# 4.0 Behavioral Analysis

## 4.1 Introduction

In emergency management, as in any profession that must manage the collective actions of large number of individuals, it is clear that people do not always behave in the way emergency managers would like, nor do they always comply with official safety messages. Regarding evacuation orders, entire populations of an area rarely comply with official evacuation orders. Public responses to hurricane threats have been shown to vary with storm-specific circumstances, such as storm category, perceptions of the public (e.g., the perceived safety of their home, etc.) and advice of local officials (i.e., mandatory versus recommended). Under-compliance, where fewer than expected people evacuate from a risk area, place individuals in harm's way and may force emergency management officials to launch rescue efforts during a storm. Alternatively, over-compliance (shadow evacuation), where individuals from outside of an ordered evacuation zone decide to evacuate can also complicate evacuations by loading additional cars on an already taxed evacuation network. To capture the intricacies of human behavior and its impact on evacuation modeling, Dr. Jay Baker of Hazards Management Group conducted the most recent behavioral analyses for the study area. These behavioral analyses provide estimates of public response to a variety of hurricane threats. The complete behavioral analysis can be found in the File Bank.

## 4.2 Purpose

The behavioral analysis is conducted to provide reliable estimates of how the public in the study area will respond to a variety of hurricane threats. These assumptions are not only incorporated into the Shelter Analysis (Chapter Five) and Transportation Analysis (Chapter Six) data and figures, but also help guide emergency management decision making and public awareness efforts.

## 4.3 Objectives

A behavioral analysis is designed to answer the following questions:

- What percentage of the population will evacuate given various hurricane threat scenarios or in response to evacuation advisories?
- When will the evacuating population leave in response to an evacuation order given by local officials?
- How many vehicles will the evacuating population use during a hurricane evacuation?
- How many evacuating vehicles will be towing boats, camper trailers, or other vehicular equipment?
- What are the destinations of the evacuees and what type of shelter will they seek?

- How will the threatened population respond based upon forecasts of hurricane intensity or other information provided during a hurricane emergency?

Responses to these questions by the evacuating public provide a valuable insight into anticipated evacuee behavior. In addition to the questions listed above, information from state and local officials regarding historical compliance with evacuation orders and behavior during actual events provides a "real world" validation of the data employed in the analysis.

## 4.4 Behavioral Analysis

The Behavioral Analysis section deals with five principle categories of behavioral response typically addressed in the hurricane evacuation study. These five categories are:

1. Evacuation participation rates;
2. Evacuation timing;
3. Type of refuge sought;
4. Destinations for evacuees; and
5. Vehicle use.

Based on these categories, 600 interviews (300 in Zone A/Category 1 and 2 Surge Inundations Zones, 200 in Zone B/Category 3 and 4 Surge Inundations Zones, and 100 in non-surge areas of adjacent coastal communities) were conducted by landline phone in in the Rhode Island study area. Interviewees were asked a series of questions to document what they would do in three hypothetical hurricane situations. The hurricanes were described as:

- **Category 2 hurricane** (winds of 100 MPH / storm surge 7 to 13 feet high)
  *Evacuation zones include everyone living in areas that would be affected by flooding in a Category 1 or 2 hurricane and everyone living in mobile homes or manufactured housing.*
- **Category 3 hurricane** (winds of 125 MPH / storm surge 9 to 18 feet high)
  *Evacuation zones include everyone living in areas that would be affected by flooding in a Category 1, 2 or 3 hurricane and everyone living in mobile homes or manufactured housing.*
- **Category 4 hurricane** (winds of 140 MPH / storm surge 11 to 25 feet high)
  *Evacuation zones include everyone living in areas that would be affected by flooding in a Category 1, 2, 3 or 4 hurricane and everyone living in mobile homes or manufactured housing.*

Their responses to each of these hypothetical hurricanes are included in this section.

### 4.4.1 Evacuation Participation Rates

Identifying the evacuation participation rates within the study area is an important first step comprised of many variables. Evacuation participation rates take into consideration one's intention to evacuate, perception of vulnerability, expectation of evacuation notices, and other considerations as discussed in this section.

#### A. Intention to Evacuate

Rhode Island interviewees were told to assume that officials had issued evacuation notices recommending that certain portions of the population evacuate for each of the three hypothetical hurricanes.

Throughout the study area, a high percentage of interviewees indicated their intention to evacuate in the storm scenarios described. Across the three storm intensity scenarios, in Zone A evacuation intentions ranged from 68% to 83%, in Zone B they ranged from 67% to 83%, and in the non-surge zones they ranged from 62% to 70%. Their responses are documented in Table 4-1.

**Table 4-1:** Intention to Evacuate

| Category 2 | | | Category 3 | | | Category 4 | | |
|---|---|---|---|---|---|---|---|---|
| A / 1-2 | B / 3-4 | Non-Surge | A / 1-2 | B / 3-4 | Non-Surge | A / 1-2 | B / 3-4 | Non-Surge |
| 68% | 67% | 62% | 75% | 75% | 67% | 83% | 83% | 70% |

#### B. Perception of Vulnerability

Intention to evacuate does not always indicate how people eventually will respond in actual hurricane threats. A better indicator is whether people believe their own home would be safe in a hurricane. Interviewees were asked whether they believed their home would flood dangerously in each of three categories of hurricane, followed by if they believed their home would be safe from both wind and flood. The intensities of the storms were Category 2 (100 MPH), Category 3 (125 MPH), and Category 4 (140 MPH).

Tables 4-2 and 4-3 reflect the perceived vulnerability of interviewees regarding the safety of their home in flood and both wind and flood situations. As depicted, the concern of interviewees in all zones gradually increased with each level of storm.

**Table 4-2:** Perceived Vulnerability of Home – Believe Home would Flood Dangerously

| Category 2 | | | Category 3 | | | Category 4 | | |
|---|---|---|---|---|---|---|---|---|
| A / 1-2 | B / 3-4 | Non-Surge | A / 1-2 | B / 3-4 | Non-Surge | A / 1-2 | B / 3-4 | Non-Surge |
| 29% | 16% | 15% | 50% | 41% | 21% | 63% | 57% | 33% |

**Table 4-3:** Perceived Vulnerability – Believe Home would not be Safe

| Category 2 | | | Category 3 | | | Category 4 | | |
|---|---|---|---|---|---|---|---|---|
| A / 1-2 | B / 3-4 | Non-Surge | A / 1-2 | B / 3-4 | Non-Surge | A / 1-2 | B / 3-4 | Non-Surge |
| 32% | 29% | 15% | 48% | 45% | 32% | 59% | 58% | 38% |

### C. Expectation of Evacuation Notices

An evacuation notice from public officials is usually a strong indicator to people that they need to evacuate. Unfortunately many people living in areas ordered to evacuate do not think the order applies to them, particularly when door-to-door dissemination of notices is not conducted. Studies indicate that when asked, people respond that they did not hear an evacuation notice for them specifically. For this analysis, , interviewees were asked if they thought emergency management officials in their community would issue an evacuation notice saying they should leave their home to go someplace safer. That is, would officials tell them to evacuate. The question was asked for a Category 2, 3 and 4 hurricanes.

Survey results indicate that most but not everyone in Zones A/1-2 and B/3-4 expect to be told to evacuate in Category 2, 3, and 4 hurricanes, with small differences between the zones. In non-surge areas, 38% to 67% expect to be told to evacuate in Category 2 storms as do a majority in Category 3 and 4 hurricanes.

**Table 4-4:** Expectation of Evacuation Notice

| Category 2 | | | Category 3 | | | Category 4 | | |
|---|---|---|---|---|---|---|---|---|
| A / 1-2 | B / 3-4 | Non-Surge | A / 1-2 | B / 3-4 | Non-Surge | A / 1-2 | B / 3-4 | Non-Surge |
| 63% | 49% | 38% | 74% | 67% | 52% | 81% | 84% | 66% |

### D. Other Considerations

Reasons to Evacuate: Interviewees who stated they would evacuate were then asked to state the main reason they would evacuate their home for each storm scenario. Interviewers recorded up to three answers for each interviewee. These answers included:

- Surge/Waves
- Wind

- River Flooding
- Home Vulnerability
- Official Notice
- Family Influence
- Electricity/Water Loss
- Isolation
- Do Not Know
- Other

Of the reasons for those intending to evacuate, 'Official Notice' was the most recorded answer, followed by 'Wind' in all storm categories and all zones.

Reasons for Not Evacuating: Interviewees who indicated they would not evacuate if ordered to by officials were asked why they would not comply. They were asked to provide up to three reasons for not evacuating which included:

- Home Will Not Flood
- Home is Well Built
- Not in Evacuation Zone
- Past Experience
- Protect from Looters
- Traffic Concerns
- Job
- Pet
- Do Not Know
- Other

'Home is Well Built, Home Will Not Flood, Not in Evacuation Zone, and Past Experience' were the most popular responses. The most significant overall pattern is that the overwhelming majority of reasons provided had to do with perceived safety, not constraints to leaving, such as work, lack of funds, and no place to go.

### 4.4.2 Evacuation Timing

One set of critical behavioral assumptions included in the Chapter 6: Transportation Analysis is the speed of evacuation response by the evacuating population; establishing how quickly the vulnerable population will respond to an evacuation notice or advisory. Behavioral data from past hurricane evacuation research demonstrates that mobilization and actual departures of

the evacuating population can occur over a very brief time, or over a period of many hours. To account for this variation, clearance times were tested for three evacuation response rates represented by different behavioral response curves. The behavioral response curves shown in Figure 4-1 are generalized scenarios that have been used in past HES efforts and were originally based on work done by Dr. Jay Baker of Hazards Management Group. Every evacuation has a different response curve/footprint. The response curves in Figure 4-1 reflect rapid, medium, and long responses and are designed to include the range of mobilization times that may be experienced in a hurricane evacuation situation.

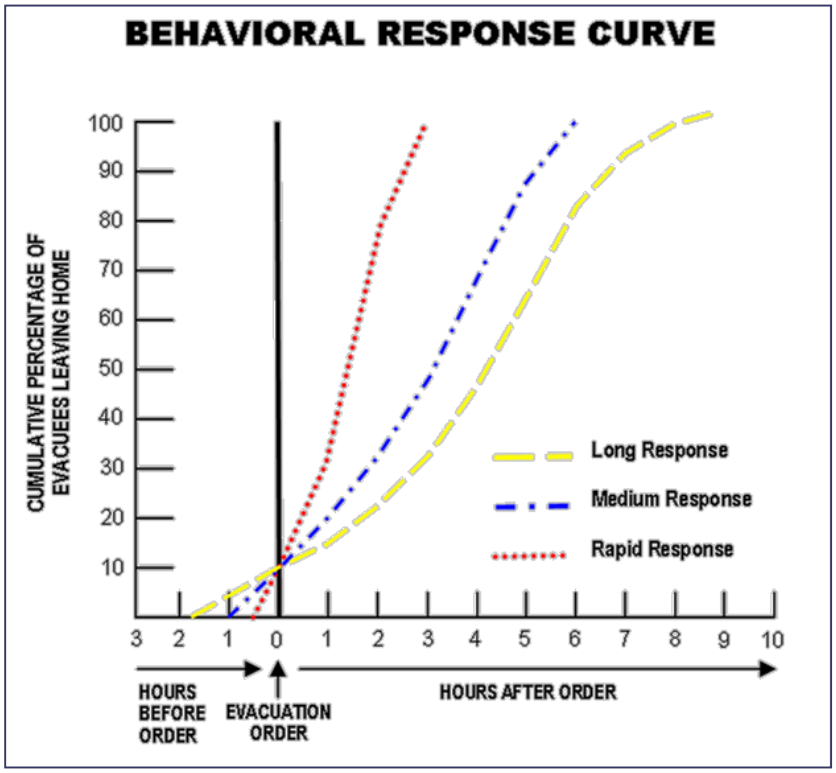


**Figure 4-1:** Evacuation Response Curve

The response curves depicted above relate to the following real-world examples regarding their use during an actual tropical cyclone response. A long response would be an appropriate clearance time assumption during nighttime hours, or during the middle of a normal weekday when most families are scattered to work, school and other routine activities away from home. A medium response curve would be appropriately applied during weekend days and any evening hours when most families have been rejoined at their residences and can be informed and mobilized in relatively short order. A rapid response relates to periods when most families are together and can be alerted and motivated to respond quickly, such as in the morning before most families have left from normal daytime activities and before schools and businesses are opened.

### 4.4.3 Type of Refuge

Rhode Island interviewees, both those who said they would evacuate in the respective storm scenarios and those who said they would not, were asked what source of refuge they would seek if they evacuated. Refuge options included 'will not leave, do not know, other, hotel/motel, friend/relative, or public shelter'. Intended Refuge in a Category 3 results are shown in Table 4-5. Of all the interviewees that participated in the survey, a small number insisted that they would not evacuate, and between 7% and 20% said they did not know where they would go if they evacuated in a Category 3 storm. Excluding those who will not leave or do not know, approximately 62% said they would go to the homes of friends and relatives, 14% to 20% would go to public shelters, 10% to 13% would go to hotel/motels, with the remaining 3% to 5% going to miscellaneous locations such as second homes, churches, and workplaces.

**Table 4-5:** Intended Refuge in a Category 3 Hurricane

| | Category 3 | | | Category 3 (excluding Will Not Leave/Do Not Know) | | |
|---|---|---|---|---|---|---|
| | A / 1-2 | B / 3-4 | Non-Surge | A / 1-2 | B / 3-4 | Non-Surge |
| Will Not Leave | 3% | 4% | 3% | excluded | excluded | excluded |
| Do Not Know | 7% | 14% | 20% | excluded | excluded | excluded |
| Other | 5% | 5% | 3% | 5% | 5% | 6% |
| Hotel / Motel | 13% | 10% | 13% | 15% | 14% | 14% |
| Friend / Relative | 58% | 51% | 41% | 62% | 62% | 61% |
| Public Shelter | 14% | 17% | 20% | 19% | 19% | 20% |

The same question concerning intended refuge was asked in all three hurricane scenarios, but the results varied little among storms as shown in Table 4-6.

**Table 4-6:** Intended Refuge by Hurricane Category

| | Category 2 | Category 3 | Category 4 |
|---|---|---|---|
| Other | 5% | 5% | 6% |
| Hotel / Motel | 15% | 14% | 14% |
| Friend / Relative | 62% | 62% | 61% |
| Public Shelter | 19% | 19% | 20% |

Interviewees were told that public safety officials encourage evacuees to stay with friends or relatives outside the areas being told to evacuate. They were asked if they had friends and relatives in safe locations with whom they could stay in an evacuation if necessary. A large majority (62%) said they could stay with friends or relatives if necessary.

### 4.4.4 Destination

Interviewees were asked to indicate the location of the refuge they would seek when evacuating. Responses included 'do not know, out of state, own state, own community, and own neighborhood' as shown in Table 4-7. Only 10% to 16% said they would go someplace in their own neighborhood, but in evacuation Zones 1-2 and 3-4 an additional 27% and 25% respectively said they would go to another location in their own community. The great majority of other destinations were within Rhode Island. Variations among risk zones were small. Responses for Category 2 and 4 scenarios were almost identical to those for Category 3 storms as shown in Table 4-8.

**Table 4-7:** Intended Location of Refuge in a Category 3 Hurricane

| | In a Category 3 Hurricane | | |
|---|---|---|---|
| | A / 1-2 | B / 3-4 | Non-Surge |
| Do Not Know | 4% | 4% | 4% |
| Out of State | 23% | 16% | 10% |
| Own State | 31% | 42% | 42% |
| Own Community | 27% | 25% | 34% |
| Own Neighborhood | 16% | 13% | 10% |

**Table 4-8:** Intended Location of Refuge by Hurricane Category

| | By Hurricane Category | | |
|---|---|---|---|
| | Category 2 | Category 3 | Category 4 |
| Do Not Know | 4% | 4% | 4% |
| Out of State | 18% | 19% | 21% |
| Own State | 36% | 36% | 36% |
| Own Community | 28% | 27% | 25% |
| Own Neighborhood | 14% | 14% | 14% |

Of those seeking refuge, almost everyone intending to seek public shelter anticipates the shelter's location to be in their own neighborhood (36%) or elsewhere in their own community (47%). Most evacuees going to the homes of friends and relatives said those locations would be outside their own community. As shown in Table 4-9, most hotel and motel destinations are anticipated to be either in one's own community or elsewhere in Rhode Island, although 27% could be out of state.

**Table 4-9:** Intended Location of Refuge by Type

| | Public Shelter | Friend / Relative | Hotel / Motel | Other |
|---|---|---|---|---|
| Do Not Know | 4% | 3% | 5% | 8% |
| Out of State | 1% | 19% | 27% | 50% |
| Own State | 12% | 47% | 28% | 12% |
| Own Community | 47% | 22% | 31% | 15% |
| Own Neighborhood | 36% | 9% | 8% | 15% |

### 4.4.5 Vehicle Use

Interviewees were asked a number of questions dealing with transportation during an evacuation. Questions asked included:

- How many vehicles were available in their household to use in an evacuation?
- How many vehicles would be used in an evacuation?
- If they would trailer or take a motor home?

Between 1% and 6% of the interviewees said they had no vehicles available to be used in an evacuation. The mean number available ranged from 1.76 to 1.93, and the mean number to be taken during an evacuation ranged from 1.25 to 1.42. The percentage of available vehicles that would be used in an evacuation was 71% in non-surge areas and 74% in Zones 1-2. Between 2% and 6% plan to pull trailers or take motor homes. Table 4-10 summarizes the responses.

**Table 4-10:** Transportation Modes

| | A / 1-2 | B / 3-4 | Non-Surge |
|---|---|---|---|
| % with No Vehicles Available | 1% | 6% | 5% |
| Mean Vehicles Available | 1.93 | 1.83 | 1.76 |
| Mean Vehicles to Take | 1.42 | 1.37 | 1.25 |
| % Available to Take | 74% | 75% | 71% |
| % with Trailers / Motor homes | 6% | 3% | 2% |

In addition to questions related to modes of transportation, interviewees were also asked to name the main route or routes they would use if they evacuated. Results are shown in Figure 4-2. I-295 was mentioned most often, followed by I-295 and Route 1.

# 4.0 Behavioral Analysis

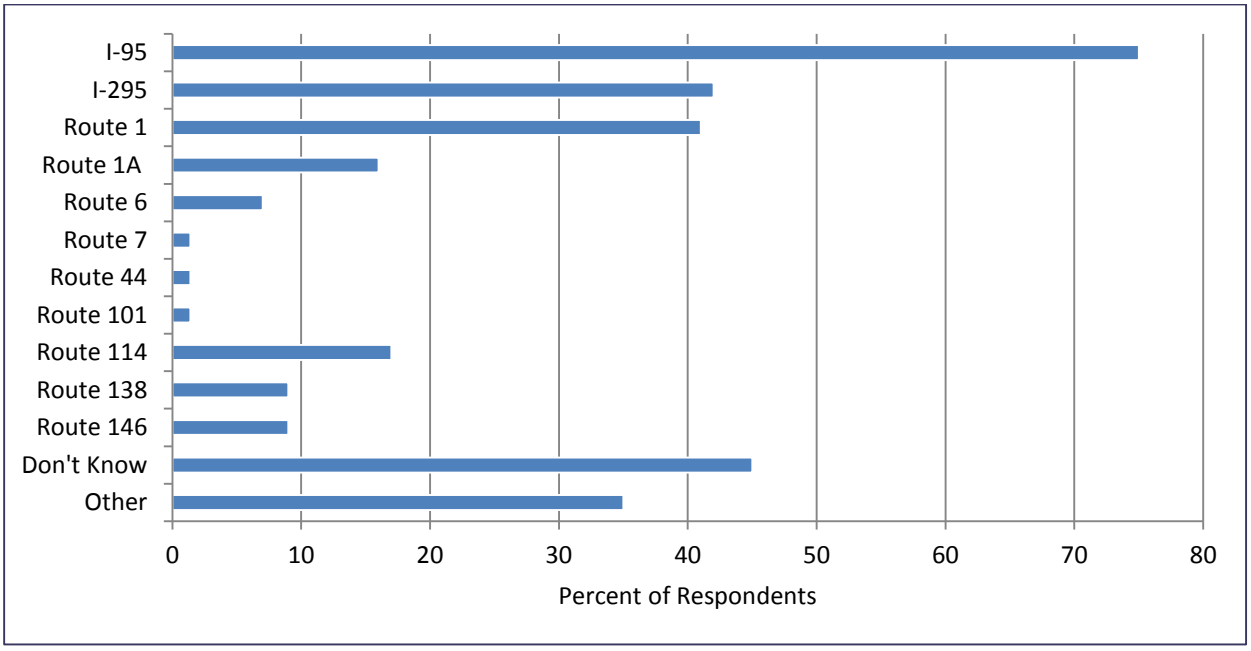


**Figure 4-2:** Intended Evacuation Routes

## 4.5 Possible Evacuation Obstacles

A variety of obstacles may arise in any evacuation event causing individuals to not evacuate. Interviewees were asked what their obstacles may be if ordered to evacuate and are summarized in this section.

### 4.5.1 Households Needing Assistance to Evacuate

Emergency management officials need to anticipate there will be a number of people who will need assistance in order to evacuate. When asked if someone in their household would need assistance in order to evacuate, 11% or less said yes in each risk area.

Of the 11% or less who would need assistance, they were then asked what type of assistance and source of assistance would be needed in order to evacuate. In Zone 1-2, 64% of the households needing evacuation assistance had a special need with an additional 9% both needing transportation and having a special need as shown in Table 4-11. Of the households needing assistance, Table 4-12 summarizes the anticipated source of assistance while Table 4-13 identifies those interviewees who indicated the person needing assistance was registered with a local government agency for evacuation assistance.

**Table 4-11:** Type of Assistance Needed

| | A / 1-2 | B / 3-4 | Non-Surge |
|---|---|---|---|
| Other | 9% | 12% | 0% |
| Do Not Know | 0% | 0% | 9% |
| Both | 9% | 24% | 18% |
| Special Need | 64% | 29% | 27% |
| Transportation | 18% | 35% | 46% |

**Table 4-12:** Source of Assistance Needed

| | A / 1-2 | B / 3-4 | Non-Surge |
|---|---|---|---|
| Other | 0% | 6% | 0% |
| Do Not Know | 5% | 0% | 9% |
| Agency | 9% | 12% | 27% |
| Friend / Relative | 32% | 47% | 36% |
| Household | 55% | 35% | 27% |

**Table 4-13:** Registered as Special Need

| | A / 1-2 | B / 3-4 | Non-Surge |
|---|---|---|---|
| Do Not Know | 5% | 6% | 18% |
| No | 64% | 59% | 46% |
| Yes | 32% | 35% | 36% |

### 4.5.2 Other Challenges

All interviewees were asked if there were any obstacles other than a lack of transportation or special need that would prevent the interviewee from being able to evacuate to a safer place during a hurricane threat. Fewer than 11% in any of the three risk areas, and just 5% in non-surge, said that there were such obstacles. Those who said an obstacle existed were asked to describe it, and up to three responses were recorded. The presence of pets in the household and medical issues were mentioned the most common challenges other than the need for assistance as shown in Figure 4-3.

# 4.0 Behavioral Analysis

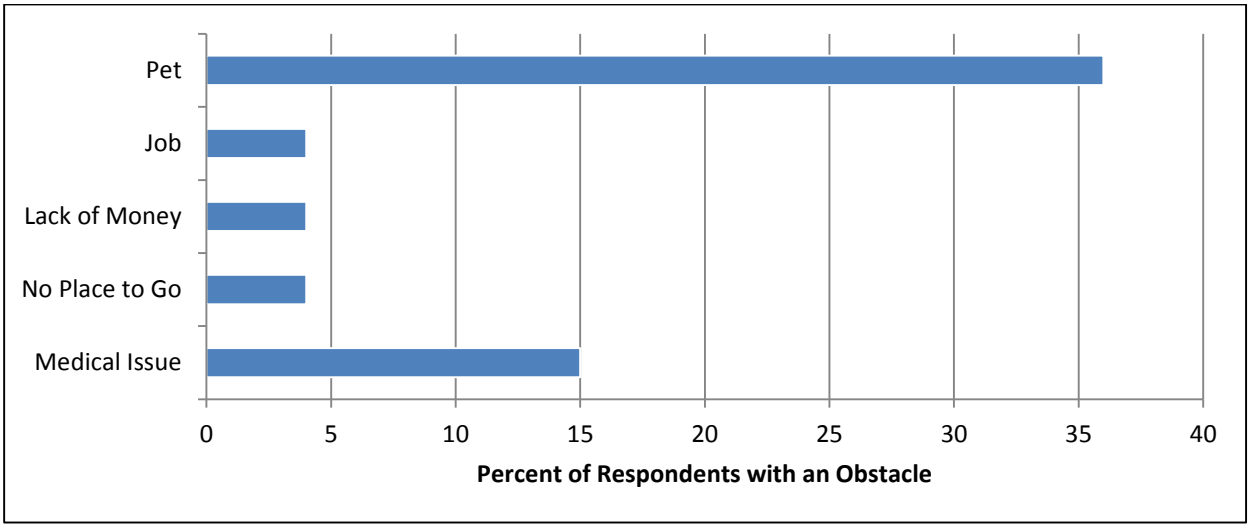


**Figure 4-3:** Other Obstacles to Evacuating

More than half of those interviewed were pet owners. Pet ownership was lower in the evacuation zones (53%) than in the non-surge area (56%). When asked what they would do with their pet during an evacuation, approximately 83% to 92% of the interviewees said they would take their pets with them to their evacuation destinations, followed by 9% who would stay home with their pets or 3% to 5% who would leave pets at home. At least 72% of those interviewed said they were aware that most public shelters do not allow pets inside. Table 4-14 provides the responses of interviewees when asked if the pet shelter policy would prevent them from evacuating.

**Table 4-14:** Effect of Public Shelter Pet Policy on Evacuation

| | A / 1-2 | B / 3-4 | Non-Surge |
|---|---|---|---|
| Other | 4% | 3% | 4% |
| Do Not Know | 2% | 1% | 4% |
| Not Applicable | 4% | 2% | 0% |
| Go Elsewhere | 81% | 82% | 91% |
| Keep from Evacuating | 9% | 13% | 2% |

## 4.6 Planning, Information Access, and Home Characteristics

Other important aspects of an evacuation include the readiness of families, accessibility and sources for evacuation information, and housing characteristics. In the following sections, interviewees were asked a series of questions related to these topics to provide emergency planners additional insight into public awareness or evacuation preparedness.

### 4.6.1 Family Evacuation Plan

Interviewees were asked if they and their family have a definite plan for deciding whether to evacuate and where to go if a hurricane threatens. Responses shown in Table 4-15 reflect that about half of those in the evacuation zones said they did while another 12% said they did, but it was not very definite.

**Table 4-15:** Family has Evacuation Plan

| | A / 1-2 | B / 3-4 | Non-Surge |
|---|---|---|---|
| No | 33% | 42% | 51% |
| Not Definite | 12% | 13% | 13% |
| Yes | 55% | 46% | 36% |

### 4.6.2 Information Awareness and Access

Interviewees were asked if they had ever seen a map of their community showing areas that would need to evacuate in case of a hurricane. In the evacuation zones, more than half (66% in Zone 1-2 and 62% in Zone 3-4) said they had, and 47% in the non-surge area said they had as shown in Table 4-16.

**Table 4-16:** Saw Map of Evacuation Zones

| | A / 1-2 | B / 3-4 | Non-Surge |
|---|---|---|---|
| Do Not Know | 1% | 3% | 2% |
| No | 32% | 36% | 51% |
| Yes | 66% | 62% | 47% |

At least 83% of interviewees said they have access to the internet so they could view hurricane information. When asked if they had ever visited their local government website to find hurricane information, only 28% to 40% indicated they had as shown in Table 4-17.

**Table 4-17:** Visited Local Government Website for Hurricane Information

| | A / 1-2 | B / 3-4 | Non-Surge |
|---|---|---|---|
| Do Not Know | 1% | 1% | 1% |
| No | 64% | 60% | 71% |
| Yes | 35% | 40% | 28% |

### 4.6.3 Housing Characteristics

A majority of interviewees live in single family detached structures, followed by multi-family buildings fewer than five stories and duplexes, triplexes, and quadraplexes. Less than one percent lives in mobile or manufactured homes as illustrated in Figure 4-4.

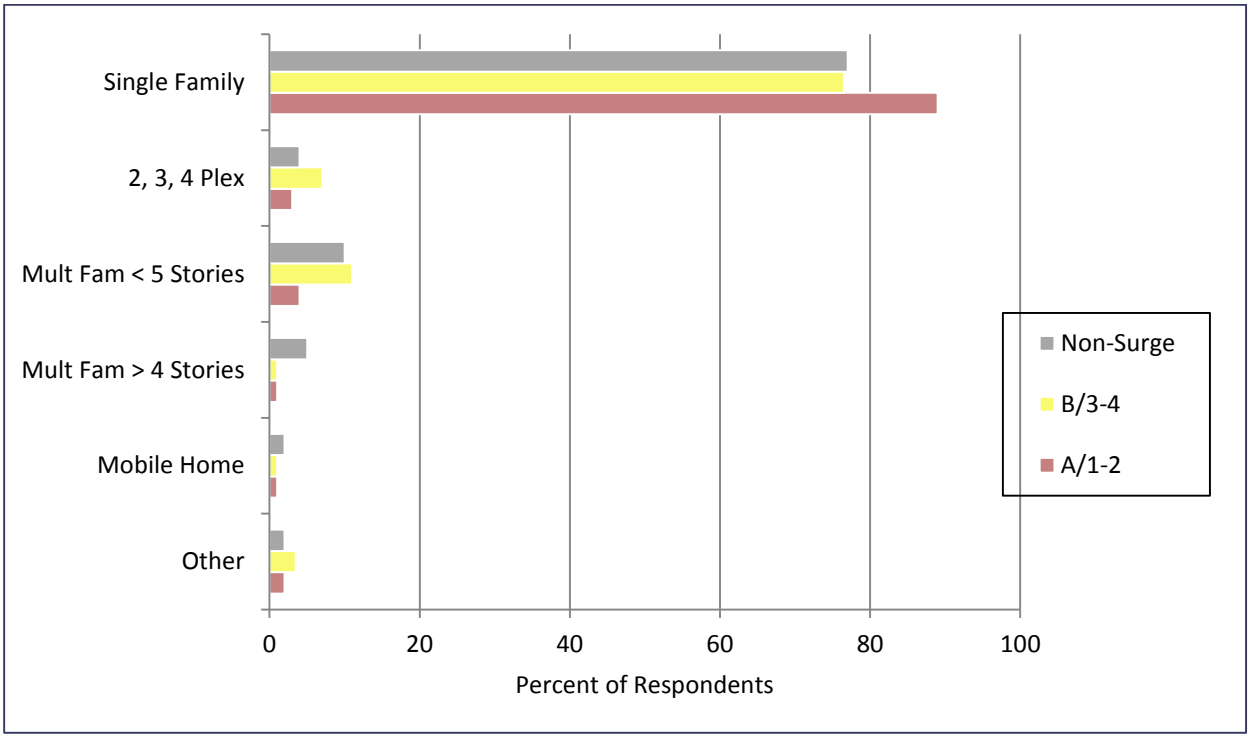


**Figure 4-4:** Type of Housing

## 4.7 Past Evacuation Experiences

How interviewees responded in past hurricanes is a good indicator of how they will act in future situations. Given the study area's recent Hurricane Sandy (2012) and Hurricane Irene (2011) events, interviewees were asked questions related to if they evacuated, why they evacuated, what type and location of refuge they sought, and if they would respond differently next time.

### 4.7.1 Hurricane Sandy (2012)

Of those interviewed in 2013, 91% said they had been in the area and at home when Hurricane Sandy threatened in 2012. They were then asked a series of questions related to how they responded.

In Zone 1-2, 18% said they left their homes to go someplace safer in Hurricane Sandy, followed by 6% in Zone 3-4, and 2% in non-surge areas. Most interviewees reported that they had no knowledge of an evacuation order for their location in response to Hurricane Sandy. Only 13% in Zone 1-2, 3% in Zone 3-4 and 1% in the non-surge area said they heard that they must evacuate.

**Table 4-18:** Type of Evacuation Notice Heard in Hurricane Sandy

| | A / 1-2 | B / 3-4 | Non-Surge |
|---|---|---|---|
| Must | 13% | 3% | 1% |
| Should | 25% | 17% | 5% |
| None | 62% | 81% | 94% |

Hearing evacuation notices (or believing that one heard evacuation notices) had a positive effect on whether people left or not. In Zone 1-2, 71% of those who heard mandatory evacuation notices compiled, compared to 15% of those who heard recommendations, and 8% of those who heard neither. The effect was similar in Zone 3-4 but less pronounced. (The non-surge area is misleading because just one person in the sample heard a mandatory notice, and that person did not leave.) These results are shown in Table 4-19.

**Table 4-19:** Evacuation in Hurricane Sandy by Type of Notice Heard

| | A / 1-2 | B / 3-4 | Non-Surge |
|---|---|---|---|
| Must | 71% | 60% | 0% |
| Should | 15% | 13% | 20% |
| None | 8% | 3% | 1% |

When asked to indicate the main reason they evacuated their home in Hurricane Sandy, most cited a concern about hazards from the storm or hearing evacuation notices (with up to three reasons being recorded per interviewee) as shown in Figure 4-5. River flooding, family influences, wind, and vulnerability of the location or construction of one's home were frequent reasons.

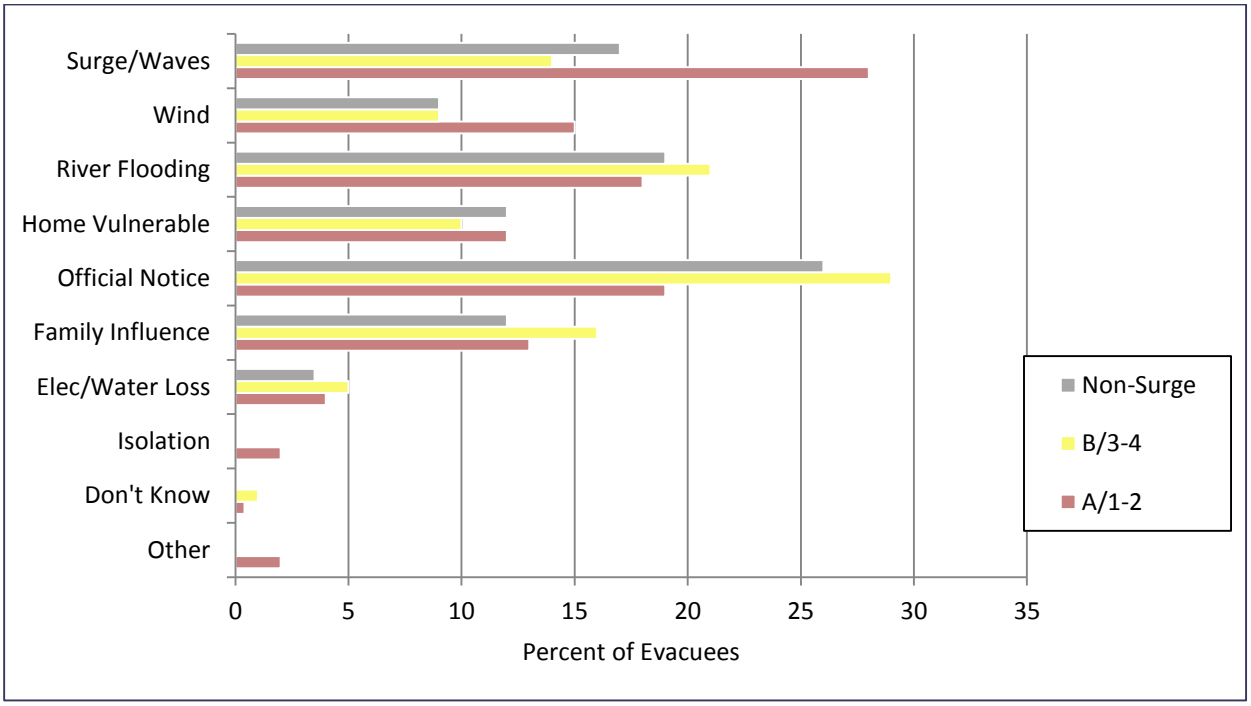


**Figure 4-5:** Reasons Given for Evacuating in Hurricane Sandy

When non-evacuees were asked for the main reason they did not evacuate in Hurricane Sandy, most people cited one or more reasons for why the storm posed little if any threat to their safety as illustrated in Figure 4-6. Non-surge area residents and those in Zone 3-4 were more likely than others to say they were not in an area told to evacuate. Very few mentioned the fact that Hurricane Sandy was not technically a hurricane near landfall or that the National Hurricane Center did not issue a hurricane warning. Constraints such as a lack of funds, no transportation, and pets were mentioned much less frequently than beliefs about safety.

# 4.0 Behavioral Analysis

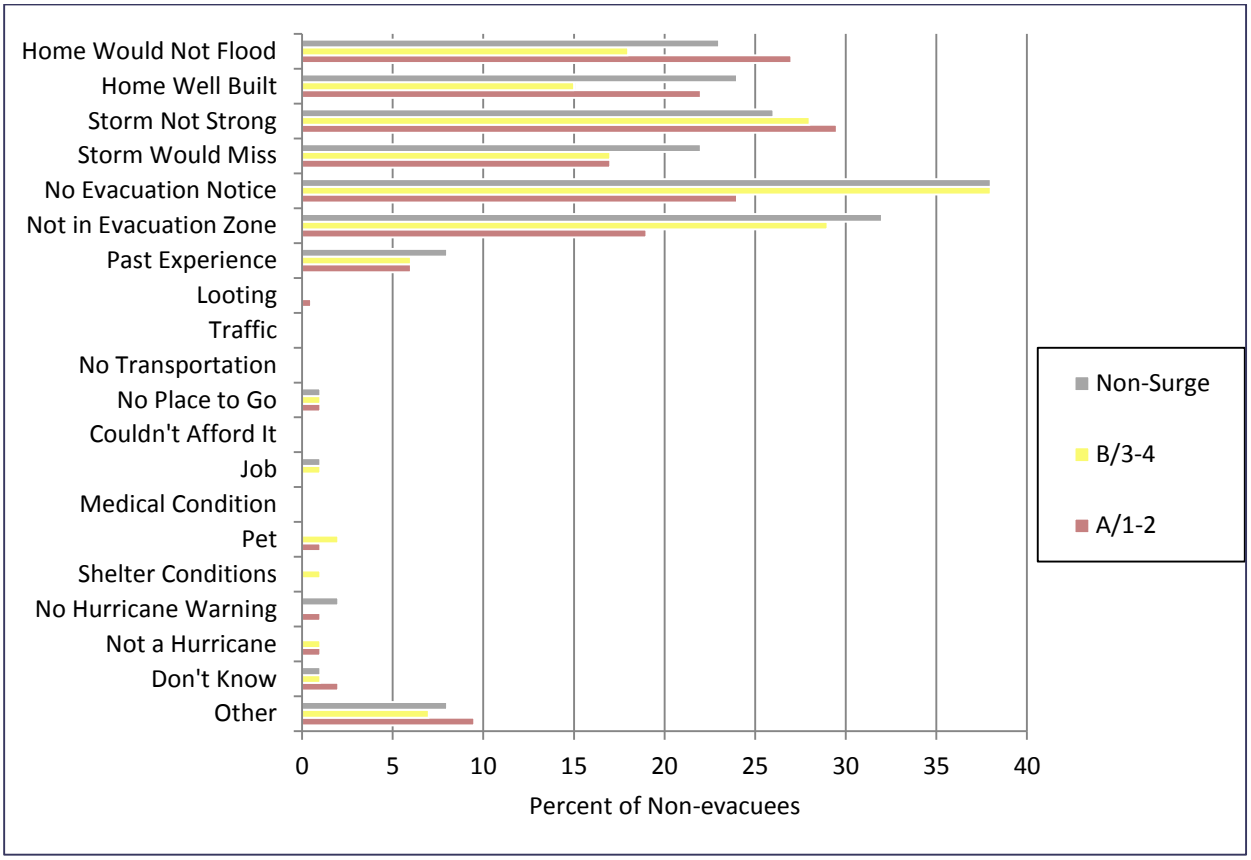


**Figure 4-6:** Reasons Given for Not Evacuating in Hurricane Sandy

Most Hurricane Sandy evacuees went to the homes of friends and relatives, followed by hotels and motels. Only 5% said they used public shelters as shown in Figure 4-7. Of those who sought refuge, approximately 37% stayed within their own community, 37% stayed within Rhode Island, 15% within their own neighborhood, and 11% went out of state as shown in Figure 4-8.

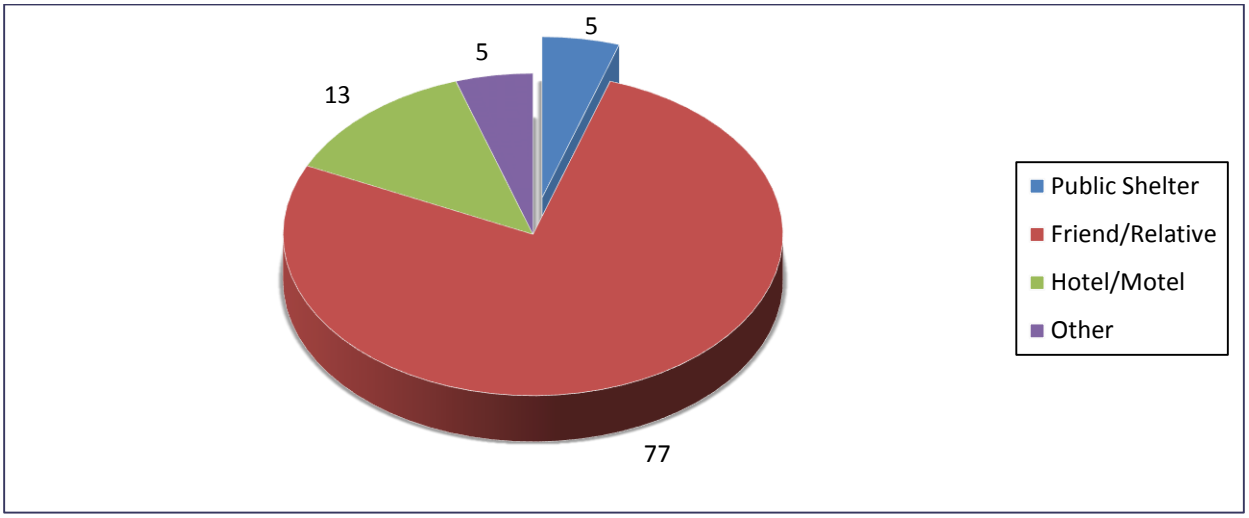


**Figure 4-7:** Type of Refuge in Hurricane Sandy

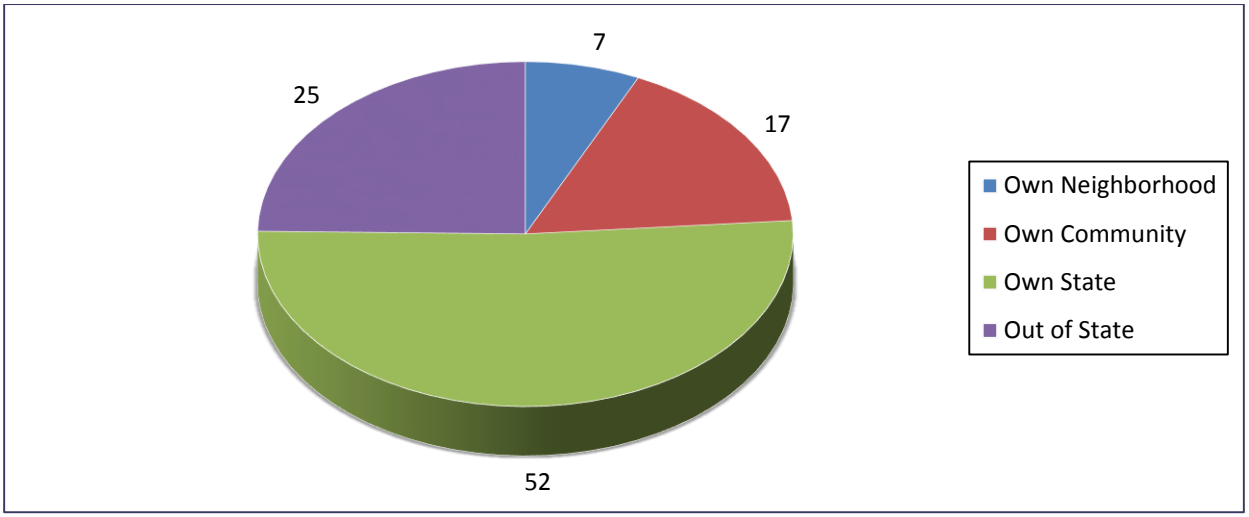


**Figure 4-8:** Location of Refuge in Hurricane Sandy

The great majority (84% to 94%) of interviewees said they would do the same thing if presented with the same situation again. Of those who said they would do something different, approximately 28% who did not leave in Hurricane Sandy said they would in the future, and about 22% of those who did leave in said they would not in the future as shown in Figure 4-9.

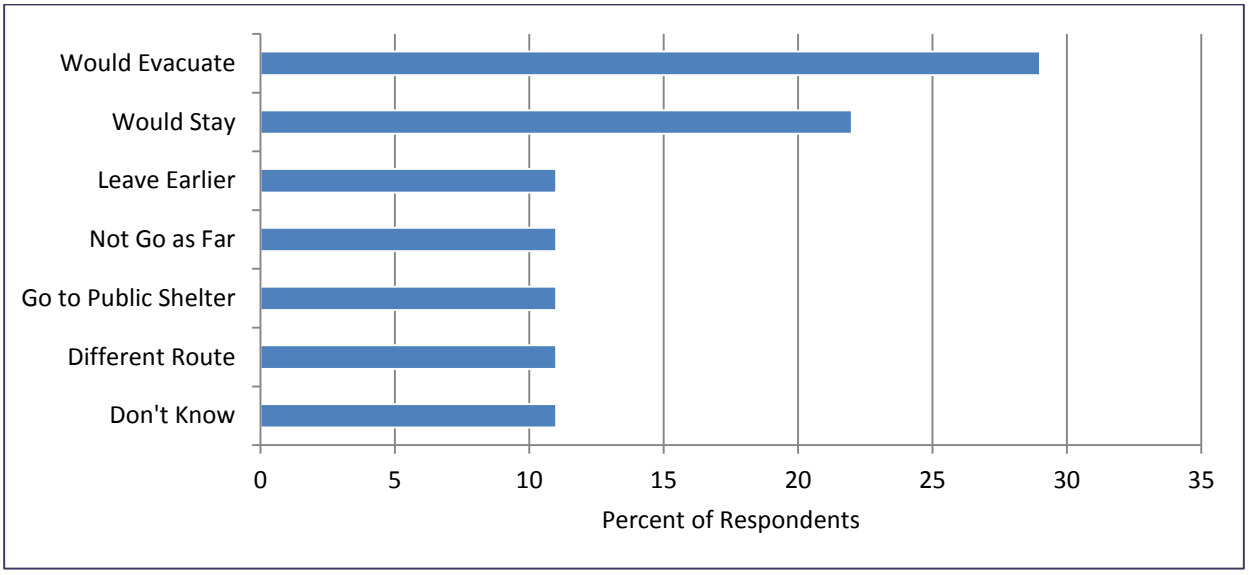


**Figure 4-9:** Different Responses Next Time

### 4.7.2 Hurricane Irene (2011)

Of those interviewed in 2013, 85% said they had been in the area and at home when Hurricane Irene threatened New England in 2011. If those respondents were indeed present during that event, then the same questions asked for Hurricanes Sandy and Earl were asked regarding their responses for Hurricane Irene.

Similar to the response from Hurricane Sandy, only 16% left from Zone 1-2, 6% from Zone 3-4, and 3% from the non-surge area. Few said they received evacuation notices in Hurricane Irene with 13% in the evacuation zones and 0% in the non-surge areas as shown in Table 4-20.

**Table 4-20:** Type of Evacuation Notice Heard in Hurricane Irene

| | A / 1-2 | B / 3-4 | Non-Surge |
|---|---|---|---|
| None | 69% | 87% | 92% |
| Should | 21% | 11% | 8% |
| Must | 11% | 2% | 0% |

People who believed they were told by officials to evacuate were more likely to do so than those who said they were not told, but even those hearing evacuation notices were unlikely to leave in Hurricane Irene. The responses are shown in Table 4-21.

**Table 4-21:** Evacuation in Hurricane Irene by Type of Notice Heard

| | A / 1-2 | B / 3-4 | Non-Surge |
|---|---|---|---|
| None | 4% | 4% | 2% |
| Should / Must | 37% | 21% | 14% |

Reasons given for evacuating in Hurricane Irene were concerns about hazards posed by the storm as illustrated in Figure 4-10. In Zone 3-4 and in non-surge areas, the most frequent reason was hearing evacuation notices from public officials. In Zone 1-2, concern over storm surge and waves was the greatest motivation, followed by river flooding.

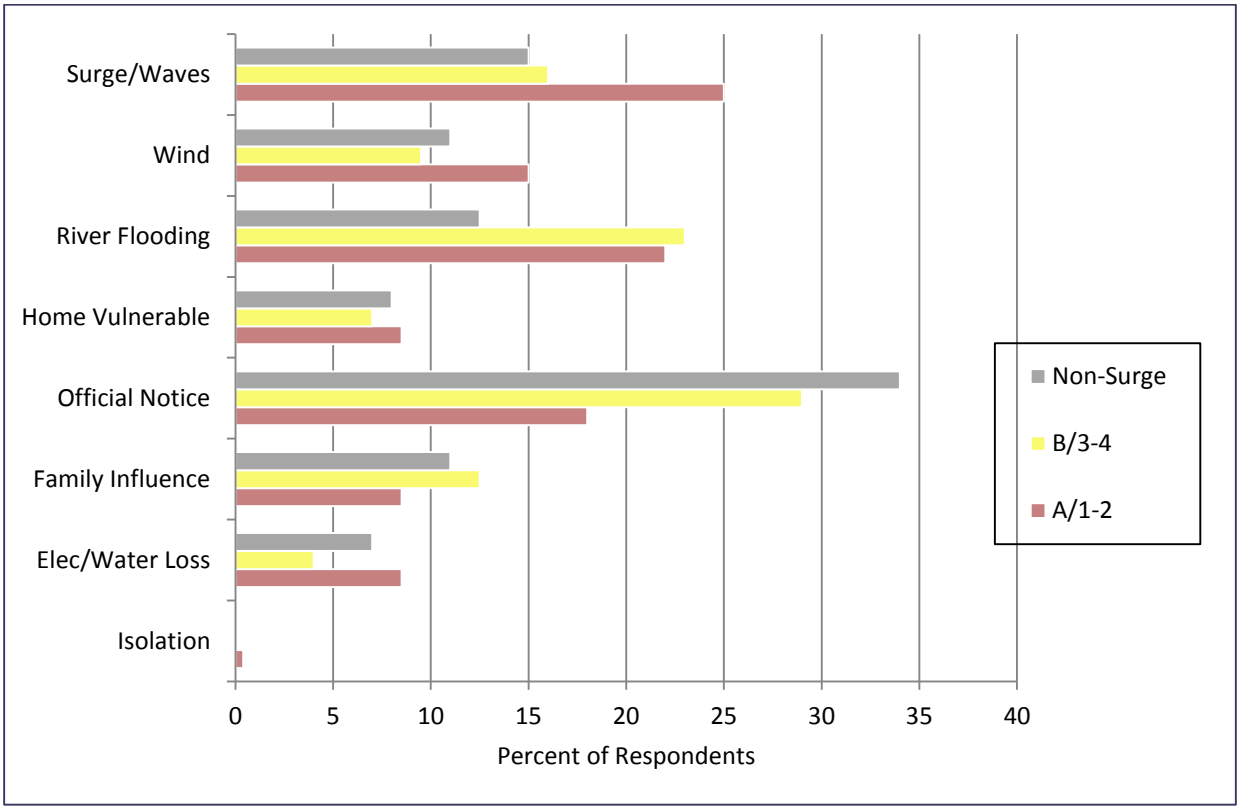


**Figure 4-10:** Reasons Given for Evacuating in Hurricane Irene

The vast majority of reasons given for not evacuating had to do with judgments that the threat was insufficient to merit leaving or that no evacuation notices were received. Very few people cited obstacles to being able to evacuate as their reason for staying. Their responses are illustrated in Figure 4-11.

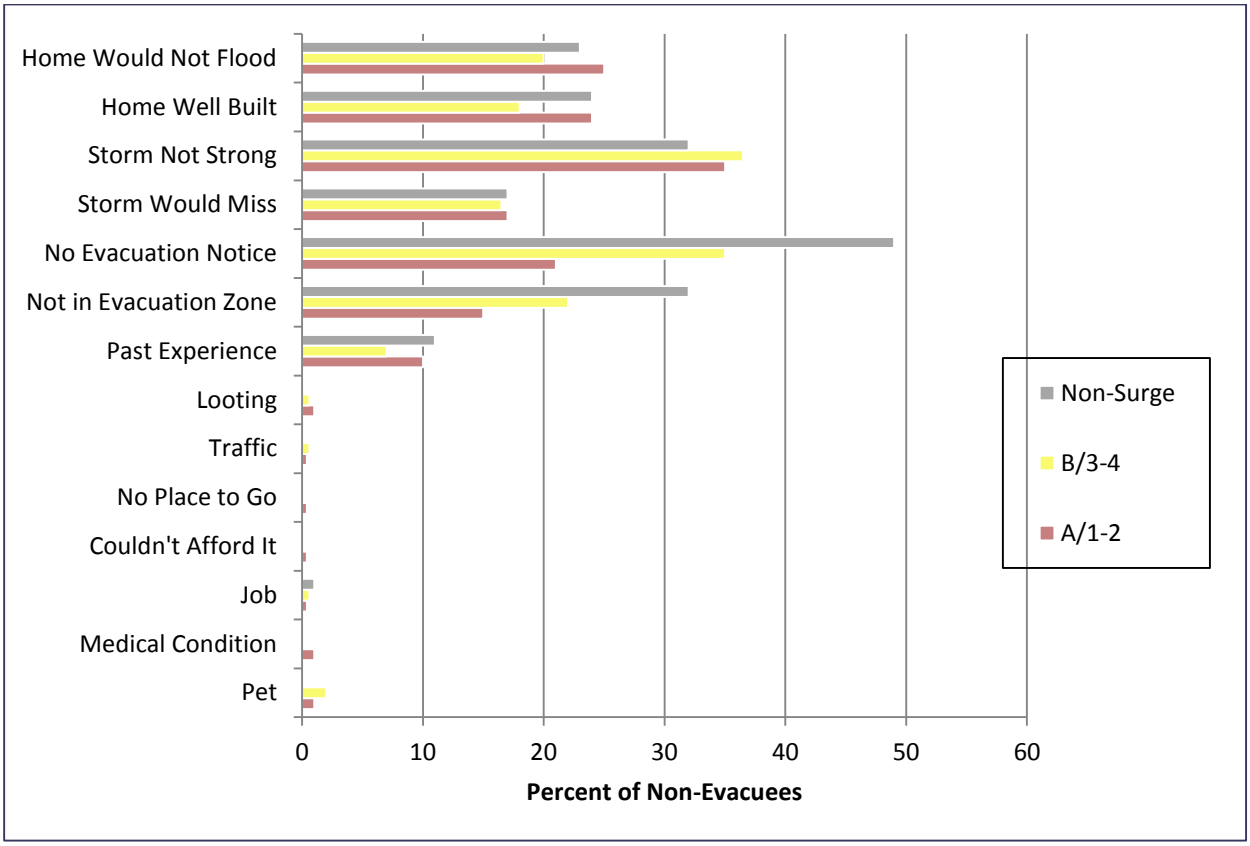


**Figure 4-11:** Reasons Given for Not Evacuating in Hurricane Irene

More than half of the evacuees interviewed went to the homes of friends and relatives, followed by about one-in-four going to hotels and motels. Only 2% went to public shelters as shown in Figure 4-12. Of the interviewed evacuees, 25% stayed within their own community or neighborhood and 29% left Rhode Island as depicted in Figure 4-13.

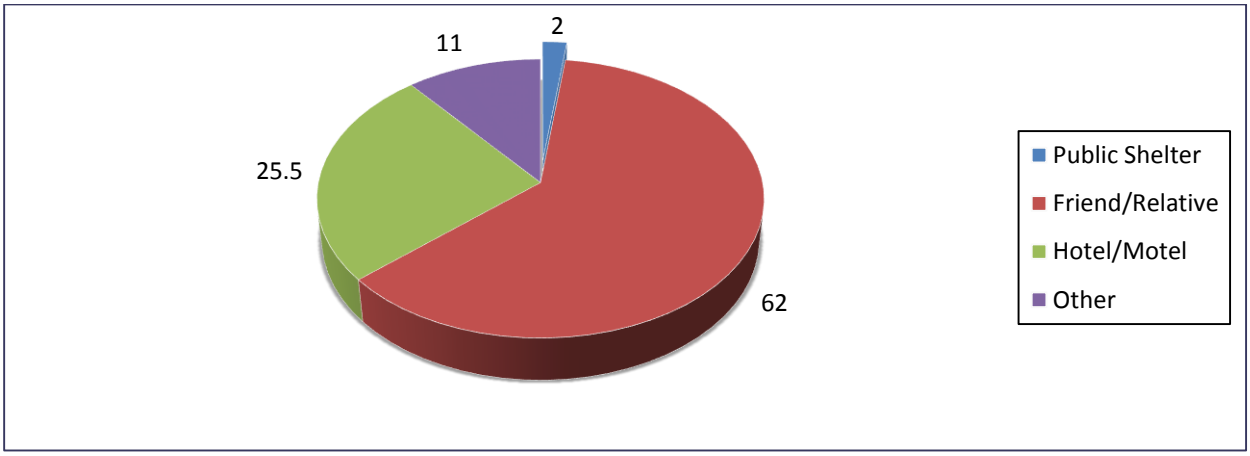

**Figure 4-12:** Type of Refuge in Hurricane Irene

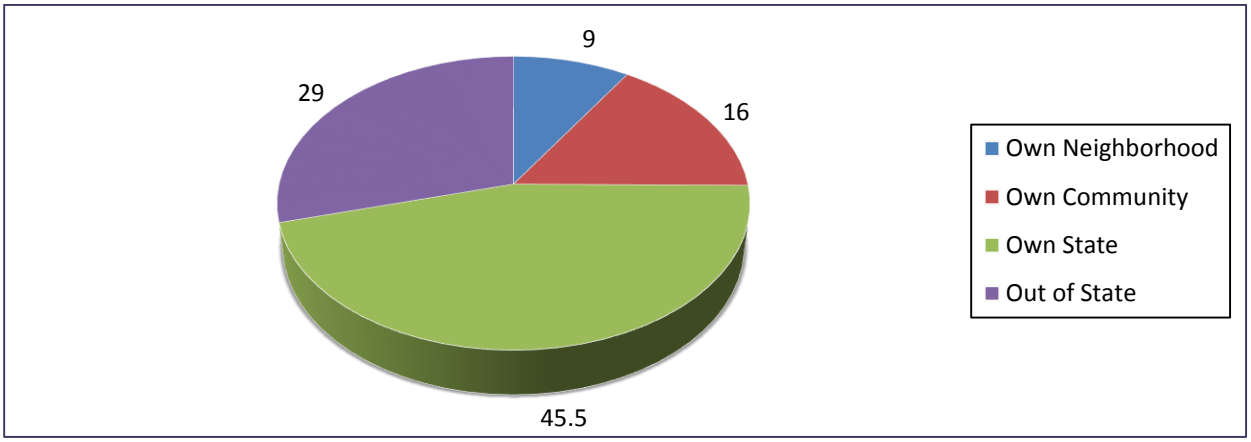


**Figure 4-13:** Location of Refuge in Hurricane Irene

### 4.7.3 Hurricane Earl (2010)

Of those interviewed in 2013, 78% said they had been in the area and at home when Hurricane Earl threatened the area in 2010. They were then asked the same questions about their responses in Hurricane Earl as those asked about Hurricanes Sandy and Irene.

Very few evacuated in Hurricane Earl with 4% leaving from Zone 1-2, 3% from Zone 3-4, and 2% from the non-surge area. Again, few said they received evacuation notices in Hurricane Earl with 37% in the evacuation zones and 2% in the non-surge areas as shown in Table 4-22.

**Table 4-22:** Type of Evacuation Notice Heard in Hurricane Earl

| | A / 1-2 | B / 3-4 | Non-Surge |
|---|---|---|---|
| None | 76% | 88% | 91% |
| Should | 10% | 6% | 7% |
| Must | 15% | 6% | 2% |

People who heard evacuation notices in Hurricane Earl were more likely than others to evacuate as shown in Table 4-23. However, even those saying they heard evacuation notices were more likely to stay than leave.

**Table 4-23:** Evacuation in Hurricane Earl by Type of Notice Heard

| | A / 1-2 | B / 3-4 | Non-Surge |
|---|---|---|---|
| None | 1% | 1% | 3% |

| | | | |
|---|---|---|---|
| Should / Must | 20% | 21% | 0% |

For those who did evacuate, concern about hazards were mentioned frequently, especially storm surge and wind as illustrated in Figure 4-14. Hearing evacuation notices, concerns about loss of utilities and worries about river flooding were mentioned by about 20% of evacuees.

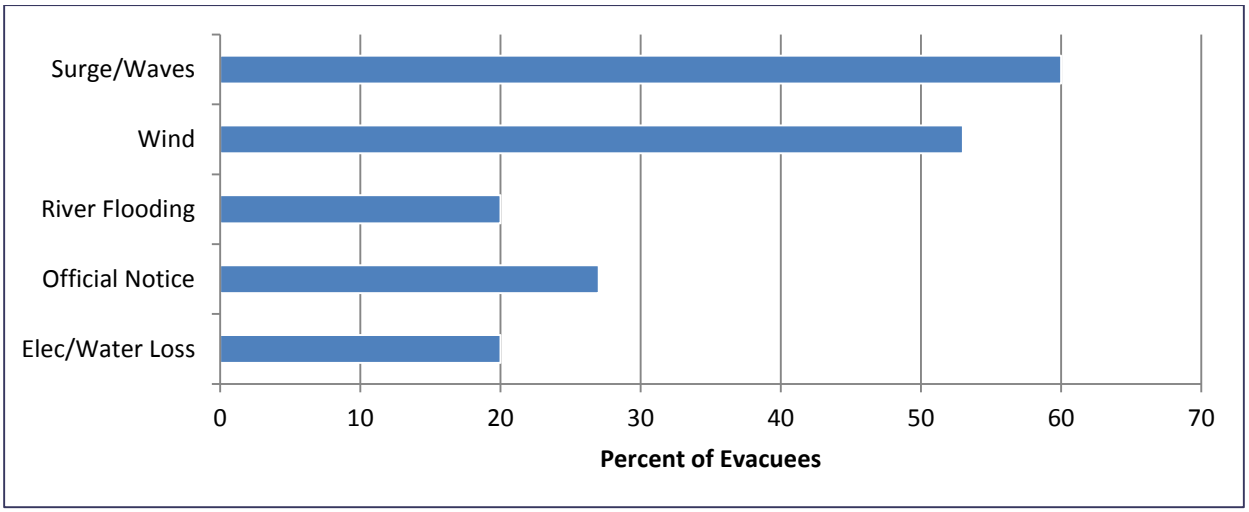


**Figure 4-14:** Reasons Given for Evacuating in Hurricane Earl

Most of those who did not evacuate indicated that the storm was not strong enough to pose a danger to their safety or that they were not told by officials to evacuate as shown in Figure 4-15. As in Hurricane Sandy, Hurricane Irene, and the hypothetical storm scenarios, few people said that constraints to leaving played a significant role in their decisions to stay.

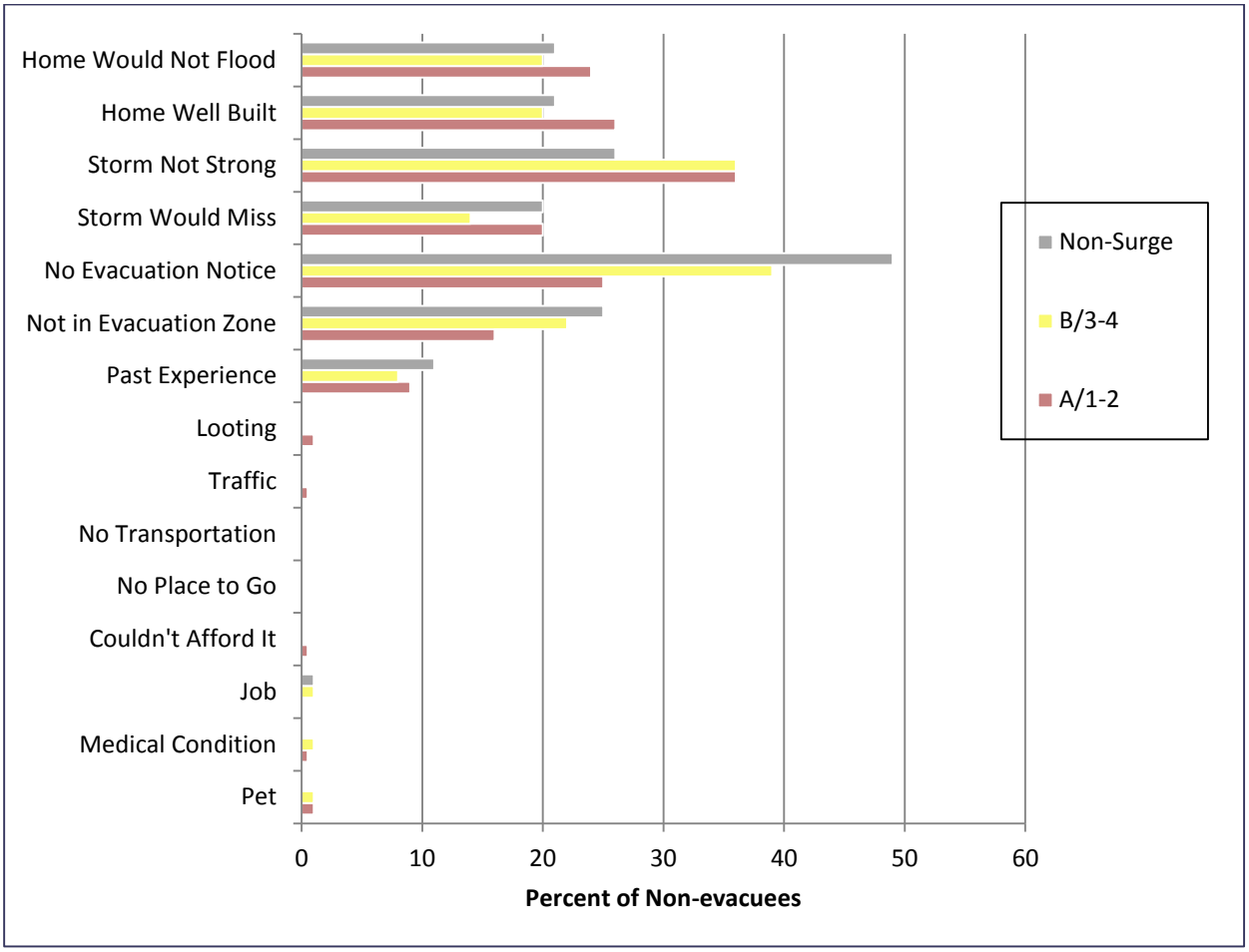


**Figure 4-15:** Reasons Given for Not Evacuating in Hurricane Earl

Due to there being so few evacuees, especially within any single risk area, estimates of where evacuees went in Hurricane Earl are not very reliable. It is clear, however, that very few went to public shelters and most went to the homes of friends and relatives as shown in Figure 4-16. Of the interviewed evacuees, most did not go very far with a third staying in their own community and 27% going out of state as depicted in Figure 4-17.

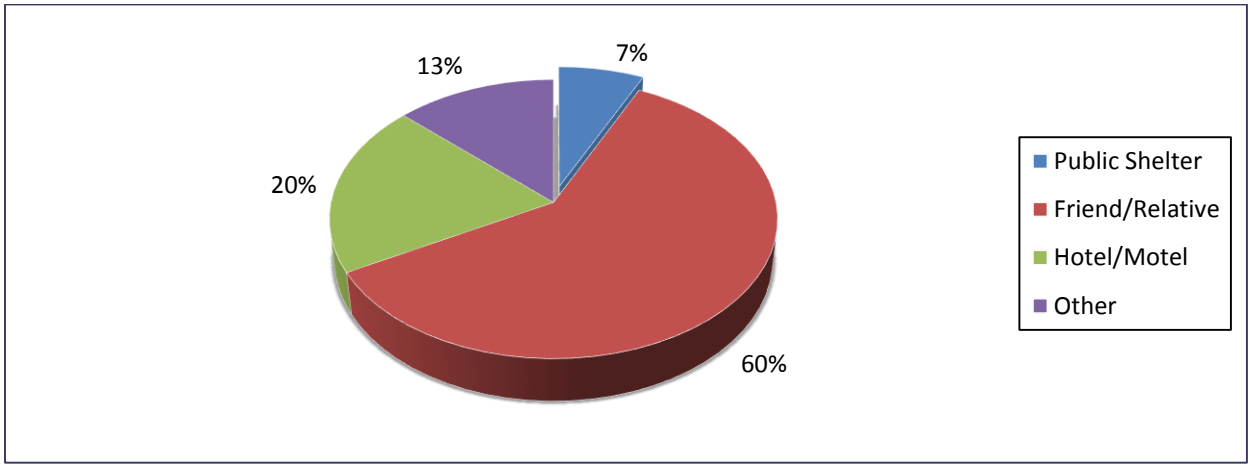


**Figure 4-16:** Type of Refuge in Hurricane Earl

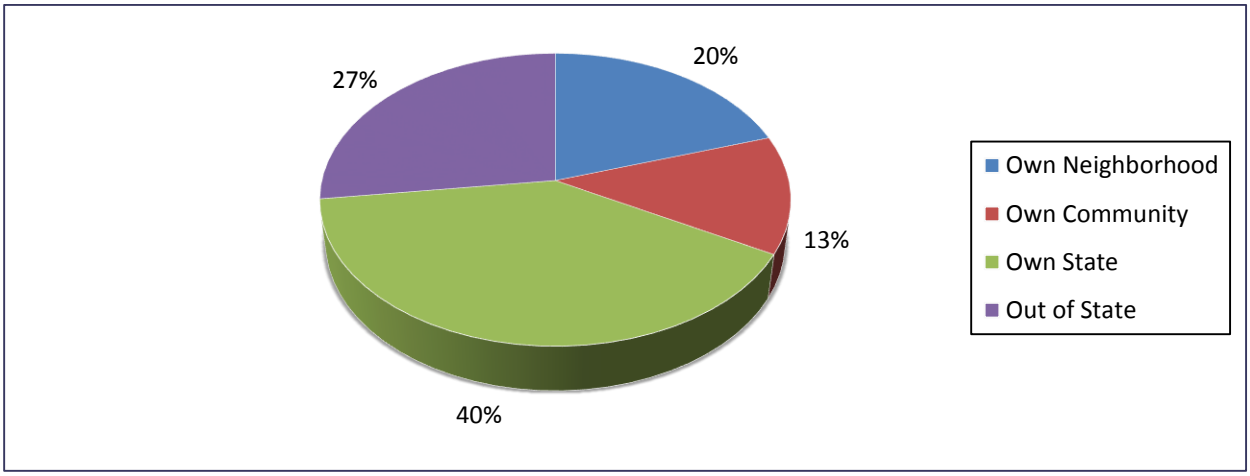


**Figure 4-17:** Location of Refuge in Hurricane Earl