



US Army Corps
of Engineers
Baltimore District

HURRICANE EVACUATION BEHAVIORAL SURVEY AND ANALYSIS FOR THE MARYLAND WESTERN SHORE

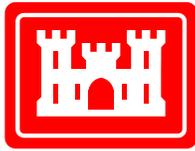
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DRAFT



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* The hurricane evacuation behavioral survey and analysis for the eastern shore of Maryland was included in the Delmarva Hurricane Evacuation Study, conducted by the Philadelphia District of the U.S. Army Corps of Engineers in 2003.

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1.0 INTRODUCTION AND METHODS

Evacuation outcomes depend upon many factors, including how the public responds. The public responses having the greatest impact upon an evacuation are:

1. The number of households which evacuate.
2. How promptly evacuees leave.
3. The number of evacuees who seek refuge in public shelters.
4. The number of evacuees who leave or attempt to leave the local area and where they go.
5. The number of vehicles used.

1.1 DERIVING CORRECT ASSUMPTIONS

There are at least three basic ways to derive behavioral assumptions:

1. Conduct interviews with people in a large number of locations asking what they did in multiple hurricane threats, documenting patterns of behavior under various conditions (general response model).
2. Conduct interviews asking people what they did in one particular evacuation (single event survey).
3. Conduct interviews asking people what they would do during a hurricane threat (intended response survey).

1.2 AN INTEGRATED APPROACH

1.2.1 Building a Quantitative General Response Model.

A response model can be constructed to indicate quantitative values of specific responses, given a set of circumstances which the planner specifies. For each of the behaviors to be anticipated, the model predicts a value, depending upon specific situations and circumstances of interest. The extent of shadow evacuation in hurricanes, for example, can be forecast by specifying the severity of the storm, hazardousness of the neighborhood, vulnerability perceptions of the public, and actions taken by public officials.

The model is simply a set of empirical patterns observed in actual evacuations in many locations under a large variety of circumstances. This is the way science is conducted, and this is the heart of the approach used in this analysis in formulating behavioral assumptions for hurricane evacuation planning for the Maryland western shore.

A concern sometimes expressed about the general response model is that it is based upon responses of people in "other places" and that "our people are different." Actually the strength of the general model is that it accounts for differences in responses as they vary due to demographic characteristics of the population, actions by emergency management personnel, physical hazardousness of the study area, options available to the vulnerable populations, and so forth. Evidence of the model's validity lies in its history of accurately explaining and forecasting actual response behavior observed in a variety of places. Nevertheless, it is important to be aware of factors that could cause behavior in Maryland to vary from patterns normally predicted by the general response model.

1.2.2 Single Event Actual Response Data.

One way to supplement the general response model is to collect data on what residents in Maryland have actually done in past hurricane evacuations. However, it is dangerous to over generalize from a single evacuation in a location. Even the same people will respond differently in different circumstances. If an evacuation occurs late at night, for example, and the evacuation is urgent, those circumstances tend to lead to fewer people leaving the local area than normal. Thus, if the single event was a late night, urgent evacuation, it might provide an indication of the "worst case" to expect in that location for certain types of behaviors.

Single events also provide opportunities to validate the use of the general response model for forecasting in a specific location. Actual behavior in a single event can be documented and compared to that which would have been predicted by the general response model. Its "fit" gives a clue to how much the model might need to be adjusted to work best for the specific location and hazard.

As part of this project, telephone interviews (described below) were conducted in the spring of 2004 in which residents of the region were asked how they responded during Isabel in 2003. The only other actual response data for the region consisted of 100 interviews in the Anne Arundel County area following Gloria in 1985.

1.2.3 Intended Responses.

Although hypothetical response data can rarely be used literally for quantitative forecasts, it does have uses. It can also be misleading, however. There are consistent biases in some sorts of hypothetical response data, for example. People are more likely to say they would evacuate in "low risk" situations than they usually do, more likely to say they would leave early than they usually do, and more likely to say they would use public shelters than they usually do. Hypothetical response data can be adjusted to account for those sorts of known biases. Hypothetical data in one location can be compared with that collected elsewhere for an indication of relative variation between the samples. If more people in one location say they would refuse to leave than in another, they probably really are more likely to refuse. At least more effort will be required to have them move. So, although the magnitude of people saying they wouldn't leave might not be quantitatively valid, it at least gives a relative indication. This can be particularly useful when actual response data is also available in the second location.

A major component of this current behavioral analysis involved a sample survey documenting residents' beliefs about their exposure to hurricanes, their intentions to respond in future hurricane threats, and demographic information which could be related to their behavior. The questions were asked in the same survey administered in 2004 following hurricane Isabel which affected the region in 2003.

1.3 POST-ISABEL SURVEY METHODS

Telephone interviews were conducted with Maryland residents in the spring of 2004 concerning their response during hurricane Isabel, to measure their perceived vulnerability to hurricanes, and to elicit responses to a series of hypothetical hurricane evacuation scenarios. The U.S. Army Corps of Engineers, Baltimore District provided listings of streets in each surge inundation area on the western shore of Chesapeake Bay. The sample was allocated among five areas of the state and three storm surge inundation areas as shown in Table 1-1. Note that the location names in the tables are shorthand for the actual areas included in that portion of the sample. An attempt was made to interview residents in surge-prone areas of Montgomery and Prince George's Counties (MC/PGC), but there were too few respondents contacted successfully to make separate analyses in those areas valid. A discussion of statistical reliability of estimates derived from samples of various sizes is included in Appendix I. The complete questionnaire used in the survey appears in Appendix II.

Table 1-1. Sample sizes by hurricane risk area and location

	S. Shore	A. Arundel	MC/PGC	Baltimore
Cat 1	129	129	13	159
Cat 2-4	129	127	4	150
Non-surge	105	101	185	110

S. Shore (Charles, St. Mary's and Calvert Counties)

A. Arundel (Anne Arundel County, south of Severna Park)

MC/PGC (Montgomery and Prince George's Counties)

Baltimore (Anne Arundel County, north of Severna Park, Baltimore City, and Baltimore, Howard, and Carroll Counties)

2.0 EVACUATION PARTICPATION RATES

2.1 RESPONSE DURING HURRICANE ISABEL

There was relatively little evacuation along the Maryland western shore during Hurricane Isabel (Table 2-1). The highest participation rate was in the category 1 surge area of the southern shore region, but even there only 32% said they left their homes to go anyplace safer.

Table 2-1. Evacuation participation rates, by location (percent of respondents)

	S. Shore	A. Arundel	MC/PGC	Baltimore
Cat 1	32	9	NA	18
Cat 2-4	16	13	NA	15
Non-surge	13	6	4	6

During Hurricane Isabel most residents said their evacuation decisions were based primarily on their assessment of the storm’s track and strength (Table 2-2). Fewer than 15% cited information from public officials as their primary decision factor. The lack of influence by public officials is also reflected in the fact that few respondents said they heard evacuation notices from public officials (Table 2-3).

Table 2-2. Primary reason given for decision to leave or stay, by location (percent of respondents)

	S. Shore	A. Arundel	MC/PGC	Baltimore
Track	41	42	29	27
Strength	23	21	23	20
Officials	12	11	13	11
Media	15	19	29	22
DK/Other	10	9	6	21

Table 2-3. Official evacuation notices heard, by location and risk area (percent of respondents)

	S. Shore	A. Arundel	MC/PGC	Baltimore
Cat 1	30	10	NA	21
Cat 2-4	16	17	NA	28
Non-surge	12	7	1	10

People who did not evacuate in Isabel were asked whether concerns about being trapped on the road while attempting to evacuate played a role in their evacuation decision, and few said it did (Table 2-4). Only slightly more said they had been concerned about being able to return to their

homes following the evacuation (Table 2-5). Between 22% and 39% of the respondents said someone in their household had to work during the Isabel evacuation (Table 2-6), but few of those households cited that as being the reason they didn't evacuate (Table 2-7).

Table 2-4. Concerned in Isabel about being caught on the road attempting to evacuate, by location (percent of respondents)

	S. Shore	A. Arundel	MC/PGC	Baltimore
Yes	25	28	33	22
No	73	71	65	75
Don't Know	2	1	1	2

Table 2-5. Concerned in Isabel about being able to return home after evacuating, by location (percent of respondents)

	S. Shore	A. Arundel	MC/PGC	Baltimore
Yes	37	32	21	34
No	59	65	75	62
Don't Know	4	3	5	4

Table 2-6. Households with someone required to work during evacuation, by location (percent of respondents)

	S. Shore	A. Arundel	MC/PGC	Baltimore
Yes	30	22	39	23
No	69	75	60	76
Don't Know	1	2	1	1

Table 2-7. Effect of work on household's evacuation, by location (percent of respondents)

	S. Shore	A. Arundel	MC/PGC	Baltimore
None	88	86	90	88
Stayed	2	4	4	7
Part Stayed	0	0	0	1
Delayed	7	5	3	3
DK/Other	3	6	4	5

.....

Most people who did not evacuate in Isabel said they would have left if they been convinced that Isabel was going to strike their location directly (Table 2-8). Except in the MC/PGC area most of those who did not evacuate said they had made preparations to do so in case the threat worsened (Table 2-9).

Table 2-8. Would have evacuated if a direct hit had been anticipated, by location (percent of respondents who did not evacuate)

	S. Shore	A. Arundel	MC/PGC	Baltimore
Yes	65	64	52	66
No	23	22	26	23
Don't Know	12	14	23	12

Table 2-9. Made preparations to evacuate in case threat worsened, by location (percent of respondents who did not evacuate)

	S. Shore	A. Arundel	MC/PGC	Baltimore
Yes	61	53	36	50
No	37	46	62	49
Don't Know	2	2	3	1

Local television was cited as the source of Isabel information relied upon a great deal by the largest number of respondents (Table 2-10). This was followed by The Weather Channel and then local radio. Only 5% to 12% said they relied a great deal on the internet for information about Isabel.

Table 2-10. Relied a great deal on source of information, by location (percent of respondents)

	S. Shore	A. Arundel	MC/PGC	Baltimore
Local Radio	33	36	41	30
Local TV	60	64	61	66
CNN	10	14	6	14
Weather Ch	46	50	32	43
Other Cable	17	15	9	19
Internet	8	12	9	5
AOL	4	5	5	2
Friends	14	15	7	13

2.2 PERCEIVED VULNERABILITY

Respondents were reminded how strong Isabel had been at various stages in her existence and asked how the storm would have affected their homes if the strongest part of Isabel had struck their locations with three different intensities. They were asked whether their homes would have flooded dangerously and whether their homes would have been safe to stay in, considering both wind and water, if Isabel had struck them directly with winds of 155 MPH, 125 MPH, and 100 MPH. Results are shown in Tables 2-11 thru 2-16.

A clear majority living in surge areas believe their homes would be vulnerable to flooding in storms having winds of 155 MPH or 125 MPH and believe it would be unsafe to stay in their homes, considering both wind and water. Baltimore vicinity residents were more likely than others to perceive flooding to be a hazard. In general people living in category 2, 3, and 4 surge zones were about as likely as people living in the category 1 zone to say they were vulnerable. A significant number of respondents in non-surge areas also perceive themselves to be unsafe, even in a 100 MPH hurricane.

Table 2-11. Believe home would have flooded dangerously if Isabel had struck community directly with 155 MPH winds, by location and risk area (percent of respondents)

	S. Shore	A. Arundel	MC/PGC	Baltimore
Cat 1	60	69	NA	72
Cat 2-4	61	73	NA	78
Non-surge	40	45	21	57

Table 2-12. Believe home would have been unsafe, considering both wind and water, if Isabel had struck community directly with 155 MPH winds, by location and risk area (percent of respondents)

	S. Shore	A. Arundel	MC/PGC	Baltimore
Cat 1	71	81	NA	77
Cat 2-4	77	79	NA	75
Non-surge	59	65	59	57

Table 2-13. Believe home would have flooded dangerously if Isabel had struck community directly with 125 MPH winds, by location and risk area (percent of respondents)

	S. Shore	A. Arundel	MC/PGC	Baltimore
Cat 1	55	62	NA	68
Cat 2-4	49	64	NA	70
Non-surge	36	37	19	50

Table 2-14. Believe home would have been unsafe, considering both wind and water, if Isabel had struck community directly with 125 MPH winds, by location and risk area (percent of respondents)

	S. Shore	A. Arundel	MC/PGC	Baltimore
Cat 1	71	70	NA	68
Cat 2-4	63	68	NA	63
Non-surge	51	60	51	51

Table 2-15. Believe home would have flooded dangerously if Isabel had struck community directly with 100 MPH winds, by location and risk area (percent of respondents)

	S. Shore	A. Arundel	MC/PGC	Baltimore
Cat 1	45	42	NA	58
Cat 2-4	33	44	NA	56
Non-surge	26	28	14	35

Table 2-16. Believe home would have been unsafe, considering both wind and water, if Isabel had struck community directly with 100 MPH winds, by location and risk area (percent of respondents)

	S. Shore	A. Arundel	MC/PGC	Baltimore
Cat 1	54	50	NA	55
Cat 2-4	44	52	NA	52
Non-surge	40	40	41	39

2.3 INTENDED RESPONSES

Interviewees were presented with three hypothetical hurricane threats and asked what they would do in each presented events. The hypothetical hurricanes included: (1) a category 1 with 80 MPH winds, (2) a category 2 with 100 MPH winds, and (3) a category 3 with 125 MPH winds. They were told in each case that a hurricane warning was in effect for their location and that officials had called for evacuation of all areas that would flood in the hurricane as well as all mobile homes. Respondents were asked if they would leave their homes to go someplace safer. Results are shown in Tables 2-17 thru 2-21.

In a category 1 hurricane only 30% to 40% said they would evacuate from category 1 surge areas. In a category 2 storm that figure rose to approximately 50%, and in a category 3 storm was slightly over 70%. In the less hazardous category 2-4 surge zone, responses were within five percentage points of those in category 1 areas. Intended evacuation participation rates were almost as high in non-surge areas as in surge areas, especially in stronger hurricanes.

Table 2-17. Intend to evacuate in Cat 1 (percent of respondents)

	S. Shore	A. Arundel	MC/PGC	Baltimore
Yes	34	28	28	40
No	61	69	70	56
Don't Know	5	3	2	3

Table 2-18. Intend to evacuate in Cat 2 (percent of respondents)

	S. Shore	A. Arundel	MC/PGC	Baltimore
Yes	46	46	38	50
No	46	50	57	42
Don't Know	8	5	6	7

Table 2-19. Intend to evacuate in Cat 3 (percent of respondents)

	S. Shore	A. Arundel	MC/PGC	Baltimore
Yes	67	69	58	69
No	25	24	34	23
Don't Know	8	7	8	10

Table 2-20. Intend to evacuate by surge zone (percent of respondents)

	Cat 1 Zone	Cat 2-4 Zone	Non-surge
Cat 1 Storm	35	36	30
Cat 2 Storm	50	47	42
Cat 3 Storm	72	69	61

Table 2-21. Intend to evacuate by area and surge zone (percent of respondents)

	S. Shore			A. Arundel			MC/PGC			Baltimore		
	<i>Zone</i>			<i>Zone</i>			<i>Zone</i>			<i>Zone</i>		
Storm	<i>1</i>	<i>2-4</i>	<i>NS</i>									
Cat 1	40	35	27	30	28	25	NA	NA	28	37	43	42
Cat 2	51	47	39	51	44	41	NA	NA	38	49	51	51
Cat 3	69	66	66	74	71	60	NA	NA	57	72	69	65

3.0 TYPE OF REFUGE

3.1 RESPONSE DURING HURRICAN ISABEL

During Hurricane Isabel the great majority of evacuees went to the homes of friends and relatives (Table 3-1). Only 3% along the south shore and in the southern Anne Arundel County area went to public shelters. In the Baltimore vicinity 8% went to shelters.

Table 3-1. Type of refuge used in Isabel (percent of respondents who evacuated)

	S. Shore	A. Arundel	MC/PGC*	Baltimore
Public Shelter	3	3	NA	8
Church	0	0	NA	0
Friend/Relative	79	74	NA	77
Hotel/Motel	13	11	NA	3
Workplace	0	0	NA	2
Other	5	11	NA	9

*Too few evacuees to estimate refuge use.

3.2 INTENDED REFUGE

In each of the three hypothetical hurricane scenarios described previously, respondents were asked what sort of refuge they would seek if they did evacuate. Results are shown in Tables 3-2 thru 3-5. Intention to use public shelters was much greater than shelter use observed in Isabel, with approximately 25% saying they would go to public shelters. Intended use of public shelters was slightly greater in areas of lesser risk from storm surge. Planned reliance on public shelters was greater than average among black and lower-income interviewees (no table). Poor blacks were more likely than poor whites to say they would go to public shelters.

Table 3-2. Type of intended refuge in Cat 1 hurricane by area (percent of respondents)

	S. Shore	A. Arundel	MC/PGC	Baltimore
Public Shelter	20	17	28	26
Friend/Relative	60	53	39	60
Hotel/Motel	11	17	14	9
Other	4	4	2	1
Don't Know	6	9	17	5

Table 3-3. Type of intended refuge in Cat 2 hurricane by area (percent of respondents)

	S. Shore	A. Arundel	MC/PGC	Baltimore
Public Shelter	21	22	27	27
Friend/Relative	56	56	42	58
Hotel/Motel	15	14	17	9
Other	2	3	0	1
Don't Know	6	5	15	5

Table 3-4. Type of intended refuge in Cat 3 hurricane by area (percent of respondents)

	S. Shore	A. Arundel	MC/PGC	Baltimore
Public Shelter	24	23	25	26
Friend/Relative	55	53	44	55
Hotel/Motel	14	15	20	10
Other	2	4	0	3
Don't Know	5	6	13	7

Table 3-5. Intention to use public shelter by surge zone (percent of respondents)

	Cat 1 Zone	Cat 2-4 Zone	Non-surge
Cat 1 Storm	19	21	28
Cat 2 Storm	19	25	28
Cat 3 Storm	20	22	30

Respondents were also asked if they would be likely to use a public shelter arranged for by their local officials, outside their own city or county, even if the location might not be their preferred destination. Almost half of the interviewees said they would be likely to go to that location (Table 3-6).

Table 3-6. Willing to use shelter outside of city or county (percent of respondents)

	S. Shore	A. Arundel	MC/PGC	Baltimore
Cat 1	43	44	NA	51
Cat 2-4	56	40	NA	44
Non-surge	42	50	49	52

4.0 EVACUATION DESTINATIONS

4.1 RESPONSE DURING HURRICANE ISABEL

In Isabel a majority of evacuees went to destinations within their own counties, and between 22% and 40% went to places in their own neighborhoods (Table 4-1). Most of the evacuees leaving their county went elsewhere in Maryland.

Table 4-1. Location of refuge used in Isabel (percent of respondents who evacuated)

	S. Shore	A. Arundel	MC/PGC*	Baltimore
Neighborhood	22	40	NA	35
County	46	34	NA	43
Maryland	20	20	NA	20
Virginia	11	0	NA	0
Other	1	6	NA	0

*Too few evacuees to estimate destination.

4.2 INTENDED RESPONSES

Intended destinations were generally consistent with the figures observed in Isabel. Most people said they would go to places in their own counties, although the figure was somewhat lower than in Isabel, particularly in the southern Anne Arundel County sample (Tables 4-2 thru 4-5). There was little variation in planned destinations among the three hurricane scenarios and little variation among risk zones, although slightly more in the non-surge area said they would go to destinations in their own neighborhood.

Table 4-2. Type of intended destination in Cat 1 hurricane by area (excludes “don’t know”) (percent of respondents)

	S. Shore	A. Arundel	MC/PGC	Baltimore
Neighborhood	28	26	32	31
Own County	29	22	24	40
Maryland	31	33	19	22
Virginia	7	8	7	2
Delaware	0	0	0	1
DC	4	8	6	1
Pennsylvania	0	2	7	2
Other	1	2	6	2

**Table 4-3. Type of intended destination in Cat 2 hurricane by area (excludes “don’t know”)
(percent of respondents)**

	S. Shore	A. Arundel	MC/PGC	Baltimore
Neighborhood	29	24	25	35
Own County	27	26	18	33
Maryland	29	30	24	25
Virginia	6	8	11	1
Delaware	1	1	0	<1
DC	6	7	4	1
Pennsylvania	1	2	8	3
Other	1	2	11	1

**Table 4-4. Type of intended destination in Cat 3 hurricane by area (excludes “don’t know”)
(percent of respondents)**

	S. Shore	A. Arundel	MC/PGC	Baltimore
Neighborhood	26	25	33	36
Own County	29	23	16	32
Maryland	27	32	20	24
Virginia	8	9	10	1
Delaware	0	0	1	<1
DC	6	7	4	1
Pennsylvania	1	3	9	4
Other	3	2	9	2

**Table 4-5. Intended Destination by surge zone in a Cat 3 hurricane (excludes “don’t know”)
(percent of respondents)**

	Cat 1 Zone	Cat 2-4 Zone	Non-surge
Neighborhood	25	29	36
Own County	31	30	20
Maryland	29	27	23
Virginia	7	6	6
Delaware	0	<1	<1
DC	4	3	5
Pennsylvania	2	3	6
Other	2	2	5

The great majority of those who said they would go to public shelters expected the shelter to be in their own neighborhood, and over 90% expected it to be in their own county (Table 4-6). Slightly more than half of the respondents who plan to go to friends and relatives said their destination would be within their own county. Those going to hotels and motels expect to go the farthest.

Table 4-6. Type of intended destination in Cat 3 hurricane by type of refuge (excludes “don’t know”) (percent of respondents)

	Public Shelter	Friend/Relative	Hotel/Motel	Other
Neighborhood	73	16	11	13
Own County	19	39	27	35
Maryland	7	35	30	39
Virginia	<1	8	9	9
Delaware	0	<1	0	0
DC	<1	5	9	4
Pennsylvania	<1	4	9	0
Other	0	3	6	0

5.0 VEHICLE USE

5.1 RESPONSE DURING HURRICANE ISABEL

Evacuating households were asked how many vehicles were available that could have been used in the evacuation, and how many were actually used. Between 55% and 69% of the available vehicles were used (Table 5-1). Number of vehicles per evacuating household was highest in the south shore area and lowest in the Baltimore vicinity. In the Baltimore region 9% of the households took RV's or motor homes or pulled trailers, a considerably higher figure than in other areas.

Table 5-1. Vehicle use in Isabel

	S. Shore	A. Arundel	MC/PGC*	Baltimore
% of Available Vehicles	69	59	NA	55
Vehicles per Household	1.17	1.03	NA	.85
RV's, Trailers	3	0	NA	9

*Too few evacuees to estimate vehicle use.

5.2 INTENDED RESPONSES

Intended responses varied somewhat from those observed in Isabel, but most were not large enough, given the relative small number of evacuees in Isabel, to conclude that the differences were statistically significant. Only .6% to 3.8% of the survey participants said they had no vehicles available in their household that could be used in an evacuation (Table 5-2).

Table 5-2. Available and intended vehicle use by area

	S. Shore	A. Arundel	MC/PGC	Baltimore
% of Available Vehicles	60	62	55	69
Vehicles per Evacuating HH	1.34	1.31	1.18	1.35
HH w/ No Vehicles (%)	1.1	.6	1.5	3.8
RV's, Trailers (%)	7	6	4	8

6.0 HOUSEHOLDS NEEDING ASSISTANCE

6.1 RESPONSE DURING HURRICANE ISABEL

In the south shore area only one percent of the respondents in evacuating households said that anyone in the home required assistance from an agency in evacuating. The figure was higher in the southern Anne Arundel County (6%) and Baltimore (9%) areas (Table 6-1). Transportation was the need cited by almost all respondents.

Table 6-1. Household required evacuation assistance in Isabel (percent of households that evacuated)

S. Shore	A. Arundel	MC/PGC*	Baltimore
1	6	NA	13

*Too few respondents to estimate need for assistance.

6.2 INTENDED RESPONSES

Again, responses to the hypothetical varied somewhat from responses in Isabel, but again the sampling error was sufficient to account for most of the variation. Overall 4% to 7% of the respondents said someone would need evacuation assistance (Table 6-2). More than half the interviewees said the need would involve special care in a shelter.

Table 6-2. Households requiring evacuation assistance

	S. Shore	A. Arundel	MC/PGC	Baltimore
Assistance Needed	4	4	4	7
Type of Assistance				
Transportation	27	20	29	15
Special Need	33	33	43	49
Both	27	13	14	24
DK/Other	13	34	14	12

7.0 EVACUATION TIMING

7.1 RESPONSE DURING HURRICANE ISABEL

Isabel made landfall in North Carolina around 1 PM on Thursday, September 18th. Interviewees were reminded of that timing as well as the times when watches and warnings were posted and asked when they left their homes. Along the south shore and in Anne Arundel, most of the evacuation took place on the 17th and 18th, but in the Baltimore vicinity most of it occurred on the 18th and 19th, presumably in response to flooding as it occurred (Table 7-1). The overall response timing prior to the 19th is shown in Figure 7-1, to reflect response to warnings rather than flooding.

Table 7-1. Date of departure (percent of respondents who evacuated)

	S. Shore	A. Arundel	MC/PGC	Baltimore
Sep. 15 th	4	0	NA	0
Sep. 16 th	6	10	NA	3
Sep. 17 th	34	26	NA	12
Sep. 18 th	54	61	NA	45
Sep. 19 th	0	3	NA	34
Sep. 20 th	1	0	NA	5

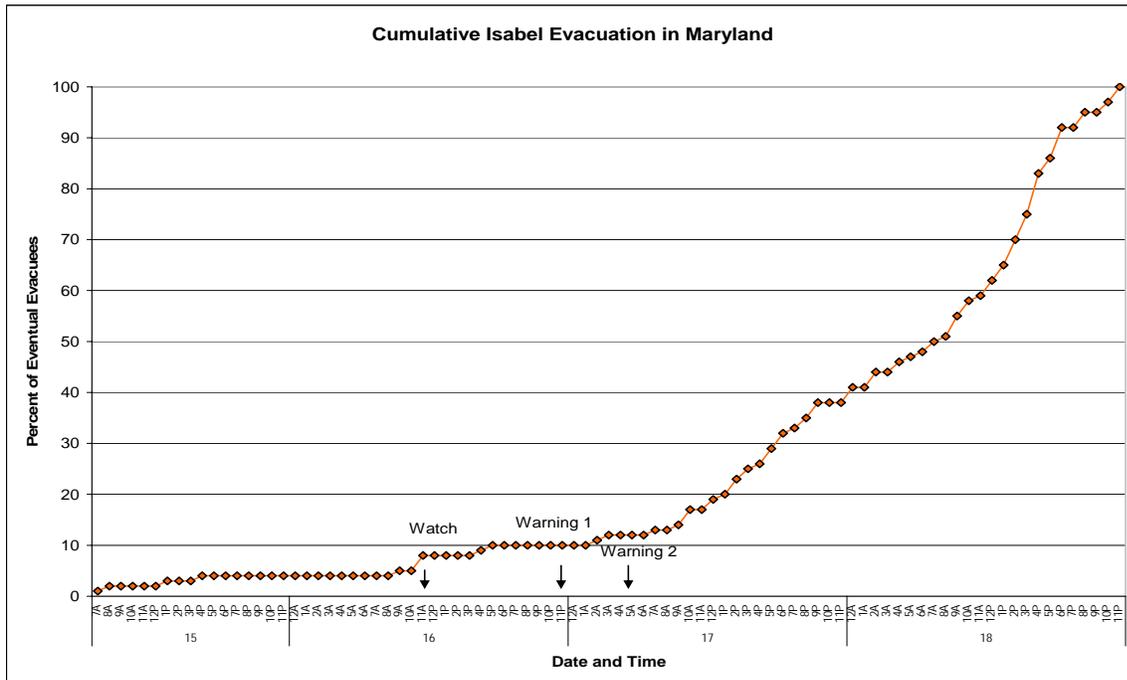


Figure 7-1. Cumulative evacuation response in Isabel

8.0 PLANNING ASSUMPTIONS FOR RESIDENTS

8.1 EVACUATION PARTICIPATION RATE

Residents of the western shore of Maryland suffer from some of the same misconceptions about vulnerability as people who live in many other coastal locations. Those misconceptions tend to result in under response from high-risk locations and over-response from low-risk locations. There is little difference among category 1, 2, 3, and 4 surge area residents with respect to their perceptions of vulnerability and evacuation intentions. Although the participation rate in Isabel was low, most respondents said they did not hear from officials that they should evacuate and most who did not leave said they would have done so if the threat had been greater. Tables 8-1 and 8-2 indicate the most probable participation rates for three categories of hurricane for each surge risk zone. It assumes that officials issue mandatory evacuation orders for areas that would be inundated by the respective storm and for all mobile homes and that the evacuation orders are communicated aggressively. Responses within the study area could vary significantly depending on actions taken by officials in each location.

Table 8-1. Evacuation Participation Rate Planning Assumptions for Residents in Housing Other Than Mobile Homes (percent of residents)

Risk Zone	<i>Cat 1 Storm</i>	<i>Cat 2 Storm</i>	<i>Cat 3 Storm</i>
Non-surge	20	25	30
Cat 2-4	30	40	60
Cat 1	50	55	70

Table 8-2. Evacuation Participation Rate Planning Assumptions for Residents in Mobile Homes (percent of residents)

Risk Zone	<i>Cat 1 Storm</i>	<i>Cat 2 Storm</i>	<i>Cat 3 Storm</i>
Non-surge	50	60	65
Cat 2-4	60	65	75
Cat 1	65	70	80

8.2 TYPE OF REFUGE

People tend to overstate the likelihood that they will go to public shelters when they evacuate, and the intended figure in the Maryland western shore survey is almost certainly too high. In most instances only half as many people go to shelters as planned. The extent to which people go to public shelters as well as other destinations will depend on the actual availability of those options. If shelters are not opened locally, shelter use will be substantially lower. Reliance on hotels and motels will also depend on the extent to which they are available. Although most respondents indicated a willingness to go to public shelters outside their own city and county, that would be extremely unusual. Most people who go to public shelters go to shelters in their

own community. Table 8-3 contains average figures to be used for planning. Public shelter demand will be higher in poor neighborhoods, particularly those that are predominantly black.

Table 8-3. Type of Refuge to Be Used by Evacuees

Public Shelter	10
Friend/Relative	65
Hotel/Motel	15
Other	10

8.3 LOCATION OF REFUGE

Respondents don't anticipate going very far when they evacuate. However, if the options they assume will be available nearby don't exist, they will have to travel farther than planned. Local emergency management policies will have a significant effect on how far evacuees travel. The figures in Table 8-4 project that evacuees will not find some of the options they anticipate being available locally. Residents of non-surge areas will travel less far than evacuees from other locations, as will residents in downtown areas of Baltimore.

Table 8-4. Destinations of Evacuees (percent of evacuees)

Own Neighborhood	25
Other Own County	40
Out of County	25
Out of State	10

8.4 VEHICLE USE

Between 60% and 65% of the vehicles available to evacuating households will be used in an evacuation, averaging 1.3 vehicles per evacuating household. Five percent of the evacuating households will pull trailers or take motor homes or campers.

8.5 EVACUATION TIMING

Relatively few evacuees (fewer than 20%) typically leave before officials issue an evacuation notice. People do not leave in substantial numbers until someone in a position of authority tells them, and then they will leave as promptly as they believe they must. The urgency of evacuations varies because of the error inherent in hurricane forecasting and the reluctance of public officials to have residents leave unnecessarily. If a storm intensifies, increases forward speed, or changes course unexpectedly, it usually becomes more necessary for evacuees to leave quickly, for example.

Regardless of the proficiency of emergency management officials, circumstances are going to arise sometimes in which very prompt evacuation is necessary. In other cases the notice will be issued earlier, and evacuation can proceed more gradually. For planning, at least three different timing response curves such as those shown in Figure 8-1 should be evaluated, because eventually the region will experience all three. The flattest of the three curves assumes that evacuation orders were issued at least 24 hours before landfall. In each threat scenario occupants of low risk areas will tend to wait longer to evacuate than those living in more hazardous locations.

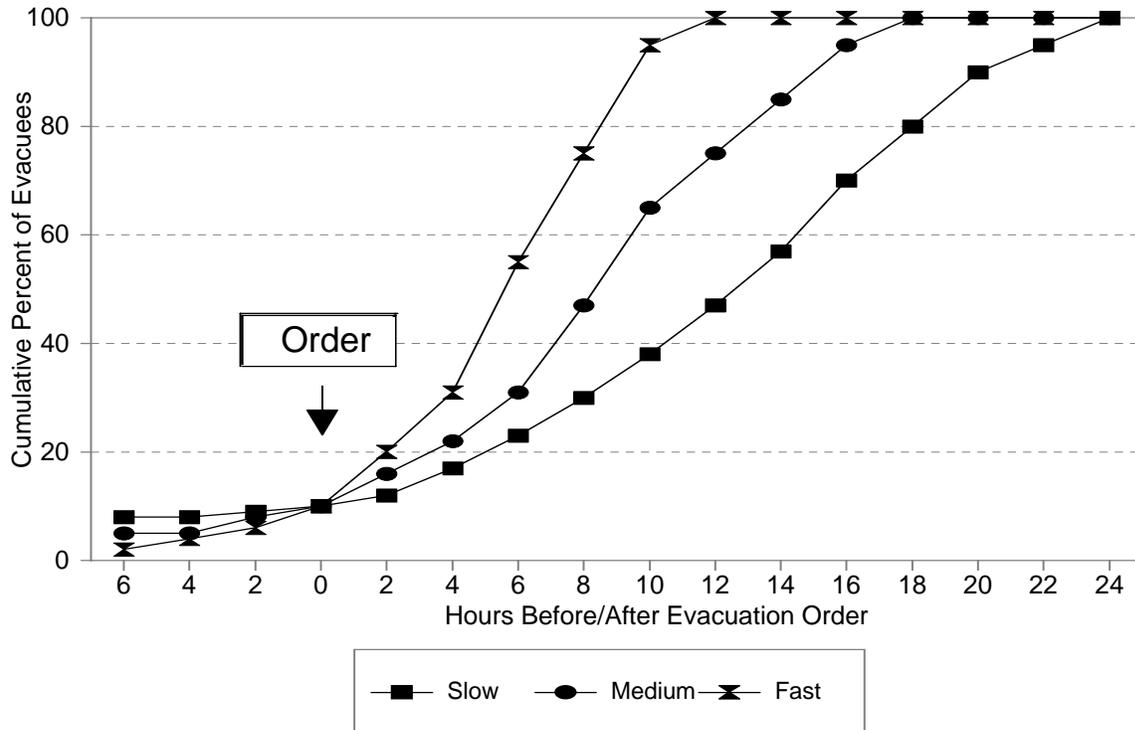


Figure 8-1. Cumulative evacuation response curves for planning

If officials issue evacuation notices more than 24 hours prior to anticipated landfall, evacuation departures will be distributed over a period longer than 24 hours. Some evacuees will leave shortly after the evacuation notice during daylight hours, then departures will essentially stop on the evening of the first day, and then resume on the morning of the second day.

9.0 VACATIONER RESPONSE

Compared to residents, there is relatively little data documenting how vacationers respond to hurricane threats, and no survey was conducted with visitors to the Maryland western shore to ascertain their intentions. Behavioral assumptions for tourists are derived from intended-response survey findings with visitors to other locations and from the existing data on how vacationers have responded in other places. A survey was conducted by the Baltimore Area Convention and Visitors Association in 2002 with visitors to Baltimore to document their characteristics, but the survey data was not specific to visitors during hurricane season. Those characteristics are used in part to derive the behavioral assumptions about evacuation for visitors to the area.

9.1 EVACUATION PARTICIPATION RATES

There is no evidence that vacationers are reluctant to evacuate when a hurricane interrupts their visit to a coastal community. Based on observations of vacationer behavior in other locations, surveys in other locations concerning intended responses, and survey data regarding vacationer characteristics in Baltimore, it is reasonable to assume that 90% to 95% of vacationers will evacuate their commercial accommodations *if evacuation orders are issued for those accommodations*. Almost 40% of Baltimore visitors stay with friends and relatives in the region, and they will respond as residents. However, 22% of leisure travelers to Baltimore arrive by air. Although they will be willing to evacuate, their behavior will be constrained by flight availability.

9.2 EVACUATION TIMING

Tourists leave at least as early as residents. The same curves used for residents should be used for tourists.

9.3 TYPE OF REFUGE

Officials sometimes report a large number of vacationers in certain shelters, but they represent a very small percentage of the total visitor population. The majority of leisure visitors to Baltimore travel in their own vehicles and live just a few hours away. Fewer than 5% will go to public shelters, and 10% already in hotels and motels will seek other hotels or motels. The remainder will return home.

9.4 DESTINATIONS

At least 90% of vacationers will return home when they evacuate. Table 9-1 indicates the percentage of vacationers to Baltimore who come from various states.

Table 9-1. Destinations of Vacationers Evacuating Home from Baltimore

Pennsylvania	17
New York	15
New Jersey	10
Virginia	9
Maryland	9
California	9

9.5 VEHICLE USE

At least 75% of the vacationers to Baltimore drive from homes. They will use their own vehicles when evacuating.

APPENDIX I

STATISTICAL RELIABILITY AND SAMPLE SIZE

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 200 will provide estimates which one can be 90% "confident" are within 4 to 6 percentage points of the true population values, whereas a sample of 100 will provide the same degree of confidence of being 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 11 percentage points of the actual population value, and a sample of 25 is 90% "accurate" only within 10 to 17 percentage points. 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

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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. Table I-1 indicates the sampling error for samples of a range of sizes and distributions.

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

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

APPENDIX II

MARYLAND BEHAVIORAL RESPONSE QUESTIONNAIRE

Hurricane Isabel in Maryland Response Questionnaire

Hello, my name is _____ and I'm calling on behalf of the Army Corps of Engineers and the **MARYLAND EMERGENCY MANAGEMENT AGENCY**. I'm conducting a telephone survey of residents concerning experiences in hurricane Isabel last year, so that we can improve hurricane evacuation plans for the future. May I please 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.

To refresh your memory, Isabel was the hurricane that made landfall near Drum Inlet on the southern part of North Carolina's Outer Banks on September 18th of last year. At one time Isabel was an extremely powerful storm, but weakened before crossing the coast. A Hurricane Warning was issued from Cape Fear, North Carolina to Chicoteague, Virginia, and a Hurricane Watch was posted as far north as Sandy Hook, New Jersey.

1. Were you at home, that is, not out of town, when **HURRICANE ISABEL** began to threaten this area last year?
1 Yes (**GO TO Q2**)
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."

2. Did you leave your home to go someplace safer in response to the threat created by Hurricane Isabel?
1 Yes (**GO TO Q7**)
2 No (**GO TO Q3**)
9 Don't know (**THANK AND TERMINATE**)

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3. What made you decide *not* to go anyplace else?
(CATEGORIZE - PROBE UP TO 3) (THEN GO TO Q4)
- necessary
1. Forecast said storm would hit a different location
 2. Officials seemed unsure whether evacuation was necessary
 3. Heard conflicting messages from officials whether evacuation was necessary
 4. Storm wasn't severe enough to pose a severe danger even if it hit
 5. Location was on the weak (left) side of the storm
 6. House is well built (strong enough to be safe in storm)
 7. Home is elevated above the level of storm surge
 8. Officials said evacuation was not necessary
 9. Officials didn't say to evacuate
 10. Media said evacuation wasn't necessary
 11. Friend/relative said evacuation wasn't necessary
 12. Probabilities indicated low chance of a hit
 13. Other information indicated storm wouldn't hit
 14. Had no place to go
 15. Wanted to protect property from looters
 16. Wanted to protect property from storm
 17. Left unnecessarily in past storms
 18. Job required staying
 19. Waited too long to leave
 20. Evacuation notice from officials came too late
 21. Traffic too bad
 22. Tried to leave, but returned home because of traffic
 23. Too dangerous to evacuate because might get caught on road in storm
 24. No place to take pets/Shelter would not accept pets
 25. Concerned about being able to re-enter community after evacuating
 26. Unable to re-enter area after evacuating in past storms (e.g., Floyd)
 27. Had no transportation
 28. Other, specify: _____
 29. Don't know
 30. No second or third option.
4. **IF** Isabel had looked to you like it was going to hit your location directly, would you have left your home to go someplace safer?
- 1 Yes
 2 No
 3 Don't Know/Depends
 4 Other
(Specify) _____
5. Were you ready, that is had you made the necessary preparations, to leave your home to go someplace safer if the threat had gotten worse?
- 1 Yes
 2 No
 3 Don't Know/Depends
 4 Other
(Specify) _____
6. What would you have done if Isabel had turned toward your location and it looked like it was too late for you to evacuate out of your county? Would you have ridden the storm out in your own home, gone someplace nearby, gone to

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another town in your county, or would you have tried to evacuate out of your county anyhow?

- 1 Would have ridden the storm out at home
- 2 Would have gone someplace nearby
- 3 Would have gone to another town in own county
- 4 Would have tried to get out of county
- 5 Don't Know/Depends
- 6 Other
(Specify)_____

IF ANSWERING Q6, SKIP TO Q22

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

- 1 Public shelter (or Red Cross shelter)
- 2 Church
- 3 Friend/relative
- 4 Hotel
- 5 Workplace
- 6 Other, specify: _____
- 9 Don't know

8. Is that **(ANSWER FROM Q7)** located in your neighborhood or someplace else?

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

9. Is that **(ANSWER FROM Q7)** located in your county?

- 1 Yes **(SKIP TO Q17)**
- 2 No
- 9 Don't know

10. Is that **(ANSWER FROM Q13)** located in **Maryland** or out-of-state (specify state)?

- 1 North Carolina
- 2 Virginia
- 3 Maryland
- 4 Delaware
- 5 Pennsylvania
- 6 D.C. (Washington, D.C.)
- 7 Other_____
- 9 Don't know

11. What city or town was that (specify)?

- _____ 9 Don't know

12. What convinced you to leave your home to go someplace safer? **(CATEGORIZE**

- PROBE UP TO 3)

1. Advice or order by elected officials
2. Advice or order by public safety officials
3. Advice from National Weather Service
4. Advice/order from police officer or fire fighter
5. Advice from the media
6. Advice from friend or relative
7. Information about the severity of the storm
8. Concerned storm would cause home to flood
9. Concerned strong winds would make house unsafe
10. Concerned flooding would cut off roads
11. Had no transportation
12. Concerned that storm might hit
13. Forecast indicated storm would hit
14. Forecast indicated storm could hit
15. Probability (odds) were high that the storm could hit
16. National Weather Service issued Hurricane Watch
17. National Weather Service issued Hurricane Warning
18. Experience in Floyd
19. Experience in other storms
20. Other, specify: _____
21. Don't know
22. No Second or third option.

13. I'm going to ask about when you left your home to go someplace safer, but to refresh your memory I'm going to remind you when certain events took place. First, the National Hurricane Center issued a Hurricane Watch for Isabel, extending from the South Carolina/North Carolina state line northward to Chincoteague, Virginia, shortly before noon (11 AM) on Tuesday, September 16th. Then late that night, at 11 PM on that same Tuesday, September 16th, the Hurricane Center changed the watch to a hurricane warning as far north as the North Carolina/Virginia line. Early Wednesday morning, 5 AM on the 17th, the Warning was extended north to the Virginia/Maryland state line. Isabel made landfall near Drum Inlet at 1 PM in the afternoon on Wednesday, September 18th.

On what day did you leave your home to go someplace safer?

- 1 Monday, September 15th or earlier
- 2 Tuesday, September 16th
- 3 Wednesday, September 17th
- 4 Thursday, September 18th
- 5 Other _____
- 9 Don't know

14. About what time on the **(REPEAT DATE)** did you leave? **(USE 1 HOUR INCREMENTS)**
- (TAKE MIDPOINT)**
- (99=DK)**
- _____ Hour **(IF 99, SKIP TO Q. 16)**

15. Was that morning AM or PM? **(NOTE: 12 O'CLOCK NOON = 12 PM)**
(NOTE: 12 O'CLOCK MIDNIGHT = 12 AM)

ON THE "NEW" DAY)

- 1 AM (morning / or midnight until noon)
2 PM (afternoon/evening or noon until midnight)
16. How many vehicles were available in your household that you could have used to evacuate?
_____ Number of vehicles **(IF 0, GO TO Q17; OTHERWISE GO TO Q18)**
(9 = DK) (IF 1 OR MORE IN Q16, SKIP TO Q18) (8 =NA)
(RECORD "0" IF NO VEHICLES ARE AVAILABLE)
17. 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 Q20)**
2 Public transportation **(GO TO Q20)**
3 Other, specify: _____ **(GO TO Q20)**
9 Don't know **(GO TO Q20)**
18. How many vehicles did your household take in evacuating? **(9 = DK) (8 =NA)**
(RECORD "0" IF NO VEHICLES ARE AVAILABLE)
_____ Number of vehicles
19. 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
20. Did anyone in your household need assistance from an agency in order to evacuate or require any sort of special care in a shelter?
1 Yes
2 No **(Skip to Q22)**
3 Other, specify: _____
9 Don't know
21. Did they receive transportation assistance from an agency, special care in a shelter, or both?
1 Transportation
2 Shelter care
3 Both
4 Other, specify: _____
9 Don't know
22. During the threat, did you hear either directly or indirectly anyone in an official position - such as elected officials, emergency management officials, police, etc. - say that you and people in your location should evacuate to a safer place? That is,

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did state or local officials issue any kind of evacuation notice that applied to you that you were aware of at the time it was issued?

- 1 Yes (**GO TO Q23**)
- 2 No (**GO TO Q25**)
- 9 Don't know (**GO TO Q25**)

23. 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

24. 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

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

- 1. Would evacuate
- 2. Wouldn't evacuate
- 3. Would leave earlier
- 4. Would wait later to leave
- 5. Would go further away
- 6. Wouldn't go as far away
- 7. Would go to public shelter
- 8. Wouldn't go to public shelter
- 9. Would use different route
- 10. No
- 11. Other, specify: _____
- 12. Don't know
- 13. No second or third option.

26. We're interested in how you got most of your information about Isabel - 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 stations
f	0	1	2	3	The Internet
g	0	1	2	3	Services like America Online
h	0	1	2	3	Word of mouth

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27. In general would you say that public officials in your city or county gave you the kind of information about Isabel that was helpful in deciding whether to evacuate or would you say it was generally not helpful?

- 1 Generally helpful
- 2 Generally not helpful
- 3 Mixed; some of both
- 4 Don't Know; Don't Recall
- 5 Other

(specify) _____

28. Would you say that public officials in your city or county were definite in their messages about whether you should evacuate in Isabel? That is, did they appear to be certain about whether you needed to evacuate or did they seem uncertain?

- 1 Very certain
- 2 Fairly certain
- 3 Generally not certain
- 4 Depends on which official
- 5 Sometimes certain, sometimes not
- 6 Don't Know; Don't Recall
- 7 Other

(specify) _____

29. In general, not just in Isabel, but in hurricanes generally, how much confidence do you have in the ability of public officials in your city or county to decide whether you really need to evacuate or not when they issue evacuation orders? Do you have a great deal of confidence, a fair amount of confidence, not much confidence, or no confidence in their ability to decide whether you need to evacuate?

- 1 Great deal of confidence
- 2 Fair amount of confidence
- 3 Not much confidence
- 4 No confidence
- 5 Don't Know/Depends
- 6 Other

(specify) _____

30. Do you think that public officials in your city or county tend to call for evacuation more often than they should, less often than they should, or about as often as they should?

- 1 More often
- 2 Less often
- 3 About as often as they should
- 4 Don't Know/Depends
- 5 Other

(specify) _____

31. Did you or anyone in your household have to go to work while the Isabel evacuation was going on?
- 1 Yes (**GO TO Q32**)
 - 2 No (**SKIP TO Q33**)
 - 9 Don't Know (**SKIP TO Q33**)
32. How did that affect the way your household responded during the evacuation?
- 1 Not at all
 - 2 Kept household from evacuating
 - 3 Kept part of household from evacuating
 - 4 Delayed at least part of household from evacuating
 - 5 Other, _____
 - 9 Don't Know
33. At one point when the storm was still well out in the Atlantic Isabel's maximum sustained winds were over 155 MPH. That made it a strong category 4 hurricane on the Saffir-Simpson scale, nearly a category 5 —what meteorologists would call a **very** dangerous hurricane. A category 1 on the scale is the weakest hurricane and a category 5 is the strongest possible. If Isabel had made landfall near your location with sustained winds of 155 MPH and then passed directly over your home, do you believe that your home would have been flooded by storm surge, river flooding, or wave action severe enough to pose a threat to your safety if you stayed in your home?
- 1 Yes
 - 2 No
 - 3 Don't Know/Depends
34. Considering both wind and water, do you think it would have been safe for you to have stayed in your home if Isabel had hit near your location with winds of 155 MPH and then passed directly over your home?
- 1 Yes
 - 2 No
 - 3 Don't Know/Depends
35. Later Isabel lost some strength and had winds of 125 MPH. That made it a category 3 hurricane on the Saffir-Simpson scale, still what meteorologists call a major hurricane. Eventually Isabel go weaker than this, but if Isabel had made landfall near your location with sustained winds of 125 MPH and then passed directly over your home, do you believe that your home would have been subject to storm surge, river flooding, or wave action severe enough to pose a threat to your safety if you stayed in your home?
- 1 Yes

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- 2 No
- 3 Don't Know/Depends

36. Considering both wind and water, do you think it would have been safe for you to have stayed in your home if Isabel had hit near your location with sustained winds of 125 MPH and then passed directly over your home?

- 1 Yes
- 2 No
- 3 Don't Know/Depends

37. Before landfall Isabel lost more strength and had winds near 100 MPH when it crossed the coastline. That made it a category 2 hurricane on the Saffir-Simpson scale. If Isabel had made landfall near your location with sustained winds of 100 MPH and then passed directly over your home, do you believe that your home would have been subject to flooding or wave action severe enough to pose a threat to your safety if you stayed in your home?

- 1 Yes
- 2 No
- 3 Don't Know/Depends

38. Considering both wind and water, do you think it would have been safe for you to have stayed in your home if Isabel had hit near your location with sustained winds of 100 MPH and then passed directly over your home?

- 1 Yes
- 2 No
- 3 Don't Know/Depends
- 4

39. How did you come to believe that your home would be safe or unsafe in hurricanes?

(CATEGORIZE) (PROBE UP TO 3)

- 1. Personal experience with this structure in past storms (e.g., Floyd, Hazel)
- 2. Personal experience in other structures in past storms this location
- 3. Personal experience in other storms in other locations
- 4. Observations of effects of storms on other structures in this location
- 5. Observations of effects of storms on other structures in other locations
- 6. Knowledge of how well this structure is built
- 7. Knowledge about safety of location of this structure
- 8. Height of location in the building
- 9. Information provided by the media about storm effects and construction
- 10. Information provided by the builder
- 11. Information provided by neighbors or long-time residents
- 12. Information provided by public officials
- 13. Don't Know/Depends
- 14. Other

(Specify)_____

15. No second or third option.

40. While you were deciding whether to leave, did you have any concerns that you might try to evacuate but have the storm arrive while you were caught on the road because of heavy traffic?

- 1 No
- 2 Yes
- 3 Don't Know/Depends
- 4 Other
(Specify)_____

41. About how many hours do you think it would take to evacuate everyone to safe locations if people in this area were ordered to evacuate for a major hurricane?
(READ)

- 1 6 hours
- 2 12 hours
- 3 18 hours
- 4 24 hours
- 5 more than 24 hours
- 6 don't know/depends

42. While you were deciding whether to leave, did you have any concerns about being able to get back into your community and to your home when you wanted to return after the evacuation?

- 1 No
- 2 Yes
- 3 Don't Know/Depends
- 4 Other
(Specify)_____

43. Have you ever personally had difficulty being allowed to get back to your home after evacuating in past storms?

- 1 No
- 2 Yes
- 3 Don't Know/Depends
- 4 Other
(Specify)_____

44. Which of the following would you say was the single most important factor in your decision to evacuate or not in Isabel? **(READ THE FIRST FOUR)**

- 1 The forecast track
- 2 The forecast strength of the storm
- 3 Statements issued by officials
- 4 Statements issued by media
- 5 Other factors

- (Specify) _____
 6 Combination of factors (don't list as a response option, but record if stated)
 9 Don't Know

Q. 45 – Q. 50 N/A

I would like for you to consider a possible situation that might exist in the future. With that in mind, please tell me what you would do in the following situations:

51. Suppose there's a **category 1** hurricane approaching from southeast of here. That's a category 1 storm on the Saffir-Simpson scale that goes up to 5. The storm has **winds of 80 MPH**, and there's a hurricane **WARNING** in effect for your community and all of the **MARYLAND** coast. Officials have called for evacuation of all areas that would be flooded by a category 1 hurricane and also for all mobile homes. In that situation, do you think you would leave your home to go someplace safer?
 Yes
 No (**SKIP TO Q58**)
 Depends/Don't Know
 Other (specify) _____
52. If you did evacuate, would you go to a public shelter, the home of a friend or relative, a hotel, or someplace else?
 Public shelter
 Friend or Relative
 Hotel/Motel
 Other Place (specify) _____
 Depends/Don't Know
53. Would that be located in your own neighborhood, or someplace else?
 Neighborhood (**SKIP TO Q57**)
 Somewhere Else
 Don't Know (**SKIP TO Q57**)
54. In what city would that be located? (**If they cannot name a specific city, WRITE "NOT SURE"**)

55. Is that (**ANSWER FROM Q52**) located in your county?
 Yes (**SKIP TO Q57**)
 No
 Don't Know
56. In what state is that located?
 Virginia

- Maryland
- Delaware
- D.C.
- Pennsylvania
- Other (specify) _____
- Don't Know

57. What main highway (s) would you use when you evacuated? **(DO NOT READ, ACCEPT UP TO 3)**

- _____
- _____
- _____
- Don't Know

58. Now suppose there's a strong **category 2** hurricane approaching from southeast of here; that's a category 2 storm on the 5-point Saffir-Simpson scale. The storm has **winds of 100 MPH**, and there's a hurricane WARNING in effect for all your community and all of the **MARYLAND** coast. Officials have called for the evacuation of all areas that would be flooded by a category 2 hurricane and also all mobile homes. In that situation, do you think you would leave your home to go someplace safer?

- Yes
- No **(SKIP TO Q65)**
- Depends/Don't Know
- Other (specify) _____

59. If you did evacuate, would you go to a public shelter, the home of a friend or relative, a hotel, or someplace else?

- Public shelter
- Friend or Relative
- Hotel/Motel
- Other Place (specify) _____
- Depends/Don't Know

60. Would that be located in your own neighborhood, or someplace else?

- Neighborhood **(SKIP TO Q64)**
- Somewhere Else
- Don't Know **(SKIP TO Q64)**

61. In what city would that be located? **(If they cannot name a specific city, WRITE "NOT SURE")**

62. Is that **(ANSWER FROM Q59)** located in your county?

- Yes **(SKIP TO Q64)**
- No

_____ Don't Know

63. In what state is that located?

- _____ Virginia
- _____ Maryland
- _____ Delaware
- _____ D.C.
- _____ Pennsylvania
- _____ Other (specify) _____
- _____ Don't Know

64. What main highway (s) would you use when you evacuated? (**ACCEPT UP TO 3**)

- _____
- _____
- _____
- _____ Don't Know

65. What if a **strong category 3** hurricane were approaching from southeast of here. That's a category 3 storm on the 5-point Saffir-Simpson scale. Meteorologists refer to a category 3 hurricane as a **major** hurricane. The storm has **winds of 125 MPH**, and there's a hurricane WARNING in effect for your community and for all of the **MARYLAND** coast. Officials have called for the evacuation of all areas that would be flooded by a category 3 hurricane and also for all mobile homes. In that situation, do you think you would leave your home to go someplace safer?

- _____ Yes
-  _____ No (**SKIP TO Q72**)
- _____ Depends/Don't Know
- _____ Other (specify) _____

66. If you did evacuate, would you go to a public shelter, the home of a friend or relative, a hotel, or someplace else?

- _____ Public shelter
- _____ Friend or Relative
- _____ Hotel/Motel
- _____ Other Place (specify) _____
- _____ Depends/Don't Know

67. Would that be located in your own neighborhood, or someplace else?

-  _____ Neighborhood (**SKIP TO Q71**)
- _____ Somewhere Else
- _____ Don't Know (**SKIP TO Q71**)

68. In what city would that be located? (**If they cannot name a specific city, WRITE "NOT SURE"**)

69.  Is that (ANSWER FROM Q66) located in your county?

- Yes (SKIP TO Q71)
- No
- Don't Know

70. In what state is that located?

- Virginia
- Maryland
- Delaware
- D.C.
- Pennsylvania
- Other (specify) _____
- Don't Know

71. What main highway (s) would you use when you evacuated? (ACCEPT UP TO 3)

- _____
- _____
- _____
- Don't Know

72. Suppose public safety officials arranged for public shelter space to be provided for evacuees from your community in an inland location outside your city or county, but in a different location than you would normally prefer to evacuate to. Would you be likely to go to that location to take advantage of the shelter being provided?

- Yes
- No
- Don't Know/Depends
- Not Applicable – Wouldn't Evacuate
- Other (specify) _____

73.  How many vehicles would be available in your household that you could use to evacuate?

- Number of vehicles (IF 0, SKIP TO Q76; OTHERWISE GO TO Q74)
(33 = DK) (RECORD "0" IF NO VEHICLES ARE AVAILABLE)

74. How many vehicles would your household take if you evacuated? (33 = DK) (RECORD "0" IF NO VEHICLES WOULD BE TAKEN)

- _____ Number of vehicles

75. If you evacuated, would you take a motor home or pull a trailer, boat, or camper?

- Yes
- No

___ Other, (specify) _____
 ___ Don't know

76. In an evacuation would you or anyone in your household need assistance from an agency in order to evacuate or require any sort of special care in a shelter?

- ___ Yes
 ___ No (**SKIP TO Q78**)
 ___ Not sure (**SKIP TO Q78**)

77. Would the person need transportation assistance from an agency, special care in a shelter, or both?

- ___ Transportation only
 ___ Special need (disability or medical problem)
 ___ Both
 ___ Other, (specify) _____
 ___ Don't know

78. 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

79. 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 (**GO TO Q80**)
 2 No (**SKIP TO Q81**)
 9 Don't Know/Not Sure (**SKIP TO Q81**)

80. What kind of protection is it?

- 1 Permanent roll-down metal panels
 2 Removable metal panels
 3 Plywood sheets
 4 Security Film
 5 Impact-resistant glass
 6 Other _____
 9 Don't Know/Not Sure

81. 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

82. 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)

1. ___ Roof/truss Strengthening
2. ___ Door/Garage Door Protection
3. ___ Flood proofing
4. ___ Other (Specify) _____

5. None
 6. Don't Know/Not Sure
 7. No second option.
83. How much money do you plan to spend **this year** on changes to your home to make it stronger or safer from hurricanes? **(9999=DK)**
 \$ _____
84. 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
85. Was your home damaged in Isabel?
 1 Yes
 2 No **(SKIP TO Q87)**
 9 Don't Know/Not Sure **(SKIP TO Q87)**
86. How much damage, in dollars, did you experience in Isabel?
 1 None
 2 Less than \$1,000
 3 \$1,000 to \$4,999
 4 \$5,000 to \$9,999
 5 \$10,000 to \$24,999
 6 \$25,000 to \$49,999
 7 \$50,000 or more
 8 Don't Know/Refused
87. What was the most damage, in dollars, you've ever experienced to your property as the result of ANY hurricane?
 1 None
 2 Less than \$1,000
 3 \$1,000 to \$4,999
 4 \$5,000 to \$9,999
 5 \$10,000 to \$24,999
 6 \$25,000 to \$49,999
 7 \$50,000 or more
 8 Don't Know/Refused

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

88. 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 Manufactured home
 7 Some other type of structure
 8 Don't Know

9 Refused

**IF ANSWER IS NOT MOBILE HOME OR MANUFACTURED HOUSE,
GO TO Q91**

89. In what year did you buy your Mobile Home or Manufactured House?
(2222=Don't Know)

90. Was it new when you bought it?

1 Yes

2 No

3 Don't Know

91. How old were you on your last birthday?

_____ Number of years (99 = DK) (88=REFUSED)

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

_____ Number of years

93. How long have you lived in the coastal area of MARYLAND?

(ROUND UP) (99 = DK)(88=REFUSED)

_____ Number of years

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

_____ Number of people (IF 1, SKIP TO Q76)

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

_____ Number of children

96. Do you own your home or rent?

1 Own

2 Rent

3 Other

97. Do you have any pets?

1 Yes

2 No

9 Refused

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

1 African American or Black

2 White or Caucasian

3 Hispanic

4 Asian

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- 5 American Indian
- 6 Other
- 9 Refused

99. Which of the following ranges best describes your total household income for 2003? **(READ)**

- 1 Less than \$15,000
- 2 \$15,000 to \$24,999
- 3 \$25,000 to \$39,999
- 4 \$40,000 to \$79,999
- 5 Over \$80,000
- 9 Refused

100. Which category best describes your education level? **(READ)**

- 1 Some high school
- 2 High school graduate
- 3 Some college
- 4 College graduate
- 5 Post graduate
- 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?

rname.

RECORD INTERVIEW INFORMATION ON RESPONDENT DISPOSITION SHEET

vgender. Sex of respondent 1 Male 2 Female

