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Understanding the Relationships between Household Decisions and Infrastructure Investment in Disaster Recovery: Cases from Superstorm Sandy

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Submitted by:

Sue McNeil
Professor

Joseph Trainor
Assistant Professor

Alex Greer
Research Assistant

Israt Jahan
Research Assistant

Kelsey Mininger
Undergraduate Research Assistant

Disaster Research Center
166 Graham Hall
University of Delaware
Newark DE 19716

External Project Manager
Frank Lawrence, Sea Bright, NJ

In cooperation with
Rutgers, The State University of New Jersey
And
U.S. Department of Transportation
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16. Abstract

Hurricanes, storms and floods damage roads, bridges, transit lines and other elements of our transportation infrastructure. Restoring the transportation infrastructure is widely recognized as an important element of short-term recovery as the reconstruction of the built environment and other elements of long-term recovery are dependent on a functional transportation system. Legislated requirements for risk-based asset management plans suggest that infrastructure systems should recognize the potential risks of extreme weather events, including mitigation, restoration and emergency services. However, asset management plans also need to understand the demand for transportation services — regrettably, little is understood of these interactions.

Based on surveys of residents of Oakwood Beach, New York and Sea Bright, New Jersey, we found that the decision to rebuild or relocate after Hurricane Sandy was influenced by the available transportation services. We also found that little effort has been made to connect household decisions related to rebuilding to the asset management process.

Most importantly, the MAP-21 and FAST Act requirements for risk-based asset management underscore the need to integrate the risks of natural hazards and the risks involved in assessing future demand in the context of the hazards. While NYSDOT recognized these elements, much work remains to operationalize them. This project serves as a foundation for future work in this area.

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INTRODUCTION

Description of the Problem

Hurricanes, storms and floods damage roads, bridges, transit lines and other elements of our transportation infrastructure. Restoring the transportation infrastructure is widely recognized as an important element of short-term recovery as the reconstruction of the built environment and other elements of long-term recovery are dependent on a functional transportation system (Smith and Wenger, 2006). However, in the long-term, changes in development and settlement patterns occur and additional or different investments in transportation infrastructure are required to deliver safe and efficient transportation. We know very little about how, where, when and why these changes occur. This exploratory research project helps to better understand the role transportation infrastructure plays in the disaster recovery process. By documenting transportation infrastructure damage and repair, conducting interviews to understand community and household attitudes, and researching incentives and resources related to household decisions regarding relocation and rebuilding in two communities impacted by Hurricane Sandy, we better understand how to provide transportation infrastructure recovery activity that meets the needs of communities impacted by disaster. Specifically, this research focuses on household decisions regarding relocation and the role of disruption of the transportation infrastructure in those decisions. In turn, these decisions impact transportation infrastructure investments.

Recovery research is not new. Community level studies of disaster recovery date back to Eugene Haas' work in the late 1970s. Through the mid-1980s, recovery research continued (Olshansky 2005; Quarantelli 1999). Even so, numerous researchers have noted that the recovery phase is the least-understood phase of the disaster cycle (Berke et al. 1993; Bevington et al. 2011; Mileti 1999; Olshansky 2005; Rubin 2009; Rubin et al. 1985). That problem is beginning to change as recent catastrophes and disasters, such as the Indian Ocean Tsunami, Hurricane Katrina, the Japanese Tsunami, and Hurricane Sandy, have inspired increased attention to recovery. Policymakers, researchers and the media are all devoting more attention to the recovery phase of disasters. One dimension of that increased attention has included intensified discussion about whether resettling is a better option than rebuilding in some situations. Another issue is whether to invest in mitigation and repair or just repair of transportation infrastructure (Croope and McNeil, 2011). While many have discussed these issues in passing, research devoted to recovery and research on resettlement is still relatively sparse, and research on the impact of transportation infrastructure on these decisions is even sparser.

From a transportation perspective, household relocation decisions are important. As significant disaster events reveal unforeseen vulnerabilities to the natural environment and/or the limits of mitigation, preparedness, and response capabilities, the number of households that choose to stay or leave makes a difference for those charged with investing in repair and/or re-development in these communities. Those choices need to be calibrated to the demand shifts that areas might face in the aftermath of a major event. The outcomes of those household decisions are a critical input because communities must make difficult repair and development decisions in a post-disaster environment. Simply stated, the number of households that remain should influence the demand for infrastructure and, as a result, the need for investment in different areas. Similarly, it is important to know where people who leave are moving to relocate. Depending on the distribution of these households, very different infrastructure rebuilding and expansion projects could be warranted. Estimating that demand, however, is complicated by the prospect of significant resettlement, particularly in the case where governmental agencies are incentivizing such choices. It is further complicated by the fact that we know very little about what factors influence this kind of household decision-making. Most of the resettlement studies either focus on forced resettlement outside the U.S. or more short-term sheltering issues (Oliver-Smith 1991; Sastry

2009).

Goals and Objectives

The primary goals of this study are to:

1) Shed light on how households understand their relationship with the environment (including the built environment) and what drives their decisions of whether to rebuild *in-situ* or resettle.
2) Explore how these household decisions can be integrated into plans to repair, replace or improvement transportation infrastructure. For example, ultimately, information on household decisions will be used to supplement transportation demand estimates for planning purposes.

The specific objectives of the study are to:

1) Better understand how the post-disaster transportation demand changes over time and from pre-disaster conditions;
2) Better understand how the state of transportation infrastructure influences the decision to relocate;
3) Explore how household surveys after a disaster can be used to complement existing data and models to forecast demand;
4) Explore the role risk of natural hazards, including damage to infrastructure and changes in demand, play in asset management.

Context

Natural hazards can rapidly degrade transportation infrastructure from a state of good repair to failure, reduced capacity or compromised performance. Recent experiences with Hurricane Irene and Superstorm Sandy in the Mid-Atlantic states have underscored the impacts of damaged and degraded infrastructure. Although the focus on rebuilding of the transportation infrastructure has been effective in delivering functional infrastructure, little attention has been paid to the infrastructure needs for long-term recovery, as well as where investments are required to strategically meet the needs of the residents and businesses. In addition to addressing state of good repair in the short term, the proposed research also considers state of good repair in the long term, as well as safety and economic competitiveness, by asking what investments should be made considering the household decisions that will be made about location. Understanding the demand for transportation services is a key element of asset management and an important strategic tool for maintaining infrastructure in a State of Good Repair. Furthermore, the MAP-21 requirements for risk-based asset management will need to integrate the risks of natural hazards and the risks involved in assessing future demand in the context of said hazards. This project will serve as a foundation for future work in this area.

Outline of the Report

This report documents our case study research. The following section describes the research approach. The subsequent section presents a synthesis of the relevant literature. The next section describes the case study selection and profiles the communities. The following section documents the survey results and interviews. The report concludes with a discussion of the results, recommendations, conclusions and opportunities for future research. Appendices focus on the detailed research methodology, including the survey questions and detailed summaries of the survey results.

RESEARCH APPROACH

This study uses an exploratory, multiple case study methodology to explore the most influential factors associated with household decision-making in two communities: one in New York and one in New Jersey. Data collection for each case study community included background information on the community, a survey, and semi-structured, in-depth interviews with adult members of households that sustained substantial damages from Hurricane Sandy.

The relationships between this qualitative data, assessments of damage, existing data and models to assess transportation data, are explored to better understand strategic, effective and efficient investments in transportation infrastructure that help to meet the needs of communities but also help to make these communities more resilient to potential hazards. This exploration is undertaken in the context of enhancing and understanding the demand component of asset management.

Case study methodology is sensible for this study because it gives a large-scale, holistic view of relocation decision-making choices embedded in specific communities. This allows us to more accurately describe causal relationships in ways that other exploratory methodologies cannot (Schramm 1971, Yin 2009). There is also precedence for this in the literature. Perry and Mushkatel (1984), in their study of post-flood relocation, used case-study methodology with data collection methods that included interviews with households and key officials involved in the resettlement effort to better understand the process.

Yin (2009) suggests that when selecting cases for a comparative case study to not use a random sampling logic: selecting cases with desirable characteristics will offer more information on the study question. With this in mind, this study employs a "two-tail" design that suggests selecting cases that fall on the extremes of the phenomenon. This method is useful because it allows for replication of methods and comparison of findings both within and between groups, while allowing for maximum variation. Since this study focuses on resettlement decision-making, we selected two cases that, in a collective sense, take drastically different stances regarding resettlement post-Sandy. We also selected cases from two different states to take into account the potential effects differing state and local policies may have on the communities. Past this, we ensured that these communities have comparable mean gross incomes, population size and demographics.

Media reports indicated that Sea Bright, NJ (see Figure 1), on a community level, is dedicated to rebuilding in the same spot. Mayor Dina Long of Sea Bright, NJ organized spring break trips to come to Sea Bright and assist in repairing homes and businesses. The state is also offering financial incentives of up to $10,000 for families to rebuild in the same county in New Jersey, with the caveat that they sign a promissory note stating that they will not move over the next three years (http://www.renewjerseystronger.org/homeowners/resettlement/). Lisa Ryan, a spokesperson for the state Department of Community Affairs, noted that these efforts are intended to help avoid a mass exodus from the state, as was seen following Hurricane Katrina in Louisiana.

In contrast, Oakwood Beach in Staten Island, NY (see Figure 2) has a large group of its citizens interested in resettlement buyouts (Schuerman 2013). Specifically, in the Fox Beach area, 170 of the 184 households indicated that they wanted to be part of a buyout. Oakwood is the site of a pilot program testing property buyouts ran by Governor Cuomo that will give homeowners 100% of their pre-Sandy home value with an additional 5% if they choose to relocate on Staten Island.

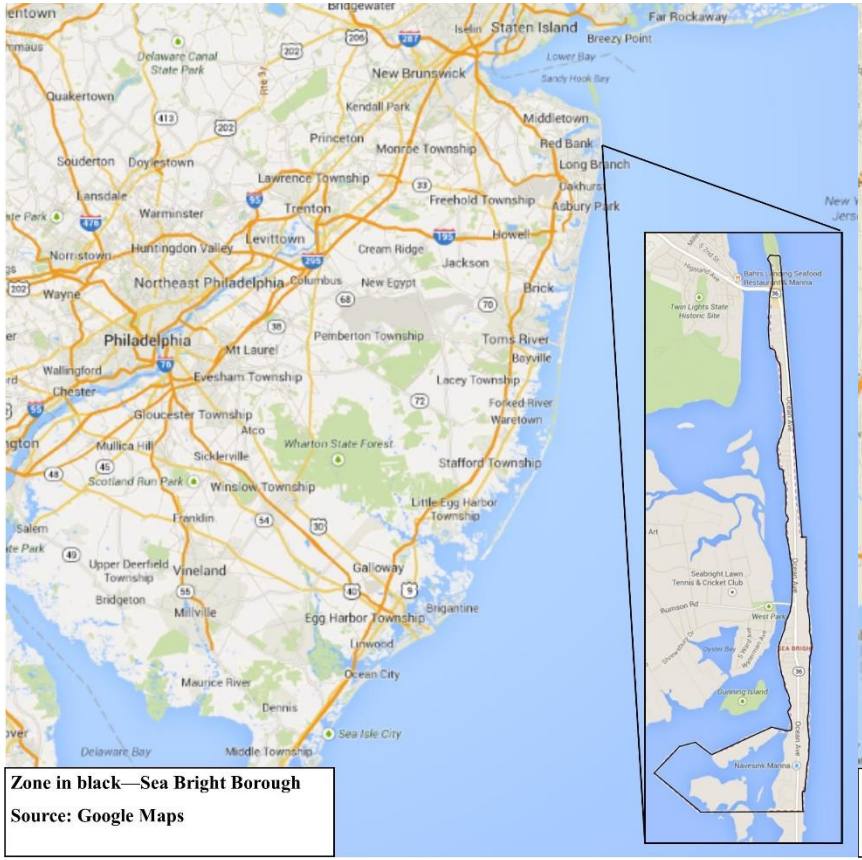

Figure 1 Sea Bright, New Jersey

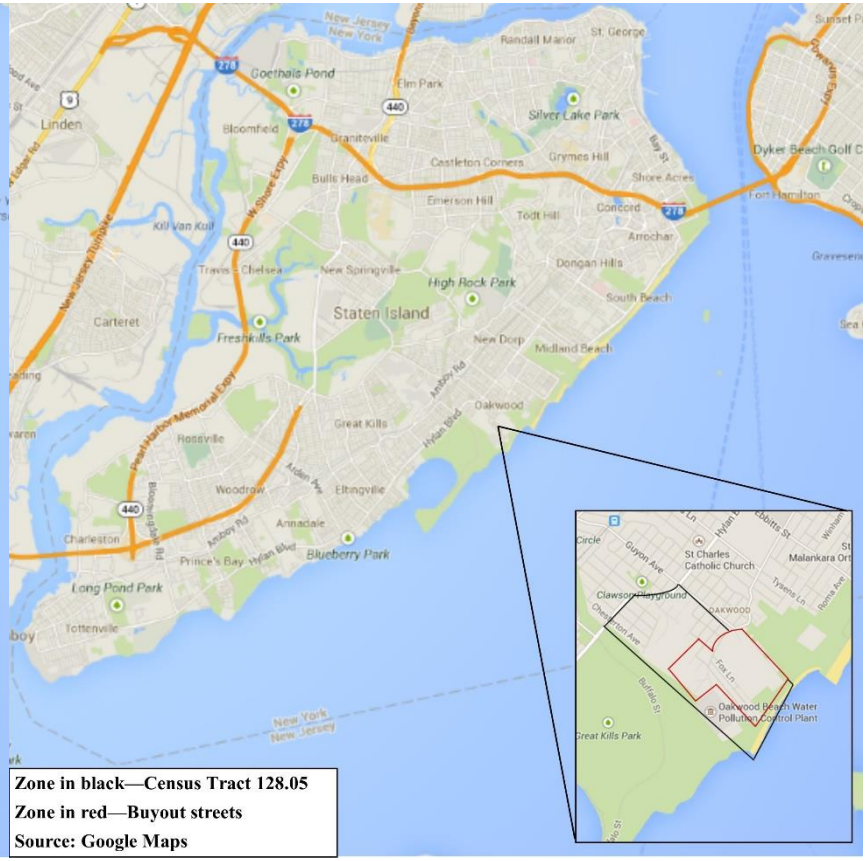

Figure 2 Oakwood Beach, New York

The state intends to use $400 million in federal Sandy aid to support buyouts.

A thorough literature review was conducted to understand the how the terms resettlement and relocation are defined and the factors considered in household decision-making with respect to relocation and resettlement. Significant policies were also identified to understand how assistance (or lack thereof) and insurance also impact household decision-making. The literature and these policies were used to inform the data collection process. We also profile the two communities to understand the demographics and existing transportation infrastructure.

Data collection for each case study community included a survey (sent via mail), and semi-structured, in-depth interviews with adult members of households that sustained substantial damages from Hurricane Sandy. The survey was sent to every member of each community. The response data were analyzed and mapped. Respondents were asked if they were willing to participate in follow-up interviews. Potential interviewees were contacted directly. Where possible, the interviews were conducted in person, in a public space (such as a library or community center) for their own comfort. When this was not possible, interviews were conducted over the telephone. Interviews in both communities were recorded (with consent) for later analysis. Both directed content analysis (focused on topics identified in the literature) and inductive content analysis (where themes in the data are allowed to emerge) were used to make sense of the interview data. The interviews covered issues informed by the literature and the survey, including connection to place, motivations for resettlement and reconstruction, impacts to daily life including transportation infrastructure, and changes in stress levels. In addition, interviews were conducted with policy makers.

Figure 3 summarizes the key elements of the research methodology. A detailed explanation of the methodology is included in Appendix A.

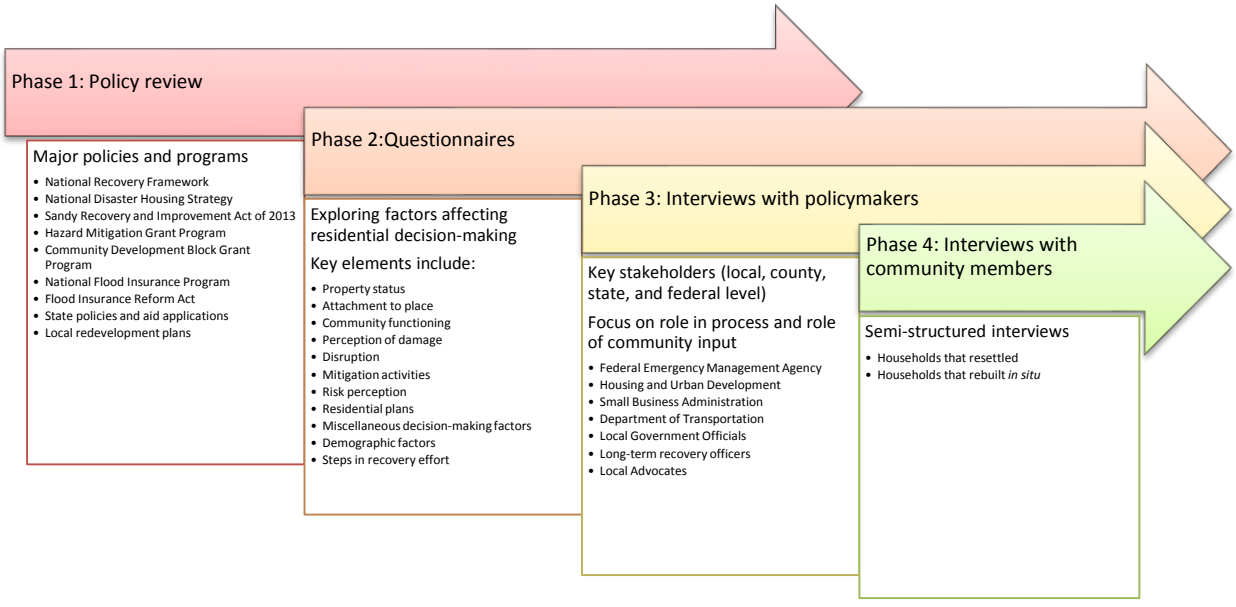

Figure 3 Research Methodology

SYNTHESIS OF RELEVANT LITERATURE

Post-Disaster Household Decision-Making

We built the questionnaire to include items other researchers who looked at past events noted as important. We reviewed over 70 documents (including books, peer-reviewed journal articles and reports). These studies created the basis for our own work. We found the following six themes in these studies:

1. Households tend to rebuild in the same spot in the same way following disasters (Berke and Campanella 2006; Dynes 1991:11; Haas, Kates, and Bowden 1977; Oliver-Smith 1996:308),
2. Households that feel strongly attached to where they live are more likely to rebuild in the same place than residents that do not feel the same level of attachment to their community (Cuba and Hummon 1993; Fraser et al. 2003; White, Virden, and Riper 2008),
3. Households that suffer extensive damage are less likely to rebuild in the same place than residents that experience minimal damage (Emily and Storr 2009; Miller and Rivera 2007; Myers, Slack, and Singelmann 2008; Wilson and Stein 2006),
4. Households that are more concerned about another similar disaster are less likely to build in the same place than residents less concerned about another similar event (Slovic 1999; Kirschenbaum 2005),
5. A number of demographic characteristics may influence this decision, such as age, household income and minority status (de Vries and Fraser 2012; Fraser et al. 2003; Weber and Peek 2012:16), and
6. Households with negative opinions of their community prior to the disaster are less likely to rebuild in the same spot than households that have positive opinions of their community (Castles 2002; Correa 2001; David and Meyer 1984).

Figure 4 is a representation of the influences among these themes.

Infrastructure Damage, Disruption, Transportation Decisions and Recovery

There are few studies focused on the experiences of households or the connection between household location decisions and the disruption of transportation. However, there is a large body of literature focused on modeling the economic impacts of infrastructure damage and disruption (Okuyama 2007, Van der Veene 2004). There are also tools, such as HAZUS-MH, that capture the losses due to damage, but not disruption.

There are also studies focusing on network performance and traveler behavior. Chang and Nojima (2001), recognizing the importance of measuring post-event system performance, captured changes in commuting 1995 Kobe, 1989 Loma Prieta, and 1994 Northridge earthquakes using aggregate measures, such as length of the network open and accessibility. Zhu, et al. (2010) modeled the changes due to the I-35W bridge collapse in Minneapolis. Zhu and Levinson (2012) reviewed many previous studies and classified changes due to network disruption as follows:

- Route changes
- Adjustment in travel time departure
- Consolidation of trip purposes or less frequent travel
- Mode changes
- Shared travel duties among household members

Edara and Matisziw (2014) also provide a synthesis of the literature. They report that both for planned and unplanned disruptions, demand is reduced and responses, such as use of alternative routes, tended not to be permanent. The main focus is really on short-term disruptions, rather than the longer-term impacts observed in this study.

In the long term, travelers can also adjust their residential and employment locations. Finally, Nakanishi, et al. (2013) identified two studies that developed models of demand, but neither are relevant to communities. They then developed a travel demand model that can be used for sketch planning. Our survey data could serve as an input to such a model.

Nakanishi, et al. (2013) point to the lack of tools to support transportation in the recovery phase. While they argue that communities in the United States are well resourced to conduct this exercise, we see little evidence that they make the connections between household travel decisions and infrastructure investment. They report that numerous studies have reviewed short travel behavioral responses to infrastructure disruption due to bridge failures, earthquakes and hurricanes. Many of these studies are based on analysis of traffic counts where others are based on survey data.

Kontou, et al. (2016) explore the impacts of Hurricane Sandy based on a survey of commuters with a particular emphasis on transit commuters. They found that transit commuters were more likely to cancel trips, change modes or change the time of departure and these changes varied by gender and responsibilities. Most importantly for this study, their survey showed that Hurricane Sandy impacted the demand for transit.

Impact of Infrastructure Condition on Household Decision-Making

The literature on housing decisions and transportation infrastructure is also relatively sparse. The studies identified focused on temporary housing, but like the literature on post-disaster household decision-making, identify similar variables. For example, optimization models that attempt to locate temporary housing based on a displacement distance equivalent, recognize the needs of families, socioeconomic disruptions, costs and the transportation network configuration (El-Anwar and Chen, 2013, El-Anwar et al, 2010). Similarly, the importance of transportation to provide access to services and jobs is also recognized in planning for temporary housing (Johnson, 2007).

Relevant Policies and Programs

This section documents the relevant policies and programs that support or influence residential decision-making following a disaster, as well as the related policies that support the rebuilding of infrastructure and the recovery of the community.

Residential Decision-Making

Greer (2014) provides a more detailed account of the policies related to residential decision-making. Policies and programs exist at the federal state and local levels. It also must be acknowledged that recovery is a messy process (FEMA 2011; Johnson 1999) involving many governmental organizations. At the federal level, FEMA, HUD, SBA and USDA are engaged in housing recovery. It is also complicated by other laws. For example, relocation must be voluntary based on the Takings Clause in the Fifth Amendment (Lewis 2012). Table 1 lists relevant policies and programs.

Table 1 Federal Programs to Support Housing Recovery

Agency	Program	Scope	Reference
FEMA	National Disaster Housing Strategy	Summaries strategies for sheltering, interim housing and permanent housing.	(FEMA 2009)
FEMA/HUD and others	National Disaster Recovery Framework (NDRF)	Operational guidance for post-disaster recovery	(FEMA 2011)
US Congress	Disaster Relief Appropriations (2013) and Sandy Recovery Improvement Act	Funds appropriation	(Public Law 2013)
FEMA	Flood Insurance Reform Act	Aimed at making the NFIP financially solvent by eliminating subsidized insurance rates for about 20% of policies over a 4 years period.	(FEMA 2014c).
FEMA	Hazard Mitigation Grant Program (HMGP)	Grants to states for long-term hazard mitigation activities in Presidentially declared disaster areas. Requires 25% match. May be used for buyouts subject to requirements.	FEMA 2010
FEMA	Homeowner Flood Insurance Affordability Act	Repeals and modifies the Biggert-Waters Flood Insurance Reform Act of 2012 (BW-12)	FEMA 2014a
FEMA	Individual Assistance (IA)	Requires a Presidential disaster declaration. Used to support temporary housing, repair or replacement of damaged homes, assistance with other related individual expenses beyond what is covered by loans and insurance.	FEMA 2016a
FEMA	National Flood Insurance Program (NFIP)	Federally backed insurance for structures and building contents	FEMA 2014b
HUD	Community Development Block Grant – Disaster Recovery (CDBG-DI)	Flexible support for long term recovery. Intended to be the last source of funding when other sources are exhausted.	HUD 2012
SBA	Small Business Administration Loans	Provides low-interest disaster loans to businesses of all sizes, private non-profit organizations, homeowners and renters.	SBA 2014
USDA	Farm Service Agency, US Department of Agriculture – Agricultural Act of 2014s	Provides assistance (compensation and loans) to farms and farmers for natural disaster losses.	FSA 2016

It is important to note that New York used CDBG-DR to support the “Recreate NY Buyout Program” focused on high-hazard zones.

Infrastructure Rebuilding

Damage to the infrastructure affects the recovery time, and researchers found that as damage increases, so does the necessary time for recovery (Eadie 2011; Haas, Kates and Bowden 1977; Mader, et al. 1980). Table 2 lists Federal programs that support infrastructure recovery.

Table 2 Federal Programs to Support Infrastructure Recovery

Agency	Program	Scope	Reference
FEMA/HUD and others	National Disaster Recovery Framework (NDRF)	Operational guidance for post-disaster recovery	(FEMA 2011)
US Congress	Disaster Relief Appropriations (2013) and Sandy Recovery Improvement Act	Funds appropriation	(Public Law 2013)
FEMA	Public Assistance (PA)	Requires a Presidential disaster declaration. Provides assistance to state and local governments for projects essential to community functioning.	FEMA 2016b
HUD	Community Development Block Grant – Disaster Recovery (CDBP-DR)	Flexible support for long-term recovery. Intended to be the last source of funding when other sources are exhausted.	HUD 2012

Literature Summary

To explore these themes within Sea Bright and Oakwood Beach, we developed an academic case study, which is a research technique that uses different kinds of evidence to develop an overall understanding of a topic (Berg and Lune 2012:325). Appendix A provides more details about the methods we used for this study. In the pages that follow, we provide an overview of the results from these data collection efforts. The topics we focus on are demographics, attachment to Sea Bright, damage, disruption, risk perception and the housing recovery process. For each topic, we provide three section 1) by the numbers 2) in your words, and 3) take away.

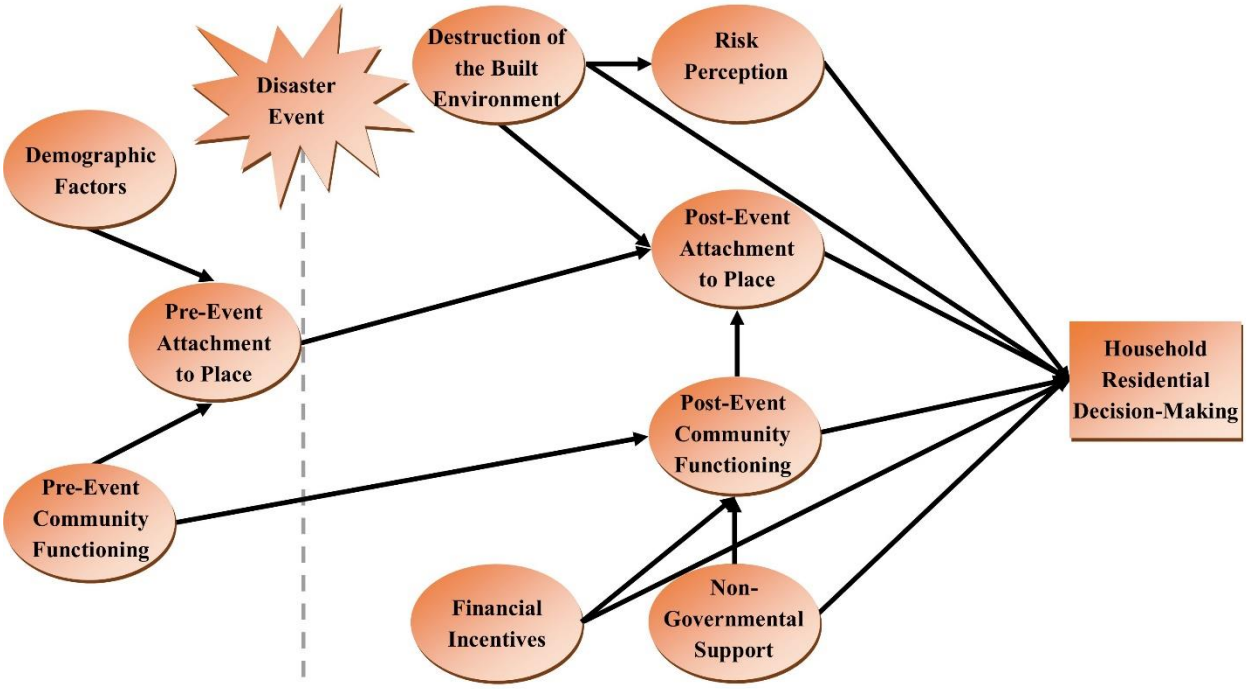

Figure 4 Conceptualization of the Post-Disaster Household Residential Decision-Making

SELECTION OF AND PROFILES OF THE CASE STUDIES

The case study sites were selected to be similar in respect to hazard exposure, but different in their approach to housing recovery from Sandy. Specifically, Oakwood Beach, NY and Sea Bright, NJ were selected. While Sea Bright and Oakwood Beach are small coastal communities, there are many of these communities. In New Jersey, there are 64 cities with populations less than 2,000, and many of these are coastal communities (http://www.city-data.com/city/New-Jersey3.html). These demographics are mirrored in other states, for example, Fenwick Island in Delaware, Buxton (Cape Hatteras) in North Carolina, and Point Lookout in New York.

Greer (2014) provides detailed profiles of the historical development, geography and demographics, hazard experience and exposure, and the impacts of Hurricane Sandy in both Oakwood Beach and Sea Bright. These profiles are summarized here.

Demographic Profiles

The demographic profiles of Oakwood Beach and Sea Bright based on data from the 2010 Census are shown in Table 3.

Table 3 Demographic Profiles of Oakwood Beach and Sea Bright Based on the 2010 Census

Community		Oakwood Beach, NY	Sea Bright, NY
Population		3,158	1,412
Average Household Size		3.08	1.82
Housing Units		1154	1,211
Occupancy Rate		90%	65%
Owner Occupied (of those Occupied)		76%	55%
Vacancy Rate		5%	35%
Households with Children under 18		38%	11%
Population Over 65		11%	15%
Median Household Income		$87,303	$78,688
Mean Household Income		$110,448	$130,449
Race	Population Identifying as White	92%	95%
	Population Identifying as non-Hispanic or Latino	91%	92%
Education - Bachelor's Degree or Higher		27%	52.4%

Oakwood Beach, NY

Oakwood Beach is a coastal community in the Staten Island Borough of New York City. Figure 2 shows the location of Oakwood Beach within Staten Island Borough. Oakwood Beach is approximately 1.025 square miles and averages five feet above sea level. The community of converted beach bungalows sits between a marsh with 12-foot tall reeds and a sewage treatment facility. These homes are primarily one-to-two-story, single-family dwellings, with approximately six feet separating one house from the next. There are some concentrated areas further north with sections of condominiums. Closer to the shore there are larger, newer, more traditional beachfront homes. Aside from the sewage treatment plant and Grace Bible Church, the area is entirely residential.

The neighborhood of Oakwood was founded in 1890 and grew as a tourist destination and beach community. Beginning during the Great Depression, many of the homes have been converted to year-round residences; tourism dropped in the 1950s as New Yorkers began to travel further. The sewage plant to the southeast of Oakwood was constructed in 1950. Rapid development from the 1960s

to the 1990s also had the secondary effect of removing a portion of the wetlands and much of the marsh that offered natural mitigation against storm surges (Knafo and Shapiro 2012).

Oakwood Beach has experienced flooding due to storm surge, coastal erosion due to storms, and power outages due to wind and flooding. Notably, a nor'easter in 1992, storms in 1994 and 1996, a nor'easter in 2010, and Tropical Storm Lee and Hurricane Irene in 2011 impacted the area. Mitigation measures in the form of berms, a levee and tidal gate have been built, damaged and repaired.

Hurricane Sandy made landfall approximately 120 miles south of Oakwood, resulting in 23 deaths on Staten Island (Barr 2013). According to HUD (2014), Hurricane Sandy damaged 909 structures, flooding 152 structures with one to four feet of water and an additional 228 with over four feet of water in Oakwood. Of those damaged, 733 owned their homes and 176 rented. Approximately 57% of the homeowners in that area carried a homeowner's insurance policy. Many of those impacted were permanent residents; the storm damaged 79% of the non-seasonal housing stock. According to ACE (2013), Sandy was a 300-year storm for Oakwood Beach.

As a part of the recovery effort, HUD provided $1.71 billion for New York State through Community Development Block Grant Disaster Recover (CDBG-DR) Program on April 26, 2013. The state created the State of New York Action Plan for Community Development Block Grant Program – Disaster Recovery (Action Plan) in response to repeat losses resulting from Tropical Storm Lee, Hurricane Irene and Hurricane Sandy (Cuomo and Towns 2013). The state set aside $400 million of this money to assist with buying high-risk properties, categorized by FEMA as Special Flood Hazard Areas (SFHA), as an effort to prevent future losses (Ferris, Petz, and Stark 2013). SFHA properties include houses that are in the highest-risk areas (called the V-Zones on flood maps) with greater than 50% of the value of the structure damaged (State of New York 2014).
If they agree to participate, the homeowners receive full, pre-storm value for their home and may be eligible for a number of incentives, discussed further in the policy chapter. The prospect of buying property in Oakwood is appealing to the state for a few reasons. This allows the state to expand the Staten Island Bluebelt, a natural drainage corridor, and opens up green space for the community and wildlife to enjoy (New York City 2014). This drainage corridor acts as a natural marshland that reduces flooding risk for the surrounding area (New York Rising 2013).

Sea Bright, NJ

Sea Bright began to develop in 1865 when the Long Branch and Seashore Railroad line provided access to the area. Despite storm damage due to the flattening of the natural dunes to support development, the town continued to rely on tourism to support its economy until the 1940s (Moskowitz 1989). The construction of the Garden State Parkway in 1947 reduced the travel time from New York City to approximately an hour, effectively reinvigorating tourism in the area. This development made Sea Bright increasing accessible for tourism and made the site more appealing for a seasonal home.

Geographically, Sea Bright is a barrier spit, constrained by the Shrewsbury River on west, the Atlantic Ocean on the east, Sandy Hook to the north, and Monmouth Beach to the south. The area is small, with an average width of less than half a mile, a total of four miles in length, approximately 0.64 square miles of land, and averages only four feet above sea level (Sea Bright 2016a). A sea wall, constructed of rocks and concrete averaging 12 feet high, was built in 1947 for $703,000 (funded by the state, county, and town) on the abandoned Long Branch and Seashore Railroad line. This wall separates the town from the beach and the ocean, and parallels Ocean Avenue (Route 36), the main thoroughfare through the town. The sea wall breaks in the downtown area and provides public access to the beach. Figure 1 shows the location of Sea Bright within the state of New Jersey.

A majority of the land on the peninsula is developed on the west side of Ocean Avenue, and ordinances in place before Hurricane Sandy did not allow residential construction over 38 feet high,

limiting houses to three stories or less (Sea Bright 2016b). The southern end of the island begins as detached, single-family homes and blends to multi-family condominiums north along Ocean Avenue. The downtown is a mix of densely populated urban housing on the western side of Ocean Avenue, with a fusion of businesses and municipal buildings on the eastern side of the road. The northern end of the island is primarily detached, single-family homes.

Within the town, the main industry is tourism, which drives the restaurant and beach club businesses. This is a "bedroom community", with only approximately 30 residents of Sea Bright working in town and approximately 450 traveling into Sea Bright for work, while the other working residents commute (typically more than 15 minutes) outside of the town for work.

Sea Bright's experience with damage due to storms goes back to the 1880s. The construction of the sea wall in 1947 has only provided limited protection and a 1992 nor'easter reshaped the coastline and broke the sea wall in two spots. In addition to repairing the sea wall, mitigation actions include planting dune grass beginning in 1997 and beach replenishment in 2001 and 2013. More recent storms impacting Sea Bright include Hurricane Ida in 2009 and Hurricane Irene in 2011.

Hurricane Sandy made landfall approximately 87 miles South of Sea Bright, bringing with it a 13-foot-high storm surge and 100 mph winds to the town. The storm inflicted a tremendous amount of damage to the area, with storm-related damage estimates reaching approximately $391 million (Spahr 2012). According to HUD (2014) Hurricane Sandy damaged 720 structures, flooding 376 structures with one-to-four feet of water and an additional 215 with over four feet of water in Sea Bright. Of the homes damaged, 360 were owner-occupied and 360 were rental properties. Of those that owned their homes, 25% did not have homeower's insurance. Many of those affected were permanent residents; the storm damaged 76% of the non-seasonal housing stock. Six feet of sand and debris piled on to Ocean Avenue in the wake of the hurricane. The storm lifted Driftwood Beach Club, built on the seaward side of the wall and assessed at $10.8 million prior to Sandy, off its foundation, and totaled the building (Spoto and Renshaw 2013). All of the businesses temporarily shut down following the storm, and three quarters of the homes were uninhabitable (Brady 2013).

INFRATRUCTURE DAMAGE AND INVESTMENT IN RECOVERY

Infrastructure Damage – Oakwood Beach

Transportation infrastructure damage in Oakwood Beach is consistent with damage throughout New York City (plaNYC 2013, Chapter 10) and the East and South Shores of Staten Island (plaNYC 2013, Chapter 15). The impacts of Hurricane Sandy were felt before landfall as MTA and NYC shutdown transit, and major tunnels and bridges linking the boroughs of New York. Across New York City, 60 lane miles of roads experienced major damage, 500 lane miles of roads experienced minor damage, and signals at nearly 700 intersections were damaged.

On the East and South Shores of Staten Island, major transportation infrastructure provides important links to neighboring boroughs and New Jersey. These include:

- Bridges – Outerbridge Crossing (Port Authority of New York and New Jersey), Goethals Bridge (Port Authority of New York and New Jersey), Bayonne Bridge (Port Authority of New York and New Jersey), Verrazano Narrows Bridge (MTA) – all bridges were closed prior to the event and one day after.
- Hylan Boulevard – an important link along the coast carrying 44,000 vehicles per day and 32,000 bus riders. Many sections are prone to flooding.
- Staten Island Rail (SIR) – an MTA commuter line providing access to the ferry to Manhattan. Several stations on the line are subject to flooding. The line was out of service until November 3, 2012. Sandy severely damaged the St. George terminal, destroying cabling, signals and communications, causing damage to the Clinton mechanical shop. Track work damage also occurred and a tie replacement program undertaken.
- Staten Island Ferry – the ferry was out of service for five days.
- Father Capodanno Boulevard – this road at the northern end of the eastern shore, paralleling the coast, was not damaged but was overtopped. As an elevated structure above the level of the surrounding community, this prevented floodwater from draining.

This damage was disruptive for the residents of Oakwood Beach. The response to the damage impacting Staten Island residents was much the same as for much of New York:

- reconstruct and resurface key streets,
- elevate traffic signals and provide backup power,
- protect ferry terminals, and
- plan for emergency service in case of subway suspension.

Added to the list is the relocation of SIR stations.

Infrastructure Damage – Sea Bright

Damage to transportation infrastructure and the DOT response is documented in a case study (Baglan 2014). New Jersey experience $2.9B in damage to roads, bridges and transit. The DOT's role in response and short-term recovery included moving 116,000 people under mandatory evacuation, moving up to four feet of sand on many roadways, repairing some form of damage on every rail line, and addressing fuel shortages and communication failures. Actions included debris removal, road closures and repair. In the longer term, actions included:

- clearing and reconstruction,
- response to emerging sink holes,
- restoration of signage, and
- more permanent repairs.

The response was complicated by a November 7, 2012 snowstorm and nor'easter, as well as the return of residents. One of the success stories was the use of storm kites to document evidence for FEMA reimbursement. In addition to the activities that directly responded to damage and restoring service, $2.3 billion in resiliency projects were identified.

Access to Sea Bright is via Route 36 from the south, the Highlands Bridge to the north, and the Rumson Bridge to the west. Bus routes use Route 36 and the nearest rail is in Red Bank.

More specific details of the damage to transportation infrastructure in Sea Bright are provided in the Strategic Recovery Planning Report (Kutner, 2014). Sea Bright filed for $6 million in Public Assistance to address damage to utilities, public buildings, roads, bridges, bulkheads, sea walls and parks. The removal of four-to-six feet of sand and debris (approximately 53,000 cubic yards of sand) was critical to providing access.

The Highlands Bridge, maintained by NJDOT, sustained no damage, but the Runson Bridge experienced scour and damage to the bearing. The damage to the seawall and bulkheads along the Shrewsbury River are important as this infrastructure serves to protect the roads.

Long-term recovery includes risk assessments (including possible impacts of sea level rise), participation in "Getting to Resilience", the County's Hazard Mitigation Plan and Master Plan.

Investment in Recovery

The magnitude of investment in infrastructure recovery for Oakwood Beach and Sea Bright are not readily available. However, data available for the state of New York and New Jersey can be assembled for the programs listed in Table 4 and shown in Figure 5. Apart from the NFIP, the relative investment in each state is fairly consistent across all programs.

Table 4 Investment in Recovery in New York and New Jersey

Program	New York		New Jersey	
	Amount ($M)	Source	Amount ($M)	Source
IA	$1,000	FEMA 2013d	$422.48	FEMA 2013c
PA	$2,100	FEMA 2013b	$926.00	FEMA 2013c
SBA Loans	$1,500	FEMA 2013b	$828.50	FEMA 2013a
NFIP	$3,700	FEMA 2013b	$3,599	FEMA 2013a
HMGP	$500	New York 2013b	$290	FEMA 2013a
CDBG-DR	$5,570	New York 2013a	$1,830	Christie, Guadagno, and Constable II 2013
New York State Homeownership Repair and Rebuilding Fund and the Empire State Relief Fund	$29	New York 2013a		

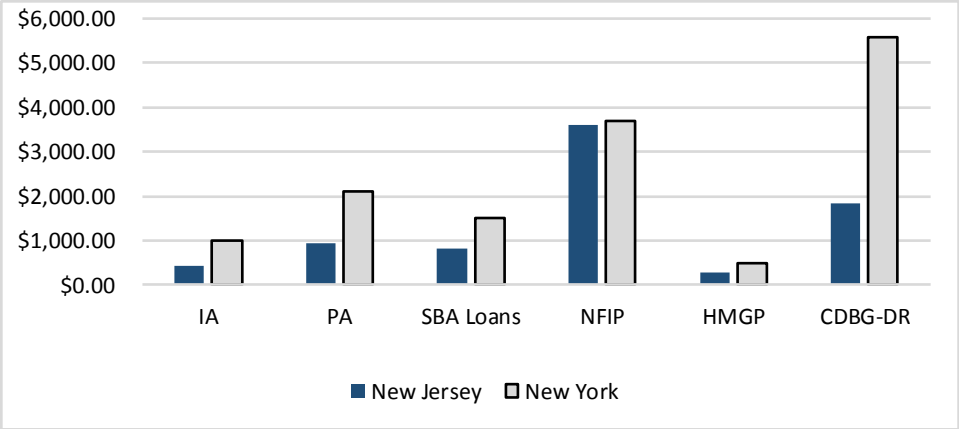

Figure 5 Federal Investment in Recovery in New York and New Jersey

SURVEY AND INTERVIEW DATA

Complete survey and interview results are presented in Greer (2015). Greer also provides additional analysis focused on housing recovery. Summaries of the survey data were also developed for the communities of Sea Bright and Oakwood Beach. All survey respondents who requested the summary data were sent the relevant summary. These summaries, "Household Residential Decision-making in the Wake of Disaster: Report of Results Prepared for Oakwood Beach Residents" and "Household Residential Decision-making in the Wake of Disaster: Report of Results Prepared for Sea Bright Residents", are Disaster Research Center Miscellaneous Report No. 76 and Disaster Research Center Miscellaneous Report No. 77, respectively, and can be accessed at: http://udspace.udel.edu/handle/19716/17210 and http://udspace.udel.edu/handle/19716/17211 (McNeil et al 2015a, McNeil et al 2015b).

This section reports on key data from the survey. Relevant supporting data are included in Appendix B.

Community Profile: Demographics

Table 5 shows the response rates and demographic information for the respondents. More details on the profile of the respondents are presented in Appendix B.1. The demographic characteristics of respondents are fairly consistent with the community profile.

Table 5 Community Profiles Based on Survey Responses

Community	Oakwood Beach, NY	Sea Bright, NJ
Number of Households	1154	1211
Number of Responses	54	303
Average Age	54	60
At Least 1 Dependent	65%	56%
Household Income Pre-Sandy	46% > $79,999	58% > $79,999
Household Income Post-Sandy	48% > $79,999	56% > $79,999
Gender	59% Female	46% Female
Race	93% White	93% White
Education	45% At Least Bachelor's Degree	68% At Least Bachelor's Degree

Community Profile: Residences

Responses related to home ownership, use of the property, and type of home are included in Appendix B.2. Key observations are:

- In both communities, approximately 90% of respondents owned their home.
- In Oakwood Beach, 98% of respondents used the property as their primary residence. In Sea Bright almost a third of the respondents used the property as a second home and almost 10% described the property as a rental property.
- The profile of type of property differed significantly between the two communities as shown in Figure 5 and Figure 6. The majority of property in Oakwood Beach are single family homes. The majority of properties in Sea Bright are condos or townhouses.
- In each community, the median number of years the respondent has lived in the community is 13 years.

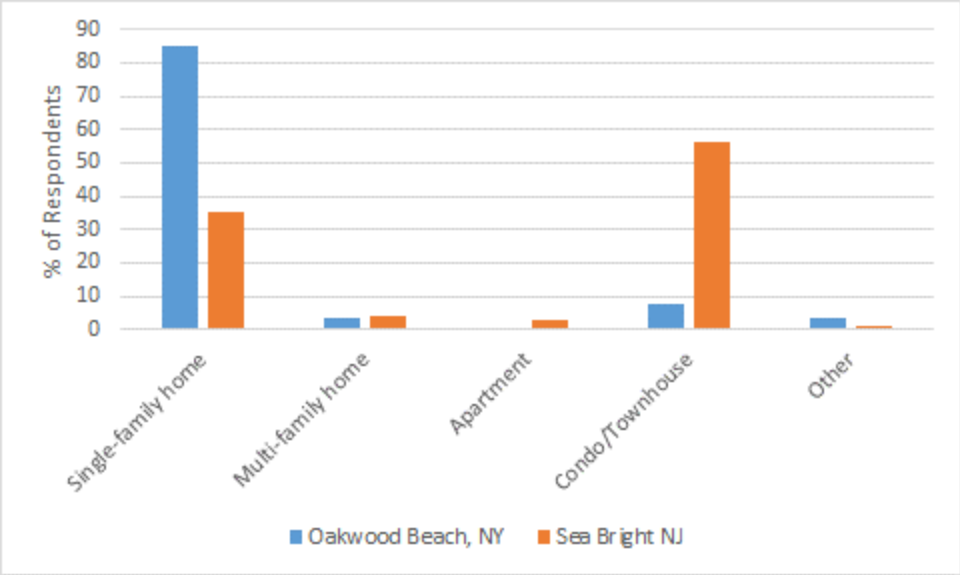

Figure 6 Percentage of Respondents in Each Community by Type of Property

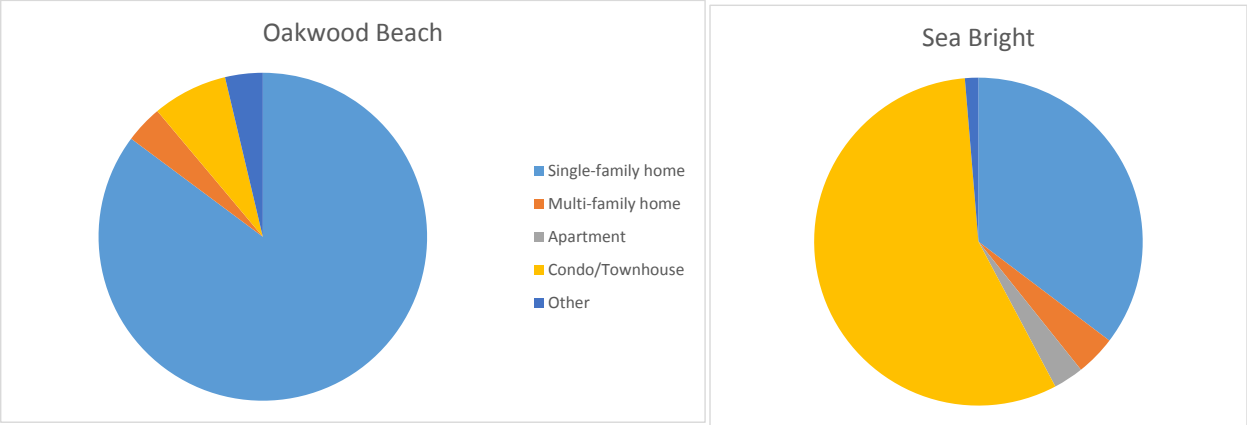

Figure 7 Types of Properties by Community

Place Identity and Attachment to Place

Appendix B.3 documents the response to questions about the identity of the communities and attachment to place. We developed a variable "Attachment" to aggregate this data (Greer, 2014). As shown in Figure 8, residents in Sea Bright more strongly identified with their community and felt more attached to their community than residents of Oakwood Beach.

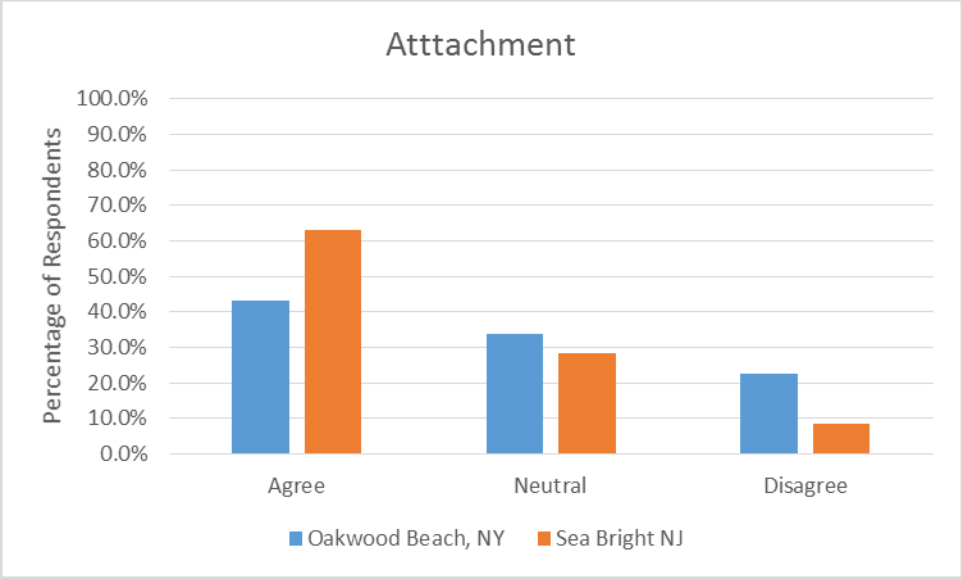

Figure 8 Respondents' Attachment

Damage and Insurance Coverage

The survey respondents reported data on the estimated damage to their home in dollars, whether or not they had flood insurance, and a qualitative assessment of the extent of damage to their home and their community. The results are shown in B.4. Damage and Insurance Coverage

Table 14 Responses to Questions Related to Damage and Insurance Coverage

B.4 (Table 14).

The mean cost of damage reported by survey respondents was approximately $67,000 in Oakwood Beach and $93,000 is Sea Bright. Approximately 75% of respondents had flood insurance. Flood insurance covered an average amount of $35,500 in Oakwood Beach and $52,700 in Sea Bright. Respondents in Oakwood Beach indicated more extensive damage to their homes but slightly less extensive damage to their community than Sea Bright as shown in **Error! Reference source not found.**. Nevertheless, both communities reported extensive damage to their community.

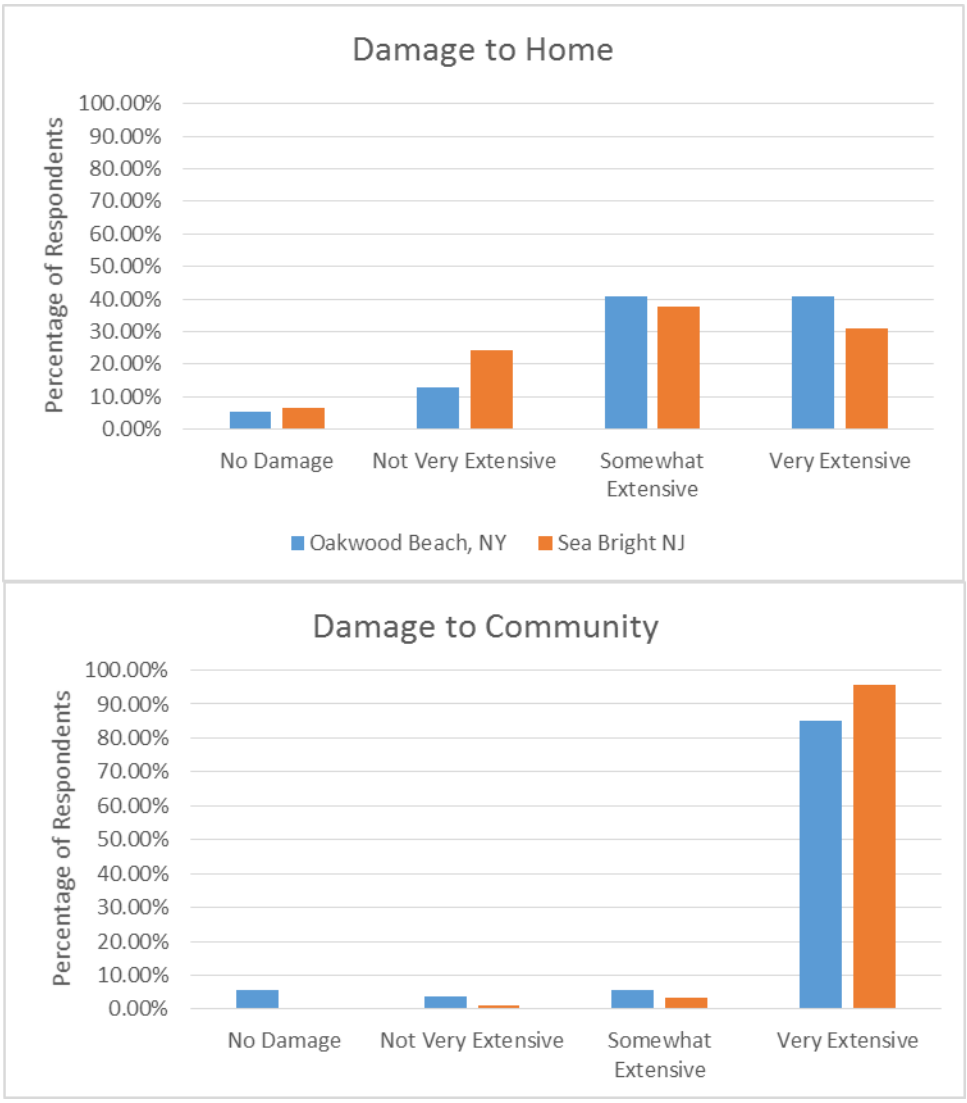

Figure 9 Qualitative Perceptions of Damage to Respondents' Homes and the Community

Travel Disruption

Appendix B.5 (Table 15) document respondents experience with travel disruption following Hurricane Sandy. Approximately 75% of respondents in Oakwood Beach and 85% of respondents in Sea Bright experienced disruptions to travel within the community due to Hurricane Sandy. The distribution of how long these disruptions lasted is shown in Figure 10. Disruptions in Sea Bright were longer than Oakwood Beach.

More respondents from Oakwood Beach (60%) experienced disruption to travel outside Oakwood Beach than Sea Bright respondents (42%) experienced disruption to travel outside Sea Bright. However, Sea Bright residents experience longer disruptions as shown in Figure 10.

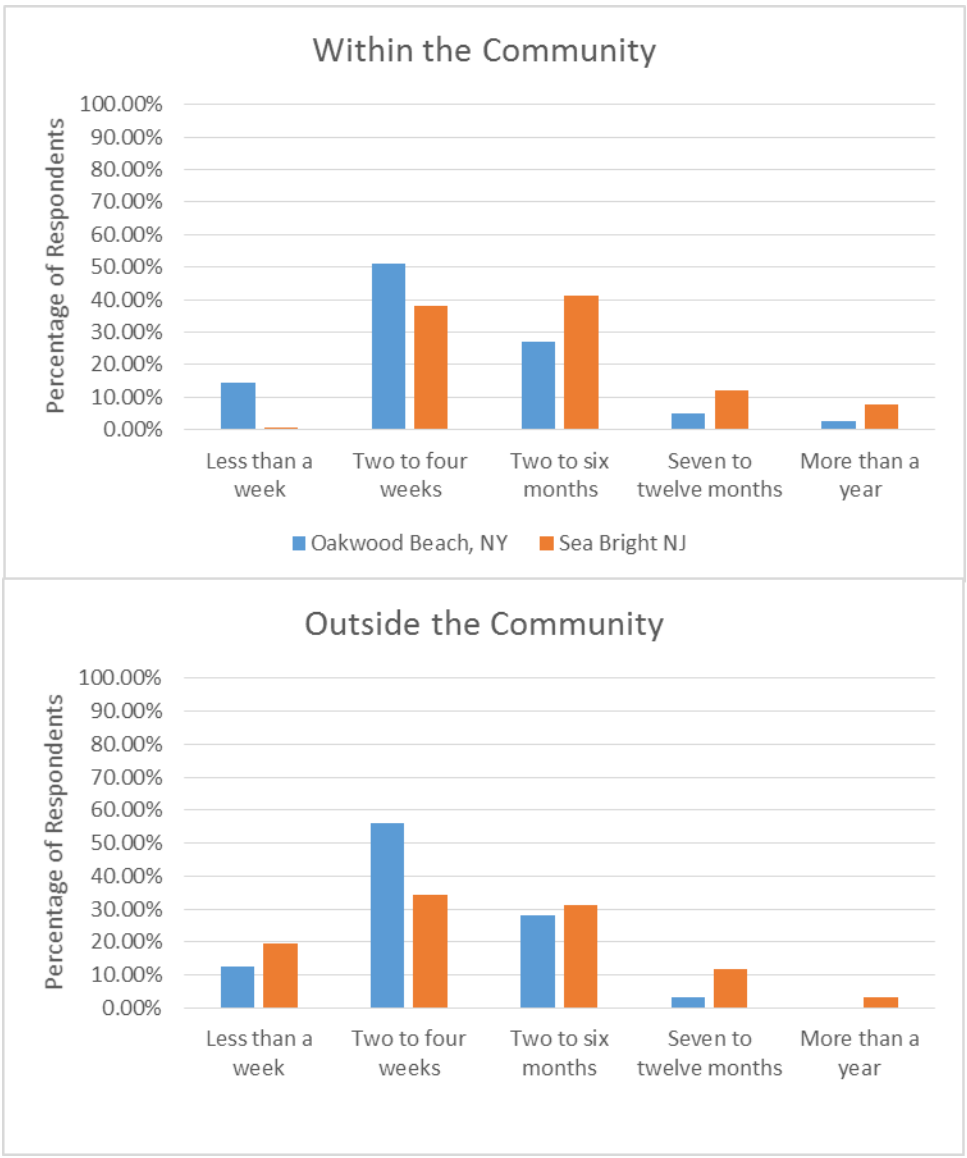

Figure 10 Distribution of the Duration of Disruptions Within and Outside the Communities

Residential Status

We asked respondents if they still lived in the same community and if they still lived at the same address. The responses are summarized in Appendix B.6 (Table 16) and Figure 11. The majority of respondents still live in the same community. Not surprisingly, the number is significantly higher for Sea Bright (86.5%) compared with Oakwood Beach (57.4%). Of those that still live in Oakwood Beach, 100% still live at the same address, whereas in Sea Bright, approximately 96% live at the same address. In each community, around half (50% in Oakwood Beach and 57% in Sea Bright) of the respondents plan to live at their current residence more than five years.

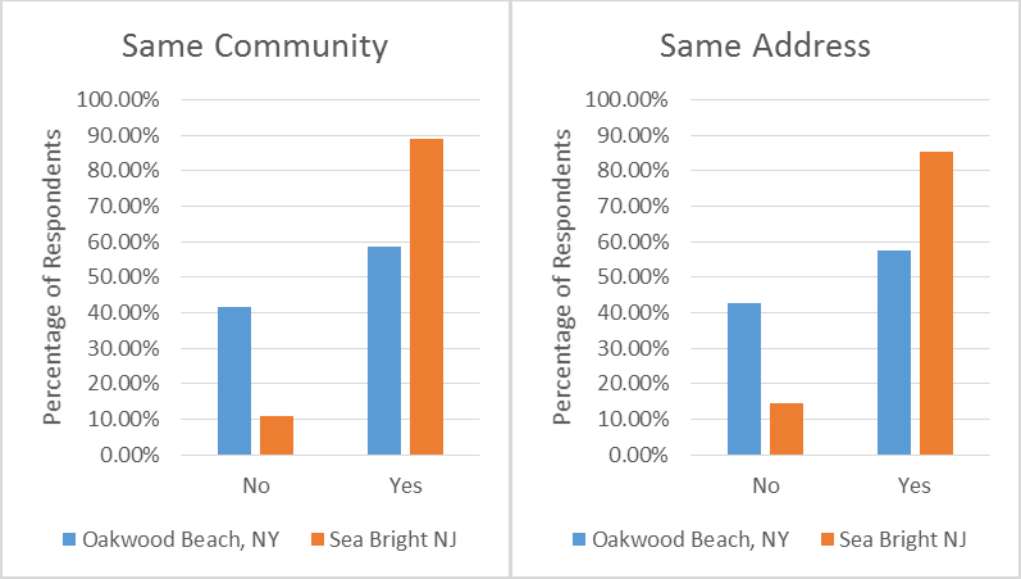

Figure 11 Residential Status

Buyout Decisions

The survey responses for questions related to property buyouts are included in Appendix B.7 (Table 17 and Table 18.)

As a part of the recovery effort, Housing and Urban Development provided $1.71 billion for New York State through Community Development Block Grant Disaster Recover (CDBG-DR) Program for residential buyouts in high risk areas. If they agree to participate, the homeowners receive full, pre-storm value for their home and may be eligible for a number of incentives. Buyouts were offered to residents in a defined area of Oakwood Beach. In Oakwood Beach, 63% of the respondents were offered a buyout. Almost 90% accepted the buyout.

Buyouts were not an option for residents in Sea Bright. However, we did ask respondents about the importance of several factors (listed in Table 6) in the decision of where to live after Hurricane Sandy. We grouped these factors as risk-related factors, household preference, household community interactions, institutional and organizational, and trust related factors. The results for both communities are shown in Figure 12 through Figure 16.

In summary, the factors that differed between the two communities are:

- Residents of Oakwood Beach were more influence by the likelihood of another hurricane and concerns over sea level rise than residents of Sea Bright.
- Residents of Oakwood Beach place more importance on being close to family, being close to employment opportunities, and going into debt than residents of Sea Bright.
- Residents of Sea Bridge place more importance on being close to the beach than residents of Oakwood Beach.
- Residents of Oakwood Beach place more importance on affordable housing than residents of Sea Bright.
- Residents of Sea Bright place more importance on their ability to travel easily within the community than residents of Oakwood Beach.
- Residents of Oakwood Beach place more importance on changes to where homes can be built, insurance rates, building codes and incentives to rebuild in a new location than residents of Sea Bright.

- Residents of Sea Bridge value help from other organizations more than residents of Oakwood Beach.
- Residents of Oakwood Beach indicated that they highly value the trustworthiness of organizations administering the buyout.

Table 6 Factors Affecting Residential Location Decisions

Factor	**Group**
The likelihood of a hurricane	Risk-related
Concerns over sea level rise	Risk-related
Being close to family	Household preference
Being close to friends	Household preference
Being close to employment opportunities	Household preference
Being close to the beach	Household preference
Access to affordable housing	Household interaction with community
Family history in the area	Household
Opinions of neighbors	Household interaction with community
Concerns about going into debt	Household
Changes in where homes can be built	Institutional and organizational
Changes in insurance rates	Institutional and organizational
Changes to the building code	Institutional and organizational
Ability to travel easily within [Oakwood Beach/Sea Bright]	Household interaction with community
Ability to travel easily outside of [Oakwood Beach/Sea Bright]	Household interaction with community
Financial incentives to rebuild your home in the same community from the government (aid programs)	Institutional and organizational
Financial incentives to build your home in a new location from the government (aid programs)	Institutional and organizational
Help from other organizations (such as a local church or civic group)	Institutional and organizational
Trustworthiness of organizations running the buyout program	Trust
Trustworthiness of community leaders	Trust

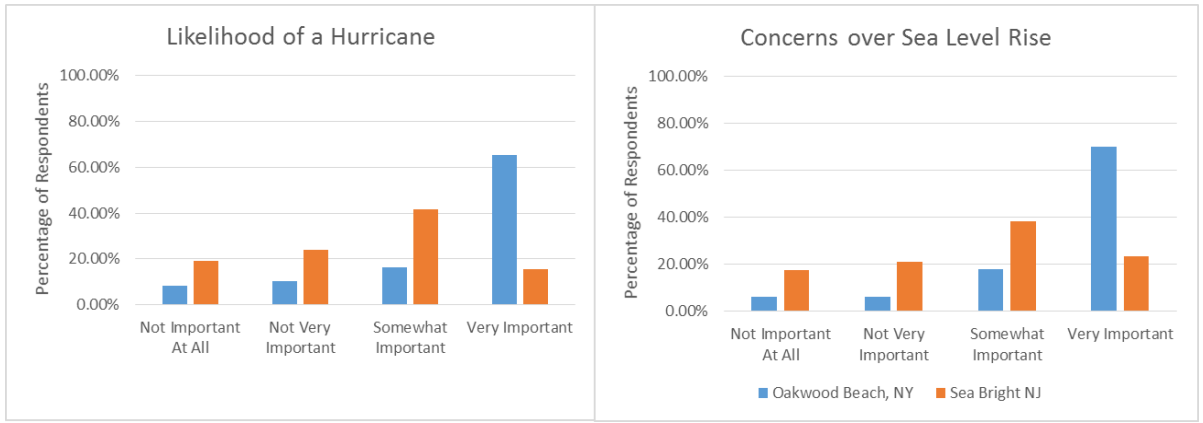

Figure 12 Risk-Related Factors Impacting Residential Location

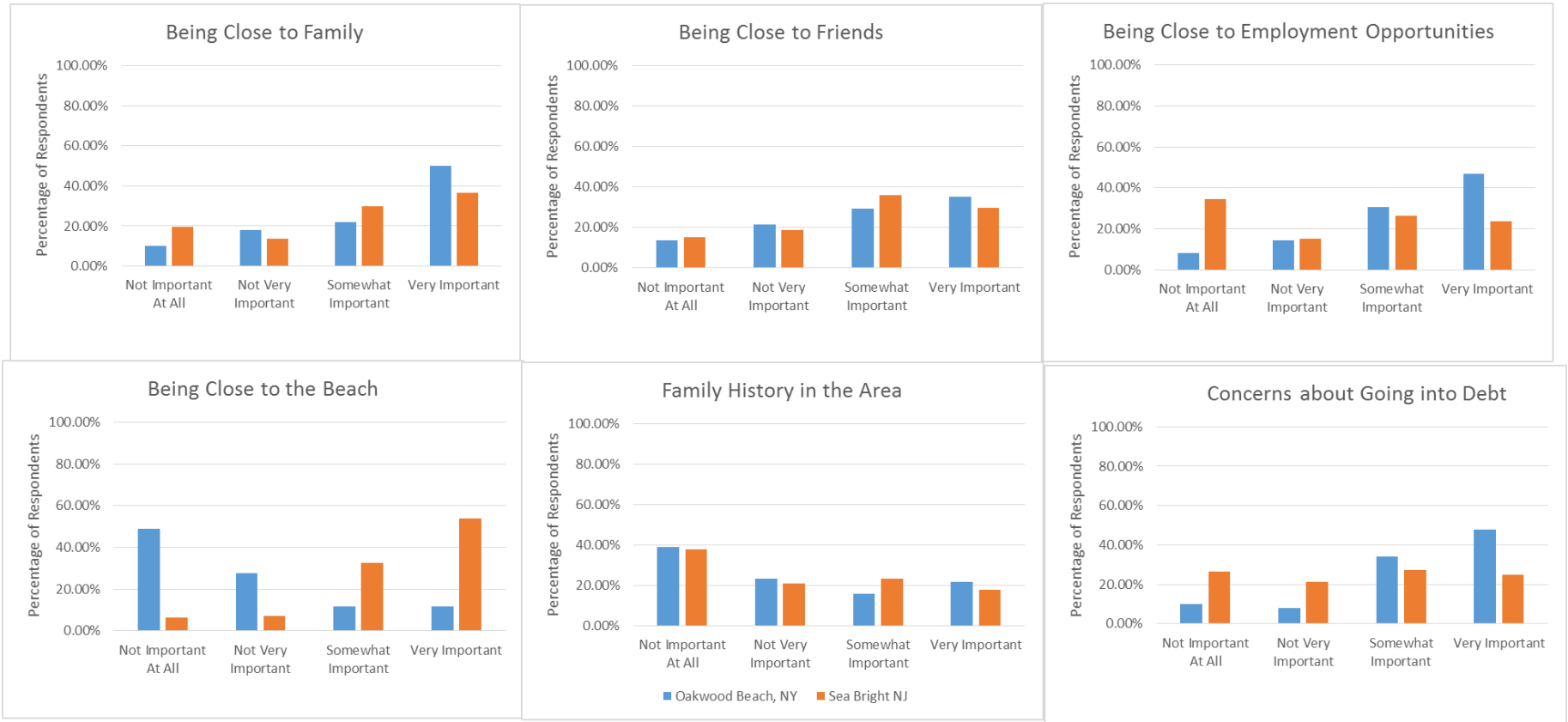

Figure 13 Household Factors Impacting Residential Location

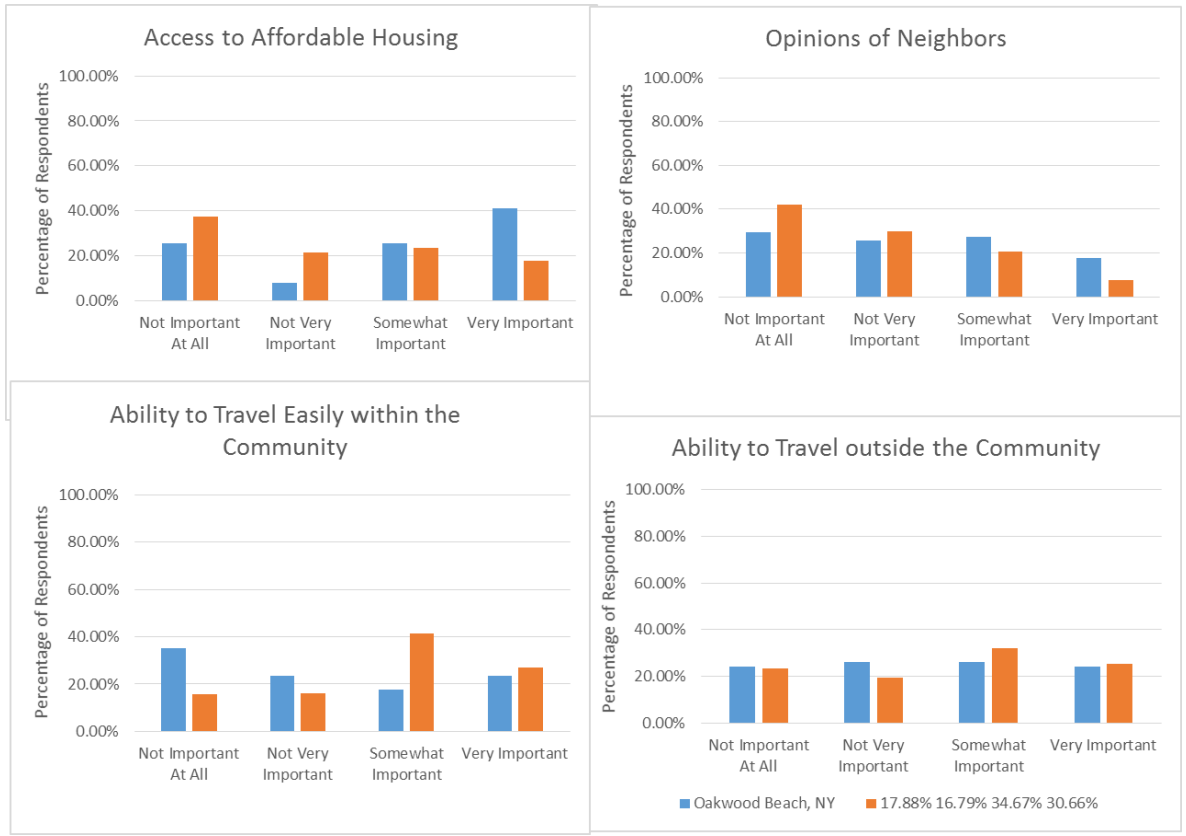

Figure 14 Household Community Interaction Factors Impacting Residential Location

Figure 15 Institutional and Organizational Factors Impacting Residential Location

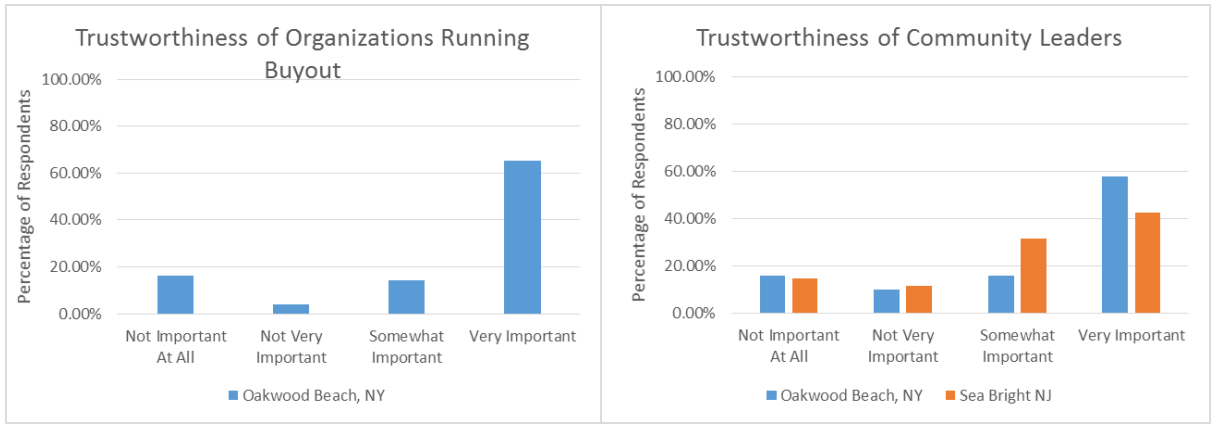

Figure 16 Trust Factors Impacting Residential Location

Risk Perception

To better understand the respondents' perception of risk, we asked them about the chances of a similar event hitting their community and the potential impacts of an event like Sandy in the next 10 years. The results are shown in Figure 17 and Figure 18. Details are included in Appendix B.7. (Table 19 and Table 20). The figures suggest that residents of Oakwood Beach perceive a high risk and a higher likelihood of impact of a similar event than do residents of Sea Bright.

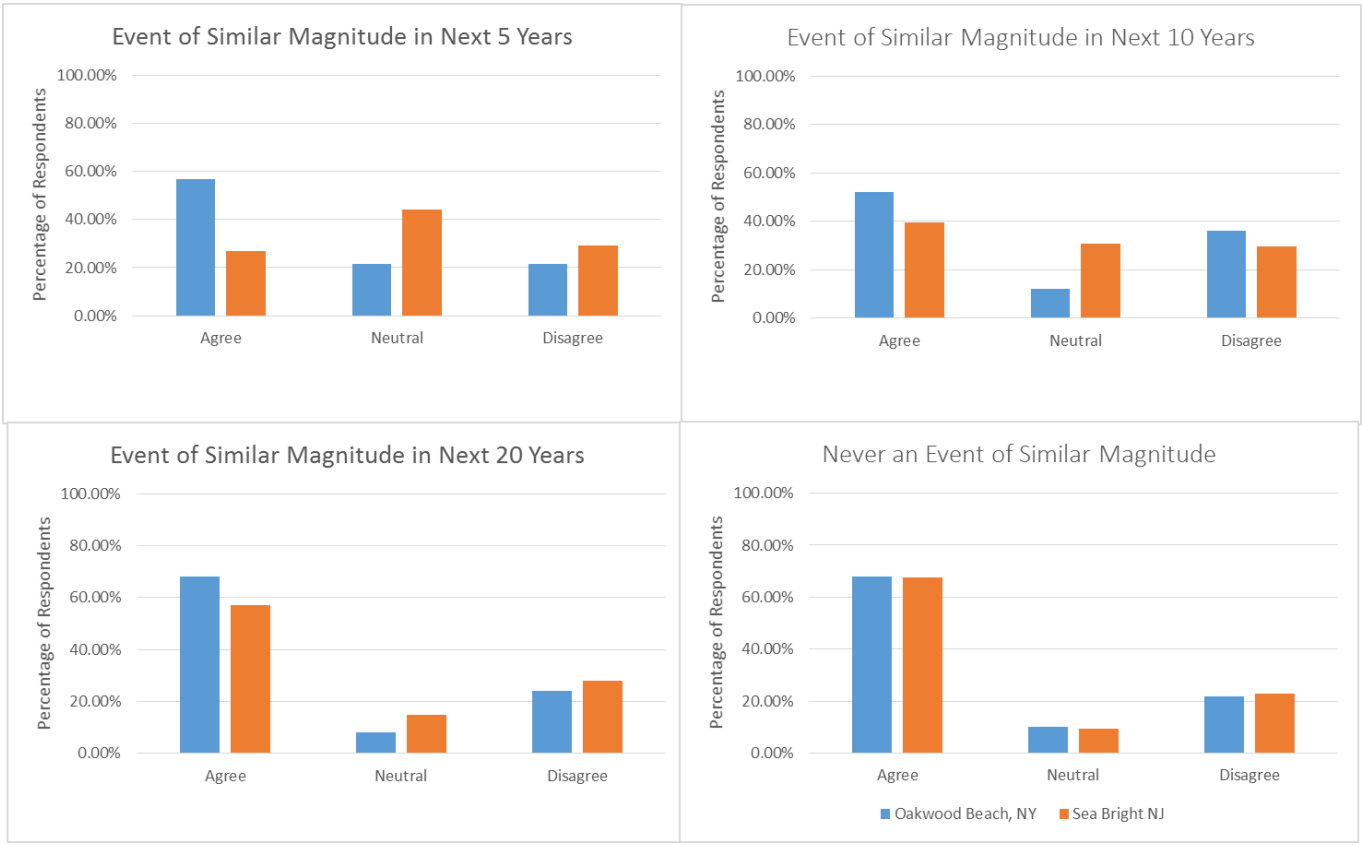

Figure 17 Risk perception – risk of recurrence (the chances of a future event like Hurricane Sandy affecting Oakwood Beach/Sea Bright)

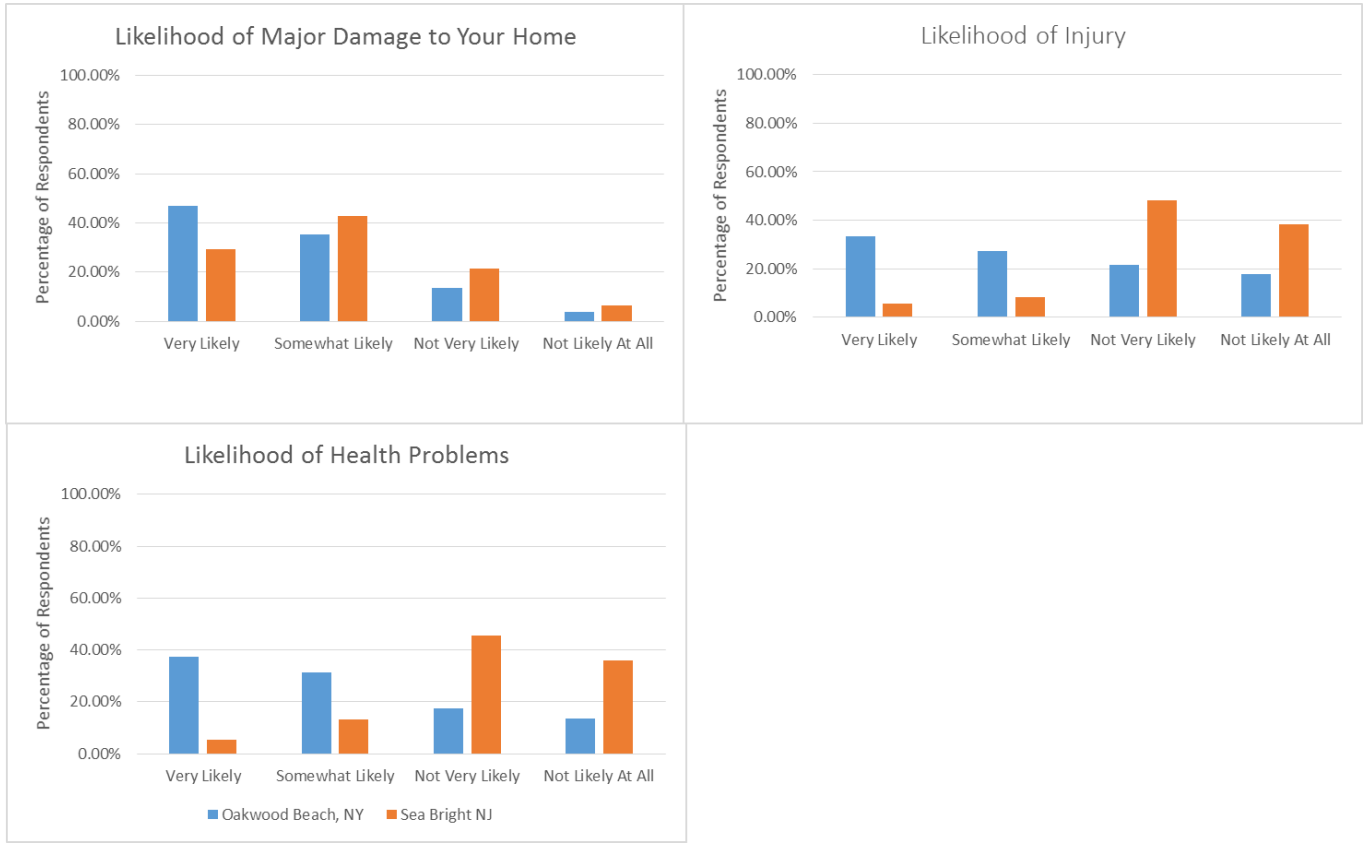

Figure 18 Potential impacts (of an event like Hurricane Sandy within the next 10 years)

Interview Findings

As documented in Appendix A.1, interviews with residents were conducted using the format and questions shown in Appendix A.7 and Appendix A.8. Eighteen interviews were conducted, including 15 from Sea Bright and three from Oakwood Beach. The interviewees from Sea Bright reflected a range of experiences as summarized in Table 7.

Table 7 Residential Status of Interviewees in Sea Bright

Interviewee	*Do you still live in the same community as you did at the time of Hurricane Sandy?*	*Do you still live at the same address as you did at the time of Hurricane Sandy?*	*How long do you plan to live at your current residence?*
S0032	Yes	Yes	Less than one year
S0044	Yes	No	One to five years
S0173	No	No	Less than one year
S0202	Yes	Yes	One to five years
S0387	Yes	Yes	More than five years
S0412*	Yes	No	One to five years
S0413*	Yes	Yes	One to five years
S0617	Yes	Yes	More than five years
S0691	Yes	Yes	More than five years
S0716	Yes	Yes	More than five years
S0832	Yes	Yes	More than five years
S0911	No	No	One to five years
S0932	Yes	Yes	Less than one year
S1051	Yes	Yes	Less than one year
S1254	No	No	More than five years

*S0412 and S0413 were the same interviewee that owned two properties in Sea Bright

All the interviewees indicated that Hurricane Sandy disrupted travel within Sea Bright, and only five stated that travel was not disrupted outside of Sea Bright. Three interviewees indicated that Hurricane Sandy disrupted travel within Sea Bright for seven to twelve months or longer, and four indicated that Hurricane Sandy disrupted travel outside of Sea Bright for two to six months or longer.
Two of the residents noted travel disruption within Oakwood Beach due to Hurricane Sandy, but both noted that it lasted less than a month. Only one resident noted disruption to travel outside of Oakwood Beach, but noted that it lasted less than a week.

Residential Decisions and Disruption

To better understand the relationships between residential decisions and disruption.

Quantitative analysis – damage and disruption

As detailed in the case study descriptions, Hurricane Sandy caused extensive damage to both communities. The questionnaire asked residents to detail damage to their home, their community, and travel disruption resulting from Hurricane Sandy. Table 14 (Figure 9) and Table 15 (Figure 10) detail the damage and disruption reported for each study site.
The average damage to their home reported by residents of Oakwood Beach was $66,744.38 and $92,639.53 for residents of Sea Bright. Flood insurance coverage was almost identical for both sites, but the average payout by flood insurance varied dramatically. In Oakwood Beach, 76% of respondents

indicated that they carried an active flood insurance plan, and the average payout was approximately $35,507.76. In Sea Bright, 72% of respondents indicated that they carried an active flood insurance plan, but the average payout, at $52,742.00, was much higher than Oakwood Beach.

A majority of respondents in both communities felt that damage to both their homes and their communities was extensive. When asked how they would assess damage to their own homes, 41% of Oakwood Beach residents said their damage was “very extensive”, compared to 31% of Sea Bright residents. Interestingly, 83% of Oakwood Beach residents rated damage to their community as very extensive, compared to 91% of Sea Bright residents. On the other end, only 19% of Oakwood Beach residents reported “not very extensive” to “no damage” to their homes, compared to 31% of Sea Bright residents. Again, the findings flip when discussing damage to their community, where 9% of Oakwood residents reported “not very extensive” to “no damage”, compared to only 1% of Sea Bright residents.

When asked about travel disruption within Sea Bright, 86% of respondents indicated that Hurricane Sandy did disrupt their travel, and 17% suggested that this disruption lasted seven or more months. In Oakwood Beach, 76% of respondents stated that Hurricane Sandy disrupted their travel within Oakwood Beach, while only 6% suggested that this disruption lasted seven or more months. On average, respondents indicated that Hurricane Sandy disrupted travel within their community for two to four weeks at both sites.

Respondents indicated that traveling outside of their community, while it presented its own issues, was not as much of a problem, and not for as long as travel within the community. Only 41% of Oakwood Beach residents indicated that travel outside of their community was an issue, compared to 54% of Sea Bright residents. The length of outside travel disruption was also shorter, in general, than travel within the communities. While the average for each site was the same as the internal travel disruptions, only 2% of Oakwood Beach residents indicated the travel disruption outside of their community lasted seven or more months, compared to 6% of Sea Bright residents.

As part of a panel of questions designed to gain insights on the residential decision-making process, residents were also asked how important they felt their ability to easily travel within their community was in their post-Hurricane Sandy residential decision-making process. Respondents from Sea Bright, on average, suggested that their ability to travel within their community was more important in their decision-making process than Oakwood Beach respondents. Only 39% of Oakwood Beach respondents indicated that the ability to travel within Oakwood Beach was somewhat-to-very important in their decision-making process, compared to 62% of Sea Bright respondents. When considering travel outside their community, 46% of Oakwood Beach respondents indicated that the ability to travel outside of Oakwood Beach was somewhat-to-very important in their decision-making process, compared to 59% of Sea Bright respondents.

When exploring the role of damage in the residential decision-making process, a few trends emerge, as shown in Table 8. For the sample from Sea Bright, the extent to which Hurricane Sandy damaged their home was significantly related to whether they lived in the same community or at the same address. In both cases, the Phi score indicated that this was a moderate relationship. Analysis of crosstabs indicates, as expected, that respondents with extensive damage were more likely to move than respondents with less than extensive damage were. Perception of damage to either home or community did not significantly relate to the dependent variables in the Oakwood Beach sample.

Table 8 Bivariate Analysis of Damage to Home

24. How extensive was the damage to your home due to Hurricane Sandy? (No damage (1) to Very Extensive (4))

	Significant Relationship (P-value)	Relative Strength (1)	Proportional Reduction of Error (PRE) Percentage (2)
Same Community (0,1)			
Oakwood Beach	- (3)	-	-
Sea Bright	0.00	Moderate***	Tau (3.1%)***
Same Address (0,1)			
Oakwood Beach	-	-	-
Sea Bright	0.00	Moderate***	Tau (3.4%)***

* p≤0.05. ** p<0.01, *** p<0.001

(1) Relative strength based on Phi or Cramer's V score.

(2) PRE test chosen based on type of variables tested.

(3) Missing values indicates the relationship was not significant.

The existence of disruption both within and outside of each community returned mixed results. The perceived existence of disruption within the community was only significantly related to respondents "Committed" for the Oakwood Beach sample. The phi value indicates that the relationship strength is moderate and, since it is a 2x2 table, gives a negative directionality, suggesting that individuals that relocated were more likely to note the presence of disruption than individuals that rebuilt *in situ*. The perceived existence of disruption outside the community was significantly related to Same Address and Reside Plan for the sample from Sea Bright, with the phi scores indicating a weak and moderate association, respectively. It is interesting to note, however, that the phi score for Same Address was positive, indicating that individuals that perceived disruption outside their community were more likely to have rebuilt.

When considering the perceived length of time Hurricane Sandy disrupted travel both within a community, there was a significant relationship for both Same Community and Same Address for the sample from Sea Bright, with the phi score indicating a moderate relationship for both variables. Table 9 displays the results of this test. Knowing the rank score for the perceived length of disruption outside Sea Bright gives a 10% better chance of correctly predicting whether a respondent from Sea Bright still lives in Sea Bright. The perceived length of disruption to travel outside a community was significantly related to Same Address and Reside Plan for the sample from Sea Bright, with the phi score returning moderate and weak associations, respectively.

Table 9 Bivariate Analysis of Length of Disruption within Community

27. How long did the disruption from Hurricane Sandy affect your ability to travel within [community name] for everyday activities (go to work, church, the post office, the grocery store, etc.)? (Less than a week (1) to More than a year (5))

	Significant Relationship (P-value)	Relative Strength (1)	Proportional Reduction of Error (PRE) Percentage (2)
Same Community (0,1)			
Oakwood Beach	- (3)	-	-
Sea Bright	0	Moderate***	Tau (10.0%)***
Same Address (0,1)			
Oakwood Beach	-	-	-
Sea Bright	0.00	Moderate**	Tau (6.8%)**

* p≤0.05. ** p<0.01, *** p<0.001
(1) relative strength based on Phi or Cramer's V score.
(2) PRE test chosen based on type of variables tested.
(3) Missing values indicates the relationship was not significant.

One of the interesting tests this study provided was to see differences in the existence of disruption and the perceived importance of being able to travel within and outside of a community. While the existence of disruption was not statistically significant in relation to any of the dependent variables for Oakwood Beach, the importance of travel within Oakwood Beach was, in many cases, critical in the decision-making process. Same Community and Same Address both were significantly related to the ability to travel within Oakwood Beach, and the phi scores indicate that both were relatively strong associations. This relationship was so strong that knowing the rank importance given to the ability to travel in Oakwood Beach increases the likelihood of positively predicting whether the respondent still lived in the same community by 19% and the same address by 20%. Analysis of crosstabs indicates that respondents that felt their ability to travel both within and outside their community as important were more likely to live at the same address than respondents that did not rate this element of mobility as important.

Table 10 Bivariate Analysis of Ability to Travel within Community
50. Ability to travel easily within [community name]
(Not Important at all (1) to Very Important (4))

	Significant Relationship (P-value)	Relative Strength (1)	Proportional Reduction of Error (PRE) Percentage (2)
Same Community (0,1)			
Oakwood Beach	0.02	Relatively Strong***	Tau (19.2%)*
Sea Bright	- (3)	-	-
Same Address (0,1)			
Oakwood Beach	0.01	Relatively Strong*	Tau (21.9%)*
Sea Bright	0.02	Weak*	Tau (3.6%)*

* p≤0.05. ** p<0.01, *** p<0.001
(1) Relative strength based on Phi or Cramer's V score.
(2) PRE test chosen based on type of variables tested.
(3) Missing values indicates the relationship was not significant.

Qualitative analysis – damage and disruption
While individuals did not list "damage" in either of the Best or Worst sections, they did discuss missing pieces of their community. Even though this is an outcome of damage, this relates more to post-event functioning, since it relates to the state of the community, and perceivably is a result of it not being repaired at the time of the questionnaire.
Respondents mentioned elements associated with disruption prominently, both in the Pre- and Post-Best sections. When considering Pre-Best, elements suggesting that traveling was favorable were noted, since any pre-existing disruption noted should not be related to Hurricane Sandy. For Pre-Best, respondents from both sites often mentioned that the centrality of their community was one of the best things about it.
When discussing Pre-Best, respondents from Oakwood Beach listed "proximity to other places" (19) and "lack of traffic" (2). When looking at Post-Best, "proximity to other places" dropped (9), "public transportation" emerged (2), and "lack of traffic" disappeared. In Sea Bright, in contrast, "proximity to other places" (71) was one of the most-liked elements of their pre-Sandy community. Respondents also mentioned "walkability" (27) of the community and access to "public transportation" (6). Post-Best

responses, however, see a dramatic drop across all of those responses. “Proximity to other places” drops by 13, “walkability” falls by 19, and public transportation falls to two.
Respondents from Oakwood Beach, when responding to Pre-Worst, did not focus on travel, only mentioning “traffic” (5). When responding to Post-Worst, traffic increased by one and “proximity to other places” emerged with nine respondents, suggesting some either felt that they were further away from necessities after the storm or that this became more important to them following the storm. Sea Bright respondents, interestingly, were both concerned and displeased with travel before Hurricane Sandy. For Pre-Worst, “traffic” (127), “parking” (15), and “proximity to other places” (14) were the top three responses. “Traffic” had the highest response total of any item in Pre-Worst, suggesting that traffic issues were a real concern for residents of Sea Bright. Interestingly, “parking” disappeared for Post-Worst and “traffic” dropped to 41, while “proximity to other places” rose to 58.
When discussing the Process and Pitfalls, responses associated with disruption centered on two related issues: disruption precipitating from a mandatory evacuation and disruption caused by relocation. Following Hurricane Sandy, authorities restricted access to Sea Bright for approximately two weeks while authorities repaired gas leaks, and then instated a curfew that lasted until May 30, 2013, for the side streets within the town. Many residents noted that while they understood the purpose of this, they feared their inability to reach their homes exposed their homes to more damage due to sitting water. They also discussed the general anxiety induced by not being able to see their homes. The other issue discussed is the increased distance many respondents had to drive to reach their homes in the affected communities and to work after Hurricane Sandy displaced them. Respondents stated that many of them either lost their modes of transportation (a car for many, but others lost the train or ferry operation they relied on) but still needed to work, so a portion of respondents discussed their time in transit increasing by as much as two-and-a-half hours each way.

Interviews – damage and disruption
Every interviewee, when describing their experience with Sandy, detailed the damage to their community. When considering the role that destruction played in their residential decision-making process, a few themes materialized in the interviews. First, a number of interviewees in Sea Bright suggested that damage from the hurricane led to a number of shops and services never returning to the area, thus lowering their quality of life and taking away amenities that made their communities a desirable place to live.

> *And then, of course, after the storm there was nothing, there was a lot of devastation and now we have, some things are better and some things are worse. We don’t have any services, we have plenty of restaurants and that sort of thing, but we don’t have any gas stations. We have sort of a storefront post office but not a real post office. I think I already mentioned the gas stations; we have no drycleaners, and we have no bank, although it looks like the bank may be coming back. We don’t have any of the services that we used to have, so those are the things that are missing and it doesn’t look like they’re coming back, you know, with the exception of the bank. So um, you know we do have a grocery store, but it’s not much of a grocery store. So some of the kind of essential services have been coming back; we do have a hardware store. It’s the only store, really. The rest are pretty much the restaurants; we have a liquor store and, you know, a clothing store, but that’s pretty much it.*

This quote emphasizes a related point that was a larger theme between Sea Bright interviewees. While the damage precipitated losses within the community, interviewees often lamented the rate of recovery by the town. As noted in the attachment to place literature, interviewees grieved the loss of these local icons (most notably, the library), and wanted them to return to form as quickly as possible. When discussing disruption, interviewees often noted that their job was accommodating in light of what had happened, and that work offered them a sense of normalcy. Many interviewees noted that they had

capabilities to work remotely once they found a location with electricity. As noted in the questionnaire, however, their commute often increased, as illustrated by the following exchange[1]:

[S1]: It added another 45 minutes. Yeah, it was taking me close to three hours each way to get in and out cause I [laugh] well…

[I1]: Wow.

[S1]: You know, I had to keep my job.

[I1]: Mm-hmm.

[I2]: Right. Yeah.

[S1]: You know, I had no choice so.

[I2]: Oh, my gosh!

[I1]: How many times a week were you doing that?

[S1]: Five. [laughs]

[I1]: Five? Wow.

[S1]: Yeah, once I went back, I was back to work five days a week, yeah. I periodically would work at home for a day, but I really, basically was going in every day.

[I1]: Wow.

[I2]: I'm impressed, yeah.

[S1]: Listen, compared to what some people went through, it's nothing. Like seriously, seriously. I got home way faster than a lot of the people that I know and I know people that still aren't home, so I was lucky.

[1] "[S]" indicates that the following quote is from the interviewee, and "[I]" indicates that the following quote is from the interviewer. Numbers distinguish between multiple interviewees and interviewers.

FINDINGS FROM SURVEY AND INTERVIEWS

The surveys and interviews indicated that damage to infrastructure does influence residents' decision to rebuilt and relocate. In term, these decisions influence the demand for transportation. While the number of residents relocating to nearby communities is not likely to be large enough to significantly influence demand, the changes in demand may influence the level of reinvestment in existing infrastructure during the recovery process. More importantly, respondents underscored the complexity of the decision-making process.

Key observations from our survey and interviews that are supported by or challenge the literature (Greer 2015) are summarized in Table 11.

Table 11. Key Observations

Concept	Observations from Survey and/or Interviews	Notes
Recovery is influenced by pre-event economic, social and political factors.	No significant relationship between demographic characteristics and decision-making.	Samples are relatively homogenous. Focus is on household decisions rather than individual decisions.
Individual property rights and local land use policy mean that relocation and changes in land use require stakeholder buy-in.	Responses reflect a lack of understanding of federal, state and local policies.	Respondents focused on the frustrations with the process.
Affordable housing is critical to community recovery.	Households offered a buyout were more likely to move than households not offered a buyout.	The relationship between decisions and available resources is consistent in the literature and the survey responses.
NGOs support the recovery process.	NGOs playing an important role for households that rebuild in situ.	The survey distinguishes between households that rebuild and households that relocate.
Resources help support the recovery process.	The influence of buyouts, incentives to rebuild, and financial support on the household decision-making process is complex.	Respondents' interpretations of incentives varied with the situation and available resources
The decision-making process is impacted by the level of damage.	The survey found that residents experiencing more damage were more likely to relocate. The survey also found that residents perceiving more disruption outside the community were more likely to rebuild. Residents of Oakwood Beach were also more likely to relocate based on perceived disruption within their community. Concern with stress and other factors related to the functioning of the community emerged in the interviews.	Disruption is a novel measure, not explored in previous studies. The inclusion of this measure is considered important.

THE ASSET MANAGEMENT PROCESS

An Overview of the Process

This research is relevant to how agencies use and implement their asset management process from three perspectives. First, risk analysis is a key element of Transportation Asset Management Plan (TAMP) that is required of states in the July 2012 law Moving Ahead for Progress in the 21st Century (MAP-21) (USDOT 2013). The generic TAMP includes the following elements:

- Set the context for risk management.
- Define key programmatic risks associated with implementation of the TAMP (e.g., cost escalations, budget cuts and environmental delays).
- Define system risks that could adversely affect the NHS (e.g., asset failure and external events such as floods, earthquakes, and hurricanes).
- Provide a map showing the NHS assets most at risk.
- Include a risk register that provides the following for each programmatic risk – likelihood of occurrence, consequences of occurrence, and mitigation activities.

In particular, system risks are particularly relevant.

Second, current and future travel demand are key data items needed to develop the TAMP. In fact, the International Infrastructure Management Manual (IIMM) (NAMS 2015) devotes a whole subsection in the chapter titled, "Understanding Requirements" to demand estimation. The chapter recognizes the role that population growth, GDP growth, environment, alternatives, price and demographics play. Furthermore, government policy, technological change, environmental issues, and consumer preferences play a role.

Finally, the IIMM emphasized emergency management as an important element of asset management, emphasizing the need for plans for emergency response, and short- and long-term recovery. Such plans need to be consistent with the risks identified in the risk analysis, and understand the relevant constraints.

Each of these perspectives are relevant to this study, as our surveys and interviews underscored the impact of disruptions to transportation.

Asset Management – New York and Oakwood Beach

New York State Department of Transportation (NYSDOT) released their asset management plan in 2014 (NYSDOT 2014). The plan includes a chapter on risk management and explicitly addresses extreme weather events. In particular, the plan recognizes the challenges that extreme weather events present, including decision-making, cost implications of restoration versus hardening, and the need to maintain emergency management plans. The plan does not discuss the impact on demand.

Asset Management – New Jersey and Sea Bright

New Jersey Department of Transportation (NJDOT) adopted asset management in 2008 (http://www.state.nj.us/transportation/about/asset/). There are two primary elements:

1. An overall Asset Management Plan for NJDOT assets.
2. An overall Asset Management Improvement Strategy.

The strategy links to the 10 Year Capital Investment Strategy, the 10 Year Capital Transportation Improvement Program, the Annual Transportation Capital Program and The Annual Study and Development Program.

The NJDOT Asset Management Plan (http://www.tamptemplate.org/wp-content/uploads/tamps/020_newjerseydot.pdf) does not address risk, disruption, failure or disasters. Nor does the plan recognize the impact of potential changes in demand.

Observations

Very little attention has been paid to how to operationalize the risk and impacts of extreme weather events in asset management plans. In general, changes in demand are largely ignored. The NYSDOT plan does recognize that different actions are required for restoration (recovery), hardening (mitigation) and emergency planning (preparedness) but no details are presented.

CONCLUSIONS

The primary goals of this study were to:

1) Shed light on how households understand their relationship with their environment (including the built environment) and what drives their decisions of whether to rebuild *in-situ* or resettle.
2) Explore how these household decisions can be integrated into plans to repair, replace, or improvement transportation infrastructure. For example, ultimately, information on household decisions will be used to supplement transportation demand estimates for planning purposes.

From this study, we learned that the household decision-making process is extremely complex and fraught with uncertainty from the perspective of the resident. We also learned that access to facilities and services, and changes to commute times influence the decisions. Further work is needed to understand the subtleties and complexities of these connections.

The specific objectives of the study were to:

1) Better understand how the post disaster transportation demand changes over time and from pre-disaster conditions;
2) Better understand how the state of transportation infrastructure influences the decision to relocate
3) Explore how household surveys after a disaster can be used to complement existing data and models to forecast demand
4) Explore the role risk of natural hazards including damage to infrastructure and changes in demand play in asset management.

Our study suggests that the transportation needs immediately following the event differed from those during the recovery process. We can also use the survey responses to track recovery. A subsequent project and survey provide more details on this process. In this project, we found a disconnect between the household experience and forecasting demand. One reason may be that we are dealing with small communities. However, these small communities, particularly Sea Bright, are representative of many similar communities on the eastern seaboard. Sea Bright is a small coastal community by any measure. Its population is 1,400 and covers just 0.64 square miles. In New Jersey, there are 64 cities with fewer than 2,000 population and many of these are coastal communities (http://www.city-data.com/city/New-Jersey3.html). These demographics are mirrored in other states (for example, Fenwick Island in Delaware, Buxton (Cape Hatteras) in North Carolina, and Point Lookout in New York). Finally, we found little evidence that the risk of extreme weather was considered in the estimation of demand used in exploring asset management.

This study addresses the gaps in our understanding of how households decide where to live after a disaster and the relationship to the disruption of transportation infrastructure. This work contributes an exploratory study, providing insight on the factors that influenced the decision-making process within the larger context of community recovery. Hurricane Sandy furnished a valuable opportunity to study this phenomenon in a setting unexperienced with damage to this scale and with unique demographic characteristics that set it apart from the body of literature emerging following Hurricane Katrina and other recent catastrophes.

In this context, the influence of the following factors on the household decision-making process was supported by strong evidence from the surveys and interviews:

- pre-event functioning,
- attachment to place,
- risk perception,
- destruction of the built environment, incentives, the availability of buyouts, and post-event

functioning.

The role of perceived trustworthiness of officials and NGO support only showed mixed evidence of influence, and contrary to the literature, demographics and individual indicators did not influence the household decision-making process.

The surveys and interviews underscored the complexity and uncertainty involved in the process. This is in contrast to the presentation of the recovery process in plans and policies as a linear process. Respondents tended to provide an overall assessment of the process, rather than identify the steps in the process. Potential solutions to address these issues include developing robust recovery plans.

RECOMMENDATIONS

This study contributes to the knowledge base on decision-making in recovery and helps understand what factors most heavily influence decisions during the recovery process. For transportation agencies, our results suggest that access to transportation influences the decision to rebuild or relocate underscoring the complexity of the recovery process.

Natural hazards can rapidly degrade transportation infrastructure from a state of good repair to failure, reduced capacity or compromised performance. Recent experiences with Hurricane Irene and Superstorm Sandy in the Mid-Atlantic states have underscored the impacts of damaged and degraded infrastructure. Although the focus on rebuilding of the transportation infrastructure has been effective in delivering functional infrastructure, little attention has been paid to the infrastructure needs for long-term recovery and where investments are required to strategically meet the needs of the residents and businesses. In addition to addressing the state of good repair in the short-term, the research could also consider state of good repair in the long-term, safety and economic competitiveness by asking what investments should be made considering the household decisions that will be made about a particular location. Understanding the demand for transportation services is a key element of asset management, and an important strategic tool for maintaining infrastructure in a State of Good Repair.

Most importantly, the MAP-21 and FAST Act requirements for risk-based asset management underscore the need to integrate the risks of natural hazards and the risks involved in assessing future demand in the context of the hazards. While NYSDOT recognized these elements, much work remains to operationalize them. This project serves as a foundation for future work in this area.

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Appendix A. Research Methodology

A.1 Task Descriptions

Specific tasks were as follows:

Task 1. Synthesis of relevant literature
An existing literature review covers the disaster recovery literature, including rebuilding and resettlement, relevant policy documents, the role of demand forecasts and risk in asset management, and the relationships among transportation infrastructure, re-development and disaster recovery. This task synthesized the literature and experiences that are expected to be of value to transportation decision makers.

Task 2. Plan case studies
This task focused on identifying the communities, making appropriate contacts, developing the survey and the interview guide, and obtaining Institutional Review Board (IRB) approval. The original proposal did not include a survey, but the opportunity presented itself to conduct the survey and this clearly became the most expeditious way to collect substantive data.

Task 3. Conduct case studies
The case studies involved conducting the surveys, conducting the in-person, semi-structured interviews with community members and policy makers.

Task 4. Analyze results
The survey responses were coded and analyzed. Verbatim transcriptions of the interviews were analyzed using content analysis to develop a chronology and identify themes.

Task 5. Document the Asset Management Processes in New York and New Jersey
Both New York and New Jersey have been developing asset management processes for some time. In general these state level activities are conducted in isolation from long range regional plans and responses to disasters. The existing processes were documented through plans and informal discussions with state, regional and local decision makers and professionals.

Task 6. Propose connections to transportation decision making
Building on the outcomes of Task 4 and Task 5, the connections between household decisions and infrastructure investment decisions are identified, as well as identify opportunities to improve the processes, potential policies to support the process, and areas for future research.

Task 7. Conduct workshop
The original research plan called for a half-day workshop with representatives of impacted communities, federal and state Emergency Management Agencies, the relevant MPOs, and state DOTS to better explore the integration of the qualitative data into the decision-making process. This workshop is still under development.

Task 8. Final report
This final report documents the results of this research.

A.2 IRB Approval

Project Number: 523471-1

Project Title: "Understanding the Relationships between Household Decisions and Infrastructure Investment in Disaster Recovery"
Approval Date: October 13, 2013
Expiration Date: October 13, 2014

A.3 Survey Methodology

This section outlines the survey methodology. The survey instruments are included in Section A.3 (Oakwood Beach) and Section A.4 (Sea Bright). The questionnaire contained 75 questions for Sea Bright and 80 for Oakwood Beach. Five questions were Oakwood Beach-specific because residents of Sea Bright did not have a buyout option. Greer (2015) includes additional details. The strategy and timeline for developing and administering the survey is summarized in as follows:

Date	Action
January 2014	Addresses for Oakwood Beach purchased from USADATA. Addresses were selected within 0.3 miles of the centroid of the buyout area. Total = 281 entries
January 2014	Cleaned merge of voter registration list (714 entries), owner-occupied tax list (575 entries), and renter and owner tax list (1076 entries). Total = 1254 entries (including 86 outside Sea Bright and 35 post office boxes)
April 29, 2014	Postcard mailed to each household
May 12, 2014	Wave 1: Questionnaire packet mailed to each household. Packet included: 1) a cover letter that described the researchers, the project, the importance of the data, and provided residents contact information for the researchers and the institutional review board for questions, 2) a copy of the questionnaire, and 3) a self-addressed, prepaid return mailer.
June 3, 2014	Wave 2: Questionnaire packet with revised cover letter to households that had responded and addresses returned as undeliverable.
July 2, 2014	Wave 3. Questionnaire packet with revised cover letter indicating that this is the final chance to participate.

A.4 Survey Instrument – Oakwood Beach

168 Graham Hall, Newark, DE, 19711 | (302) 831-6618 | Smcneil@udel.edu

May 2014

Dear Oakwood Beach Resident:

This is our **third and final attempt** to ask for your participation in an important study about your experiences during and after Hurricane Sandy. It is critical that we receive feedback from the entire community on this significant issue. We are particularly interested in unique and different opinions. Let your voice be heard. Information from the original survey is included.

We are writing on behalf of the Disaster Research Center at the University of Delaware to ask for your participation in the following survey about your experiences during and after Hurricane Sandy. We are inviting every household in Oakwood Beach to participate. The goal is to better understand how you have been making housing decisions after the storm.

The University will be collecting information specific to your home, but we will not publish or release information about individual households. The results will only be presented for neighborhoods or the whole community. Topics will include questions about your home, your community, the impacts of the storm, how you decided where to live after the hurricane, and basic information about yourself and your household. The goal is to use the experiences of Oakwood Beach residents to learn more about why residents rebuild in the same location or move after a disaster.

We expect that for most people the questions below will take about 20-30 minutes to complete. Participation in this study is voluntary and your decision to participate will have no bearing on your relationship with the University of Delaware.

Please have one of the heads of this household (age 18 or older) complete this survey and return it in the enclosed postage paid envelope. Please return the survey **as soon as you complete it**.

If you have any questions about this survey please contact the Principal Investigator at the University, Sue McNeil, at (302) 831-6618. Alternatively, if you have any questions about your rights as a participant in this study, you can also contact the University of Delaware Institutional Review Board at (302) 831-2137. We appreciate your assistance, and look forward to learning more about you and your experiences with Hurricane Sandy.

Sincerely,

University of Delaware Disaster Research Center

First, we would like to ask you about the home you lived in at the time Hurricane Sandy occurred and the community of Oakwood Beach.

1. Do you own or rent the property addressed on the envelope of this survey?
   - ☐ Own
   - ☐ Rent (Please go to question 4)

2. Which of the following describes how you use this property? Mark all that apply.
   - ☐ Primary residence
   - ☐ Second home
   - ☐ Rental property
   - ☐ Other_____
   - ☐ Prefer not to answer

3. How long has this residence been owned by your family? Please answer in years.

   _____ years

4. What type of home is this?
   - ☐ Single-family home
   - ☐ Multi-family home
   - ☐ Apartment
   - ☐ Condo/Townhome
   - ☐ Other_____
   - ☐ Don't know

5. When did you move into or take ownership of this house, apartment, or mobile home? Please provide the calendar year (for example, 2001).

   _____

6. In total, how many years have you lived in Oakwood Beach?

   _____

Now, we would like you to answer a few questions about Oakwood Beach. Please tell me how strongly you "agree" or "disagree" with the following statements.

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
7. I feel Oakwood Beach is a part of me.	☐	☐	☐	☐	☐
8. Being in Oakwood Beach says a lot about whom I am.	☐	☐	☐	☐	☐
9. I am very attached to Oakwood Beach.	☐	☐	☐	☐	☐
10. No other place can compare to Oakwood Beach.	☐	☐	☐	☐	☐
11. Oakwood Beach is the best place for what I like to do.	☐	☐	☐	☐	☐
12. The things I do at Oakwood Beach I would enjoy doing just as much at some similar community.	☐	☐	☐	☐	☐

You have two sections completed already. To understand how you saw your community prior to Hurricane Sandy, we would like to learn about your favorite and least favorite parts of your community **before the hurricane hit**.

13. Please list three things you **liked most** about Oakwood Beach **prior to Hurricane Sandy**.
    1. _____
    2. _____
    3. _____

14. Please list three things you **liked least** about Oakwood Beach **prior to Hurricane Sandy**.
    1. _____
    2. _____
    3. _____

In this section, we would like to ask you some questions about your home **at the time that Hurricane Sandy occurred**.

15. Which of the following describes the status of that property now? Has it been: (Mark all that apply)

☐ Abandoned
☐ Condemned
☐ Repairs completed; not elevated
☐ Repairs completed; elevated
☐ Repairs in progress
☐ Repairs scheduled to begin
☐ Structure was or will be totally rebuilt
☐ Property for sale or sold
☐ Structure was or will be demolished
☐ Prefer not to answer
☐ In good condition (did not require repairs)
☐ Not sure (please explain)

_____

_____

16. Following Hurricane Sandy, have you invested in any of the following mitigation measures for future storms? (Mark all that apply)

☐ Installed storm shutters
☐ Elevated utilities
☐ Purchased additional insurance
☐ Installed roof fasteners
☐ Elevated your home
☐ Installed new pilings
☐ Installed hurricane windows
☐ None of the above
☐ Strengthened attachment to foundation
☐ Prefer not to answer
☐ Other (please explain)

_____

_____

17. If you selected any of the options above, how did you pay for it? (Mark all that apply)

☐ Personal funds/savings
☐ Loans from a financial institution
☐ Insurance
☐ Government support
☐ Borrowed from friends/family
☐ Did not select anything
☐ Non-profit assistance/aid
☐ Prefer not to answer
☐ Other (please explain)

_____

_____

18. Do you plan to invest in any of the following mitigation measures for future storms? (Mark all that apply)

☐ Install storm shutters
☐ Purchase additional insurance
☐ Elevate your home
☐ Install hurricane windows
☐ Strengthen attachment to foundation
☐ Other (please explain)

☐ Elevate utilities
☐ Install roof fasteners
☐ Install new pilings
☐ None of the above
☐ Prefer not to answer

_____

_____

19. If you selected any of the options above, how do you plan to pay for it? (Mark all that apply)

☐ Personal funds/savings
☐ Insurance
☐ Borrow from friends/family
☐ Non-profit assistance/aid
☐ Other (please explain)

☐ Loans from a financial institution
☐ Government support
☐ Did not select anything
☐ Prefer not to answer

_____

_____

Now we would like you to answer questions about damage from the hurricane to your home and to your community.

20. How much damage did your home sustain related to Hurricane Sandy? Please estimate in dollars.

$_____
☐ Don't know (due to renter status)

21. Did you have flood insurance at the time that Hurricane Sandy occurred?

☐ Yes
☐ No (Please go to question 24)

22. What amount of this damage did flood insurance cover?

$_____

23. What did you base your estimate on?

_____

_____

	No Damage	Not Very Extensive	Somewhat Extensive	Very Extensive
24. How extensive was the damage **to your home** due to Hurricane Sandy?	☐	☐	☐	☐
25. How extensive was the damage **to Oakwood Beach** due to Hurricane Sandy?	☐	☐	☐	☐

This section asks you about travel disruptions resulting from Hurricane Sandy, both within and outside of Oakwood Beach.

26. At any time did the disruption from Hurricane Sandy affect your ability to travel **within** Oakwood Beach for everyday activities (go to work, church, the post office, the grocery store, etc.)?
    - ☐ Yes
    - ☐ No (Please go to question 28)

27. **How long** did the disruption from Hurricane Sandy affect your ability to travel **within** Oakwood Beach for everyday activities (go to work, church, the post office, the grocery store, etc.)?
    - ☐ Less than a week
    - ☐ Two to four weeks
    - ☐ Two to six months
    - ☐ Seven to twelve months
    - ☐ More than a year

28. Did the disruption from Hurricane Sandy affect your ability to travel **outside** Oakwood Beach at any time?
    - ☐ Yes
    - ☐ No (Please go to question 30)

29. **How long** did the disruption from Hurricane Sandy inhibit your ability to travel **outside** Oakwood Beach?
    - ☐ Less than a week
    - ☐ Two to four weeks
    - ☐ Two to six months
    - ☐ Seven to twelve months
    - ☐ More than a year

Following a disaster, people have many decisions they have to make about living in a community or leaving it. For this next set of questions, we would like to ask you about where you currently live.

30. Do you still live **in the same community** as you did at the time of Hurricane Sandy?
    - ☐ Yes
    - ☐ No

31. Do you still live **at the same address** as you did at the time of Hurricane Sandy?
    - ☐ Yes
    - ☐ No (Please share your new address on the lines below)

    _____

    _____

32. How long do you plan to live at your current residence?
    - ☐ Less than one year
    - ☐ One to five years
    - ☐ More than five years

33. Were you offered money for your home (a buyout)?
    - ☐ Yes
    - ☐ No (Please go to question 37)

34. What was the name of the organization that made this offer?

    _____

35. Did you accept the offer?
    - ☐ Yes
    - ☐ No

36. Why did you make this decision?

_____

_____

_____

_____

_____

_____

For this next set of questions, please indicate how important each element was when making your decision about where to live after Hurricane Sandy.

	Not Important At All	Not Very Important	Somewhat Important	Very Important
37. The likelihood of a hurricane	☐	☐	☐	☐
38. Concerns over sea level rise	☐	☐	☐	☐
39. Being close to family	☐	☐	☐	☐
40. Being close to friends	☐	☐	☐	☐
41. Being close to employment opportunities	☐	☐	☐	☐
42. Being close to the beach	☐	☐	☐	☐
43. Access to affordable housing	☐	☐	☐	☐
44. Family history in the area	☐	☐	☐	☐
45. Opinions of neighbors	☐	☐	☐	☐
46. Concerns about going into debt	☐	☐	☐	☐
47. Changes in where homes can be built	☐	☐	☐	☐
48. Changes in insurance rates	☐	☐	☐	☐
49. Changes to the building code	☐	☐	☐	☐
50. Ability to travel easily within Oakwood Beach	☐	☐	☐	☐
51. Ability to travel easily outside of Oakwood Beach	☐	☐	☐	☐
52. Financial incentives to rebuild your home in the same community from the government (aid programs)	☐	☐	☐	☐
53. Financial incentives to build your home in a new location from the government (aid programs)	☐	☐	☐	☐

	Not Important At All	Not Very Important	Somewhat Important	Very Important
54. Help from other organizations (such as a local church or civic group)	☐	☐	☐	☐
55. Trustworthiness of organizations running the buyout program	☐	☐	☐	☐
56. Trustworthiness of community leaders	☐	☐	☐	☐

57. Were there any other important factors that influenced your decision about where you lived that were not listed? If so, what were they?

_____

_____

_____

58. Please list three things you like **most** about where you currently live **after** Hurricane Sandy.
    1. _____
    2. _____
    3. _____

59. Please list three things you like **least** about where you currently live **after** Hurricane Sandy.
    1. _____
    2. _____
    3. _____

Now, we would like to ask you how you feel about the chances of a future event like Hurricane Sandy affecting Oakwood Beach.

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
60. An event of similar magnitude to Hurricane Sandy is likely to affect Oakwood Beach in the next **five years.**	☐	☐	☐	☐	☐
61. An event of similar magnitude to Hurricane Sandy is likely to affect Oakwood Beach in the next **ten years.**	☐	☐	☐	☐	☐
62. An event of similar magnitude to Hurricane Sandy is likely to affect Oakwood Beach in the next **twenty years.**	☐	☐	☐	☐	☐
63. An event of similar magnitude to Hurricane Sandy is **never likely to affect Oakwood Beach again**.	☐	☐	☐	☐	☐

This section asks you to imagine that if there were such an event within the next ten years, what sort of impacts you would expect.

	Not Likely At All	Not Very Likely	Somewhat Likely	Very Likely
64. Likelihood of major damage to your home.	☐	☐	☐	☐
65. Likelihood of injury to you or members of your household.	☐	☐	☐	☐
66. Likelihood of health problems to you or members of your household.	☐	☐	☐	☐

Lastly, we would like to ask you some questions about yourself, your household, and for some closing comments.

67. What is your age (in years)?

    _____ years old

68. What is your job or profession?

    _____

69. How many **adults** live in your home (individuals over the age of 17)?

    _____

70. How many of those adults are **seniors** (individuals over the age of 64)?

_____

71. How many **children** currently live in your home (individuals 17 years old or younger)?

_____

72. What was your total household income before taxes for **the year 2011** (the year prior to Hurricane Sandy)?

☐ Less than $20,000
☐ $20,000-$39,999
☐ $40,000-$59,999
☐ $60,000-$79,999
☐ $80,000-$99,999
☐ $100,000-$199,999
☐ $200,000 and up

73. What was your total household income before taxes for **the year 2013** (the year after Hurricane Sandy)?

☐ Less than $20,000
☐ $20,000-$39,999
☐ $40,000-$59,999
☐ $60,000-$79,999
☐ $80,000-$99,999
☐ $100,000-$199,999
☐ $200,000 and up

74. What is your sex?

☐ Male
☐ Female

75. What is your race?

☐ White
☐ Black or African American
☐ Other (please specify)_____
☐ Asian
☐ American Indian

76. What is the highest degree or level of school you completed? If currently enrolled, mark the previous grade or highest degree received.

☐ Kindergarten through 8th grade
☐ 9th grade through 11th (no diploma)
☐ High school diploma or GED
☐ Technical School
☐ Some College or Associates Degree (AA)
☐ Bachelor's Degree (BS, BA, etc.)
☐ Master's Degree (MS, MA, etc.)
☐ Professional Degree (MD, JD, etc.)
☐ Doctoral Degree (PhD)

77. Would you like a copy of the completed results?

☐ Yes (Please provide an e-mail address on the lines below)

☐ No

_____

_____

78. The researcher may contact me for a follow-up interview.

☐ Yes (Please provide contact information on the lines below, e-mail or phone preferred)

☐ No

_____

_____

For our last two questions, we would like to learn more about the housing recovery process you navigated following Hurricane Sandy. A number of researchers have found that this process has a number of steps, ranging from time in temporary shelters, moving, working with their insurance companies and other organizations, applying for aid, and moving into a home.

79. For your household, what were the steps you went through in this process?

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

80. What sort of problems or pitfalls, if any, did your household encounter in the process? An example may be problems acquiring insurance money or finding affordable housing.

A.5 Survey Instrument – Sea Bright

1167 Ocean Ave. Sea Bright, NJ 07760 | (732) 842-0099 | Seabrightvolunteer@gmail.com

May 2014

Dear Sea Bright Resident:
This is our **third and final attempt** to ask for your participation in an important study about your experiences during and after Hurricane Sandy. It is critical that we receive feedback from the entire community on this significant issue. We are particularly interested in unique and different opinions. Let your voice be heard. Information from the original survey is included.

We are writing on behalf of the Borough of Sea Bright and the Disaster Research Center at the University of Delaware to ask for your participation in the following survey about your experiences during and after Hurricane Sandy. We are inviting every household in the borough to participate. The goal is to better understand how you have been making housing decisions after the storm and to create specific data your community can use for planning purposes.

The University will be collecting information specific to your home, but we will not publish or release information about individual households. The results will only be presented for neighborhoods or the whole community. Topics will include questions about your home, your community, the impacts of the storm, how you decided where to live after the hurricane, and basic information about yourself and your household. The goal is to use the experiences of Sea Bright residents to learn more about why residents rebuild in the same location or move after a disaster.

We expect that for most people the questions below will take about 20-30 minutes to complete. Participation in this study is voluntary and your decision to participate will have no bearing on your relationship with the University of Delaware or the community of Sea Bright.

Please have one of the heads of this household (age 18 or older) complete this survey and return it in the enclosed postage paid envelope. Please return the survey **as soon as you complete it**.

If you have any questions about this survey, please contact Frank Lawrence at (732) 842-0099, extension 44 or the Principal Investigator at the University, Sue McNeil, at (302) 831-6618. Alternatively if you have any questions about your rights as a participant in this study, you can also contact the University of Delaware Institutional Review Board at (302) 831-2137. We appreciate your assistance, and look forward to learning more about you and your experiences with Hurricane Sandy.

Sincerely,

University of Delaware Disaster Research Center **Borough of Sea Bright**

First, we would like to ask you about the home you lived in at the time Hurricane Sandy occurred and the community of Sea Bright.

1. Do you own or rent the property addressed on the envelope of this survey?
   - ☐ Own
   - ☐ Rent (Please go to question 4)

2. Which of the following describes how you use this property? Mark all that apply.
   - ☐ Primary residence
   - ☐ Second home
   - ☐ Rental property
   - ☐ Other_____
   - ☐ Prefer not to answer

3. How long has this residence been owned by your family? Please answer in years.

   _____ years

4. What type of home is this?
   - ☐ Single-family home
   - ☐ Multi-family home
   - ☐ Apartment
   - ☐ Condo/Townhome
   - ☐ Other_____
   - ☐ Don't know

5. When did you move into or take ownership of this house, apartment, or mobile home? Please provide the calendar year (for example, 2001).

   _____

6. In total, how many years have you lived in Sea Bright?

   _____

Now, we would like you to answer a few questions about Sea Bright. Please tell me how strongly you "agree" or "disagree" with the following statements.

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
7. I feel Sea Bright is a part of me.	☐	☐	☐	☐	☐
8. Being in Sea Bright says a lot about whom I am.	☐	☐	☐	☐	☐
9. I am very attached to Sea Bright.	☐	☐	☐	☐	☐
10. No other place can compare to Sea Bright.	☐	☐	☐	☐	☐
11. Sea Bright is the best place for what I like to do.	☐	☐	☐	☐	☐
12. The things I do at Sea Bright I would enjoy doing just as much at some similar community.	☐	☐	☐	☐	☐

You have two sections completed already. To understand how you saw your community prior to Hurricane Sandy, we would like to learn about your favorite and least favorite parts of your community **before the hurricane hit**.

13. Please list three things you **liked most** about Sea Bright **prior to Hurricane Sandy**.
    1. _____
    2. _____
    3. _____

14. Please list three things you **liked least** about Sea Bright **prior to Hurricane Sandy**.
    1. _____
    2. _____
    3. _____

In this section, we would like to ask you some questions about your home **at the time that Hurricane Sandy occurred**.

15. Which of the following describes the status of that property now? Has it been: (Mark all that apply)

☐ Abandoned
☐ Repairs completed; not elevated
☐ Repairs in progress
☐ Structure was or will be totally rebuilt
☐ Structure was or will be demolished
☐ In good condition (did not require repairs)
☐ Not sure (please explain)
☐ Condemned
☐ Repairs completed; elevated
☐ Repairs scheduled to begin
☐ Property for sale or sold
☐ Prefer not to answer

_____

_____

16. Following Hurricane Sandy, have you invested in any of the following mitigation measures for future storms? (Mark all that apply)

☐ Installed storm shutters
☐ Purchased additional insurance
☐ Elevated your home
☐ Installed hurricane windows
☐ Strengthened attachment to foundation
☐ Other (please explain)
☐ Elevated utilities
☐ Installed roof fasteners
☐ Installed new pilings
☐ None of the above
☐ Prefer not to answer

_____

_____

17. If you selected any of the options above, how did you pay for it? (Mark all that apply)

☐ Personal funds/savings
☐ Insurance
☐ Borrowed from friends/family
☐ Non-profit assistance/aid
☐ Other (please explain)
☐ Loans from a financial institution
☐ Government support
☐ Did not select anything
☐ Prefer not to answer

_____

_____

18. Do you plan to invest in any of the following mitigation measures for future storms? (Mark all that apply)

☐ Install storm shutters
☐ Purchase additional insurance
☐ Elevate your home
☐ Install hurricane windows
☐ Strengthen attachment to foundation
☐ Other (please explain)

☐ Elevate utilities
☐ Install roof fasteners
☐ Install new pilings
☐ None of the above
☐ Prefer not to answer

_____

_____

19. If you selected any of the options above, how do you plan to pay for it? (Mark all that apply)

☐ Personal funds/savings
☐ Insurance
☐ Borrow from friends/family
☐ Non-profit assistance/aid
☐ Other (please explain)

☐ Loans from a financial institution
☐ Government support
☐ Did not select anything
☐ Prefer not to answer

_____

_____

Now we would like you to answer questions about damage from the hurricane to your home and to your community.

20. How much damage did your home sustain related to Hurricane Sandy? Please estimate in dollars.

$_____
☐ Don't know (due to renter status)

21. Did you have flood insurance at the time that Hurricane Sandy occurred?

☐ Yes
☐ No (Please go to question 24)

22. What amount of this damage did flood insurance cover?

$_____

23. What did you base your estimate on?

_____

_____

	No Damage	Not Very Extensive	Somewhat Extensive	Very Extensive
24. How extensive was the damage **to your home** due to Hurricane Sandy?	☐	☐	☐	☐
25. How extensive was the damage **to Sea Bright** due to Hurricane Sandy?	☐	☐	☐	☐

This section asks you about travel disruptions resulting from Hurricane Sandy, both within and outside of Sea Bright.

26. At any time did the disruption from Hurricane Sandy affect your ability to travel **within** Sea Bright for everyday activities (go to work, church, the post office, the grocery store, etc.)?
    - ☐ Yes
    - ☐ No (Please go to question 28)

27. **How long** did the disruption from Hurricane Sandy affect your ability to travel **within** Sea Bright for everyday activities (go to work, church, the post office, the grocery store, etc.)?
    - ☐ Less than a week
    - ☐ Two to four weeks
    - ☐ Two to six months
    - ☐ Seven to twelve months
    - ☐ More than a year

28. Did the disruption from Hurricane Sandy affect your ability to travel **outside** Sea Bright at any time?
    - ☐ Yes
    - ☐ No (Please go to question 30)

29. **How long** did the disruption from Hurricane Sandy inhibit your ability to travel **outside** Sea Bright?
    - ☐ Less than a week
    - ☐ Two to four weeks
    - ☐ Two to six months
    - ☐ Seven to twelve months
    - ☐ More than a year

Following a disaster, people have many decisions they have to make about living in a community or leaving it. For this next set of questions, we would like to ask you about where you currently live.

30. Do you still live **in the same community** as you did at the time of Hurricane Sandy?
    - ☐ Yes
    - ☐ No

31. Do you still live **at the same address** as you did at the time of Hurricane Sandy?
    - ☐ Yes
    - ☐ No (Please share your new address on the lines below)

    _____

    _____

32. How long do you plan to live at your current residence?
    - ☐ Less than one year
    - ☐ One to five years
    - ☐ More than five years

For this next set of questions, please indicate how important each element was when making your decision about where to live after Hurricane Sandy.

	Not Important At All	Not Very Important	Somewhat Important	Very Important
33. The likelihood of a hurricane	☐	☐	☐	☐
34. Concerns over sea level rise	☐	☐	☐	☐
35. Being close to family	☐	☐	☐	☐
36. Being close to friends	☐	☐	☐	☐
37. Being close to employment opportunities	☐	☐	☐	☐
38. Being close to the beach	☐	☐	☐	☐
39. Access to affordable housing	☐	☐	☐	☐

	Not Important At All	Not Very Important	Somewhat Important	Very Important
40. Family history in the area	☐	☐	☐	☐
41. Opinions of neighbors	☐	☐	☐	☐
42. Concerns about going into debt	☐	☐	☐	☐
43. Changes in where homes can be built	☐	☐	☐	☐
44. Changes in insurance rates	☐	☐	☐	☐
45. Changes to the building code	☐	☐	☐	☐
46. Ability to travel easily within Sea Bright	☐	☐	☐	☐
47. Ability to travel easily outside of Sea Bright	☐	☐	☐	☐
48. Financial incentives to rebuild your home in the same community from the government (aid programs)	☐	☐	☐	☐
49. Financial incentives to build your home in a new location from the government (aid programs)	☐	☐	☐	☐
50. Help from other organizations (such as a local church or civic group)	☐	☐	☐	☐
51. Trustworthiness of community leaders	☐	☐	☐	☐

52. Were there any other important factors that influenced your decision about where you lived that were not listed? If so, what were they?

_____

_____

_____

53. Please list three things you like **most** about where you currently live **after** Hurricane Sandy.

1. _____
2. _____
3. _____

54. Please list three things you like **least** about where you currently live **after** Hurricane Sandy.

1. _____
2. _____
3. _____

Now, we would like to ask you how you feel about the chances of a future event like Hurricane Sandy affecting Sea Bright.

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
55. An event of similar magnitude to Hurricane Sandy is likely to affect Sea Bright in the next **five years.**	☐	☐	☐	☐	☐
56. An event of similar magnitude to Hurricane Sandy is likely to affect Sea Bright in the next **ten years.**	☐	☐	☐	☐	☐
57. An event of similar magnitude to Hurricane Sandy is likely to affect Sea Bright in the next **twenty years.**	☐	☐	☐	☐	☐
58. An event of similar magnitude to Hurricane Sandy is **never likely to affect Sea Bright again**.	☐	☐	☐	☐	☐

This section asks you to imagine that if there were such an event within the next ten years, what sort of impacts you would expect.

	Not Likely At All	Not Very Likely	Somewhat Likely	Very Likely
59. Likelihood of major damage to your home.	☐	☐	☐	☐
60. Likelihood of injury to you or members of your household.	☐	☐	☐	☐
61. Likelihood of health problems to you or members of your household.	☐	☐	☐	☐

Lastly, we would like to ask you some questions about yourself, your household, and for some closing comments.

62. What is your age (in years)?

    _____ years old

63. What is your job or profession?

    _____

64. How many **adults** live in your home (individuals over the age of 17)?

    _____

65. How many of those adults are **seniors** (individuals over the age of 64)?

_____

66. How many **children** currently live in your home (individuals 17 years old or younger)?

_____

67. What was your total household income before taxes for **the year 2011** (the year prior to Hurricane Sandy)?

☐ Less than $20,000
☐ $20,000-$39,999
☐ $40,000-$59,999
☐ $60,000-$79,999
☐ $80,000-$99,999
☐ $100,000-$199,999
☐ $200,000 and up

68. What was your total household income before taxes for **the year 2013** (the year after Hurricane Sandy)?

☐ Less than $20,000
☐ $20,000-$39,999
☐ $40,000-$59,999
☐ $60,000-$79,999
☐ $80,000-$99,999
☐ $100,000-$199,999
☐ $200,000 and up

69. What is your sex?

☐ Male
☐ Female

70. What is your race?

☐ White
☐ Black or African American
☐ Other (please specify)_____
☐ Asian
☐ American Indian

71. What is the highest degree or level of school you completed? If currently enrolled, mark the previous grade or highest degree received.

☐ Kindergarten through 8th grade
☐ 9th grade through 11th (no diploma)
☐ High school diploma or GED
☐ Technical School
☐ Some College or Associates Degree (AA)
☐ Bachelor's Degree (BS, BA, etc.)
☐ Master's Degree (MS, MA, etc.)
☐ Professional Degree (MD, JD, etc.)
☐ Doctoral Degree (PhD)

75. What sort of problems or pitfalls, if any, did your household encounter in the process? An example may be problems acquiring insurance money or finding affordable housing.

72. Would you like a copy of the completed results?

☐ Yes (Please provide an e-mail address on the lines below)

☐ No

_____

_____

73. The researcher may contact me for a follow-up interview.

☐ Yes (Please provide contact information on the lines below, e-mail or phone preferred)

☐ No

_____

_____

For our last two questions, we would like to learn more about the housing recovery process you navigated following Hurricane Sandy. A number of researchers have found that this process has a number of steps, ranging from time in temporary shelters, moving, working with their insurance companies and other organizations, applying for aid, and moving into a home.

74. For your household, what were the steps you went through in this process?

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

A.6. Survey Response Rates

The following table summarizes the response and return rates from each wave.

Wave	*Oakwood Beach, NY*			*Sea Bright, NJ*		
	Mailed	Completed	Return to sender	Mailed	Completed	Return to sender
Postcards April 29, 2014	282	N/A	N/A	1,252	N/A	N/A
One May 12, 2014	282	22	26	1,252	132	142
Two June 3, 2014	234	23	10	978	106	61
Three July 2, 2014	201	9	5	811	65	33
Final counts	282	54	41	1,252	303	236

A.7. Semi-structured Interview Format

To complement the survey data, semi-structured interviews were also conducted. Five in-person and nine telephone interviews were conducted with Sea Bright residents between August 11 and September 8. Three telephone interviews were conducted with Oakwood Beach residents. Greer (2015) provides additional details. The interview guide is included in Section A.5.

A.8. Semi-structured Interview Guide for Residents

POST-DISASTER RESETTLEMENT
INTERVIEW GUIDE FOR RESIDENTS

Interviewer: _____

Contact: _____

Information:

Interviewee: _____

Contact: _____

Information:

Date: _____

Start Time: _____

End Time: _____

Research question for this interview guide: How do families make residential decisions following disaster?

Sub-questions: What factors are present, and distinguish them from families that do not decide to move (to answer this half I would have to interview someone who decided not to move)? What is the process? What factors do they rank as important? How do they understand their own hazard exposure?

Probes for reference

- Could you say more about that?
- What did you mean by…?
- How did your family feel about…?
- How do you think the rest of your community would feel about…?
- Just to make sure I understand, could you summarize what you just said for me?

Introduction

- Thanks for your time
- Explanation of project
- Assurance of confidentiality, overview of informed consent, and request to start recording
- Any questions?

Introductory Questions: General inquiries and life pre-Sandy

What I am generally interested in is household recovery following Hurricane Sandy. But first, I'd like to start by getting a better understanding of your community. There are no right or wrong answers.

1. Tell me about [Sea Bright/Oakwood Beach].
    a. What's it like living there?
    b. Changes pre/post-Sandy?
    c. Could you talk about the community leadership?
2. Now I'd like to talk about your household's experiences with Hurricane Sandy. Could you describe that for me?
    a. How did you go about [getting your home repaired/selling your property]? Could you describe that process?
    b. Did you ever move?
        i. Where did you stay?
            1. How long were you there?
            2. What prompted you to leave?
3. I know that after a disaster, families have many tough decisions to make. There are many options to weigh when ultimately deciding where to live. Some families decided to stay in the area, and others decided to move. What motivated you to [rebuild/move]? Try to think back for me and give me the step by step process.
    a. How long do you think you'll stay at your current residence?

    i. What makes you think that?
    ii. Do you feel safe there?
4. Let me create a hypothetical situation for you: I know you decided to [move/rebuild] after the storm, but what do you think would have happened if you decided to [move/rebuild]?
5. Let me have you step back and think about housing recovery in the community of [Sea Bright/Oakwood Beach]. What could be done to speed up recovery for homeowners?
    a. What about for renters?
6. If you were me, who would you interview next?
7. Thank you for your time and assistance. Were there any questions I didn't ask that maybe I should have?

I want to repeat how much I really appreciate your time. Your perspective on the issue was very enlightening, and I have learned so much from you.

Appendix A. 9. Quantitative Analysis

The survey data was analyzed using SPSS. For each question, exploratory statistics were developed and then a bivariate analysis of related data was completed.

The first goal of the analysis with this dataset was to understand what relationships are significant and which are not. Due to the nature of the variables tested, the chi-square inferential statistical test (x2) was used to test the null hypothesis, which posits that there is no statistical relationship between two variables (Miethe and Gauthier 2008:188). Since the dataset primarily contains nominal and ordinal independent variables, three nominal dependent variables, and two ordinal dependent variables, chi-square offers a way to check for significant relationships across these variable types. The null hypothesis is true if the observed cell frequencies are the same as the expected cell frequencies, and false if the observed cell frequencies are not equal to the expected cell frequencies. The chi-square test looks at this difference in observed-versus-expected and the degrees of freedom for a given table to see if the relationship between two variables is significant at a given alpha level (0.05 for this study). With these guidelines, using the chi-square value and rejecting the null hypothesis indicates that there is a 95% probability (based on the alpha level) that the association between two variables is not due to chance. To put it another way, there is only a 5% chance that we incorrectly rejected the null hypothesis suggesting that there is no association between the variables.

The second goal of this portion of the research is to understand the strength of identified relationships. Phi is a measure of association based on chi-square used for nominal-nominal, nominal-ordinal, or ordinal-nominal data that have exactly two possible values. This test considers the strength of the relationship between the variables in question on a scale of 0.00 (no association) to 1.00 (complete association) by dividing the chi-square score by the number of respondents (n) and taking the square root of that number, thus eliminating the effect of sample size, which can inflate the value of chi-square. For tables larger than 2x2, Cramer's V Coefficient (V) was used instead of Phi, but is interpreted in the same way. The directionality is understood by examining the crosstabs output table. For the purposes of this study, Phi and Cramer's V Coefficient were interpreted as follows:

< |0.10| is a negligible association,
|0.10| and under |0.20| is a weak association,
|0.20| and under |0.40| is a moderate association,
|0.40| and under |0.60| is a relatively strong association,
|0.60| and under |0.80| is a strong association, and

|0.80| and under |1.00| is a very strong association.

The last goal is to understand how much knowing the value of one independent variable improves accuracy when predicting the value of the dependent variable. Goodman and Kruskal's tau provides a proportional reduction in error (PRE) score between nominal-nominal, nominal-ordinal, or ordinal-nominal variables. Tau calculates the percent of relative improvement in predicting the value of the dependent variable by knowing the value of the independent variable over simply guessing. The value of tau ranges between 0.00 (no additional predictive power) to 1.00 (perfect predictive power). For example, a tau value of 0.018 indicates that knowing the value of the independent variable increases the chances of correctly guessing the value of the dependent variable by 1.8%, versus pure guessing.

For ordinal-ordinal comparisons, Goodman and Kruskal's gamma is a PRE measure that ranges from 0.00 (no association) to ±1.00 (complete association). A positive relationship suggests that as the rank of independent variable increases or decreases, so does the rank of the dependent variable. A negative relationship, for example, suggests that as the rank of the independent variable either increases or decreases, the rank of the dependent variable trends in the opposite direction. While the gamma value is interpreted in much the same way as tau it is interpreted, gamma tends to produce larger values than tau. The values are larger because, instead of predicting a point value, gamma suggests that data trends together. Gamma can predict that, for example, higher values in one variable are related to higher values in another variable (concordant) or that higher values in one variable are related to lower values in another variable (discordant). A gamma value of .252, for example, suggests that knowing the value of the independent variable increases the odds of predicting the rank (not value, since this is ordinal data) of dependent variable by 25.2%, versus pure guessing, and that the two variables are a concordant pair. As the value of gamma approaches 0, the odds of incorrectly predicting the rank of the dependent variable increases.

Appendix B. Survey Responses

B.1 Demographics

B.1.1 Age

Survey Question	Oakwood		Sea Bright		All	
	n	%	n	%	n	%
Average Age						
Mean	54		60		59	
Age categorized						
23-38	6	11.1	18	5.9	24	6.7
39-54	21	38.9	80	26.4	101	28.3
55-70	24	44.4	127	41.9	151	42.3
71-86	3	5.6	56	18.5	59	16.5
87-102	-	-	10	3.3	10	2.8
Total	54	100	291	96.0	345	96.6
Missing	-	-	12	4	12	3.4
Seniors in your home over 64?						
No	34	63	166	54.8	200	56.0
Yes	19	35.2	126	41.6	145	40.6
Total	53	98.1	292	96.4	345	96.6
Missing	1	1.9	11	3.6	12	3.4
Children in your home under 18?						
No	33	61.1	238	78.5	271	75.9
Yes	20	37	54	17.8	74	20.7
Total	53	98.1	292	96.4	345	96.6
Missing	1	1.9	11	3.6	12	3.4
Seniors in your home over 64 or children in your home under 18?						
No Dependents	18	33.3	122	40.3	140	39.2
At least 1 dependent	35	64.8	170	56.1	205	57.4
Total	53	98.1	292	96.4	345	96.6
Missing	1	1.9	11	3.6	12	3.4

B.1.2 Household Size

Survey Question	**Oakwood**		**Sea Bright**		**All**	
	n	%	n	%	n	%
Household size						
1	6	11.1	90	29.7	96	26.9
2	17	31.5	141	46.5	158	44.3
3	9	16.7	26	8.6	35	9.8
4	16	29.6	31	10.2	47	13.2
5	3	5.6	9	3.0	12	3.4
6	2	3.7	2	.7	4	1.1
7	-	-	2	.7	2	.6
8	-	-	1	.3	1	.3
9	1	1.9	-	-	1	.3
Missing			1	.3	1	.3

B.1.3 Household Size

Survey Question	**Oakwood**		**Sea Bright**		**All**	
	n	%	n	%	n	%
What was your total household income before taxes for the year 2011 (the year prior to Hurricane Sandy)?						
Less than $20,000	3	5.6	10	3.3	13	3.6
$20,000-$39,999	4	7.4	14	4.6	18	5.0
$40,000-$59,999	3	5.6	32	10.6	35	9.8
$60,000-$79,999	13	24.1	25	8.3	38	10.6
$80,000-$99,999	9	16.7	26	8.6	35	9.8
$100,000-$199,999	14	25.9	83	27.4	97	27.2
$200,000 and up	2	3.7	67	22.1	69	19.3
Total	48	88.9	257	84.8	305	85.4
Missing	6	11.1	46	15.2	52	14.6
What was your total household income before taxes for the year 2013 (the year after Hurricane Sandy)?						
Less than $20,000	2	3.7	13	4.3	15	4.2
$20,000-$39,999	5	9.3	20	6.6	25	7.0
$40,000-$59,999	2	3.7	31	10.2	33	9.2
$60,000-$79,999	13	24.1	23	7.6	36	10.1
$80,000-$99,999	10	18.5	36	11.9	46	12.9
$100,000-$199,999	13	24.1	64	21.1	77	21.6
$200,000 and up	3	5.6	70	23.1	73	20.4
Total	48	88.9	257	84.8	305	85.4
Missing	6	11.1	46	15.2	52	14.6
Change in income from pre- to post-Sandy.						
Decrease	13	16.7	34	11.2	47	10.6
No Change	35	64.8	210	69.3	245	68.6
Increase	-	-	13	4.3	13	6.2
Total	48	88.9	257	84.8	305	85.4
Missing	6	11.1	46	15.2	52	14.6
What was your total household income before taxes for the year 2011 (the year prior to Hurricane Sandy)?[recoded]						
Less than $100K	32	59.3	107	35.3	139	38.9
$100K or more	16	29.6	150	49.5	166	46.5
Total	48	88.9	257	84.8	305	85.4
Missing	6	11.1	46	15.2	52	14.6

Survey Question	**Oakwood**		**Sea Bright**		**All**	
	n	%	n	%	n	%
What was your total household income before taxes for the year 2013 (the year after Hurricane Sandy)?[recoded]						
Less than $100K	32	59.3	123	40.6	155	43.4
$100K or more	16	29.6	134	44.2	150	42.0
Total	48	88.9	257	84.8	305	85.4
Missing	6	11.1	46	15.2	52	14.6
What was your total household income before taxes for the year 2011 (the year prior to Hurricane Sandy)?[recoded]						
Below or at Median HH Income	23	42.6	81	26.7	104	29.1
Above Median HH Income	25	46.3	176	58.1	201	56.3
Total	48	88.9	257	84.8	305	85.4
Missing	6	11.1	46	15.2	52	14.6
What was your total household income before taxes for the year 2013 (the year after Hurricane Sandy)?[recoded]						
Below or at Median HH Income	22	40.7	87	28.7	109	30.5
Above Median HH Income	26	48.1	170	56.1	196	54.9
Total	48	88.9	257	84.8	305	85.4
Missing	6	11.1	46	15.2	52	14.6

B.1.4 Gender and Race of Respondents

Survey Question	Oakwood		Sea Bright		All	
	n	%	n	%	n	%
What is your sex?						
Female	32	59.3	139	45.9	171	47.9
Male	22	40.7	156	51.5	178	49.9
Total	54	100	295	97.4	349	97.8
Missing	-	-	8	2.6	8	2.2
What is your race?						
White	50	92.6	281	92.7	331	92.7
Black or African American	-	-	1	.3	1	.3
Asian	3	5.6	7	2.3	10	2.8
Other (please specify)	1	1.9	5	1.7	6	1.7
Total	54	100	294	97.0	348	97.5
Missing	-	-	9	3.0	9	2.5
What is your race? [recoded]						
Not White	4	7.4	13	4.3	17	4.8
White	50	92.6	281	92.7	331	92.7
Total	54	100	294	97.0	357	97.5
Missing	-	-	9	3.0	9	2.5

B.1.5 Education

Survey Question	**Oakwood**		**Sea Bright**		**All**	
	n	%	n	%	n	%
What is the highest degree or level of school you completed? If currently enrolled, mark the previous grade or highest degree received.						
9th grade through 11th (no diploma)	4	7.4	2	.7	6	1.7
High school diploma or GED	12	22.2	25	8.3	37	10.4
Technical School	5	9.3	8	2.6	13	3.6
Some College or Associate's Degree (AA)	8	14.8	52	17.2	60	16.8
Bachelor's Degree (BS, BA, etc.)	12	22.2	102	33.7	114	31.9
Master's Degree (MS, MA, etc.)	9	16.7	66	21.8	75	21.0
Professional Degree (MD, JD, etc.)	2	3.7	26	8.6	28	7.8
Doctoral Degree (PhD)	1	1.9	13	4.3	14	3.9
Total	53	98.1	294	97.0	347	97.2
Missing	1	1.9	9	3.0	10	2.8
What is the highest degree or level of school you completed? If currently enrolled, mark the previous grade or highest degree received. [recoded]						
Less than a bachelor's degree	29	53.7	87	11.6	108	30.2
Bachelors or higher	24	44.4	207	85.4	239	67.0
Total	53	98.1	294	97.0	347	97.2
Missing	1	1.9	22	3.0	10	2.8
What is the highest degree or level of school you completed? If currently enrolled, mark the previous grade or highest degree received. [recoded]						
Less than some college	21	38.9	35	11.6	56	15.7
Some college or bachelors	20	37	154	50.8	174	48.7
More than bachelors	12	22.2	145	34.7	117	32.8
Total	53	98.1	294	97.0	347	97.2
Missing	1	1.9	9	3.0	10	2.8

B.2 Community Profile Based on Residences

Table 12 Community Profile Based on Respondents

Survey Question	Oakwood		Sea Bright		All	
	n	%	n	%	n	%
Do you own or rent the property addressed on the envelope of this survey?						
Rent	4	7.4	30	9.9	34	9.5
Own	49	90.7	273	90.1	322	90.2
Total	53	98.1	303	100.0	356	99.7
Missing	1	1.9	-	-	1	.3
Which of the following describes how you use this property? Mark all that apply.						
Primary Residence	49	90.7	155	51.2	204	57.1
Second Home	-	-	88	29.0	88	24.6
Rental Property	-	-	27	8.9	27	7.6
Other	-	-	4	1.3	4	1.1
Prefer not to answer	1	1.9	2	.7	3	.8
Total	50	92.6	276	91.1	326	91.3
Missing	4	7.4	27	8.9	31	8.7
How long has this residence been owned by your family? Please answer in years.						
Median (years)	13		12		12	
What type of home is this?						
Single-family home	46	85.2	107	35.3	153	42.9
Multi-family home	2	3.7	12	4.0	14	3.9
Apartment	-	-	9	3.0	9	2.5
Condo/Townhouse	4	7.4	171	56.4	175	49.0
Other	2	3.7	4	1.3	6	1.7
Total	54	100	303	100.0	357	100.0
Missing	-	-	-	-	-	-
When did you move into or take ownership of this house, apartment, or mobile home? Please provide the calendar year (for example, 2001).						
Median (year)	2001		2002		2002	
In total, how many years have you lived in [Oakwood Beach/Sea Bright]?						
Median (years)	13		13		13	

B.3 Place Identity and Attachment to Place

Table 13 Respondents' Sense of Place

Survey Question	Oakwood		Sea Bright		All	
	n	%	n	%	n	%
I feel [Oakwood Beach/Sea Bright] is a part of me.						
Agree	31	57.4	230	75.9	261	73.1
Neutral	17	31.5	48	15.8	65	18.2
Disagree	6	11.1	15	5.0	21	5.9
Total	54	100	293	96.7	347	97.2
Missing	-	-	10	3.3	10	2.8
Being in [Oakwood Beach/Sea Bright] says a lot about who I am.						
Agree	28	51.9	179	59.1	207	58.0
Neutral	17	31.5	82	27.1	99	27.7
Disagree	8	14.8	33	10.9	41	11.5
Total	53	98.1	294	97.0	347	97.2
Missing	1	1.9	9	3.0	10	2.8
I am very attached to [Oakwood Beach/Sea Bright].						
Agree	26	48.1	220	72.6	246	68.9
Neutral	19	35.2	57	18.8	76	21.3
Disagree	8	14.8	16	5.3	24	6.7
Total	53	98.1	293	96.7	346	96.9
Missing	1	1.9	10	3.3	11	3.1
No other place can compare to [Oakwood Beach/Sea Bright].						
Agree	15	27.8	147	48.5	162	45.4
Neutral	18	33.3	88	29.0	106	29.7
Disagree	20	37	60	19.8	80	22.4
Total	53	98.1	295	97.4	348	97.5
Missing	1	1.9	8	2.6	9	2.5
[Oakwood Beach/Sea Bright] is the best place for what I like to do.						
Agree	20	37	198	65.3	218	61.1
Neutral	19	35.2	76	25.1	95	26.6
Disagree	14	25.9	22	7.3	36	10.1
Total	53	98.1	296	97.7	349	97.8
Missing	1	1.9	7	2.3	8	2.2

Table 13. Continued

Survey Question	Oakwood		Sea Bright		All	
	n	*%*	*n*	*%*	n	%
The things I do at [Oakwood Beach/Sea Bright] I would enjoy doing just as much at some similar community.						
Agree	8	14.8	91	30.0	99	27.7
Neutral	16	29.6	88	29.0	104	29.1
Disagree	29	53.7	116	38.3	145	40.6
Total	53	98.1	295	97.4	348	97.5
Missing	1	1.9	8	2.6	9	2.5
Attachment indexed (Greer 2015).						
Agree	23	42.6	184	60.7	207	58.0
Neutral	18	33.3	83	27.4	101	28.3
Disagree	12	22.2	25	8.3	37	10.4
Total	53	98.1	292	96.4	345	96.6
Missing	1	1.9	11	3.6	12	3.4

B.4. Damage and Insurance Coverage

Table 14 Responses to Questions Related to Damage and Insurance Coverage

Survey Question	Oakwood		Sea Bright		All	
	n	*%*	*n*	***%***	*n*	*%*
How much damage did your home sustain related to Hurricane Sandy? Please estimate in dollars.						
Mean	$66,744.38		$92,639.53		$88,809.38	
Did you have flood insurance at the time that Hurricane Sandy occurred?						
No	13	24.1	74	24.4	87	24.4
Yes	41	75.9	218	71.9	259	72.5
Total	54	100	292	96.4	346	96.9
Missing	-	-	11	3.6	11	3.1
What amount of this damage did flood insurance cover?						
Mean	$35,507.76		$52,742.00		$49,967.00	
*How extensive was the damage **to your home** due to Hurricane Sandy?*						
No Damage	3	5.6	20	6.6	23	6.4
Not Very Extensive	7	13	73	24.1	80	22.4
Somewhat Extensive	22	40.7	113	37.3	135	37.8
Very Extensive	22	40.7	93	30.7	115	32.2
Total	54	100	299	98.7	353	98.9
Missing	-	-	4	1.3	4	1.1
*How extensive was the damage **to** [Oakwood Beach/Sea Bright] due to Hurricane Sandy?*						
No Damage	3	5.6	-	-	3	.8
Not Very Extensive	2	3.7	3	1.0	5	1.4
Somewhat Extensive	3	5.6	10	3.3	13	3.6
Very Extensive	45	83.3	276	91.1	321	89.9
Total	53	98.1	289	95.4	342	95.8
Missing	1	1.9	14	4.6	15	4.2

B.5. Travel Disruption

Table 15 Respondents' Experience with Travel Disruption

Survey Question	Oakwood		Sea Bright		All	
	n	*%*	*n*	*%*	*n*	*%*
At any time did the disruption from Hurricane Sandy affect your ability to travel within [Oakwood Beach/Sea Bright] for everyday activities (go to work, church, the post office, the grocery store, etc.)?						
No	12	22.2	30	9.9	42	11.8
Yes	41	75.9	260	85.8	301	84.3
Total	53	98.1	290	95.7	343	96.1
Missing	1	1.9	13	4.3	14	3.9
How long did the disruption from Hurricane Sandy affect your ability to travel within [Oakwood Beach/Sea Bright] for everyday activities (go to work, church, the post office, the grocery store, etc.)?						
Less than a week	6	11.1	2	0.7	8	2.2
Two to four weeks	21	38.9	97	32.0	118	33.1
Two to six months	11	20.4	105	34.7	116	32.5
Seven to twelve months	2	3.7	31	10.2	33	9.2
More than a year	1	1.9	20	6.6	21	5.9
Total	41	75.9	255	84.2	296	82.9
Skipped	12	22.2	30	9.9	42	11.8
Missing	1	1.9	18	5.9	19	5.3
Did the disruption from Hurricane Sandy affect your ability to travel outside [Oakwood Beach/Sea Bright] at any time?						
No	22	40.7	162	53.5	184	51.5
Yes	32	59.3	126	41.6	158	44.3
Total	54	100	288	95.0	342	95.8
Missing	-	-	15	5.0	15	4.2
How long did the disruption from Hurricane Sandy inhibit your ability to travel outside [Oakwood Beach/Sea Bright]?						
Less than a week	4	7.4	25	8.3	29	8.1
Two to four weeks	18	33.3	44	14.5	62	17.4
Two to six months	9	16.7	40	13.2	49	13.7
Seven to twelve months	1	1.9	15	5.0	16	4.5
More than a year	-	-	4	1.3	4	1.1
Total	32	59.3	128	42.2	160	44.8
Skipped	22	40.7	162	53.5	184	51.5
Missing	-	-	13	4.3	13	3.7

B.6. Residential Status

Table 16 Respondents' Residential Status

Survey Question	Oakwood		Sea Bright		All	
	n	*%*	*n*	*%*	*n*	*%*
Do you still live in the same community as you did at the time of Hurricane Sandy?						
No	22	40.7	32	10.6	54	15.1
Yes	31	57.4	262	86.5	293	82.1
Total	53	98.1	294	97.0	347	97.2
Missing	1	1.9	9	3.0	10	2.8
Do you still live at the same address as you did at the time of Hurricane Sandy?						
No	23	42.6	43	14.2	66	18.5
Yes	31	57.4	250	82.5	281	78.7
Total	54	100	293	96.7	347	97.2
Missing	-	-	10	3.3	10	2.8
How long do you plan to live at your current residence?						
Less than one year	11	20.4	27	8.9	38	10.6
One to five years	15	27.8	95	31.4	110	30.8
More than five years	26	48.1	164	54.1	190	53.2
Total	52	96.3	286	94.4	338	94.7
Missing	2	3.7	17	5.6	19	5.3
CommittedR [index variable – Committed=same community, plan to live at same address for greater than five years.]						
No	39	72.2	126	41.6	165	46.2
Yes	12	22.2	156	51.5	168	47.1
Total	51	94.4	282	93.1	333	93.3
Missing	3	5.6	21	6.9	24	6.7
Investment [index variable]						
New community	21	38.9	28	9.2	49	13.7
Same community, less than 1 year	9	16.7	15	5.0	24	6.7
Same community, 1-5 years	9	16.7	83	27.4	92	25.8
Same community, more than 5 years	12	22.2	156	51.5	168	47.1
Total	51	94.4	282	93.1	333	93.3
Missing	3	5.6	21	6.9	24	6.7

B.7. Buyout Decisions

Table 17 Responses to Questions Related to Buyouts in Oakwood

Survey Question	Oakwood	
	n	*%*
Buyout decision and reasoning *Were you offered money for your home (a buyout)?*		
No	20	37
Yes	34	63
Total	54	100
Missing	-	-
Did you accept the [buyout] offer?		
No	5	9.3
Yes	29	53.7
Total	34	63
Skipped	20	37
Missing	-	-

Table 18 Responses Related to Factors Influencing Buyout Decisions

Survey Question	Oakwood		Sea Bright		All	
a	*n*	*%*	*n*	*%*	*n*	*%*
Variables affecting decision [how important was each element when making your decision about where to live after Hurricane Sandy] *The likelihood of a hurricane*						
Not Important At All	4	7.4	53	17.5	57	16.0
Not Very Important	5	9.3	66	21.8	71	19.9
Somewhat Important	8	14.8	115	38.0	123	34.5
Very Important	32	59.3	43	14.2	75	21.0
Total	49	90.7	277	91.4	326	91.3
Missing	5	9.3	26	8.6	31	8.7

Table 18. Continued

Concerns over sea level rise						
Not Important At All	3	5.6	49	16.2	52	14.6
Not Very Important	3	5.6	58	19.1	61	17.1
Somewhat Important	9	16.7	106	35	115	32.2
Very Important	35	64.8	65	21.5	100	28
Total	50	92.6	278	91.7	328	91.9
Missing	4	7.4	25	8.3	29	8.1
Being close to family						
Not Important At All	5	9.3	54	17.8	59	16.5
Not Very Important	9	16.7	38	12.5	47	13.2
Somewhat Important	11	20.4	82	27.1	93	26.1
Very Important	25	46.3	101	33.3	126	35.3
Total	50	92.6	275	90.8	325	91.0
Missing	4	7.4	28	9.2	32	9.0
Being close to friends						
Not Important At All	7	13	42	13.9	49	13.7
Not Very Important	11	20.4	52	17.2	63	17.6
Somewhat Important	15	27.8	99	32.7	114	31.9
Very Important	18	33.3	82	27.1	100	28.0
Total	51	94.4	275	90.8	326	91.3
Missing	3	5.6	28	9.2	31	8.7
Being close to employment opportunities						
Not Important At All	4	7.4	94	31	98	27.5
Not Very Important	7	13	42	13.9	49	13.7
Somewhat Important	15	27.8	72	23.8	87	24.4
Very Important	23	42.6	65	21.5	88	24.6
Total	49	90.7	273	90.1	322	90.2
Missing	5	9.3	30	9.9	35	9.8

Table 18. Continued

Being close to the beach						
Not Important At All	25	46.3	18	5.9	42	12
Not Very Important	14	25.9	20	6.6	34	9.5
Somewhat Important	6	11.1	90	29.7	96	26.9
Very Important	6	11.1	149	49.2	155	43.4
Total	51	94.4	277	91.4	328	91.9
Missing	3	5.6	26	8.6	29	8.1
Access to affordable housing						
Not Important At All	13	24.1	102	33.7	115	32.2
Not Very Important	4	7.4	59	19.5	63	17.6
Somewhat Important	13	24.1	64	21.1	77	21.6
Very Important	21	38.9	48	15.8	69	19.3
Total	51	94.4	273	90.1	324	90.8
Missing	3	5.6	30	9.9	33	9.2
Family history in the area						
Not Important At All	20	37	104	32,2	124	34.7
Not Very Important	12	22.2	57	18.8	69	19.3
Somewhat Important	8	14.8	64	21.1	72	20.2
Very Important	11	20.4	49	16.2	60	16.8
Total	51	94.4	274	90.4	325	91.0
Missing	3	5.6	29	9.6	32	9.0
Opinions of neighbors						
Not Important At All	15	27.8	115	38	130	36.4
Not Very Important	13	24.1	81	26.7	94	26.3
Somewhat Important	14	25.9	56	18.5	70	19.6
Very Important	9	16.7	21	6.9	30	8.4
Total	51	94.4	273	90.1	324	90.8
Missing	3	5.6	30	9.9	33	9.2

Table 18. Continued

Concerns about going into debt						
Not Important At All	5	9.3	73	24.1	78	21.8
Not Very Important	4	7.4	59	19.5	63	17.6
Somewhat Important	17	31.5	75	24.8	92	25.8
Very Important	24	44.4	69	22.8	93	26.1
Total	50	92.6	276	91.1	326	91.3
Missing	4	7.4	27	8.9	31	8.7
Changes in where homes can be built						
Not Important At All	8	14.8	98	32.3	106	29.7
Not Very Important	11	20.4	70	23.1	81	22.7
Somewhat Important	11	20.4	67	22.1	78	21.8
Very Important	20	37	38	12.5	58	16.2
Total	50	92.6	273	90.1	323	90.5
Missing	4	7.4	30	9.9	34	9.5
Changes in insurance rates						
Not Important At All	2	3.7	51	16.8	53	14.8
Not Very Important	5	9.3	43	14.2	48	13.4
Somewhat Important	13	24.1	87	28.7	100	28.0
Very Important	30	55.6	94	31.0	124	34.7
Total	50	92.6	275	90.8	325	91.0
Missing	4	7.4	28	9.2	32	9.0
Changes to the building code						
Not Important At All	2	3.7	63	20.8	65	18.2
Not Very Important	11	20.4	53	17.5	64	17.9
Somewhat Important	11	20.4	87	28.7	98	27.5
Very Important	26	48.1	69	22.8	95	26.6
Total	50	92.6	272	89.8	322	90.2
Missing	4	7.4	31	10.2	35	9.8

Table 18. Continued

Ability to travel easily within [Oakwood Beach/Sea Bright]						
Not Important At All	18	33.3	43	14.2	61	17.1
Not Very Important	12	22.2	44	14.5	56	15.7
Somewhat Important	9	16.7	114	37.6	123	34.5
Very Important	12	22.2	74	24.4	86	24.1
Total	51	94.4	275	90.8	326	91.3
Missing	3	5.6	28	9.2	31	8.7
Ability to travel easily outside of [Oakwood Beach/Sea Bright]						
Not Important At All	12	22.2	49	16.2	61	17.1
Not Very Important	13	24.1	46	15.2	59	16.5
Somewhat Important	13	24.1	95	31.4	108	30.3
Very Important	12	22.2	84	27.7	96	26.9
Total	50	92.6	274	90.4	324	90.8
Missing	4	7.4	29	9.6	33	9.2
Financial incentives to rebuild your home in the same community from the government (aid programs)						
Not Important At All	22	40.7	106	35.0	128	35.9
Not Very Important	8	14.8	38	12.5	46	12.9
Somewhat Important	6	11.1	64	21.1	70	19.6
Very Important	14	25.9	63	20.8	77	21.6
Total	50	92.6	271	89.4	321	89.9
Missing	4	7.4	32	10.6	36	10.1

Table 18. Continued

Financial incentives to build your home in a new location from the government (aid programs)						
Not Important At All	19	35.2	152	50.2	171	47.9
Not Very Important	6	11.1	52	17.2	58	16.2
Somewhat Important	7	13	38	12.5	45	12.6
Very Important	19	35.2	27	8.9	46	12.9
Total	51	94.4	269	88.8	320	89.6
Missing	3	5.6	34	11.2	37	10.4
Help from other organizations (such as a local church or civic group)						
Not Important At All	13	24.1	131	43.2	144	40.3
Not Very Important	7	13	68	22.4	75	21.0
Somewhat Important	11	20.4	43	14.2	54	15.1
Very Important	19	35.2	28	9.2	47	13.2
Total	50	92.6	270	89.1	320	89.6
Missing	4	7.4	33	10.9	37	10.4
Trustworthiness of organizations running the buyout program						
Not Important At All	8	14.8	-	-	-	-
Not Very Important	2	3.7	-	-	-	-
Somewhat Important	7	13	-	-	-	-
Very Important	32	59.3	-	-	-	-
Total	49	90.7	-	-	-	-
Missing	5	9.3	-	-	-	-
Trustworthiness of community leaders						
Not Important At All	8	14.8	40	13.2	48	13.4
Not Very Important	5	9.3	31	10.2	36	10.1
Somewhat Important	8	14.8	85	28.1	93	26.1
Very Important	29	53.7	115	38.0	144	40.3
Total	50	92.6	271	89.4	321	89.9
Missing	4	7.4	32	10.6	36	10.1

B.8. Risk Perception

Table 19 Respondents' Perception of Risk of Recurrence

Survey Question	Oakwood Beach		Sea Bright		All	
	n	%	n	%	n	%
Risk perception – risk of recurrence (the chances of a future event like Hurricane Sandy affecting [Oakwood Beach/Sea Bright]) [recoded] *An event of similar magnitude to Hurricane Sandy is likely to affect [Oakwood Beach/Sea Bright] in the next five years.*						
Agree	29	53.7	78	25.7	107	30.0
Neutral	11	20.4	128	42.2	139	38.9
Disagree	11	20.4	85	28.1	96	26.9
Total	51	94.4	291	96.0	342	95.8
Missing	3	5.6	12	4.0	15	4.2
An event of similar magnitude to Hurricane Sandy is likely to affect [Oakwood Beach/Sea Bright] in the next 10 years.						
Agree	26	48.1	115	38.0	141	39.5
Neutral	6	11.1	89	29.4	95	26.6
Disagree	18	33.3	86	28.4	104	29.1
Total	50	92.6	290	95.7	340	95.2
Missing	4	7.4	13	4.3	17	4.8
An event of similar magnitude to Hurricane Sandy is likely to affect [Oakwood Beach/Sea Bright] in the next 20 years.						
Agree	34	63	163	53.8	197	55.2
Neutral	4	7.4	42	13.9	46	12.9
Disagree	12	22.2	80	26.4	92	25.8
Total	50	92.6	285	94.1	335	93.8
Missing	4	7.4	18	5.9	22	6.2
An event of similar magnitude to Hurricane Sandy is never likely to affect [Oakwood Beach/Sea Bright] again.						
Agree	34	63	197	65.0	231	64.7
Neutral	5	9.3	27	8.9	32	9.0
Disagree	11	20.4	67	22.1	78	21.8
Total	50	92.6	291	96.0	341	95.5
Missing	4	7.4	12	4.0	16	4.5
Risk of recurrence indexed						
Agree	29	53.7	120	39.6	149	41.7
Neutral	10	18.5	106	35.0	116	32.5
Disagree	11	20.4	59	19.5	70	19.6
Total	50	92.6	285	94.1	335	93.8
Missing	4	7.4	18	5.9	22	6.2

Table 20 Respondents' Perception of Potential Impacts

Survey Question	Oakwood Beach		Sea Bright		All	
	n	%	n	%	n	%
Risk perception – potential impacts (of an event [like Hurricane Sandy] within the next 10 years) [recoded] *Likelihood of major damage to your home.*						
Likely	42	77.8	211	69.6	253	70.9
Not Likely	9	16.7	82	27.1	91	25.5
Total	51	94.4	293	96.7	344	96.4
Missing	3	5.6	10	3.3	13	3.6
Likelihood of injury to you or members of your household.						
Likely	31	57.4	40	13.2	71	19.9
Not Likely	20	37	253	83.5	273	76.5
Total	51	94.4	293	96.7	344	96.4
Missing	3	5.6	10	3.3	13	3.6
Likelihood of health problems to you or members of your household.						
Likely	35	64.8	55	18.2	90	25.2
Not Likely	16	29.6	238	78.5	254	71.1
Total	51	94.4	293	96.7	344	96.4
Missing	3	5.6	10	3.3	13	3.6
Impacts indexed.						
Likely	35	64.8	58	19.1	93	26.1
Not Likely	16	29.6	235	77.6	251	70.3
Total	51	94.4	293	96.7	344	96.4
Missing	3	5.6	10	3.3	13	3.6