and state government in Fran who found information to be generally accurate

	South Carolina	North Carolina
Local Government	89 (N=213)	95 (N=189)
State Government	82 (N=191)	92 (N=97)

Table 32. Percent receiving information from local and state government in Fran who found information to be generally useful

	South Carolina	North Carolina
Local Government	89 (N=213)	94 (N=189)
State Government	82 (N=191)	90 (N=97)

In North Carolina people saying they received information about Fran's danger or how to protect their property were more likely than others to evacuate (Tables 33, 34). There were no statistically significant differences between the two groups in South Carolina.

Table 33. Percent evacuating in Fran, by receiving information from local government

	South Carolina	North Carolina
	(N=411)	(N=400)
Received Information	50	67
Did Not Receive Information	48	48

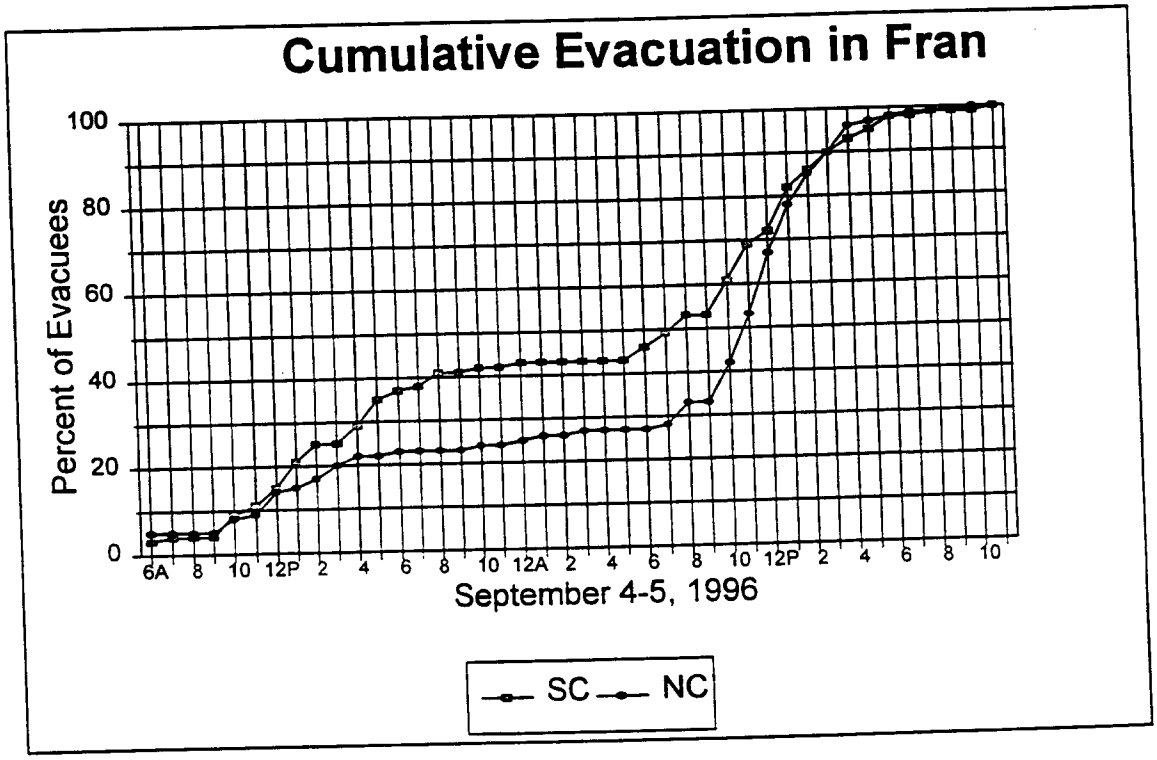
Table 34. Percent evacuating in Fran, by receiving information from state government

	South Carolina	North Carolina
	(N=412)	(N=399)
Received Information	53	70
Did Not Receive Information	46	53

Evacuation Timing in Fran

Evacuees were asked what day and time they left their homes to go someplace safer in Fran, and the results are depicted in Figure 1. The graph shows cumulative evacuation over time – that is, of all evacuees, the percentage who had left by various times. The box below the graph summarizes the times at which events occurred which might have affected evacuation behavior.

Fig. 1. Cumulative percent of evacuees having left by various times, by state



• 9-3-96	11 PM	Hurricane watch for South Carolina
• 9-4-96	7 AM	Evacuation recommended in South Carolina
	11 AM	Hurricane watch for North Carolina
	4 PM	Mandatory evacuation for South Carolina
	5 PM	Hurricane warning for North and South Carolina
	10 PM	Evacuation recommended for N. Topsail Beach, NC
• 9-5-96	8 AM	Evacuation for most of southeastern North Carolina

There was little direct response in either state to the hurricane watch which was posted through South Carolina on the evening of September 3. The early evacuation began mid-morning of the following day, probably due to the South Carolina Governor's recommendation to evacuate and to the hurricane watch being extended farther north to include southeastern North Carolina (which was a result of a northward shift of forecast tracks). Although evacuation commenced in both states on the morning of the 4th, it was steeper in South Carolina and persisted longer during the day. The change of the evacuation notice from voluntary to mandatory in South Carolina appears to have reinforced the behavior already underway but did not clearly prompt additional response at that time. The posting of the hurricane warning for both states at 5 PM did little to change the way things were going. In both states the evacuation paused on the evening of the 4th, although it persisted longer into the evening in South Carolina. By nightfall on the 4th slightly more than 40% of the eventual evacuees in South Carolina had left, compared to approximately 25% in North Carolina. On the morning of the 5th the evacuation resumed in both states, as the storm neared the coast, officials issued evacuation notices in North Carolina, and the forecast track of the storm drifted farther east. Landfall occurred between 8 PM and 9 PM on the evening of the 5th.

Interpretation of evacuation rates and timing must account for the behavior of the storm itself, which directly or indirectly drove the behavior of forecasters, officials, and the public. Had the forecast and actual track of the storm stayed farther west and landfall occurred in South Carolina, for example, evacuation rates would have been higher in South Carolina and lower in North Carolina than those documented in this survey.

Consequently, because the lines in Fig. 1 represent percentages of *eventual* evacuees, the slopes of the cumulative response curves also would have changed as the number of eventual evacuees would have changed.

Although causal analysis of evacuation timing patterns is difficult because so many things are changing at the same time, the curves in Fig. 1 are consistent with patterns generally observed in other evacuations. It is unusual for more than about 15% of the eventual evacuees to leave before someone tells them, so the response in North Carolina on the 4th might be considered slightly early. Much of that response was probably a consequence of what was happening next door in South Carolina.

Location of Evacuation Destinations in Fran

Evacuees in Fran tended to go farther than those in Bertha (Table 35). Only 19% in South Carolina and 16% in North Carolina in Fran went to places in their own neighborhoods, compared to 22% and 28% in Bertha. In South Carolina 69% and in North Carolina 60% went out of their own counties, compared to 58% and 51% in Bertha.

Table 35. Percent of evacuees going to various destinations in Fran

	South Carolina	North Carolina
	(N=201)	(N=228)
Own Neighborhood	19	16
Other, Own County	12	24
Other, Own State	41	53
Out of State	28	7

Predictors of Neighborhood Destinations

1. *Risk area.* In North Carolina evacuees from beach areas were least and evacuees from non-surge areas most likely to go to locations in their own neighborhoods. In South Carolina evacuees from the area between Highway 17 and Business 17 were more likely to stay within their neighborhoods than people west of Highway 17 or east of Business 17.
2. *Type of residence.* Mobile home residents were more likely than others to evacuate to destinations in their own neighborhoods.
3. *Years lived in current home.* People who lived in their current homes longer were more likely than others to go someplace in their own neighborhood.
4. *Years lived in the region.* Evacuees who had lived longer in the region were more likely than others to stay in their neighborhood.
5. *Living alone.* In South Carolina people living alone were more likely than others to go someplace in their neighborhood.
6. *Children.* People with children in the home had a greater tendency than others to stay in their own neighborhood when evacuating.
7. *Home ownership.* In North Carolina evacuees who were homeowners were more likely than renters to stay in their neighborhood.
8. *Race.* In North Carolina nonwhites were more likely than whites to go to places in their own neighborhoods.
9. *Income.* In South Carolina people with lower incomes were more likely than others to stay within their neighborhood when evacuating.

10. The following were not associated with neighborhood destinations in either state:
    a. Receiving information from local government officials
    b. Receiving information from state government officials
    c. Age
    d. Pet ownership

Predictors of In-County Destinations

1. *Years lived in current home.* In North Carolina people who had lived in their current homes fewer than five or more than 20 years were more likely than others to go to destinations in their own counties (but out of their neighborhoods).
2. *Years in region.* In South Carolina people who had lived in the region longer were more likely than others to stay within their own county.
3. *Living alone.* In South Carolina evacuees who lived alone were more likely than others to stay in county.
4. *Race.* In South Carolina nonwhites were more likely than whites to go to locations in their own county.
5. *Income.* In North Carolina respondents whose household incomes were below $40,000 annually were more likely than others to stay within their county when evacuating.
6. The following were not related to whether evacuees from either North or South Carolina went to destinations in their own county:

a. Risk area

b. Receiving information from local government officials

c. Receiving information from state government officials

d. Type of residence

e. Age

f. Children

g. Home ownership

h. Pets

Types of Refuge Used in Fran

As in Bertha, fewer than 10% of evacuees went to public shelters, although patterns changed slightly (Table 36). Whereas in Bertha more evacuees in North Carolina used public shelters than in South Carolina, in Fran the trend was reversed: 7% in South Carolina and 4% in North Carolina. The homes of friends and relatives still received a majority of evacuees, but the totals were down slightly from Bertha, while the percent going to hotels and motels increased. (Recall that evacuees tended to go farther in Fran than Bertha.)

Table 36. Percent of evacuees using various types of refuges in Fran

	South Carolina	North Carolina
	(N=203)	(N=234)
Public Shelter	7	4
Friend/Relative	53	54
Hotel/motel	30	22
Other	10	20

Predictors of Public Shelter Use

Because the total number of people evacuating in Fran was greater than in Bertha in both states, it makes more statistical sense to test for predictors of public shelter use in each state separately than in Bertha. However, due to the small number of people going to public shelters in either case, detecting relationships even when they exist is still difficult when the samples are separated. The following discussion, therefore, contains a mix of separate and combined analyses.

1. *Risk area.* Evacuees from beach areas of North Carolina and from east of Business 17 in South Carolina were less likely than others to use public shelters.
2. *Neighborhood destination.* In both states people whose evacuation destination was in their own neighborhood were more likely than others to go to public shelters. Of those who evacuated but went someplace in their own neighborhood 16% went to public shelters, compared to 2% to 4% who went outside their neighborhood. Of all public shelter users, 50% in South Carolina and 67% in North Carolina went to shelters in their own neighborhood.
3. *Public shelter use in Bertha.* People who went to public shelters in Bertha were more likely than others to go to public shelters in Fran also. This was true in both states.
4. *Years lived in region.* In South Carolina people who had lived on the coast fewer than 20 or more than 42 years were more likely than others to use public shelters. In North Carolina evacuees who had lived on the coast more than 42 years were more likely than others to go to public shelters.

5. *Children.* There was no relationship between presence of children in the household and shelter use in the two states separately, but when combined, people with children were more likely than others to use public shelters.
6. *Race.* In North Carolina nonwhites were more likely than whites to go to public shelters. This was also true when the two states were combined.
7. *Income.* In North Carolina as income increased, shelter use became less likely. When evacuees from the two states were tested together, people whose annual household incomes were below $12,000 were more likely than others to use public shelters.
8. The following were <u>not</u> related to use of public shelters in Fran:
    a. Receiving information from officials in Fran
    b. Type of residence
    c. Age
    d. Years in current home
    e. Living alone
    f. Home ownership
    g. Pets

<u>Transportation</u>

In South Carolina 67% of the vehicles available to households were used in the evacuation. In North Carolina 75% were used. This resulted in an average of 1.18 vehicles per evacuating household in South Carolina and 1.48 in North Carolina.

Thirteen percent of the evacuating households in North Carolina said they pulled trailers or took motorhomes, compared to 5% in South Carolina.

Five percent of the households in North Carolina said someone in their home needed assistance in evacuating, and 4% indicated the person had special needs, other than just transportation. Only 1% of the homes received that assistance from government agencies, with the remainder coming from friends and relatives. In South Carolina 2.5% of the households needed assistance, 2% having special needs. Less than 1% received government assistance in evacuating. Overall 7% in North Carolina and 2.2% in South Carolina evacuated with someone else in the other party's vehicle. When those who didn't evacuate were asked why they stayed, only one person in South Carolina and no one in North Carolina cited a lack of transportation as the reason.

Mitigation Practices and Attitudes

Protective Actions in Fran

Respondents were asked to list actions they took to protect their property before Fran's arrival, and responses are summarized in Table 37. Securing loose objects in the yard was the most common action, followed by applying window protection. In this case window protection could refer to anything from putting tape on windows to covering them with shutters or plywood. Responses were comparable in both states.

Table 37. Percent saying they employed protective actions in Fran

	South Carolina	North Carolina
	(N=412)	(N=402)
Applied Window Protection	55	55
Braced Doors/Garage	10	14
Secured Yard Objects	63	72
Moved Boat or Camper	3	10
Prepared Pool	<1	1
Elevated Furniture	6	8
Protected Documents	6	6
Sandbagged Property	<1	1
Stockpiled Repair Supplies	2	4
Acquired Generator	3	4
Secured Plants	8	9
Trimmed Tree Limbs	2	2

Predictors of Protective Actions

Total number of protective actions performed by each respondent was calculated, and tests were conducted to assess possible predictors of number of protective actions. Samples from the two states were combined for the analysis.

1. *Type of residence.* People living in multi-story residences performed fewer preparations than others.
2. *Living alone.* People living alone performed fewer protective actions than others.
3. *Race.* Whites reported fewer protective actions than nonwhites.
4. *State.* Respondents in North Carolina were more likely to perform at least one protective action.
5. The following were <u>not</u> associated with number of protective actions.
    a. Not evacuating because house was believed adequate
    b. Belief house would not flood in 125 MPH hurricane
    c. Belief house would be safe in 125 MPH hurricane
    d. Receiving information from government officials
    e. Age
    f. Years lived in present home
    g. Years lived in region
    h. Children
    i. Home ownership
    j. Pets
    k. Income
    l. Risk area

<u>Identifying Safe Areas of One's House</u>

Knowing the safest place in one's home to ride out a storm might not be a mitigation measure, but it could connote an awareness of structural or construction issues

related to safety. In South Carolina 83% of the respondents said they had identified the safest place in their house, and 77% said so in North Carolina. No attempt was made to verify the correctness of their assessments.

Predictors of Knowing Safest Place

1. *Perceived susceptibility to flooding.* People who believed their homes would not flood in a 125 MPH hurricane were more likely than others to say they had identified the safest part of the house.
2. *Perceived safety.* People who believed their homes would be safe in a 125 MPH hurricane were more likely than others to say they had identified the safest part of the house.
3. *Receiving information from officials.* People who said they received information from either local or state officials regarding dangers posed by Fran or how to protect property were more likely than others to identify safe areas.
4. *Type of housing.* People living in single family homes were the most and people living in mobile homes the least likely to identify safe areas.
5. *Income.* Wealthier people were more likely than others to identify safe areas.
6. *Risk area.* In North Carolina people living in beach areas were less likely than others to identify safe areas.
7. The following were <u>not</u> associated with having identified safe areas in homes:
    a. Not evacuating because home was safe
    b. Age

c. Years lived in present home

d. Years lived in region

e. Living alone

f. Children

g. Pets

h. Race

Window Protection

One of the lessons from Hurricane Andrew was the importance of protecting the integrity of the "building envelope" -- that is, not letting windows and doors be breached by wind, which allows wind inside the structure. Respondents were asked whether they had "any kind of window protection such as storm shutters, security film, or plywood sheets designed to protect the windows in a strong hurricane." This question was asked well after the earlier question about protective actions in Fran and was intended to exclude emergency measures such as applying tape. People who said they had no window protection were asked why not, and the results appear in Table 38.

Table 38. Use of window protection and reasons for not using it (percent)

	South Carolina	North Carolina
	(N=412)	(N=399)
Has Permanent Protection	43	53
Would Attach Before Storm	12	7
None, because:		
Not Needed	17	17
Too Expensive	2	4
Not Effective	4	3
Not Enough Time	4	4
Rental Unit	2	2

Planning on It	1	1
Too Difficult	2	2
New to Area	1	<1
Don't Know	12	8

In South Carolina 43% and in North Carolina 53% said they had permanent window protection of the sort described in the survey. Another 12% in South Carolina and 7% in North Carolina said they had protection they would attach in the event of a storm. These rates sound high. It is possible that the responses are accurate, that respondents misunderstood the question, or that respondents were being deceptive. The same survey question when used previously in the Tampa Bay region in Florida elicited a figure of 31% and was considered suspect there.

Among the reasons for not having window protection, 17% (of the total sample) said they didn't believe such protection was needed, and 3% to 4% said such devices would not be effective. Other responses included too expensive, too difficult to apply, and too time consuming. Some people were living in rental units, and others said they were planning on getting window protection or had just moved to the area and hadn't realized they needed it. Eight percent to 12% also said they didn't know why they didn't have window protection.

Predictors of Having Window Protection

1. *Type of housing.* People in single family homes were the most likely and people in mobile homes the least likely to say they had window protection.
2. *Age.* People over the age of 65 were less likely than others to say they had window protection.

3. *Living alone.* Respondents living alone were less likely than others to have window protection.
4. *Children.* People with children were more likely than others to have window protection.
5. *Risk area.* In North Carolina residents of beach areas were more likely than others to have window protection.
6. The following were <u>not</u> related to reports of having window protection:
    a. Not evacuating because house was believed to be safe
    b. Perceived susceptibility to flooding.
    c. Perceived safety from wind and water
    d. Receiving information from officials in Fran
    e. Years lived in present home
    f. Years lived in region
    g. Home ownership
    h. Pets
    i. Race
    j. Income

Respondents were asked how much they thought window protection such as storm shutters would cost per window, and the responses are given in Table 39. Most people wouldn't even guess (although they were not pressed to do so). Of those who expressed an opinion, the plurality indicated a cost of $10 to $50 per window.

Table 39. Beliefs about costs of window protection per window (percent)

	South Carolina	North Carolina
	(N=409)	(N=401)
< $10	6	4
$10 to $50	12	22
$50 to $100	6	10
> $100	10	10
Don't Know	66	54

When asked whether such window protection would mainly just prevent the windows from breaking and reduce the danger of flying glass, or whether the window protection would also significantly reduce the total damage the house would suffer in other ways, most people said the window protection would reduce damage to the entire house (Table 40).

Table 40. Beliefs about benefits of window protection (percent)

	South Carolina	North Carolina
	(N=406)	(N=400)
Window Breakage/Flying Glass	37	32
Total Damage to House Also	50	56
Don't Know	14	12

Predictors of Perceived Benefits of Window Protection

1. *Risk area.* In North Carolina people in beach areas were more likely than others to say window protection reduced total damages.
2. *Receiving information from officials in Fran.* People who said they received information from government officials in Fran about the dangers from Fran or how to protect property were less likely than others to say they didn't know whether window protection would reduce overall damages.

3. *Age*. People between the ages of 45 and 65 were more likely than others to say that window protection would reduce total storm damages. People over 65 were most likely to say don't know.
4. *Income*. Wealthier people were more likely than others to say window protection would reduce total damages.
5. The following were <u>not</u> related to perceived benefits of window protection:
    a. Not evacuating because house was believed to be safe
    b. Amount of damage in Fran
    c. Perceived susceptibility to flooding
    d. Perceived safety from wind and water
    e. Receiving information from officials in Fran
    f. Type of residence
    g. Years lived in present home
    h. Years lived in region
    i. Living alone
    j. Children
    k. Home ownership
    l. Pets
    m. Race

<u>Mitigation Measures Other Than Window Protection</u>

Respondents were asked what permanent improvements, other than window protection, they had made to their homes to reduce damage to their property in a

hurricane. The results appear in Table 41. Very few people reported doing anything of significance. The only measure indicated by more than 5% of respondents was strengthening roofs (such as bracing of trusses).

Table 41. Percent employing mitigation measures other than window protection

	South Carolina	North Carolina
	(N=411)	(N=402)
Roof/Truss Strengthening	6	10
Door/Garage Door Bracing	1	3
Flood Proofing	2	2
Anchors	3	3
Tree Trimming	3	5
Hurricane Clips	0	2

Predictors of Mitigation Measures Other Than Window Protection

1. *Property damage in Fran.* People experiencing greater property damage were also more likely than others to say they adopted at least one mitigation measure. We assume the mitigation activity followed the damage.
2. *Susceptibility to flooding.* People who don't know whether their homes would flood in a 125 MPH hurricane were less likely than others to have adopted mitigation measures.
3. *Received information from officials in Fran.* People who said they received information from government officials in Fran about the storm's danger and how to protect property were more likely than others to have adopted mitigation measures.
4. *Type of structure.* Mobile home residents were less likely than others to adopt mitigation measures.

5. *Age.* People under 30 and over 65 were less likely than others to have adopted mitigation actions.
6. *Years lived in current home.* People living in their present home more than 20 years were less likely than others to say they had adopted mitigation measures.
7. *Living alone.* People living alone practiced fewer mitigation measures than others.
8. *Race.* Whites were more likely than nonwhites to adopt mitigation practices.
9. *Income.* Wealthier respondents adopted more mitigation measures than others.
10. *Risk area.* People living in higher risk areas practiced more mitigation activities.
11. Adoption of mitigation measures was not related to
    a. Years lived in region
    b. Children
    c. Pets

Planned Mitigation Expenditures

When asked how much money they planned to spend this year on changes to make their homes stronger, as a result of Bertha and Fran, most people said they didn't plan to spend anything (Table 42). Another 12% to 16% said they didn't know how much they would spend. More people in North Carolina said they planned to make mitigation expenditures than in South Carolina.

Table 42. Planned expenditures for mitigation as result of Bertha and Fran (percent)

	South Carolina	North Carolina
	(N=411)	(N=402)
$0	81	63
< $1,000	5	5
$1,000 to $5,000	2	9
$5,000 to $10,000	<1	3
> $10,000	0	3
Don't Know	12	16

Predictors of Planned Mitigation Expenditures

1. *Property damage in Fran.* People who experienced more property damage in Fran said they planned to spend much more than others on making their homes stronger.
2. *Perceived susceptibility to flooding.* People who believe their homes would flood in a 125 MPH hurricane planned to spend more than others on mitigation.
3. *Type of residence.* Mobile home residents said they planned to spend more than others on making their homes stronger.
4. *Age.* Younger people planned to spend more than others on mitigation.
5. *Living alone.* People living alone planned to spend less than others on improvements.
6. *Race.* Nonwhites said they planned to spend more than whites on mitigation.
7. *Risk area.* People in high risk areas planned to spend more than others.
8. The following were *not* related to planned mitigation expenditures:

a. Not evacuating because house believed safe in Fran

b. Perceived safety from wind and water

c. Receiving information from officials in Fran

d. Years lived in current home

e. Years lived in region

f. Children

g. Home ownership

h. Pets

i. Income

Response to Insurance Incentives

Respondents had a very positive response to the notion of considering mitigation options in exchange for reduced insurance premiums (Table 43). Almost half said they would consider the proposal, and another 15% to 21% said they might, depending upon the incentive. Fewer than 20% said they would not consider it.

Table 43. Percent who would consider mitigation for reduced insurance premium

	South Carolina	North Carolina
	(N=406)	(N=399)
Would Consider	46	49
Would Not Consider	19	18
Depends on Incentive	21	15
Don't Know	14	19

Predictors of Response to Insurance Incentive

1. *Property damage in Fran.* People experiencing no property damage in Fran were less likely than others to say they would consider insurance incentives, but the relationship was weak.
2. *Age.* People over 65 were less likely than others to say they would consider insurance incentives.
3. *Years lived in current home.* People living in their present homes fewer years were more likely than others to say they would consider insurance incentives.
4. *Living alone.* People living alone were less likely than others to consider insurance incentives.
5. *Children.* People with children were more likely than others to say they would consider insurance incentives.
6. *Home ownership.* Owners were more likely to say their response would depend on the incentive. Renters were more likely to say they didn't know whether they would consider incentives.
7. *Pets.* Pet owners were more likely to say they would consider incentives.
8. *Income.* People with incomes below $12,000 were less likely than others to say they would consider incentives.
9. *Risk area.* In South Carolina people living east of Business 17 were less likely than others to say they would consider incentives.
10. *Type of residence.* Mobile home owners were more likely than others to say they would consider incentives.

11. The following were not related to whether people said they would consider the incentives:

    a. Not evacuating in Fran because house was believed to be safe

    b. Perceived susceptibility to flooding

    c. Perceived safety from wind and water

    d. Receiving information from officials in Fran

    e. Years lived in region

    f. Race

Confidence in Building Code Enforcement

Most people believe that building officials are enforcing the aspects of codes which deal with hurricane protection, as repairs are made after Bertha and Fran (Table 44). A large number say they don't know whether codes are being enforced, but only 10% say they believe codes are not being enforced.

Table 44. Belief officials are ensuring repairs from Fran meet building code (percent)

	South Carolina	North Carolina
	(N=409)	(N=400)
Yes, Code Enforced	51	58
No, Code Not Enforced	9	10
Don't Know	40	33

Predictors of Confidence in Code Enforcement

1. *Perceived susceptibility to flooding.* People who believe their home would flood in a 125 MPH hurricane are more likely than others to believe codes are being enforced in the wake of Bertha and Fran.

2. *Received information from officials in Fran.* People who received information from officials in Fran regarding the storm's dangers or how to prevent damage were more likely than others to believe codes were being enforced.
3. *Type of residence.* People living in multi-story buildings were more likely than others to have confidence that codes were being enforced.
4. *Age.* Older respondents were less likely than others to believe codes were being enforced.
5. *Years lived in region.* People who had lived on the Carolina coast between 20 and 42 years had greater confidence than others that codes were being enforced.
6. *Living alone.* People living alone were less likely than others to believe codes were being enforced.
7. *Children.* People with children were more likely than others to have confidence in code enforcement.
8. *Home ownership.* Renters had greater confidence than owners in code enforcement.
9. *Pets.* People without pets were more likely than others to say they didn't know whether codes were being enforced.
10. *Income.* People with low incomes were less likely than others to have confidence that codes were being enforced.
11. *Risk area.* People in beach areas of North Carolina and east of Business 17 in South Carolina were more likely than others to believe codes were being enforced.

12. The following were not associated with confidence in code enforcement:

    a. Not evacuating because of belief house was safe

    b. Perceived safety of home from wind and water

    c. Years lived in present home

    d. Race

Appendix I

Survey Instrument

Hurricanes Fran and Bertha Response Questionnaire
(1-8-97)

Hello, my name is _____ and I'm calling on behalf of the Army Corps of Engineers and your state emergency management office. I'm conducting a telephone survey of residents in the Carolinas concerning experiences in hurricanes Fran and Bertha last summer. May I speak with the **(ROTATE):**

1. Youngest male over 18
2. Oldest male
3. Youngest female over 18
4. Oldest female in your household?

My questions will only take a few minutes. Your responses are important to us so that we may have accurate information about hurricane preparedness. Before we begin, let me assure you everything you say will remain strictly confidential.

1. Do you live at this residence year-round?

_1_ Yes **(GO TO Q3)**
_2_ No **(GO TO Q2)**
_3_ Other **(GO TO Q2)**

2. Do you live here at least part of the time during the summer or fall?

_1_ Yes **(GO TO Q3)**
_2_ No **(THANK & TERMINATE)**
_3_ Other **(THANK & TERMINATE)**

IF "NO," TERMINATE THE INTERVIEW BY RESPONDING "THANK YOU FOR YOUR TIME, BUT WE ARE LOOKING FOR PEOPLE WHO ARE IN THIS REGION DURING THAT TIME FRAME. THANK YOU AGAIN. GOODBYE.

3. As you may recall, there were 2 hurricanes last year: Bertha around July and Fran in September. Were you in the area, i.e., not out of town, when **HURRICANE FRAN** began to threaten your area last September? [Fran was the second of the two hurricanes; Bertha occurred in July.]

_1_ Yes **(GO TO Q4)**
_2_ No **(THANK AND TERMINATE)**
_3_ Other **(THANK AND TERMINATE)**

IF "NO," TERMINATE THE INTERVIEW BY RESPONDING "THANK YOU FOR YOUR TIME, BUT WE ARE LOOKING FOR PEOPLE WHO WERE IN THIS AREA AT THAT TIME. THANK YOU AGAIN. GOODBYE."

4. As you may recall, the center of Hurricane Fran made landfall near Cape Fear, North Carolina on the evening of Thursday, September 5. Did you leave your home to go someplace safer **before** the hurricane?

_1_ Yes **(GO TO Q6)**
_2_ No **(GO TO Q5)**
_3_ Other, _____ **(GO TO Q19)**
_9_ Don't know **(GO TO Q19)**

5. What made you decide *not* to go anyplace else? **(CATEGORIZE - PROBE UP TO 3) (THEN GO TO Q19)**

a. 0/1 Storm not severe/house adequate
b. 0/1 Officials said evacuation unnecessary
c. 0/1 Media said evacuation unnecessary
d. 0/1 Friend/relative said evacuation unnecessary
e. 0/1 Officials didn't say to evacuate
f. 0/1 Probabilities indicated low chance of a hit
g. 0/1 Other information indicated storm wouldn't hit
h. 0/1 Had no transportation
i. 0/1 Had no place to go
j. 0/1 Wanted to protect property from looters
k. 0/1 Wanted to protect property from storm
l. 0/1 Left unnecessarily in past storms
m. 0/1 Job required staying
n. 0/1 Waited too long to leave
o. 0/1 Traffic too bad
p. 0/1 Tried to leave, but returned home because of traffic
q. 0/1 Too dangerous to evacuate
r. 0/1 Other, specify: _____
s. 0/1 Don't know

(IF ANSWERING Q5, GO TO Q19)

6. Did you go to a public shelter, a friend or relative's house, a hotel, or somewhere else? **(DO NOT READ)**

1 Public shelter (Red Cross)
2 Church
3 Friend/relative
4 Hotel
5 Second home
6 Workplace
7 Mobile home park clubhouse
8 Other, specify: _____
9 Don't know

7. Is that **(ANSWER FROM #6)** located in your neighborhood or someplace else?

1 Neighborhood **(SKIP TO Q11)**
2 Somewhere else
9 Don't know

8. In which city is that located?

_____

9. Is that **(ANSWER FROM #8)** located in your county?

1 Yes **(SKIP TO Q11)**
2 No
9 Don't know

10. In which state is that located?

1 South Carolina
2 North Carolina
3 Other, _____
9 Don't know

11. What convinced you to go someplace else? **(CATEGORIZE - PROBE UP TO 3)**

a. 0/1 Advice or order by elected officials
b. 0/1 Advice from Weather service
c. 0/1 Advice/order from police officer or fire fighter
d. 0/1 Advice from media
e. 0/1 Advice from friend or relative
f. 0/1 Concerned about severity of storm
g. 0/1 Storm increased in strength
h. 0/1 Concerned storm would cause home to flood
i. 0/1 Concerned strong winds would make house unsafe
j. 0/1 Concerned flooding would cut off roads
k. 0/1 Concern that storm might hit
l. 0/1 Heard probability (odds) of hit
m. 0/1 Other, specify: _____
n. 0/1 Don't know

12a. Fran hit the Cape Fear area of North Carolina around 8 or 9 PM on the evening of Thursday, September 5th. On which day did you leave your home to go someplace safer? **(WAS IT BEFORE OR AFTER THE NATIONAL HURRICANE CENTER ISSUED A HURRICANE WARNING AT 5 PM ON WEDNESDAY EVENING?)**

[*For reference only:*

Hurricane Watch issued for South Carolina at 11 PM Tuesday, September 3rd.

Hurricane Watch issued for North Carolina at 11 AM Wednesday, September 4th.]

1 Tuesday, September 3rd →**READ**: The hurricane warning didn't come until 5 PM on Wednesday the 4th. Are you sure you left on Tuesday? **(REVISE ANSWER IF NECESSARY)**
2 Wednesday, September 4th
3 Thursday, September 5th
4 Friday, September 6th
5 Other _____
9 Don't know

12b. About what time on the **(REPEAT DATE)** did you leave? **(WAS IT BEFORE OR AFTER THE HURRICANE WARNING AT 5 PM ON WEDNESDAY THE 4TH?) (USE 1 HOUR INCREMENTS) (TAKE MIDPOINT) (99=DK)**

_____ Hour **(IF 99, SKIP TO Q13)**

12c. Was that AM or PM? **(NOTE: 12 O'CLOCK NOON = 12 PM)**
(NOTE: 12 O'CLOCK MIDNIGHT = 12 AM ON THE "NEW" DAY)

1 AM
2 PM

13. Did you or anyone in your household require assistance in evacuating?

1 Yes
2 No **(SKIP TO Q15)**
3 Not sure **(SKIP TO Q15)**

3a. Did the person just need transportation, or did they have a disability of medical problem that required special assistance?

__1__ Transportation only
__2__ Special need (disability or medical problem)
__3__ Both
__4__ Other, specify: _____
__5__ Don't know

14. Was that assistance provided by someone within your household, or by an outside agency, or by a friend or relative outside your household?

__1__ Within household
__2__ Friend/relative (outside)
__3__ Outside agency
__4__ Other, _____
__9__ Don't know

15. How many vehicles were available in your household that you could have used to evacuate?

_____ Number of vehicles **(IF 0, GO TO Q16; OTHERWISE GO TO Q17) (9 = DK) (IF 1 OR MORE IN Q15, SKIP TO Q17) (8 =NA) (RECORD "0" IF NO VEHICLES ARE AVAILABLE)**

16. Did your household members leave in someone else's vehicle, did they use public transportation, or did you evacuate another way?

__1__ Other's vehicles **(GO TO Q19)**
__2__ Public transportation **(GO TO Q19)**
__3__ Other, specify: _____ **(GO TO Q19)**

17. How many vehicles did your household take in evacuating? **(9 = DK) (8 =NA) (RECORD "0" IF NO VEHICLES ARE AVAILABLE)**

_____ Number of vehicles

18. When you evacuated, did you take a motor home or pull a trailer, boat, or camper?

__1__ Yes
__2__ No
__3__ Other, specify: _____
__9__ Don't know

19. During the threat, did you hear anyone in an official position - such as emergency management, police, etc. - say that you **should** evacuate from your location to a safer place?

__1__ Yes **(GO TO Q20)**
__2__ No **(GO TO Q22)**
__9__ Don't know **(GO TO Q22)**

20. Did officials recommend that you **should** evacuate or did they say it was mandatory that you **must** evacuate?

__1__ Should
__2__ Must
__9__ Don't know

21. Did police or other authorities come into your neighborhood going door-to-door or with loudspeakers, telling people to evacuate?

1 Yes
2 No
9 Don't know

22. Would you do anything differently in the same situation again? **(CATEGORIZE) (PROBE UP TO 3)**

a 0/1 Would evacuate
b 0/1 Wouldn't evacuate
c 0/1 Would leave earlier
d 0/1 Would wait later to leave
e 0/1 Would go further away
f 0/1 Wouldn't go as far away
g 0/1 Would go to public shelter
h 0/1 Wouldn't go to public shelter
i 0/1 Would use different route
j 0/1 No
k 0/1 Other, specify: _____
l 0/1 Don't know

23. We're interested in how you got most of your information about Fran - where the storm was; when it was going to hit; how severe it was. I'm going to list a number of different ways you might have gotten information, and I'd like you to tell me whether you relied upon that source none at all (0), a little (1), a fair amount (2), or a great deal (3). **(READ & ROTATE)**

	None	Little	Fair Amount	Great Deal	
a	0	1	2	3	Local radio stations
b	0	1	2	3	Local television stations
c	0	1	2	3	CNN on cable
d	0	1	2	3	The Weather Channel on cable
e	0	1	2	3	Other cable television stations
f	0	1	2	3	Internet * **(DO YOU HAVE A COMPUTER WITH A MODEM)**
g	0	1	2	3	Services like American Online or Compuserve * **(DO YOU HAVE A COMPUTER WITH A MODEM)**
h	0	1	2	3	Word of mouth

IF "0" TO ALL, SKIP TO Q 27a

24. Of those sources of information, did you find any one of them to be have more accurate information than the others?

1 Yes
2 No **(SKIP TO Q26a)**
3 Don't Know/Not Sure **(SKIP TO Q26a)**

25. Which one was that?

1 Local radio stations
2 Local television stations
3 Out of town television stations you could only get on cable
4 CNN on cable
5 The Weather Channel on cable
6 The Internet, if you have a computer
7 Computer services like American Online or CompuServe, if you have a computer
8 All equally accurate
9 Don't know

26a. Of those sources of information, did you find any one of them to have **less** accurate information than the others?

1 Yes
2 No **(SKIP TO Q27a)**
9 Don't Know/Not Sure **(SKIP TO Q27a)**

26b. Which one was that?

1 Local radio stations
2 Local television stations
3 Out of town television stations you could only get on cable
4 CNN on cable
5 The Weather Channel on cable
6 The Internet, if you have a computer
7 Computer services like American Online or CompuServe, if you have a computer
8 All equally inaccurate
9 Don't know

27a. Did you receive any information from local government officials about whether Fran was going to be a danger to your safety or how to protect your home and property?

1 Yes
2 No **(SKIP TO Q28a)**
9 Don't Know/Not Sure **(SKIP TO Q28a)**

27b. How would you rate the information you received from **local government officials**? Would you say it was generally accurate or generally not accurate?

1 Generally accurate
2 Generally not accurate
3 Some accurate, some not
9 Don't Know/No Opinion

27c. Would you say it was generally useful or generally not useful?

1 Generally useful
2 Generally not useful
3 Some useful, some not
9 Don't Know/No Opinion

28a. Did you receive any information from **state officials** about whether Fran was going to be a danger to your safety or how to protect your home and property?

1 Yes
2 No **(SKIP TO Q29)**
9 Don't Know/Not Sure **(SKIP TO Q29)**

28b. How would you rate the information you received from state government officials? Would you say it was generally accurate or generally not accurate?

1 Generally accurate
2 Generally not accurate
3 Some accurate, some not
9 Don't Know/No Opinion

28c. Would you say it was generally useful or generally not useful?

__1__ Generally useful
__2__ Generally not useful
__3__ Some useful, some not
__9__ Don't Know/No Opinion

29. What information did you need that you were unable to find any place as Fran approached? **(RECORD VERBATIM)**

_____
_____
_____

30. At one point Fran's maximum sustained winds were almost 125 MPH. If Fran had made landfall near your location with winds of 125 MPH, do you believe your home would have been at risk to dangerous flooding from storm surge or waves?

__1__ Yes
__2__ No
__9__ Don't Know/Depends

31. Considering both wind and water, do you think it would have been safe for you to have stayed in your home if Fran had hit near your location with winds of 125 MPH?

__1__ Yes
__2__ No
__9__ Don't Know/Depends

32. In Fran, what kinds of steps, if any, did you take before the storm arrived to protect your property? **(CATEGORIZE) (PROBE UP TO 3)**

a __0/1__ Apply window protection
b __0/1__ Apply door/garage door protection
c __0/1__ Secure or remove loose objects from yard
d __0/1__ Move boat, camper, etc.
e __0/1__ Prepare pool
f __0/1__ Elevate furniture, appliance, rugs, etc.
g __0/1__ Protect documents, photos, etc.
h __0/1__ Sandbag property
i __0/1__ Purchase items for repair after/during storm (plastic film, plywood)
j __0/1__ Buy/rent generator
k __0/1__ Secure plants
l __0/1__ Cut limbs
m __0/1__ Other (Specify)_____
n __0/1__ None
o __0/1__ Don't Know/Not Sure

33. Now let's talk about Hurricane Bertha. Were you in the area, i.e., not out of town, when Hurricane Bertha threatened? Bertha was the storm that struck between Wrightsville Beach and Topsail Beach North Carolina on the afternoon of Friday, July 12th..

__1__ Yes **(GO TO Q34)**
__2__ No **(GO TO Q43)**
__3__ Other _____ **(GO TO Q43)**
__9__ Don't Know **(GO TO Q43)**

34. In Bertha did you leave your home to go someplace safer before the hurricane?

__1__ Yes **(GO TO Q35)**
__2__ No **(GO TO Q40)**
__3__ Other _____ **(GO TO Q40)**

35. Did you go to a public shelter, a friend or relative's house, a hotel, or somewhere else? **(DO NOT READ)**

1 Public Shelter (Red Cross)
2 Church
3 Friend/Relative
4 Hotel/Motel
5 Home
6 Workplace
7 Mobile home park clubhouse
8 Other _____
9 Don't Know

36. Is that **(ANSWER TO Q35)** in your neighborhood or somewhere else?

1 Neighborhood **(SKIP TO Q40)**
2 Somewhere else
9 Don't Know **(SKIP TO Q40)**

37. In what city is that located?

_____

38. Is that **(ANSWER TO Q37)** located in your county?

1 Yes **(SKIP TO Q40)**
2 No
9 Not Sure **(SKIP TO Q40)**

39. In which state is that located?

1 South Carolina
2 North Carolina
3 Other _____
9 Don't Know

40. Did you hear anyone in an official position -- emergency management, police, etc. -- say that you **should** evacuate to a safer place?

1 Yes
2 No **(GO TO Q43)**
9 Don't Know **(GO TO Q43)**

41. Did they say that you **should** evacuate or that it was mandatory that you **must** evacuate?

1 Should
2 Must
9 Don't Know

42. Did police or other authorities come into your neighborhood going door-to-door or with loudspeakers, telling people to evacuate?

1 Yes
2 No
9 Don't Know

43. Have you identified the safest location in your home to ride out a strong hurricane if you had to?

1 Yes
2 No
9 Don't Know/Not Sure

44. Do you have any kind of window protection such as storm shutters, security film, or plywood sheets designed to protect the windows during a strong hurricane?

__1__ Yes **(SKIP TO Q46)**
__2__ Would Attach Them Before Storm **(SKIP TO Q46)**
__3__ No **(ASK Q45)**
__9__ Don't Know/Not Sure **(SKIP TO Q46)**

45. If not, why not? **(CATEGORIZE)**

__1__ Don't need it
__2__ Too expensive
__3__ Don't think it works
__4__ Don't have enough time to do it
__5__ Other (specify) _____
__9__ Don't know

46. About how much do you think window protection such as storm shutters would cost per window? **(PAUSE - READ IF NECESSARY)**

__1__ Under $10
__2__ $10 to $50
__3__ $50 to $100
__4__ $100 to $200
__5__ $200 to $500
__6__ Over $500
__9__ Don't Know/Not Sure

47. Do you believe window protection like that would mainly just prevent the windows from breaking and reduce the danger of flying glass, or do you believe they would also significantly reduce the total damage your house would suffer in other ways?

__1__ Mainly Windows
__2__ Total Damage Also
__9__ Don't Know/Not Sure

48. Other than window protection, what permanent improvements, if any, have you made to your home to reduce the damage to your property in a hurricane? **(CATEGORIZE) (PROBE UP TO 2)**

a __0/1__ Roof/truss Strengthening
b __0/1__ Door/Garage Door Protection
c __0/1__ Flood proofing
d __0/1__ Other (Specify)_____
e __0/1__ None
f __0/1__ Don't Know/Not Sure

49. Is your home or building elevated on pilings or fill material to raise it above flood water?

__1__ Yes
__2__ No
__9__ Don't Know/Not Sure

50. Based on the effects of Hurricane Fran or Bertha, ~~how~~ much money do you plan to spend **this year** on changes to your home to make it stronger? ~~**(999=DK)**~~

$_____

51. If your homeowners insurance company offered to reduce the price of your insurance premium if you were to make your home stronger, would you consider doing it?

__1__ Yes
__2__ No
__3__ Depends on Cost/Savings
__9__ Don't Know

52. How much damage to your property did you experience in Fran? **(999=DK)**

$_____

53. Do you feel that local building officials are making sure that repairs after Bertha and Fran meet the parts of the building code that deal with hurricane protection?

__1__ Yes
__2__ No
__9__ Don't Know

NOW WE HAVE JUST A FEW MORE QUESTIONS FOR BACKGROUND PURPOSES ONLY.

54. Which of the following types of structures do you live in? Do you live in a: **(READ)**

__1__ Detached single family home?
__2__ Duplex, triplex, quadruple home?
__3__ Multi-family building -- 4 stories or less? (Apartment/condo)
__4__ Multi-family building -- more than 4 stories (Apartment/condo)
__5__ Mobile home
__6__ Some other type of structure
__9__ Don't Know
__10__ Refused

55. How old were you on your last birthday?

___ Number of years **(99 = DK)** (88=REFUSED)

56. How long have you lived in your present home? **(ROUND UP) (99 = DK)** (88=REFUSED)

___ Number of years

57. How long have you lived on the Carolina Coast? **(ROUND UP) (99 = DK)**(88=REFUSED)

___ Number of years

58. How many people live in your household, including yourself? **(99 = DK)** (88=REFUSED)

___ Number of people **(IF 1, SKIP TO Q60)**

59. How many of these are children, 17 or younger? **(99 = DK)** (88=REFUSED)

___ Number of children

60. Do you own your home or rent?

__1__ Own
__2__ Rent
__3__ Other

61. Do you have any pets?

__1__ Yes
__2__ No
__9__ Refused

62. Which race or ethnic background best describes you? **(READ)**

1 African American or Black
2 Asian
3 Caucasian or White
4 Hispanic
5 American Indian
6 Other _____
9 Refused

63. Which of the following ranges best describes your total household income for 1996? **(READ)**

1 Less than $12,000
2 $12,000 to $24,999
3 $25,000 to $39,999
4 $40,000 to $79,999
5 Over $80,000
9 Refused

Thank you so much. Sometimes my supervisor will call people to check on my work. May I get your first name in case she wants to check?

64. _____

RECORD INTERVIEW INFORMATION ON RESPONDENT DISPOSITION SHEET

65. Sex of respondent __1__ Male __2__ Female
66. Interviewer ID _____
67. Date of survey _____
68. Phone number _____
69. Risk Zone _____ **(1= High Risk) (2=Moderate Risk) (3= Internal)**
70. County _____
71. Zip code _____
72. State _____ **(1=North Carolina) (2=South Carolina)**